The 11th EAFES International Congress

Ecology for a Nature-Positive Future in East Asia

July 19 (Sat) - 22 (Tue), 2025

The University of Tokyo, Yayoi Campus
(Graduate School of Agricultural and Life Sciences)

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July 19 (Sat)

Room	9:00	10:00	12:00	15:00	15:45	17:00	18:00
Room A				Opening ceremony	Plenary 1/2 Q&A		
Excursion		A. Inokashira Park Zoo Course					
Banquet						17:30 Banquet	19:30

July 20 (Sun)

Room	9:00	9:45	10:00	12:00	13:30	15:30	15:45	17:45	18:00	19:30
Room A	Plenary 3 Q&A		S01 (D)		S05 (P)		S09 (A)			
Room B			S02 (M)		S06 (F)		S10 (L)			
Room C			S03 (B)		S07 (O)		S11 (S)			
Room D			S04 (E)		S08 (Q)		S12 (H)			
Poster				Poster viewing 【P001～P106】					Poster core time 【P001～P106】	

July 21 (Mon)

Room	9:00	9:45	10:00	12:00	13:30	15:30	17:30	18:00
Room A	Plenary 4 Q&A		S13 (I)		S18 (C)		Closing ceremony	
Room B			S14 (G)		S19 (T)			
Room C			S15 (N)		S20 (R)			
Room D			S16 (J)		S21 (K)			
Room E			S17 (U)					
Poster				Poster viewing 【P107～P213】		15:45 Poster core time 【P107～P213】	17:15	

July 22 (Tue)

Room	8:45	10:00	12:00	14:00	16:00	17:30
Excursion	B. The University of Tokyo Chiba Forest (UTCBF) Course					

Plenary Lectures 1
July 19 (Sat) 15:45-17:00 : Room A

A call for a greater focus on intraspecific variation to integrate biodiversity, ecosystem functioning, evolutionary dynamics, and geodiversity

Shunsuke UTSUMI
Professor, Hokkaido University, Japan
ESJ

There is a great concern regarding biodiversity loss. The rapid decline of intraspecific variation, encompassing genomic and phenotypic diversity within and among populations, represents a hidden biodiversity crisis. Biodiversity assessments often overlook this critical loss within species. While biodiversity exists at multiple levels in the biological organization, most assessments focus primarily on species diversity and phylogenetic diversity among species. As a result, the significance of intraspecific diversity is frequently ignored.

Intraspecific diversity plays a fundamental role in shaping community structure and ecosystem function. Previous studies across various taxonomic groups have demonstrated that differences in genotypes can significantly influence population growth rate, community diversity, and ecosystem processes. Moreover, ecological effects of interspecific and intraspecific diversity are often comparable in magnitude, and both diversities can interactively influence ecosystem functioning outcomes.

Intraspecific variation is also a crucial source of evolutionary responses to environmental changes. Anthropogenic environmental changes, such as urbanization, trigger rapid evolution in many organisms. However, if intraspecific variation is lost, species may lose their ability to adapt to these changes. Understanding how intraspecific variation supports adaptive evolution and monitoring its spatio-temporal dynamics within and among species are urgent research priorities. Importantly, interspecific and intraspecific diversity are interconnected. Changes in species diversity and composition can impose different natural selection, altering genetic variation within species. These evolutionary shifts, in turn, influence species diversity and composition, forming a process known as eco-evolutionary feedback. While eco-evolutionary feedback can contribute to the maintenance of biodiversity at both interspecific and intraspecific levels, its role remains poorly understood in natural populations and communities.

Finally, geodiversity—the comprehensive abiotic heterogeneity of Earth's surface and subsurface—is gaining recognition for its influence on biodiversity and community assembly. It is well established that abiotic environments shape biodiversity and vice versa. However, the detailed relationship between geodiversity and biodiversity, in particular intraspecific diversity, remains largely unexplored. Thus, we need to newly bridge the gaps among multiple biological levels from gene to ecosystem.

In this talk, I will discuss a demand of much greater focus on intraspecific variation towards integrating biodiversity, ecosystem functioning, evolutionary dynamics, and geodiversity, even though we have already recognized the importance of intraspecific variation. Recent advances of methodology can provide tools and dataset for the new integration. We should reflourish studies on intraspecific variation in multiple fields in ecology and evolution, and in both basic and applied sides.

Plenary Lectures 2
July 19 (Sat) 15:45-17:00 : Room A

ESG, TNFD and Biodiversity Conservation

Do-Soon CHO
Professor Emeritus, Catholic University of Korea
Ex-President, National Institute of Ecology, Korea
ESK

In the 21st century, the most serious global environmental crises are global climate change and loss of biodiversity, and CBD and UNFCCC were launched at the Rio Earth Summit in 1992 to deal with these challenges. However, these two issues cannot be solved without the participation of private sectors since private corporations are significant contributors of carbon emissions and conversion and destruction of natural habitats. Fortunately, ESG (Environmental, Social and Governance) framework has emerged as a critical driver for integrating these environmental challenges into corporate and financial decision-making. ESG focuses on non-financial factors that can impact a company's long-term performance and sustainability. In the environmental pillar of ESG, climate change is currently the hottest issue, but biodiversity loss is expected to become comparable to climate change in its importance. Many international organizations and reporting initiatives have prepared disclosure standards, and EU, USA, and other countries will enforce these guidelines into regulations. However, ESG has some shortcomings in biodiversity conservation such as lack of clear standardized metrics for biodiversity, weak representation within environmental field and possibility of greenwashing, and this is part of the background for the establishment of TNFD. TNFD (Taskforce on Nature-related Financial Disclosures), launched in 2021, is a global initiative that builds on the success of TCFD (focused on climate) but applies its principles to nature-related risks. TNFD provides companies with a comprehensive framework to assess and disclose their dependencies, impacts, risks, and opportunities related to nature. Its core methodology, the LEAP (Locate, Evaluate, Assess, Prepare) approach, helps organizations systematically analyze how their activities interact with ecosystems and biodiversity. It aims to redirect financial flows toward nature-positive outcomes, thereby contributing significantly to biodiversity conservation. Its final recommendation was announced in September 2023, and it aligns with global policy goals such as the Kunming-Montreal GBF (Global Biodiversity Framework). Kunming-Montreal GBF target 15 is related with ESG, asking businesses to assess, disclose and reduce biodiversity-related risks and negative impacts. In 2023, Korean Government established NBSAP for 2024-2028 based on the Kunming-Montreal GBF, setting up 21 targets, one of which is ESG management (disclosure) on biodiversity. ESG and TNFD together with Kunming-Montreal GBF will serve as a pivotal tool in integrating biodiversity considerations into financial and business practices. Difficulties and current trends related with ESG and TNFD will be discussed.

Plenary Lectures 3
July 20 (Sun) 9:00-9:45 : Room A

Spatial conservation planning toward integrated solutions for biodiversity conservation and other environmental and social issues

Fumiko ISHIHAMA
Chief Senior Researcher, National Institute for Environmental Studies, Japan
ESJ

Spatial conservation planning is becoming increasingly important. in recent years. The "30 by 30" goal that aims to conserve 30% of the land and sea by 2030 is exactly on spatial planning. In addition to biodiversity conservation, there are multiple critical environmental issues that need to be addressed at the same time as conservation, such as climate change mitigation. Spatial planning is also essential to the simultaneous resolution of such environmental issues, for example, ensuring the appropriate siting of renewable energy installations considering conservation.
In addition, because of limited human and financial resources, it is essential to search for measures that enable integrated solutions of conservation and the other social issues using ecosystem services, such as disaster prevention and sustainable agriculture utilizing pollination service. Spatial planning also plays an important role for such purposes by efficiently allocating area of conservation and land uses depending on ecosystem services. I will introduce examples of integrated spatial planning analysis in Japan and discuss research efforts related to the "Nature Symbiosis Sites," which are the Japanese certification system of OECM (Other Effective Area-based Conservation Measures), which is attracting attention in achieving the 30by30 target.

Plenary Lectures 4
July 21 (Mon) 9:00-9:45 : Room A

Planetary homeostasis of reactive nitrogen

Yongguan ZHU
Director General, Research Center for Eco-Environmental Sciences, CAS, China
ESC

Nitrogen is an essential element for all lives. The increasing demand to feed growing world population requires ever increasing use of chemical nitrogen, which has dire consequences on both environmental quality and climate change, such as the emission of potent greenhouse gas-N_2O and high demand on energy for ammonia synthesis. On a global average, reactive nitrogen (Nr) in Earth's environment has crossed the safe operation space of the planetary boundaries, therefore maintaining the homeostasis of reactive nitrogen is key to planetary health and sustainability. This presentation will discuss major pathways that will contribute to the mitigation of environmental pollution with Nr. The first pathway is the anaerobic ammonium oxidation (anammox) process that can counteract the release of ammonium and N_2O in many oxygen-limited situations, facilitating the homeostasis of Nr in the Earth's ecosystem. In this talk we will discuss the characteristics of the anammox hotspots across various types of ecosystems, particularly at the oxic-anoxic transition zones worldwide. Based on the discovery of an anammox hotspot capable of oxidizing ammonium under anoxic conditions into N_2 without N_2O by-product, an innovative concept and technical route of nature-based anammox hotspot geoengineering has been developed and used in the real world. In this 'Earth's wrinkle zones' geoengineering project, anammox has been proven to be effective in ensuring clean drinking water, regulating the climate, fostering plant and animal diversity, and enhancing long-term environmental quality. The second pathway is to use microbial reduction of N_2O through the enzyme N_2O reductase (NosZ), which catalyzes the reduction of N_2O to N_2, thus mitigating the emission of greenhouse gas and reducing Nr pollution. It has been demonstrated that by using organic waste as a substrate and vector for N_2O-respiring bacteria selected for their capacity to thrive, thus will significantly strengthen NosZ activity in the environment to mitigate N_2O emission. The last route this talk will cover is the Nr retention and recovery from soil and waste stream, which is facilitated by both microbial and chemical processes, such as abiotic nitrate reduction to ammonium in paddy soils, and microbial protein production from high Nr-organic wastes.

Symposium Program

Symposium 01 July 20 (Sun) 10:00-12:00 Room A

Responses of forest ecosystems to geographical and temporal environmental changes in East Asia

Organizer Hiroyuki Muraoka (The University of Tokyo, ESJ)

Co-Organizer Tsutom Hiura (The University of Tokyo, ESJ)

Forest ecosystems cover approximately 30% of the terrestrial biosphere and play crucial roles in providing ecosystem services such as environmental regulation, biodiversity conservation, and natural resources. Ecological and biogeochemical mechanisms on the temporal dynamics of tree and forest growth, their consequences with carbon and nutrient cycles, and impacts on local and regional ecosystem services in a changing environment have been explored by numerous scientists in the last decades. These understandings are formulating our fundamental knowledge in basic ecology and development of Earth system science under climate change. However, we are facing urgent needs of further comprehensive understanding on the forest ecosystem dynamics and their responses to ongoing and future climate change for pursuing harmonization of nature and society. This symposium will share recent knowledge on tree growth, carbon cycle, and ecosystem functions in a changing environment in typical forest ecosystems in East Asia. We will learn achievements and emerging research questions from intensive studies applying broad-scale plot surveys, open-field manipulation experiments, and carbon cycle process research. Through the presentations and discussions, we aim to gain further insights on how these forest ecosystem studies contribute to biodiversity conservation and forest management in the era of climate and societal changes.

S01-1 **Unraveling the diversity-productivity link: Findings from long-term forest census records**

＊Tetsuo I. Kohyama (The University of Tokyo, ESJ), Tsutom Hiura (The University of Tokyo), Douglas Sheil (Wageningen University and Research), Takashi S. Kohyama (Hokkaido University)

S01-2 **Long-Term Forest Dynamics in a Typhoon-Prone Ecosystem: 20 Years of Research at Fushan FDP, Taiwan**

＊I-Fang Sun (National Dong Hwa University)

S01-3 **Responses of *Pinus densiflora* seedlings to open-field climate manipulation: a synthesis of fifteen years of experiments**

＊Yowhan Son (Korea University, ESK), Heejae Jo (Korea University)

S01-4 **Effects of long-term warming on plant-insect interactions in boreal forest**

＊Masahiro Nakamura (Hokkaido University, ESJ), Takafumi Hino (Hokkaido Research Organization), Chisato Terada (Hokkaido University), Hayato Iijima (Forestry and Forest Products Research Institute), Tatsuro Nakaji (Hokkaido University), Tsutom Hiura (The University of Tokyo)

S01-5 **Assessment of Alpine Forest Expansion in Taiwan: A Multi-Temporal Analysis (1980-2021)**

＊Teng-Chiu Lin (National Taiwan Normal University), Kuang-Yu Chen (National Taiwan Normal University)

Symposium 02 July 20 (Sun) 10:00-12:00 Room B

Ecology and biogeography of aquatic organisms in various systems

Organizer Shin-ichi Nakano (Kyoto University, ESJ)

Co-Organizer Renhui Li (Wenzhou University)

Aquatic organisms are susceptible to subtle changes in environmental conditions and have been used as indicators of eutrophication, pollution, and climate warming. These organisms also drive biogeochemical processes regulated through stoichiometry (carbon, nitrogen, and phosphorus mass-balance). Thus, information about the ecology, biodiversity, and biogeography of aquatic organisms provides both structural and functional understanding for freshwater, brackish, and marine systems, and can be used for environmental assessments. The purpose of this symposium is to stimulate studies on the ecology, biodiversity, and biogeography of aquatic organisms, along with research on biogeochemical processes. We welcome any topics related to aquatic organisms in freshwater, brackish, and marine systems, regardless of whether the talks are basic or applied. Most importantly, we encourage presentations by budding researchers such as students and post-docs.

S02-1 **Benthic cyanobacteria/cyanobacterial biofilms: diversity and eco-environmental effects**

＊Renhui Li (College of Life and Environmental Sciences, Wenzhou University), Youxin Chen (Institute of Hydrobiology, the Chinese Academy of Sciences), Yao Cheng (College of Life Science and Technology, Harbin Normal University), Yangyang Wu (College of Life and Environmental Sciences, Wenzhou University), Ruozheng Geng (College of Life and Environmental Sciences, Wenzhou University)

S02-2 **Physiological response of toxin-producing *Microcystis aeruginosa* to CO_2 change**

＊Nanqin Gan (Institute of Hydrobiology, CAS/University of Chinese Academy of Sciences), Jingyu Jiang (Institute of Hydrobiology, CAS)

S02-3 Spatiotemporal change of snow-ice microbes on the glacier

＊Masato Ono (Center for Ecological Research, Kyoto University, ESJ), Jun Uetake (Field Science Center for Northern Biosphere, Hokkaido University), Fuki Konishi (Graduate School of Science and Engineering, Chiba University), Daiki Seto (Graduate School of Science and Engineering, Chiba University), Suzunosuke Usuba (Graduate School of Science and Engineering, Chiba University), Kino Kobayashi (Graduate School of Science and Engineering, Chiba University), Nozomu Takeuchi (Department of Earth Sciences, Graduate School of Science, Chiba University)

S02-4 Diversity and feeding strategy of predatory protist and their application to the control of harmful algal bloom

＊Yingchun Gong (Institute of Hydrobiology, Chinese Academy of Sciences)

S02-5 Simulating the response of freshwater plankton communities to climate change in Republic of Korea

＊Hyun-Woo Kim (Sunchon National University, ESK), Hyo Gyeom Kim (Korea Environment Institute), Gea-Jae Joo (Pusan National University)

S02-6 Interpreting long-term changes of food web structure of fish community in brackish water along environmental gradients

＊Dae-Hee Lee (Kyung Hee University, ESK), Hye-Ji Oh (Nara Women's University), Yerim Choi (Kyung Hee University), Geun-Hyeok Hong (Kyung Hee University), Jeong-Hui Kim (EcoResearch Incorporated), Doo-Hee Won (Doohee Institute of Ecological Research, Korea Ecosystem Service Inc.), Sung-Ho Lim (Doohee Institute of Ecological Research, Korea Ecosystem Service Inc.), Kwang-Hyeon Chang (Kyung Hee University)

S02-7 Cold-water fish distribution responds to horizontal heterogeneity in dissolved oxygen, potentially restructuring offshore lake food webs

＊Ryosuke Katayose (National Institute for Environmental Studies/United Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology, ESJ), Taku Kadoya (National Institute for Environmental Studies)

S02-8 How to improve longitudinal connectivity of aquatic ecosystem: Current status of fish passages in South Korea

＊JuDuk Yoon (National Institute of Ecology, ESK), Dongwon Kang (National Institute of Ecology)

Symposium 03 July 20 (Sun) 10:00-12:00 Room C

Biodiversity, functional stability and restoration of cold and arid ecosystems

Organizer Jianming Deng (State Key Laboratory of Herbage Improvement and Grassland Agro-Ecosystems, College of Ecology, Lanzhou University, ESC)

Co-Organizer Xiang Liu (State Key Laboratory of Herbage Improvement and Grassland Agro-Ecosystems, College of Ecology, Lanzhou University, ESC)

Cold and arid ecosystems, encompassing more than half of the world's terrestrial area, are vital components of the Earth's biosphere. These regions provide indispensable ecosystem functions and services, particularly to countries in the Global South, supporting livelihoods through livestock production, biodiversity conservation, and the regulation of material cycling and energy flow. Additionally, they play a critical role in global carbon sequestration, windbreak and sand fixation, and soil and water conservation, making them essential for mitigating climate change and combating desertification. However, the integrity and resilience of these ecosystems are increasingly threatened by the dual pressures of climate change and human activities. Climate change manifests in these regions through rising temperatures, shifting precipitation patterns, and the increased frequency of extreme weather events, while human activities such as overgrazing, nitrogen deposition, urbanization, and infrastructure development further exacerbate ecological degradation. These stressors collectively undermine biodiversity, disrupt ecosystem functions, and reduce the stability and provisioning of ecosystem services. This symposium, titled "Biodiversity, Functional Stability, and Restoration of Cold and Arid Ecosystems", aims to address these pressing challenges by fostering interdisciplinary discussions and presenting cutting-edge research. We invite contributions that explore the impacts of climate change and human activities on cold and arid ecosystems across multiple scales—from individuals and populations to communities and entire ecosystems. Topics of interest include, but are not limited to, the adaptive mechanisms of plants, animals, and microorganisms; the dynamics of biodiversity under environmental stress; the functional stability of ecosystems in response to disturbances; and innovative strategies for ecosystem restoration and sustainable management. By bringing together ecologists, conservationists, and policymakers, this symposium seeks to advance our understanding of these critical ecosystems and promote science-based solutions for their preservation and restoration. We welcome studies that integrate field observations, experimental approaches, and modeling techniques to provide holistic insights into the challenges and opportunities facing cold and arid ecosystems in a rapidly changing world. Together, we aim to contribute to the global effort of safeguarding these ecosystems for future generations.

S03-1 Asymmetric response of aboveground and belowground temporal stability to nitrogen and phosphorus addition in a Tibetan alpine grassland

＊Yonghui Wang (Inner Mongolia University, ESC), Wenhong Ma (Inner Mongolia University)

S03-2 Microbial Network Complexity of Biocrusts and Its Role in Ecosystem Restoration in Arid Regions

＊Guang Song (Xi'an University of Architecture and Technology, ESC)

S03-3 The effects of fine roots and arbuscular mycorrhizal fungi on soil macropores

＊Ying Zheng (Chang'an University, ESC)

S03-4 Shrub encroachment reduces herbaceous diversity via enhancing light competition in grasslands
＊Yao Xiao (Lanzhou University, ESC)

S03-5 Microbial community succession during soil development in an arid land
＊Yaping Liu (Peking University, ESC), Kazuo Isobe (Peking University), Zhihua Bao (School of Ecology and Environment), Yaru Wei (School of Ecology and Environment)

S03-6 The response of greenhouse gases to global change in a temperate desert steppe
＊Ping Yue (Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, ESC)

S03-7 The effects of precipitation changes on the stability of plant communities in arid desert steppe ecosystems
＊Xiaoan Zuo (Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science, ESC), Ping Yue (Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science)

S03-8 Biodiversity Patterns and Near-Natural Restoration of Urban Vegetation in Arid and Semi-Arid Regions, Shaanxi Province, China
＊Tianyi Chen (College of Architecture, Xi'an University of Architecture and Technology, ESC), Yuandong Hu (College of Landscape Architecture, Northeast Forestry University), Liangjun Da (Institute of Ecological Science and Engineering for Arid and Semi-Arid Zones, Xi'an University of Architecture and Technology)

S03-9 Navigating the biogeography of wide-spread short-forests in global drylands
＊Ning Chen (Lanzhou University, ESC), Xiaoxue Dong (Lanzhou University), Changming Zhao (Lanzhou University)

S03-10 Impacts of climate change on plant species distribution range and richness in drylands
＊Ying Sun (Lanzhou University, ESC)

Symposium 04 July 20 (Sun) 10:00-12:00 Room D

Pathways to biodiversity-friendly farmlands in East Asia: challenges and opportunities

Organizer Naoki Katayama (Institute for Agro-Environmental Sciences NARO, ESJ)
Co-Organizers Da-Li Lin (Taiwan Biodiversity Research Institute, ESJ)
Yuta Nagano (Kobe University, ESJ)

Agriculture is one of the most detrimental causes of biodiversity loss globally. Nevertheless, the impacts of agriculture on biodiversity depend on various factors, including crop type, management type and intensity, surrounding landscape, climate, and the history of agriculture. For example, low-intensity managed traditional rice paddies can provide habitats for some wetland species. Understanding such complex relationships between agriculture and biodiversity conservation is crucial for paving the way for sustainable agriculture in East Asia. The objective of this symposium is to explore current knowledge, barriers, and opportunities for biodiversity-friendly farmlands. Our focus is broad, and we welcome various topics on different threats (e.g., agricultural intensification, abandonment, and climate change), taxonomic groups (e.g., plants and birds), opportunities (e.g., organic farming, land-sparing approaches, and ecological intensification), and countries. We hope that this symposium will serve as a starting point for future collaborations towards more sustainable agriculture in East Asia.

S04-1 Assessing Anthropogenic Pressures and Habitat Suitability for Farmland Birds in Taiwan: Insights from Chiayi Region
＊Chen-Fa Wu (National Chung Hsing University), Tzu-Yao Liu (National Chung Hsing University), Chih-Peng Tsou (National Chung Hsing University), Luu Van Thong Trac (National Chung Hsing University)

S04-2 Enhancing the Occurrence of Reintroduced Oriental Storks with Wildlife-friendly Rice Paddy Managements
＊Mina Izaki (University of Hyogo/Toyooka Municipal Government, ESJ), Yota Imai (Kobe City College of Technology), Hiromune Mitsuhashi (Museum of Nature and Human Activities), Tomohiro Deguchi (University of Hyogo/Hyogo Park of the Oriental White Stork)

S04-3 Monitoring Population Trajectories of Wild Animals through Low-Cost Conservation Actions in Agricultural Landscapes of Taiwan
＊Da-Li Lin (Taiwan Biodiversity Research Institute, ESJ)

S04-4 Does organic farming promote soil fauna diversity? Lessons from earthworms in subtropical pomelo orchards in Taiwan
＊Chih-Han Chang (Department of Life Science, National Taiwan University/Institute of Ecology and Evolutionary Biology, National Taiwan University), Hui-Ming Zhong (Institute of Ecology and Evolutionary Biology, National Taiwan University), Da-Li Lin (Taiwan Biodiversity Research Institute), Zeng-Yei Hseu (Department of Agricultural Chemistry, National Taiwan University), Pei-Ling Wang (Institute of Oceanography, National Taiwan University)

S04-5 Impact of Solar Power Generation on Habitat Management in Rice-Paddy Wetlands
＊Ji Yoon Kim (Kunsan National University, ESK), Woong-Bae Park (Kongju National University), Miharu Nakatani (Tokyo Metropolitan University), Kota Tawa (National Institute for Environmental Studies), Shohei Tsujimoto (Meijo University), Yuna Hirano (National Institute for Environmental Studies), Akira Noda (Tokyo Metropolitan University), Yuno Do (Kongju National University), Hyun-Woo Kim (Sunchon National University)

S04-6 Challenges and opportunity for biodiversity conservation in Japanese rice ecosystems

＊Naoki Katayama (NARO, ESJ)

S04-7 Field margin grasslands as a key to enhancing crop pollination services in smallholder agricultural landscapes

＊Yuta Nagano (Kobe University/The University of Tokyo, ESJ), Tadashi Miyashita (The University of Tokyo)

S04-8 Advantages and Challenges of Access to Newly Developed Climate-Resilient Varieties: Case Study on Rice in Asia

＊Kenichi Imai (Osaka University of Economics and Law, ESJ)

Symposium 05 July 20 (Sun) 13:30-15:30 Room A

Mobilizing regional efforts to conceptualize and craft Essential Biodiversity Variables for East Asia

Organizer Jamie M. Kass (Tohoku University, ESJ)

Co-Organizers Yayoi Takeuchi (Osaka Metropolitan University, National Institute for Environmental Studies, ESJ)
Sangdon Lee (Ewha Womans University, ESK)

International frameworks for ecological monitoring and conservation are developing quickly to address global declines in biodiversity. These frameworks were originally modeled on similar ones for climate change, but as the complexity of biodiversity has resulted in many metrics and definitions, measuring and reporting it have proven to be difficult exercises compared to those for greenhouse gases. In response, a set of Essential Biodiversity Variables (EBVs) was established in 2013 by the Group on Earth Observations Biodiversity Observation Network (GEO BON) to standardize the data products used to derive global indicators. But this framework, mostly envisioned and adopted in North America and Europe, has not seen much development in other regions of the world, including East Asia. As these efforts are global in nature, we must recognize that data availability differs around the world, but also that regional differences in the ways people interact with and manage nature will shape what biodiversity variables they deem "essential". Each region needs agency in deciding how to craft their variables. Particularly in East Asia, data sharing and collaborative ecological research tends to be rather insular, but this must be overcome if we are to develop EBVs that cross country borders. In this symposium, we will discuss what EBVs for East Asia should look like and what progress we are making to realize them. We will also focus on how to cooperatively leverage existing data-collection techniques (e.g., remote sensing, semi-automated monitoring, eDNA) and modeling approaches (e.g., species distribution models, geospatial analysis) to build and maintain shared datasets that describe biodiversity in this region.

S05-1 Implementation and accessibility of modeling methods for production of Essential Biodiversity Variables

＊Jamie M Kass (Tohoku University, ESJ)

S05-2 Advancing Essential Biodiversity Variables in Japan and Asia: fostering regional collaboration for effective implementation

＊Yayoi Takeuchi (Biodiversity Division, National Institute for Environmental Studies/Graduate School of Science, Osaka Metropolitan University, ESJ), Lea Végh (Biodiversity Division, National Institute for Environmental Studies), Jamie M. Kass (Macroecology Lab, Graduate School of Life Sciences, Tohoku University)

S05-3 Assessment of habitat suitability for endangered species in South Korea using MaxEnt models

＊Sangdon Lee (Ewha Womans University, ESK)

S05-4 Spatiotemporal factors driving the distribution of the river otter (*Lutra lutra*) in South Korea using high-resolution imagery

＊Hyomin Park (The Hwaseong Institute/Ewha Womans University), Sangdon Lee (Ewha Womans University)

S05-5 From Data to Decisions: Connecting EBVs to Biodiversity Policy through Citizen Science and Cutting-Edge Technology

＊Chanho Park (Chonnam National University, ESK)

S05-6 Improving the forecast for redistribution of marine biodiversity in East Asia under climate change

＊Zhixin Zhang (South China Sea Institute of Oceanology, Chinese Academy of Sciences, ESC), Xin Wang (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Meng Qu (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Geng Qin (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Jiahui Xu (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Qiang Lin (South China Sea Institute of Oceanology, Chinese Academy of Sciences)

Symposium 06 July 20 (Sun) 13:30-15:30 Room B

Carbon and Nitrogen Cycling in Asian Terrestrial Ecosystems under Global Change

Organizer Yunting Fang (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)
Co-Organizers Naishen Liang (National Institute for Environmental Studies, Japan, ESJ)
Poneng Chiang (National Taiwan University)

Global change, characterized by a complex interplay of factors, is having a far-reaching and profound impact on the structure and function of ecosystems across the globe. Among these, the carbon and nitrogen cycles stand out as key processes within ecosystems. These cycles are not only fundamental to determining the productivity and stability of ecosystems but also play a pivotal role in global climate change. Understanding how the carbon and nitrogen cycles respond to and feedback on global change is of utmost importance. It is essential for accurately predicting future trends in ecosystem changes and formulating effective, targeted strategies. This session is specifically centered on carbon and nitrogen cycling in Asian ecosystems in the context of global change. Asia, with its diverse range of ecosystems from tropical rainforests to arctic tundras, provides a unique and rich study ground. Global climate change, nitrogen deposition, and land-use change are three major factors that can significantly alter the carbon and nitrogen cycles in these ecosystems. For example, rising temperatures due to climate change can accelerate the decomposition of organic matter, affecting carbon storage. Nitrogen deposition from industrial and agricultural activities can disrupt the natural nitrogen balance, leading to changes in plant growth and biodiversity. Land-use change, such as deforestation and urbanization, can directly modify the carbon and nitrogen stocks in soil and vegetation. The session aims to gather researchers from various related fields, including ecology, environmental science, and biogeochemistry. By bringing these experts together, we hope to comprehensively explore the impact mechanisms, detailed processes, and wide-ranging ecological effects of the aforementioned factors on the carbon and nitrogen cycles in Asian ecosystems. This session will serve as an excellent platform for participants to exchange and share their latest research findings, which will greatly promote cross-disciplinary integration. This session will provide scientific evidence and technical support for solving relevant environmental problems. It will also play a crucial role in cultivating and uniting outstanding young scientific researchers in this field. By enhancing international influence, we can better address the global challenges related to carbon and nitrogen cycling. We sincerely invite experts and scholars from around the world to participate in this session and jointly contribute to the research on carbon and nitrogen cycling in ecosystems under global change.

S06-1 The important role of soil microbes in carbon and nitrogen cycling
＊Edith Bai (Northeast Normal University, ESC)

S06-2 Capacity of foliar NO2 uptake and turnover of assimilated N from a tree seedling leaf-15NO2 feeding study
＊Ronghua Kang (Institute of Applied Ecology, Chinese Academy of Sciences, ESC), Meng Yao (Institute of Applied Ecology, Chinese Academy of Sciences)

S06-3 Effects of long-term high nitrogen deposition on tropical forest ecosystems
＊Xiankai Lu (South China Botanical Garden, Chinese Academy of Sciences, ESC)

S06-4 The key processes of soil C and N response to landuse change in tropics
＊Wenjun Zhou (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences, ESC), D. Balasubramanian (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences), Yunting Fang (Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110016, China/University of the Chinese Academy of Sciences), Ping Ding (Guangzhou Institute of Geochemistry, Chinese Academy of Sciences), Liqing Sha (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences), Qinghai Song (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences), Yiping Zhang (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences)

S06-5 Climate warming reduces carbon sequestration of coastal wetlands: Evidence from the Yellow River Delta, China
＊Guangxuan Han (Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, ESC)

S06-6 Disproportional community structure and abundance of ammonia-oxidising archaea and bacteria decipher the heterogeneity of fertilizer-induced N_2O emissions in long-term conservation tillage soils
＊Weiyan Wang (Northwest A&F University, ESC), Xiaoxia Wen (Northwest A&F University)

S06-7 Effects of water and straw management on nitrous oxide emission during rice cultivation
＊Chuan Fu Kao (National Taiwan University), Shan Li Wang (National Taiwan University)

S06-8 The Impact of Land Use Changes on Greenhouse Gas Emissions in Wetlands: A Case Study of the Sun and Moon Lake peatland
＊Cheng Chun He (Agricultural Net-Zero Carbon Technology and Management Innovation Research Center, College of Bioresources and Agriculture, National Taiwan University), Po-Neng Chiang (The Experimental Forest, College of Bio-Resources and Agriculture, National Taiwan University), Shan-Li Wang (Agricultural Net-Zero Carbon Technology and Management Innovation Research Center, College of Bioresources and Agriculture, National Taiwan University/Department of Agricultural Chemistry, College of Bioresources and Agriculture, National Taiwan University)

Symposium 07 July 20 (Sun) 13:30-15:30 Room C

Ecosystem GHGs Exchange and Its Response to Climate Change in Northeast Asia

Organizer Naishen Liang (National Institute for Environmental Studies, ESJ)

Co-Organizers Hyun Seok Kim (Seoul National University, ESK)
Zhi Chen (Institute of Geographic Sciences and Natural Resources Research, CAS, ESC)
Yoshiyuki Takahashi (National Institute for Environmental Studies, ESJ)

Asian terrestrial ecosystems, spanning tropical forests and wetlands in Southeast Asia to boreal ecosystems in northeastern Asia and alpine regions on the Tibet Plateau, are crucial as regional and global carbon sinks, helping mitigate global warming. However, climate change, especially extreme events linked to the Pacific and Indian Ocean monsoons, significantly impacts their carbon cycle. Precisely quantifying balances of CO_2, CH_4, N_2O, and H_2O is essential for setting emission reduction targets and identifying effective mitigation strategies. By integrating ChinaFLUX, JapanFlux, and KoFlux, an East Asian consortium of three countries (A3) has conducted advanced and comprehensive research on the Asian terrestrial carbon cycle. This session will feature leading researchers and highly motivated young scientists from A3, who will present their recent findings on Northeast Asia's climate-sensitive terrestrial ecosystems. Their presentations will cover long-term, multi-scale measurements of carbon flux and storage, field experiments, remote sensing, and data-model fusion techniques.

S07-1 Eddy covariance observations of terrestrial carbon flux in Asia: recent development of AsiaFlux

＊Ryuichi Hirata (National Institute for Environmental Studies, ESJ), Hiroki Iwata (Department of Environmental Science, Shinshu University), Masahito Ueyama (Graduate School of Agriculture, Osaka Metropolitan University), Takashi Hirano (Research Faculty of Agriculture, Hokkaido University,), Shuli Niu (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences), Minseok Kan (National Center for AgroMeteorology, Seoul National University), Guan Xhuan Wong (Sarawak Tropical Peat Research Institute), Lulie Melling (Sarawak Tropical Peat Research Institute)

S07-2 Energy-Water-Carbon Coupling Analysis in a Rice Paddy Field at the Naju Observation Site

＊Jaeil Cho (Chonnam National University, ESK), Bo-Kyeong Kim (Chonnam National University), Hyunki Kim (National Institute of Crop Sciences), Hyung-Dong Moon (Chonnam National University), Kyeong-Min Kim (Chonnam National University), Hayeon Won (Chonnam National University), Subin Choi (Chonnam National University), Hyunhwan Yang (Chonnam National University), Jong-Sung Ha (Korea Aerospace Research Institute), Seung-Taek Jung (Korea Aerospace Research Institute), Jong-Min Yeom (Jeonbuk National University)

S07-3 Withdrawn

S07-4 Estimating forest carbon stock and changes using multi-scale satellite imagery

＊Jaebeom Kim (Department of Environmental Science, Kangwon National University, ESK), Minkyu Moon (Department of Environmental Science, Kangwon National University)

S07-5 Widespread Greening Significantly Enhanced Evapotranspiration in Chinese Terrestrial Ecosystems

＊Le Xin Ma (Key Laboratory of Ecosystem Network Observation and Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, ESC), Zhi Chen (Key Laboratory of Ecosystem Network Observation and Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)

S07-6 Comparative assessment of methane ebullition in a rice paddy by chamber and eddy covariance methods

＊Minseok Kang (Gangneung-Wonju National University, ESK), Sung-Won Choi (National Center for AgroMeteorology), Seungwon Sohn (National Center for AgroMeteorology), Sungsik Cho (National Center for AgroMeteorology/Seoul National University), Juhan Park (National Center for AgroMeteorology)

S07-7 Interpretable Machine Learning Empowers the Study of Soil Respiration Dynamics under Climate Change

＊Fubo Yu (Institute of Geographic Sciences and Natural Resources Research, CAS, ESC), Zhi Chen (Institute of Geographic Sciences and Natural Resources Research, CAS)

S07-8 Remote Sensing of GPP and Methane Emissions via Solar-Induced Fluorescence in a cool - temperate bog in Japan

＊Kanokrat Buareal (Research Faculty of Agriculture, Hokkaido University/Graduate School of Global Food Resources, Hokkaido University), Tomomichi Kato (Research Faculty of Agriculture, Hokkaido University/Global Center for Food, Land, and Water Resources, Research Faculty of Agriculture, Hokkaido University), Tomoki Morozumi (National Institute for Environmental Studies (NIES)), Naohisa Nakashima (Department of Agro-Environmental Science, Obihiro University of Agriculture and Veterinary Medicine), Kitpanuwat Tanatarakeree (Research Faculty of Agriculture, Hokkaido University), Masahito Ueyama (Graduate School of Agriculture, Osaka Metropolitan University), Takashi Hirano (Research Faculty of Agriculture, Hokkaido University)

Symposium 08　July 20 (Sun) 13:30-15:30 Room D

Beyond boundaries I: lightning talk session for diverse ecological topics

Organizer　Kenta Uchida (The University of Tokyo, ESJ)

Co-Organizer　Yoichi Tsuzuki (The University of Tokyo, ESJ)

Ecology often addresses research themes from region-specific ecological phenomena to large-scale issues extending beyond national borders. EAFES offers an opportunity to promote ecological research in East Asia by providing a setting for active discussions with neighboring countries. However, active communication isn't always easy for those with few international connections, such as young researchers and students attending EAFES for the first time. This symposium will provide a chance to casually present their own research and encourage active interactions beyond research topics and national borders.

S08-1　Population genetics reveals ontogenetic characteristics of perennial plant populations

＊Yoichi Tsuzuki (University of Tokyo, ESJ)

S08-2　Behavioral response to humans in urban mammals

＊Kenta Uchida (The University of Tokyo, ESJ)

S08-3　Connecting Landscape (CoLa): A Cutting-Edge Simulation of Connectivity and Gene Flow for the Return of the Clouded Leopard in Taiwan.

＊Yi Feng Leo Wang (Wildlife Conservation Research Unit, University of Oxford), Ivan Orlando Gonzalez (School of Informatics, Computing and Cyber Systems, Northern Arizona University), Patrick Jantz (School of Informatics, Computing and Cyber Systems, Northern Arizona University), Zaneta Kaszta (Wildlife Conservation Research Unit, University of Oxford/Department of Biological Sciences, Northern Arizona University), Samuel A Cushman (Wildlife Conservation Research Unit, University of Oxford), Dawn Burnham (Wildlife Conservation Research Unit, University of Oxford), Andrew J Hearn (Wildlife Conservation Research Unit, University of Oxford), David W Macdonald (Wildlife Conservation Research Unit, University of Oxford)

S08-4　Evolution of Mating Systems: From Resource Defense to Lekking

＊Ryuichiro Isshiki (Sokendai RCIES, ESJ), Hisashi Ohtsuki (Sokendai RCIES)

S08-5　Effects of roads on animals and mitigation measures in Asia

＊Qilin Li (Hainan Tropical Ocean University), Yun Wang (China Academy of Transportation Sciences), Haotong Su (China Academy of Transportation Sciences)

S08-6　The evolutionary record in teeth: diversity and change in plants and dinosaurs

＊Kanna Shobayashi (University of Tsukuba, ESJ)

S08-7　Effects of chronic individuals and infected carcasses on classical swine fever infection dynamics in wild boar

＊Mayuko Uesaka (University of Tokyo, ESJ), Shohei Kawata (National Institute of Genetics), Gaku Takimoto (University of Tokyo)

S08-8　Examining the chemical trait space of dominant native and invasive plant species in Okinawa and their influence on decomposer community assembly

＊Amy Hana Morrell (Okinawa Institute of Science and Technology Graduate University), David Armitage (Okinawa Institute of Science and Technology Graduate University)

S08-9　Effect of Nitrogen Application Under Drought Treatments on the Growth, Yield, and Grain Quality of Spring Maize

＊Nina Chen (Institute of Atmospheric Environment, China Meteorological Administration, Shenyang, ESC)

S08-10　Invasion and Spatial Genetic Structure of *Humulus japonicus* in Korean Riparian Zones

＊Haeji Shin (Gwangju Institute of Science and Technology, ESK), Eunsuk Kim (Gwangju Institute of Science and Technology)

S08-11　Enhancing migrants' subjective well-being through ecosystem services perceptions in the context of hydropower resettlement

＊Xiaoyin He (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Ranhao Sun (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

Symposium 09 July 20 (Sun) 15:45-17:45 Room A

Environmental DNA Studies in East Asia: Current Status, Challenges, and Pathways to Large-Scale Applications

Organizer Masayuki Ushio (The Hong Kong University of Science and Technology, ESJ)
Co-Organizers Toshifumi Minamoto (Kobe University, ESJ)
Junjie Wang (South China Normal University, ESC)
Venus Leopardas E. (Mindanao State University at Naawan)

This symposium will bring together leading environmental DNA (eDNA) researchers from China, Hong Kong, Japan, the Philippines, and South Korea to present and discuss the current status of eDNA studies in their respective countries. eDNA refers to genetic material obtained directly from environmental samples such as soil, water, or air, without the need for capturing or observing the organisms themselves. This technique has revolutionized ecological studies by enabling the detection and monitoring of multiple species, including those that are rare or elusive. Each invited speaker will present the ongoing eDNA research, latest findings, and challenges they are facing in their country. We also accepted young researchers from Asian countries for contributed oral presentations. This will provide attendees with a broad understanding of the regional progress in eDNA applications. In particular, the symposium will address the common challenges faced by researchers in East Asia, such as technical limitations, data analysis, protocol standardization, and environmental variability. Discussions will focus on identifying solutions and best practices to overcome these obstacles. A portion of the symposium will be dedicated to exploring the potential for establishing a larger eDNA network across East Asia. The symposium will provide a platform for researchers, practitioners, and policymakers to connect, fostering collaborations and partnerships that can drive future eDNA initiatives.

S09-1 Tracing Biodiversity: eDNA Insights from Philippine Mangrove Ecosystems
＊Venus Empron Leopardas (Mindanao State University at Naawan)

S09-2 Expanding eDNA Applications through Epigenetics: Spawning Monitoring Focus
＊Itsuki T Hirayama (Kobe Univ., ESJ), Toshifumi Minamoto (Kobe Univ.)

S09-3 Understanding urban ecosystem structure through species composition: insights from eDNA research in Korea
＊Youngkeun Song (Seoul National Univ.), Heejung Sohn (Seoul National Univ.), Yujin Kang (Seoul National Univ.)

S09-4 Community and evolutionary dynamics in the wild ecosystems and their connections: Exploring eco-evolutionary feedback using an arboreal eDNA approach
＊Fugen Okuma (Graduate School of Env. Science, ESJ), Shunsuke Utsumi (Faculty of Env. Earth Science)

S09-5 Empirical Dynamic Modeling of Environmental DNA Time Series Identifies Temperature-Caused Community Assemblages and Their Stability Drivers
＊Sangwook Scott Lee (Hong Kong University of Science and Technology (HKUST), ESK), Masayuki Ushio (Hong Kong University of Science and Technology (HKUST))

S09-6 From Headwaters to Mangroves: eDNA-Based Insights into Fish Biodiversity in the Urauchi River, a Subtropical UNESCO World Heritage Site
＊Bernadeth Grace Suerte Pananganan (United Graduate School of Agricultural Sciences, Kagoshima University/ Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Marizka Grafane Juliano (United Graduate School of Agricultural Sciences, Kagoshima University/Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Yukinobu Isowa (Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Maria Daniela Artigas Ramirez (Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Tadashi Kajita (United Graduate School of Agricultural Sciences, Kagoshima University/ Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus)

S09-7 ANEMONE Global: Building an Inclusive Network for eDNA-Based Aquatic Biodiversity Monitoring.
＊Imane Sioud (Tohoku University, ESJ), Michio Kondoh (Tohoku University), Yuki Minegishi (University of Tokyo), Tadashi Kajita (University of the Ryukyus), Yukinobu Isowa (University of the Ryukyus)

S09-8 The Research Progress of environmental DNA in China
＊Junjie Wang (South China Normal University, ESC)

Symposium 10 July 20 (Sun) 15:45-17:45 Room B

The mechanisms underlying variation in forest structure and the maintenance of ecosystem functions

Organizer Hiroko Kurokawa (Kyoto University, ESJ)

Co-Organizer Qing-Wei Wang (Institute of Applied Ecology, Chinese Academy of Science, ESC)

Forests, the main body of terrestrial ecosystems, have crucial ecological functions, playing a vital role in maintaining regional ecological security and providing numerous societal services. Historically, long-term logging and other human activities have led to unprecedented resource depletion and ecological degradation in existing forests. This degradation has disrupted ecosystem functions, causing imbalances and widespread loss of synergistic effects. Against the backdrop of global climate change and increasingly diverse human resource demands, systematically clarifying the key processes regulating forest structure and ecosystem functions is an urgent prerequisite for enhancing forest ecosystem service quality while maintaining a coordinated balance between ecological security and sustainable forest resource use. Therefore, this symposium invited the latest research on a wide range of topics, including but not limited to: mechanisms of forest succession and community assembly, biodiversity maintenance, relationships between forest diversity and ecosystem functions, community structure of forest soil food webs and their role in ecosystem multifunctionality, key processes in biogeochemical cycles (e.g., aboveground-belowground processes, soil C or N decomposition), and responses and adaptation mechanisms of forest biological communities and ecosystem functions to disturbances and environmental changes (e.g., warming, increased nitrogen deposition, elevated CO_2 concentrations, and changes in solar radiation). Future trends and research hotspots will be discussed to provide a scientific basis for enhancing the multifunctionality and sustainability of global forest ecosystems.

S10-1 Variations of growth strategies and environmental adaptations among diverse canopy tree species in temperate natural forests of Japan

＊Kyaw Kyaw Htoo (Kyoto University, ESJ), Masanori Onishi (Kyoto University/DeepForest Technologies Co., Ltd), Md. Farhadur Rahman (Kyoto University/Bangabandhu Sheikh Mujibur Rahman Agricultural University), Ryuichi Takeshige (Kyoto University/National Institute for Environmental Studies), Kaoru Kitajima (Kyoto University), Yusuke Onoda (Kyoto University)

S10-2 In situ nitrogen uptake preference and regulating mechanisms by dominant tree species in northeast China

＊Feifei Zhu (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

S10-3 Tree species turnover along soil nutrient gradients sustains forest productivity in tropical ecosystems

＊Ryota Aoyagi (Kyoto University, ESJ), Richard Condit (Individual Researcher), Benjamin L. Turner (Gyeongsang National University)

S10-4 How tree diversity affects soil carbon accumulation?

＊Xinli Chen (Zhejiang A&F University, ESC), Scott X. Chang (University of Alberta), Masumi Hisano (Hiroshima University), Anthony R. Taylor (University of New Brunswick), Peter B. Reich (University of Michigan), Han Y.H. Chen (Lakehead University)

S10-5 The contribution of photodegradation to aboveground carbon loss along latitude

＊Qing-Wei Wang (Institute of Applied Ecology, Chinese Academy of Sciences, ESC), Juanjuan Zhang (Institute of Applied Ecology, Chinese Academy of Sciences), Hiroko Kurokawa (Kyoto University)

S10-6 Withdrawn

S10-7 Legacy over a thousand years: Canopy soil of old-growth Yakusugi forest fosters rich and unique invertebrate diversity

＊Ikuyo Saeki (University of Osaka/Tokyo Metropolitan University, ESJ), Sho Hioki (Kobe University), Wakana A Azuma (Kobe University), Noriyuki Osada (Meijo University), Shigeru Niwa (Japan Wildlife Research Center), Aino T Ota (National Museum of Nature and Science), Hiroaki Ishii (Kobe University)

Symposium 11 July 20 (Sun) 15:45-17:45 Room C

Advances in Ecological Science: Understanding Biodiversity and Ecosystem Functions from Microbes to Ecosystems

Organizer Lee Changsuk (National Institute of Ecology, ESK)

Co-Organizer Keisuke Koba (Center for Ecological Research, Kyoto University, ESJ)

This symposium, an official collaboration between NIE (Korea) and CER (Japan), highlights recent advances in ecological science, exploring biodiversity and ecosystem functions across scales—from microbes to entire ecosystems. Researchers from Korea, China, and Japan will present innovative survey methodologies, long-term monitoring results, and diverse ecological processes. The symposium aims to deepen ecological understanding and promote collaboration within East Asia.

S11-1 Integrated plant-soil-microbiome systems constrained by microbial metabolism across forests in Japan

＊Kazuo Isobe (Peking University, ESJ), Yaping Liu (Peking University), Nobuhito Ohte (Kyoto University)

S11-2 National Ecosystem Survey System and Its Role in Analyzing the State of National Ecosystem

＊Seung Se Choi (National Institute of Ecology, ESK), Tae Woo Yi (National Institute of Ecology), Ju-Kyeong Eo (National Institute of Ecology)

S11-3 Monitoring Seabird Populations using UAVs and Deep learning

＊Yunkyoung Lee (National Institute of Ecology, ESK)

S11-4 Deep Learning Meets Ecology: Advancing Camera Trap Data Processing for Wildlife Conservation

＊Youngmin Kim (National Institute of Ecology/Pusan National Universuty, ESK), Anya Lim (National Institute of Ecology), Cheol-Han Kim (Sphere AX), Chang-Seob Yun (Sphere AX), Geajae Joo (Pusan National Universuty)

S11-5 Transfer of long-chain polyunsaturated fatty acids between aquatic and terrestrial ecosystems via animal movements

＊Ayano Medo (Center for Ecological Research, Kyoto University, ESJ), Takuya Sato (Center for Ecological Research, Kyoto University)

S11-6 Assessing plant microbial interaction in rhizosphere across forests in north China

＊Wen Guo (Peking University), Kazuo Isobe (Peking University)

S11-7 Garlic mustard (*Alliaria petiolata*) Invasion Reshapes Soil Microbial Communities and Network Structures in South Korea

＊Yousuk Kim (Gwangju Institute of Science and Technology (GIST)/University of Minnesota/Institute for Basic Science (IBS), ESK), Eunsuk Kim (Gwangju Institute of Science and Technology (GIST)), Byungwook Choi (University of Minnesota), Seorin Jeong (Institute for Basic Science (IBS)), Tae-min Kim (Gwangju Institute of Science and Technology (GIST))

Symposium 12 July 20 (Sun) 15:45-17:45 Room D

Evolution and biogeography of freshwater organisms

Organizer Takahiro Hirano (University of the Ryukyus, ESJ)

Co-Organizer Mingbo Yin (Fudan University)

The freshwater ecosystems on our planet are undergoing a biodiversity crisis that has been influenced by long-term impact of anthropogenic pressures including eutrophication, habitat degradation and climate change. East Asia is recognized as a biodiversity hotspot for freshwater organisms, ranging from micro-organisms to vertebrates. However, much of their evolutionary history in this region remains unexplored. This symposium aims to address key issues related to the evolution and biogeography of freshwater organisms in East Asia. By integrating ideas from multiple disciplines (e.g. taxonomy, ecology, evolution and genomics), we seek to develop a comprehensive understanding of the evolutionary processes that had shaped current freshwater biodiversity in this region. Major topics in this symposium will include the impact of historical events such as the formation of ancient lakes and river basins, biological dispersal processes, climate changes, and anthropogenic effects on freshwater biodiversity (across various taxa) in East Asia. Since freshwater ecosystems transcend national borders, international collaboration is crucial for advancing biogeographic and evolutionary researches. This symposium will bring together international researchers specializing in different model organisms. By comparing patterns of speciation and adaptation across different freshwater taxa and different geographical regions in East Asia, we aim to derive both unified and specific insights. During the symposium, we seek to foster interdisciplinary and international dialogue to deepen our understanding of the evolution and biogeography of freshwater organisms in East Asia. By doing that, we aim to facilitate the establishment of new research networks and promote future collaborations to address conservation challenges faced by the freshwater ecosystems in East Asia. The knowledge gained from this symposium is expected to contribute to the advancement of evolutionary researches on freshwater biodiversity and to lay the foundation for conservation strategies.

S12-1 High-altitude adaptations of a keystone zooplanktonspecies on the Tibetan Plateau

＊Mingbo Yin (Fudan University)

S12-2 The fascinating world of riverine insects: insights from phylogeography

＊Masaki Takenaka (University of Tsukuba)

S12-3 Phylogeographic consequences of land-locked life history evolution in freshwater shrimps

＊Yusuke Fuke (Setsunan University, ESJ)

S12-4 Insights into the evolutionary history of Japanese amphibians from genetic data

＊Atsushi Tominaga (University of the Ryukyus)

S12-5 Revealing hidden species interaction via bird banding: foraging and dispersal

＊Masanori Tatani (Graduate School of Life Sciences, Tohoku University, ESJ)

S12-6 New insights into the evolutionary history of the freshwater fishes in Japan, focusing on Lake Biwa, based on nuclear genome information

＊Ryoichi Tabata (Lake Biwa Museum, ESJ)

S12-7 Evolution and biogeography of freshwater molluscs in East Asia

＊Takahiro Hirano (University of the Ryukyu's, ESJ)

S12-8 Diversity and geographic distribution of parasitic trematodes in the freshwater snails in the genus *Semisulcospira*

＊Osamu Miura (Kochi University, ESJ)

Symposium 13 July 21 (Mon) 10:00-12:00 Room A

Collaborating restoration and biodiversity in a changing environment

Organizer Shirong LIU (Chinese Academy of Forestry, ESC)

Co-Organizers Zuomin SHI (Ecology and Nature Conservation Institute, Chinese Academy of Forestry, ESC)
Hui Wang (Ecology and Nature Conservation Institute, Chinese Academy of Forestry, ESC)

Background:
Global biodiversity loss and ecosystem degradation, exacerbated by climate change and anthropogenic pressures, demand urgent interdisciplinary collaboration. Ecological restoration has emerged as a critical tool to reverse these trends, yet its integration with biodiversity conservation remains fragmented. This conference seeks to bridge gaps between science, policy, and practice, fostering innovative solutions for resilient ecosystems in a rapidly changing world. This conference will catalyze transdisciplinary partnerships to address the dual crises of biodiversity decline and climate disruption, aligning with UN Sustainable Development Goals. By integrating diverse perspectives, we aim to redefine restoration paradigms for a sustainable future.
Objectives:
1. Advance Knowledge: Explore innovative approaches integrating ecological restoration, biodiversity conservation, and climate adaptation. Share cutting-edge research on biodiversity-ecosystem linkages under climate stressors.
2. Promote Collaboration: Unite ecologists, policymakers, Indigenous leaders, and NGOs to co-design restoration frameworks.
3. Drive Action: Translate science into scalable strategies for habitat recovery, species protection, and sustainable resource management.
Themes:
Climate-adaptive restoration theory and techniques, Socioecological synergies in conservation, Policy integration and funding mechanisms, Technology-driven monitoring (e.g., AI, remote sensing).
Format: A 2-hour event featuring lectures and debates.
Expected Outcomes:
A peer-reviewed conference proceedings publication, Launch of an international restoration new idea.
Target Audience:
40+ participants from academia, governmental agencies, and NGOs across China, Japan, South Korea, and more countries.

S13-1 Biodiversity and climate-friendly forest ecosystem conservation and restoration

＊Shirong Liu (Chinese Academy of Forestry, ESC)

S13-2 Distribution patterns of weeds/spontaneous plant community along urban wastelands and main affecting factors in Tibet Autonomous Region, China

＊Liangjun Da (Xi'an University of Architecture and Technology, ESC), Lin He (Xi'an University of Architecture and Technology), Yao Yao (Xi'an University of Architecture and Technology), Luyi Lan (Xi'an University of Architecture and Technology), Zhiwen Gao (East China Normal University), Jiao Chen (Xi'an University of Architecture and Technology)

S13-3 Embedding Biodiversity Conservation in Local Problem-Solving: Lessons from Nature-based Approaches in Japan

＊Jun Nishihiro (National Institute for Environmental Studies, ESJ)

S13-4 Relationship of tree species diversity and soil organic carbon under climate change

＊Hui Wang (Ecology and Nature Conservation Institute, Chinese Academy of Forestry, ESC)

S13-5 Quantifying ecosystem respiration and nitrous oxide emissions from greenhouse cultivation systems via a novel whole-greenhouse static chamber method

＊Zhi Quan (Institute of Applied Ecology, Chinese Academy of Sciences/Weifang Institute of Modern Agriculture and Ecological Environment, ESC), Xue Li (Institute of Applied Ecology, Chinese Academy of Sciences), Yunting Fang (Institute of Applied Ecology, Chinese Academy of Sciences)

S13-6 How to Maximize the Multiple Benefits of Ecosystem Restoration under Cost Constraints

＊Jiaquan Duan (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

S13-7 Latitudinal pattern of leaf P fractions sheds physiological insights into large-scale plant P-use strategy

＊Qingquan Meng (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University, ESC), Zhengbing Yan (Institute of Botany, Chinese Academy of Sciences), Zhijuan Shi (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University), Tingting Dong (Institute of Botany, Chinese Academy of Sciences), Jia Wang (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University), Hnas Lambers (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University/School of Biological Sciences, The University of Western Australia), Wenxuan Han (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University)

Symposium 14 July 21 (Mon) 10:00-12:00 Room B

Ecological Resilience and Sustainable Futures of the Mongolian Plateau

Organizer Wenhong Ma (Inner Mongolia University, ESC)

Co-Organizers Qing Zhang (Inner Mongolia University, ESC)
Biao Zhu (Peking University/Inner Mongolia University, ESC)
Jianguo Wu (Arizona State University)

The global drylands cover more than 41% of the earth's land area and support over 38% of the world's population. The Mongolian Plateau, located in central Asia and characterized by vast grasslands and deserts, is an essential part of the global drylands. The plateau is rich in biodiversity and provides diverse ecosystem services, with a long and storied history of nomadism and pastoralism. However, climate change and landscape transformations by human activities (e.g., cultivation, urbanization, and coal mining) have resulted in myriad ecological and environmental problems, undermining the ecological resilience and sustainability of the region. Although many ecological studies have been carried out on the plateau (especially within Inner Mongolia over the past 40 years), a comprehensive and holistic understanding of the ecology and sustainability of the Mongolian Plateau is lacking. To fill the knowledge gap and to promote collaborations among Asian scientists, therefore, the main objectives of this symposium are: (1) to examine the major impacts of climate change and land use and land cover change on biodiversity, ecosystem processes, and ecosystem services across the plateau through syntheses and case studies; (2) to explore pathways and mechanisms for improving the resilience and sustainability of the plateau at multiple scales; and (3) to foster future international collaborations to advance the science and practice of ecology and sustainability on the Mongolian Plateau. The symposium will feature well-established scientists from China, Japan, and Mongolia, who have conducted extensive research on the Mongolian Plateau. The organizers plan to publish a synthesis paper based on the symposium, which will involve most or all of the speakers. In addition, a special issue in a mainstream journal will be seriously pursued, depending on the level of enthusiasm among the symposium participants.

S14-1 **Human activities further amplify the cooling effect of vegetation greening in Chinese drylands**
＊Yangjian Zhang (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, ESC)

S14-2 **Impacts of multi-year extreme drought on grasslands at regional and global scales**
＊Qiang Yu (Beijing Forestry University, ESC)

S14-3 **Monitoring the Impacts of Climate Change and Assessing Adaptation in the Mongolian Grasslands**
＊Qinxue Wang (National Institute for Environmental Stuides), Tomohiro Okadera (National Institute for Environmental Stuides), Tadanobu Nakayama (National Institute for Environmental Stuides)

S14-4 **Plant litter loss exacerbates drought influences on grasslands**
＊Yongfei Bai (Institute of Botany, the Chinese Academy of Sciences/College of Resources and Environment, University of Chinese Academy of Sciences, ESC)

S14-5 **Temporal and spatial variability in aboveground net primary production of boreal steppe of Mongolia**
＊Ariuntsetseg Lkhagva (National University of Mongolia)

S14-6 **Enhancing the resilience of drylands to global change**
＊Takehiro Sasaki (Yokohama National University, ESJ)

S14-7 **The impact of herding strategies on dry rangeland resilience: insights from mathematical modelling**
＊Toyo Vignal (Okinawa Institue of Science and Technology/Maxwell Institute), Mara Baudena (National Research Council (CNR-ISAC)), Angeles Garcia Mayor (Universidad Complutense de Madrid), Jonathan Sherratt (Maxwell Institute)

S14-8 **Soil texture regulates climate-vegetation-soil carbon relationships in semi-arid grasslands**
＊(Frank) Yonghong Li (Inner Mongolia University, ESC)

S14-9 **Progress and prospects of Geography in promoting the United Nations Sustainable Development Goals: A discussion on the theoretical framework of Sustainable Geography**
＊Wenwu Zhao (Beijing Normal University, ESC), Caichun Yin (Beijing Normal University)

Symposium 15 July 21 (Mon) 10:00-12:00 Room C

Ecology and evolutionary biology of zooplankton in various systems

Organizer Kwang-Hyeon Chang (Kyung-Hee University, ESK)

Co-Organizer Yurie Otake (Kyoto University, ESJ)

Zooplankton are important components of aquatic ecosystems, serving as intermediate consumers that connect primary producers and higher-order consumers. Due to their ecological importance and unique characteristics, zooplankton have been ideal research targets in fields like Ecology and Evolution, helping to test and propose theories such as rapid evolution and the paradox of plankton. Additionally, zooplankton are used globally as environmental indicators for monitoring aquatic systems. Therefore, understanding zooplankton ecology and evolution is crucial for scientific development and environmental conservation. Recent studies increasingly highlight East Asia as a zooplankton hotspot. Integrating zooplankton research from multiple East Asian countries is vital for understanding biodiversity and its formation mechanisms, the historical formation of zooplankton phylogeographic patterns, and associated evolution. This symposium aims to share and discuss ecological and evolutionary research on zooplankton across a broad range of fields (freshwater to marine), regions throughout East Asia, zooplankton research targets, and themes. Through this, we hope to stimulate studies on zooplankton ecology and evolutionary biology and enhance our understanding of them.

S15-1 Seasonal and annual heterogeneity in the genetic structure of a *Daphnia* population in a small mountain lake

＊Jotaro Urabe (Tohoku University/Yokohama National University, ESJ), Keisuke K. Yamaki (Tohoku University)

S15-2 How population genetic structure is developed? Observation using lake sediment and *Daphnia ephippia*

＊Yurie Otake (Center for Ecological Research, Kyoto University, ESJ), Yuka Onishi (University of Tokyo), Masato Yamamichi (National Institute of Genetics), Jotaro Urabe (Tohoku University), Takehito Yoshida (University of Tokyo)

S15-3 Phenotypic integration and plasticity in invasive populations: insights from Daphnia pulex under variable environmental conditions

＊Xiaofei Tian (Zhejiang Ocean University, ESC), Wenping Feng (Zhejiang Ocean University), Xiumei Zhang (Zhejiang Ocean University)

S15-4 Body Size-Based Assessment of Zooplankton Community in a Brackish Lake: Ecological Function and Food Web Perspectives

＊Geun-Hyeok Hong (Kyung Hee University, ESK), Hye-Ji Oh (Nara Women's University), Yerim Choi (Kyung Hee University), Dae-Hee Lee (Kyung Hee University), Kwang-Hyeon Chang (Kyung Hee University)

S15-5 Effects of acid stress on life history traits of the perennial calanoid copepod *Eodiaptomus japonicus* from Lake Biwa, Japan

＊Xin Liu (Guangxi Academy of Sciences, ESC), Huanan Gao (Tsinghua University), Yasushi Iseri (Wenzhou University), Aimin Hao (Wenzhou University), Min Zhao (Wenzhou University), Syuhei Ban (The University of Shiga Prefecture)

S15-6 Divergence of the zooplankton community dynamics driven by ontogenetic omnivores

＊Hiromichi Suzuki (Tohoku University, ESJ), Jamie Michael Kass (Tohoku University), Jotaro Urabe (Tohoku University)

S15-7 Morphological traits of common rotifer species (*Keratella cochlearis*) as an ecological index: implications for the responses of zooplankton structure to lake environments

＊Yerim Choi (Kyung Hee University, ESK), Hye-Ji Oh (Nara Women's University), Geun-Hyeok Hong (Kyung Hee University), Dae-Hee Lee (Kyung Hee University), Geung-Hwan La (Eco-lab Gongsaeng), Hyun-Woo Kim (Sunchon National University), Min-Ho Jang (Kongju National University), Kwang-Hyeon Chang (Kyung Hee University)

S15-8 Ecological trait-based grouping of rotifers and its response to lake characteristics

＊Hye-Ji Oh (Nara Women's University, ESJ), Kwang-Hyeon Chang (Kyung Hee University), Nan-Young Kim (Konkuk University), Soon-Jin Hwang (Konkuk University), Min-Ho Jang (Kongju National University), Izumi Katano (Nara Women's University)

Symposium 16 July 21 (Mon) 10:00-12:00 Room D

Present and Future of Pollination Service in East Asia

Organizer Tomoyuki Yokoi (Institute of Life and Environmental Sciences, University of Tsukuba, ESJ)
Co-Organizers Chuleui Jung (Dept Plant Medicals. Andong National University, ESK)
Kae Natsume (Graduate School of Agriculture, University of Tokyo, ESJ)

This symposium, organized by East Asian researchers, will focus on pollination services in natural ecosystems. There's increasing global concern about the decline in pollinator diversity and abundance, especially among insects, which are crucial for crop production and wild plant diversity. Understanding their basic ecology and assessing food resources are urgent tasks. While Western countries have advanced in this research, studies in East Asia, including Japan, Korea, Nepal, and China, are still in early stages despite the region's high diversity of crops and wild plants. Environmental changes, like climate change and land-use alterations, significantly impact Asian pollinators. Thus, information sharing among researchers is vital for maintaining and utilizing pollinator diversity in this region. The symposium welcomes participants interested in pollination services and plant-insect interactions. We'll assess the current status of pollination in East Asia, including its utilization and challenges, and discuss conservation, sustainable management strategies, and the economic and nutritional importance of pollination. Topics will include pollination by bumble bees, honey bees, wild bees, and other insect pollinators. Invited researchers will present studies on the pollination behavior of wild and managed bees, current use and conservation management, and contributions of lesser-known pollinators like ants.

S16-1 Current status of wild bee pollination service in Japan
＊Tomoyuki Yokoi (Institute of Life and Environmental Sciences, University of Tsukuba, ESJ)

S16-2 Pollinator diversity in fruit crop orchards in Korea and possible impacts of large scale disturbance
＊Chuleui Jung (Gyeongkuk National University, ESK), Gwanhee Lee (Gyeongkuk National University), Ehsan Rahimi (Gyeongkuk National University)

S16-3 Ant pollination in common buckwheat and its implication in agriculture
＊Kae Natsume (University of Tokyo, ESJ), Tadashi Miyashita (University of Tokyo)

S16-4 Withdrawn

S16-5 Withdrawn

S16-6 Detecting flowering phenology using high-resolution satellite imagery
＊Sukyung Kim (Kangwon National University/Seoul National University, ESK), Minkyu Moon (Kangwon National University), Hyunjae Lee (Kangwon National University), Jaebeom Kim (Kangwon National University), Hyun Seok Kim (Seoul National University)

Symposium 17 July 21 (Mon) 10:00-12:00 Room E

Beyond boundaries II: lightning talk session for diverse ecological topics

Organizer Gaku Takimoto (The University of Tokyo, ESJ)

Ecology is often a scientific discipline that addresses research themes ranging from region-specific ecological phenomena to large-scale issues extending beyond national borders. EAFES is an opportunity to promote ecological research in East Asia by providing a setting for active discussions with neighboring countries. However, active communication is not always easy for those with few connections to other countries, such as young researchers and students attending EAFES for the first time. This symposium will provide an opportunity to casually present their own research and encourage active interactions beyond the research topics and national borders.
The symposium is a series of lightning talks, each of which is about 5-10 minutes long. Speakers can present their findings, introduce ongoing projects, and share their ideas. We basically welcome talks on any ecological topics, but will mainly target research fields not covered by other symposia, such as behavior, disease, population, and community ecology. We also encourage applications from students and young researchers, although there is no strict definition of "young", we welcome researchers who are in their early careers. We hope that the interactions in this symposium will be a good opportunity to build a long-term relationship and future collaborations.

S17-1 Evolutionary rescue of *Chlorella vulgaris* under temperature and salinity stress
＊Shohei Kawata (National Institute of Genetics, ESJ), Shota Shibasaki (Doshisha University), Masato Yamamichi (National Institute of Genetics)

S17-2 Unpacking laws of spatial directionality in urban expansion morphology and carbon emissions
＊Chengwei Li (NYU Shanghai/ECNU, ESC), ChengHe Guan (NYU Shanghai)

S17-3 The adaptive characteristics of growth and reproduction of *Phragmites australis* community in the Yangtze River estuary wetland and its environmental influencing factors
＊Chao Zhang (Schoof of Geographical Sciences, East China Normal University, ESC), Qi Zhang (Schoof of Geographical Sciences, East China Normal University)

S17-4 Balancing multiple protected objects and cost in national park planning

＊Zhenhua Zang (Research Center for Eco-Environmental Sciences, Chinese Academy Sciences, ESC)

S17-5 Carbon balance of post-harvest stage of forestry: Approach evolution and assessment

＊Xiaobiao Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

S17-6 Climate-induced shifts in sulfate dynamics regulate anaerobic methane oxidation in a coastal wetland

＊Jaehyun Lee (Korea Institute of Science and Technology, ESK), Yerang Yang (Korea Institute of Science and Technology)

S17-7 Impacts of Livestock Spatial Distribution under Different Resource Conditions on Grassland Health and Quality

＊Yunxiang Cheng (Inner Mongolia University)

S17-8 *In situ* nitrogen uptake from inorganic and organic sources by the fine-root systems of five alpine tree species

＊Ryunosuke Suwa (Graduate School of Science and Technology, Shinshu University, ESJ), Naoki Makita (Graduate School of Science and Technology, Shinshu University)

S17-9 Effect of Bacilius velezensis CE 100 and shading on physiological and flowering characteristics of *Platycodon grandiflorum*

＊Juhyun Kim (Department of Agriculture, Forestry and Bioresources, Seoul National University, ESK), Umashankar Chandrasekaran (Department of Biological Sciences, Kangwon National University), Mega Trishuta Pathiassana (Department of Agriculture, Forestry and Bioresources, Seoul National University), Sanghee Park (Department of Agriculture, Forestry and Bioresources, Seoul National University), Kunhyo Kim (Department of Agriculture, Forestry and Bioresources, Seoul National University), Hye young Yoo (Department of Agriculture, Forestry and Bioresources, Seoul National University), Yunhee Park (Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University), Ahrem Yun (Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University), Jiwon Baek (Department of Agriculture, Forestry and Bioresources, Seoul National University), Handoo Shin (Department of Agriculture, Forestry and Bioresources, Seoul National University), Jeonghyun Hong (Department of Agriculture, Forestry and Bioresources, Seoul National University), Seongjun Na (National Institute of Forest Science), Jimin Park (National Institute of Forest Science), Hyun Seok Kim (Department of Agriculture, Forestry and Bioresources, Seoul National University/Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University/Research Institute for Agriculture and Life Sciences, Seoul National University)

S17-10 Predator-specific prey defense stabilizes predator coexistence despite fitness differences

＊Gaku Takimoto (University of Tokyo, ESJ), Shinji Kobayashi (University of Tokyo)

Symposium 18 July 21 (Mon) 13:30-15:30 Room A

Restoring ecosystem structure and function under global change

Organizer Zhanfeng Liu (South China Botanical Garden, Chinese Academy of Sciences, ESC)

Co-Organizer Dejun Li (Institute of Subtropical Agriculture, Chinese Academy of Sciences, ESC)

Anthropogenic global change - encompassing climate shifts, biodiversity loss, and landscape fragmentation - has disrupted critical ecosystem processes at unprecedented rates. While ecological restoration traditionally focused on species reintroduction, contemporary challenges demand integrated approaches addressing both structural components (species composition, physical habitat) and functional recovery (nutrient cycling, pollination networks, carbon sequestration). This session will bridge theoretical ecology and applied restoration science to explore:
Synthesize recent advances in process-based restoration ecology
Identify critical knowledge gaps in predicting ecosystem responses to coupled stressors
Develop interdisciplinary protocols for monitoring multifunctional outcomes
Foster partnerships between academia, policymakers, and practitioners

S18-1 Joint effects of multiple natural and anthropogenic drivers on soil nitrogen cycling

＊Xiaoli Cheng (Yunnan University, ESC), Yong Zhang (Yunnan University)

S18-2 The Global Biodiversity Standard ---an Assess and Guidance for Science-Based Forest Restoration

＊Xiangying Wen (South China Botanical Garden, Chinese Academy of Sciences/Botanic Gardens Coservation International (BGCI), ESC), David Bartholomew (Botanic Gardens Coservation International (BGCI))

S18-3 The effect of inundation depth on carbon fluxes and fraction in the Yellow River Delta Wetland, China

＊Mingliang Zhao (Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, ESC), Guangxuan Han (Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences)

S18-4 Forest soil carbon sequestration and its responses to climate changes

＊Wu Fuzhong (College of Geographic Sciences, Fujian Normal University, ESC), Lin Xiaohao (College of Geographic Sciences, Fujian Normal University)

S18-5 Soil property recovery following restoration of abandoned sugarcane plantation

＊Po-Neng Chiang (Experimental Forest, National Taiwan University), Jui-Chu Yu (Experimental Forest, National Taiwan University), Yen-Jen Lai (Experimental Forest, National Taiwan University)

S18-6 TBC

＊Faming Wang (South China Botanical Garden, Chinese Academy of Sciences, ESC)

S18-7 Microbial necromass dominates particulate and mineral-associated organic carbon accumulation in calcareous soil following afforestation

＊Zihong Zhu (Institute of Subtropical Agriculture, Chinese Academy of Sciences, ESC), Dejun Li (Institute of Subtropical Agriculture, Chinese Academy of Sciences)

S18-8 Mechanisms of synergistic regulation of soil organic matter transformation by climatic and pedogenesis processes

＊Zhijian Mou (South China Botanical Garden, Chinese Academy of Sciences, ESC), Zhanfeng Liu (South China Botanical Garden, Chinese Academy of Sciences)

Symposium 19 July 21 (Mon) 13:30-15:30 Room B

Sustainability and carbon sink of plantation forest ecosystems

Organizer Jiaojun ZHU (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

Co-Organizers Guangyou HAO (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)
Qiaoling YAN (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)
Xiao ZHENG (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

With the increasing global demand for timber production and ecosystem services, such as carbon sequestration, plantation forests have expanded worldwide, with the majority established as monocultures of pure conifers or broadleaved tree species. These plantation forests play a crucial role in climate change mitigation strategies across East Asia. However, long-term sustainability challenges have emerged, including decreased soil fertility, biodiversity loss, increased vulnerability to forest diseases and pests, and reduced resilience to global changes, particularly extreme climate events.

To ensure the sustainable development of plantation forest ecosystems, this symposium aims to address critical knowledge gaps regarding:

1. Carbon sink formation and maintenance mechanisms in plantation forests, with special focus on the interactions between aboveground vegetation dynamics, belowground ecological processes, and climate factors across various forest types in East Asia;
2. Advanced methodologies for accurate carbon sink measurement and evaluation in plantation forests under complex terrain and changing environmental conditions;
3. Development of comprehensive stability indicators to assess plantation forest resistance and resilience under global change scenarios, including extreme weather events, shifts in precipitation patterns, and rising temperatures;
4. Management strategies to optimize both timber production and carbon sequestration while enhancing ecosystem stability and biodiversity.

This symposium will bring together ecologists, forest managers, and policymakers to share recent research advances, discuss practical management approaches, and explore future research directions that promote sustainable plantation forestry in East Asia. We welcome contributions addressing these critical issues through field observations, experimental studies, and modeling approaches.

S19-1 Comparison of carbon flux in larch plantation and secondary forests over complex terrains by using Qingyuan-Ker Towers

＊Jiaojun Zhu (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

S19-2 Effects of warming and snow changes on phenology, growth and physiology of two co-existing seedlings in a temperate forest

＊Qiaoling Yan (Institute of Applied Ecology, Chinese Academy of Sciences/Qingyuan Forest CERN, National Observation and Research Station, ESC), Junfeng Yuan (Qingyuan Forest CERN, National Observation and Research Station/Key Laboratory of Vegetation Restoration and Management of Degraded Ecosystems, South China Botanical Garden, Chinese Academy of Sciences), Jiaojun Zhu (Institute of Applied Ecology, Chinese Academy of Sciences/Qingyuan Forest CERN, National Observation and Research Station)

S19-3 Hydraulic functionality as a key determinant of the productivity of major afforestation tree species in Northeast China

＊Guangyou Hao (Institute of Applied Ecology, Chinese Academy of Sciences, ESC), Guang-You Hao (Institute of Applied Ecology, Chinese Academy of Sciences), Jing-Jing Guo (Institute of Applied Ecology, Chinese Academy of Sciences), Yong-Jiao Zhou (Institute of Applied Ecology, Chinese Academy of Sciences), Shen-Hao Song (Institute of Applied Ecology, Chinese Academy of Sciences), Xiao-Han Yin (Institute of Applied Ecology, Chinese Academy of Sciences), Da Yang (Institute of Applied Ecology, Chinese Academy of Sciences), Jia Song (Institute of Applied Ecology, Chinese Academy of Sciences)

S19-4 Assessing farmland shelterbelts in combating soil erosion, carbon storage and crop yields

＊Xiao Zheng (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

S19-5 TBC

＊Yirong Sun (Institute of Applied Ecology Chinese Academy of Sciences, ESC)

S19-6 Near real-time monitoring of carbon effects from continuous forest change in rapidly urbanizing region of china

＊Dou Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences/Zhejiang Sci-Tech University, ESC)

S19-7 Molecular characterization of soil organicmatter across forests in northeastern China

＊Xiangxia Yang (Institute of Ecology, Peking University, ESC), Xiaoding Lin (Institute of Ecology, Peking University), Le Chang (Institute of Ecology, Peking University), Kazuo Isobe (Institute of Ecology, Peking University)

Symposium 20 July 21 (Mon) 13:30-15:30 Room C

Illuminating Marine Ecology Through Genomic Innovations

Organizer Nina Yasuda (The University of Tokyo, ESJ)

Co-Organizer Masumi Kamata (The University of Tokyo, ESJ)

This symposium will spotlight cutting-edge ecological research leveraging genomic data from diverse aquatic organisms. One highlight focuses on how reduced genomic information is clarifying coral taxonomy, especially for groups previously difficult to distinguish morphologically. These genomic approaches allow for sharper species boundaries and reveal hidden biodiversity within coral communities. Another topic is the rapidly evolving field of environmental DNA (eDNA) applications. By employing fish metabarcoding techniques, researchers can now assess marine biodiversity with unprecedented accuracy and speed. This advancement not only streamlines the evaluation of species presence and distribution but also helps detect elusive or rare organisms that may escape conventional survey methods. The symposium will also feature ongoing research on chemical communication in marine life, elucidated through whole-genome analyses. Of particular interest is the identification and characterization of olfactory genes. Insights into the molecular basis of chemical sensing have broad implications for understanding starfish behavior and developing novel management strategies. We aim to foster interdisciplinary collaboration and showcase how genomic insights can drive innovative approaches to conservation, management, and our broader understanding of life in the oceans.

S20-1 Withdrawn

S20-2 Exploring the Microbiome of Acropora digitifera in the Sesoko Region

＊Kodai Gibu (University of Tokyo/National Institute of Advanced Industrial Science and Technology, ESJ), Hiroki Kise (National Institute of Advanced Industrial Science and Technology), Yuki Yoshioka (National Institute of Technology Okinawa College), Naoki Saito (National Institute of Advanced Industrial Science and Technology), Yuichi Nakajimka (National Institute for Environmental Studies), Kazuhiko Sakai (University of the Ryukyus), Atsushi Suzuki (National Institute of Advanced Industrial Science and Technology), Nina Yasuda (University of Tokyo), Akira Iguchi (National Institute of Advanced Industrial Science and Technology)

S20-3 The Evolution and Functional Roles of Olfactory Receptors in Starfish: Insights from the Genus Acanthaster

＊Masumi Kamata (The University of Tokyo/Geological survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST), ESJ), Rei Kajitani (Institute of Science Tokyo), Takehisa Ito (Institute of Science Tokyo), Kodai Gibu (The University of Tokyo/Geological survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST)), Yoshihito Niimura (University of Miyazaki), Nina Yasuda (The University of Tokyo)

S20-4 Non-Invasive Detection of Coral Stress Responses via Environmental RNA (eRNA)

＊Anna Rudyk (The University of Tokyo), Hyuga Houtoku (The University of Tokyo), Mikito Murakami (The University of Tokyo), Fei Xia (The University of Tokyo), Nina Yasuda (The University of Tokyo)

S20-5 Monitoring Coastal Plankton Communities in Northeast Japan through Metagenomics and Epigenomics in the PlanDyO Project

＊Takeshi Obayashi (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Graduate School of Information Sciences, Tohoku University), Toyonobu Fujii (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Onagawa Field Center, Graduate School of Agricultural Science, Tohoku University), Akane Kitamura (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University), Gaku Kumano (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Asamushi Research Center for Marine Biology, Graduate School of Life Sciences, Tohoku University), Minoru Ikeda (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Onagawa Field Center, Graduate School of Agricultural Science, Tohoku University)

Symposium 21 July 21 (Mon) 13:30-15:30 Room D

Evolutionary ecology of low-dispersal insects: geographic differentiation, local adaptation and interactions between closely related species

Organizer Kohei Kubota (Heisei International University, ESJ)
Co-Organizers Yasuoki Takami (Kobe University, ESJ)
Sheng-Nan Zhang (Anhui Agricultural University)

The active and passive flight abilities of insects have promoted adaptive radiation and led to their evolutionary success. On the other hand, flight ability is a costly trait, and in stable environments, there are quite a few insects that have degenerated flight ability and reduced dispersal ability. This symposium focuses on such low-dispersal insects. Low dispersal is prone to population differentiation and speciation due to geographic isolation of insects. In addition, adaptation to local environments may cause niche differentiation of intraspecific populations. Secondary contact after differentiation may also lead to interactions such as gene flow, promoting reproductive isolation, and character displacement. In addition, due to resource competition and reproductive interference between closely related species, they may show exclusive distribution or acquire sympatry. EAFES member countries are rich in topographical diversity, with China, which is mainly continental, Korea, which is located on a peninsula, and Japan, which is an island nation. The purpose of this symposium is to discuss the above-mentioned phenomenon of low-dispersal insects in each country from an evolutionary ecological perspective.

S21-1 Evolutionary history and climate-driven range shifts in the cold-adapted beetle genus *Platycerus* in East Asia
＊Kohei Kubota (Heisei International University, ESJ), Xue-Jiao Zhu (South China Agricultural University), Tao Ma (South China Agricultural University), Xiu-Jun Wen (South China Agricultural University), Sheng-Nan Zhang (Anhui Agricultural University)

S21-2 Evolutionary History of Yeast Symbionts in *Platycerus* and *Prismognathus* Beetles
＊Shengnan Zhang (Anhui Agricultural University, ESC)

S21-3 Latitudinal variation and environmental dependence in the genital size of Eucarabus ground beetles in Korean Peninsula
＊Yutaro Nakao (Kobe University, ESJ), Tae-Woong Jang (Kangwon National University), Yong-Hwan Park (Kobe University/Kangwon National University), Jong-Kuk Kim (Kangwon National University), Jun-Lark Kim (Uiduk University), Kohei Kubota (Heisei International University), Yasuoki Takami (Kobe University)

S21-4 Reproductive character displacement in the shape and physical property of the male genitalia in *Ohomopterus* ground beetles in central Japan
＊Maemura Toon (Kobe University, ESJ), Takami Yasuoki (Kobe University), Inoue Mari (Kobe University), Nishimura Taira (Kobe University)

S21-5 Did the adaptation and subsequent isolation into mountainous forests contribute to multiple degeneration of flight ability in ground beetles?
＊Takashi Shimizu (The University of Tokyo, ESJ), Hiroshi Ikeda (The University of Tokyo), Kôhei Kubota (The University of Tokyo/Heisei International University)

S01-1 Unraveling the diversity-productivity link: Findings from long-term forest census records

＊Tetsuo I. Kohyama (The University of Tokyo, ESJ), Tsutom Hiura (The University of Tokyo), Douglas Sheil (Wageningen University and Research), Takashi S. Kohyama (Hokkaido University)

Understanding the linkage between biodiversity, ecosystem net primary productivity, and climate remains a long-standing challenge in ecology. Ecosystem productivity reflects the composition of plant species, each of which exhibits distinct demographic properties. Therefore, it is crucial to explore how species-level productivity varies within and among forest communities.
In this talk, I will share recent insights from our analysis of long-term forest monitoring plots in eastern Asia. A key finding is the consistent negative correlation between species' relative wood productivity (i.e. net primary productivity due to tree growth) and their per-area aboveground biomass across a wide range of climatic zones—from sub-boreal to tropical forests. This surprising consistency suggests a global pattern of forest productivity along thermal gradients, where higher forest productivity in warmer climates is primarily shaped by tree community structure. Tropical forests are composed of numerous small-biomass species with high per-biomass productivity, in contrast to temperate forests. As a result, tropical forests achieve higher productivity even at similar levels of standing biomass.
Our findings highlight the critical role of biodiversity in sustaining forest ecosystem functions. I will also discuss how ongoing global climate change impacts forest productivity through shifts in community structure.

S01-2 Long-Term Forest Dynamics in a Typhoon-Prone Ecosystem: 20 Years of Research at Fushan FDP, Taiwan

＊I-Fang Sun (National Dong Hwa University)

The Fushan FDP is a 25-hectare (500 m × 500 m) permanent forest research plot established in 2003, located in the subtropical rainforest of northern Taiwan (24°45'40" N, 121°33'28" E). Situated within a rugged upstream watershed, the plot spans elevations from 600 to 733 meters above sea level. The site experiences a humid subtropical climate, influenced by the northeast monsoon in winter and frequent summer typhoons, with a mean annual rainfall of 4,271 mm, an average temperature of 18.2 °C, and mean relative humidity of 95.1%.
In the initial census, 114,508 individual trees representing 110 species were recorded. Since then, four additional censuses have been conducted (2009, 2014, 2019, and 2024), providing valuable long-term data on forest dynamics.
Fushan is a typhoon-prone forest with an average of 1.5 typhoon strikes per year over the past century. These frequent typhoons have shaped a unique forest structure distinct from other ForestGEO sites, such as short tree stature, a high incidence of multi-stemmed individuals, large portion of dead biomass from broken branches, a dense understory, and a long seedling to sapling transition time.
Long-term ecological studies conducted in the plot include seed trap and seedling monitoring, plant functional trait surveys, and annual mortality assessment. Over the study period, the forest has exhibited increasing tree mortality and declining species richness. Plant phenology patterns, particularly flowering and fruiting, are strongly influenced by El Nino event and typhoon intensity. Notably, more than 75% of aboveground biomass loss is attributed to branches breakage during typhoons.
In this talk, I will briefly present key findings from our seed traps/seedlings studies, with a particular focus on how climatic conditions, especially typhoons and El Niño events affect plant reproductive phenology.

S01-3 Responses of *Pinus densiflora* seedlings to open-field climate manipulation: a synthesis of fifteen years of experiments

＊Yowhan Son (Korea University, ESK), Heejae Jo (Korea University)

To investigate the effects of climate change on *Pinus densiflora*, open-field climate manipulation studies using seedlings were conducted from 2010 to 2024 at two locations in Seoul and Pocheon, South Korea. From 2010 to 2013, a warming treatment of +3° C was applied. Between 2013 and 2022, increased and decreased precipitation treatments (±30% and ±40%) were added to the warming treatment. An additional study conducted from 2023 to 2024 introduced seasonal warming treatments (+4°C; spring and fall, summer, and constant) to further investigate the effects of warming, which had previously shown a greater impact on *P. densiflora* compared to changes in precipitation. Across the studies, warming consistently led to decreases in gas exchange parameters (net photosynthetic rate, transpiration rate, and stomatal conductance) and triggered phenological shifts (earlier leaf unfolding and increased lammas shoot occurrence). However, growth responses did not show a consistent pattern. Precipitation treatments had relatively minor effects compared to warming. In the additional study, physiological and phenological responses were significant only under summer and constant warming, with the most pronounced effects observed under constant warming. These findings confirm that *P. densiflora* seedlings are more sensitive to warming than to changes in precipitation, with the strongest responses observed when warming elevated summer temperatures. Moreover, the accumulation of heat appears to intensify these physiological and phenological responses, suggesting that both acute and cumulative warming contribute to stress in *P. densiflora* seedlings.
* This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (RS-2021-NR060142) and Carbon Neutral Infrastructure Building Program provided by Korea Forestry Promotion Institute (KoFPI) (RS-2024-00403486).

S01-4 Effects of long-term warming on plant-insect interactions in boreal forest

＊Masahiro Nakamura (Hokkaido University, ESJ), Takafumi Hino (Hokkaido Research Organization), Chisato Terada (Hokkaido University), Hayato Iijima (Forestry and Forest Products Research Institute), Tatsuro Nakaji (Hokkaido University), Tsutom Hiura (The University of Tokyo)

Recent studies highlight the importance of plant-mediated effects of global warming on herbivorous insects, yet responses in mature trees remain unclear. We conducted a 9-year soil warming experiment in mature oak trees in a boreal forest in Tomakomai, norther island Japan, using heating cables to raise soil temperature by 5℃. Each 5×5 m plot centered around a mature oak tree. This study asked: (1) Do canopy leaf traits and herbivory respond to soil warming? (2) How does the magnitude of these effects vary over time? Winter soil warming significantly reduced solute NH_4^+-N in the forest floor and mineral soil by preventing freeze-thaw cycles, a key driver of nitrogen dynamics. Warming significantly increased total phenolics in canopy leaves and slightly decreased nitrogen content, raising the C:N ratio—indicating a shift toward carbon-based defenses. Canopy herbivory was consistently lower in warmed plots from 2007 to 2015, with the strongest effect in the first three years. Even during a gypsy moth outbreak in 2014-2015, warmed trees showed reduced herbivory compared to controls. These findings suggest that soil warming can indirectly suppress herbivory in mature oak trees by altering leaf chemistry, with the effect diminishing over time.

S01-5 Assessment of Alpine Forest Expansion in Taiwan: A Multi-Temporal Analysis (1980-2021)

＊Teng-Chiu Lin (National Taiwan Normal University), Kuang-Yu Chen (National Taiwan Normal University)

Global treelines are moving upslope but the rates and drivers differ among different regions. Many studies have examined the relationship between treeline movement and climate change, while the role topographical factors received much less attention, despite the long-recognition of their importance. This study examined treeline dynamics from 1980 to 2021 in the Yushan Mountain Range and the Central Mountain Range of Taiwan, in relation to topographical and climate factors based on multi-temporal aerial imagery and U-Net deep learning segmentation. Treeline elevation approximately 60 meters across the two mountain ranges over the last four decades, with an average upward movement rate of about two meters in the first two decades and about one meter per year in the second two decades. Treeline advancement was accompanied by forest area expansion in the treeline ecotone by 197 ha in the Yushan Mountain Range and 158 ha in the Central Mountain Range over the last four decades. The forest area expansion in the treeline ecotone was mainly due to upward forest movement not tree densification. Elevation, increases in growing season temperature, maximum temperature, and precipitation were important predictors of forest area expansion, while elevation, increases in maximum temperature, slope and topographic position were key predictors of treeline elevation movement. The much greater rate of treeline advancement and area expansion in the first two decades than the second two decades, was possibly because most suitable habitat was already occupied by forests and further upward movement was constrained by topographic factors. Our study highlights the importance of including both climatic and topographic factors to fully understand treeline dynamics in responses to climate change. In addition, our study also indicates that forest upward movement may be approaching the upper limit above which treeline may show limited response to rising temperature.

S02-1 Benthic cyanobacteria/cyanobacterial biofilms: diversity and eco-environmental effects

＊Renhui Li (College of Life and Environmental Sciences, Wenzhou University), Youxin Chen (Institute of Hydrobiology, the Chinese Academy of Sciences), Yao Cheng (College of Life Science and Technology, Harbin Normal University), Yangyang Wu (College of Life and Environmental Sciences, Wenzhou University), Ruozheng Geng (College of Life and Environmental Sciences, Wenzhou University)

Massive growth of harmful cyanobacteria affects the drinking water safety and human health. During past decades more studies on cyanobacterial blooms formed by planktonic cyanobacteria have been performed, but benthic cyanobacteria in open waters in China have been hardly concerned. It is well known that benthic cyanobacteria exhibit much higher morphological, ecological, genetic and chemical diversity than the planktonic ones, and researches on benthic cyanobacteria should thus be enhanced. The present study will introduce the studies on benthic cyanobacterial communities and diversity from several Chines open canals playing key roles in the function of water diversion. Nearly 120 benthic cyanobacterial strains were successfully isolated from the three canals, identified as 13 genera such as filamentous *Microcoleus*, *Oscillatoria* and *Phormidium*. Discovering several novel genera such as *Neochroococcus* and *Microcoleusiopsis*, it was well shown that *Microcoleus vaginatus* is the most dominating species in the benthic cyanobacterial communities, confirming this species as the global dominating benthic cyanobacterial species. Another case study was focused on the neurotixic PST production from benthic *Microseira wollei* (formally as *Lyngbya wollei*) isolated from the West Lake in Hangzhou city, Zhejiang Province, and this study marked the first documented occurrence of PST-producing *M. wollei* outside of North America and identifies it as the first toxic freshwater benthic cyanobacterium in China. Such a study implies that benthic cyanobacteria may pose a higher environmental risk in China than previously acknowledged.

S02-2 Physiological response of toxin-producing *Microcystis aeruginosa* to CO_2 change

＊Nanqin Gan (Institute of Hydrobiology, CAS/University of Chinese Academy of Sciences), Jingyu Jiang (Institute of Hydrobiology, CAS)

The toxic microcystis dynamics have always been a hot topic. Previous studies showed that low CO_2 favors toxic strains, but how changing dissolved CO_2 (CO_2 [aq]) in water body influences the succession of toxic and non-toxic strains in *Microcystis* blooms remains uncertain. Here, we combined laboratory competition experiments, field observations to reveal the links be-

tween CO_2 changes and the succession. Laboratory experiments showed that under low CO_2 conditions (100-150 ppm), the toxic strains could make better use of CO_2 (aq) and be dominant. Field observations from June to November in Lake Taihu showed that the percentage of toxic strains increased as CO_2 (aq) decreased.
Further transcriptome and metabolome analysis found the number of differentially expressed genes was significantly lower in the toxic strain of *Microcystis* PCC 7806 WT than in the non-toxic mutant strain of *Microcystis* PCC 7806 Δ*mcyB*$^-$ after low-CO_2 culture. Ribosomal genes, genes encoding adenosine triphosphate (ATP) synthase, and genes encoding key enzymes of the Calvin cycle, which are indispensable for maintaining cellular life activities, were not affected by low CO2 condition in the wildtype, whereas all of them were significantly down-regulated in the non-toxic mutant PCC 7806 Δ*mcyB*$^-$. The specific ways in which MCs assist the toxic *Microcystis* to gain a low-carbon competitive advantage were also explored. The low CO_2 environment can induce the synthesis of more MCs by the toxic *Microcystis* and promote the binding of MCs to *Microcystis* proteins. This thesis identified two key proteins of the Calvin cycle, phosphoglycerate kinase (PGK) and glyceraldehyde-3-phosphate dehydrogenase (GAPDH), that can bind to MCs through screening and validation. And further analysis revealed that this binding facilitates the maintenance of their activities in low CO_2 environments, which improves the toxic algae's Carbon sequestration efficiency.
Our findings provide new insights for cyanoHABs prediction and prevention.

S02-3 Spatiotemporal change of snow-ice microbes on the glacier

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Snow-ice microbes, which adapt to harsh conditions such as low temperatures and high doses of UV, inhabit cryospheric environments. They cause unique phenomena represented by colored snow and ice occurring with blooms of snow and glacier algae, and cryoconite holes formed by filamentous cyanobacteria with mineral particles. These phenomena darken glacial surfaces and significantly affect the albedo of the snow and ice. Therefore, it is important to understand the factors that control the abundance of microbes. However, most studies have focused only on each taxon (algae, cyanobacteria, fungi, or heterotrophic bacteria), and there is a lack of information on the spatiotemporal changes in microbial communities. This study aimed to describe spatiotemporal changes in microbial communities and discuss the growth process and the factors that determine their distribution. The fieldwork was carried out from June to September 2022 on Gulkana Glacier in the Alaska Range. Three different types of samples (snow, bare ice, and cryoconite) were collected spatially, at a maximum of 54 points across the glacier. Microscopy revealed the presence of red-pigmented algae (*Sanguina nivaloides*, *Chloromonas* spp., and *Rosetta* spp.), purple-pigmented algae (*Ancylonema* (*A.*) *nordenskioeldii* and *A. alaskana*), cyanobacteria, and tardigrades. Red-pigmented algae increased on snow surfaces toward late July, and subsequently distributed to nearby ice surfaces and cryoconite holes. *A. nordenskioeldii* dominated mid-glacier ice surfaces throughout the season, while *A. alaskana* distributed to up-glacier along the northeastern side. Cyanobacteria were widely distributed on ice surfaces at both the up- and down-glaciers and throughout the cryoconite holes across the glacier. Comparison with environmental conditions suggests that microbial distribution is influenced by elevation, slope, mineral particle abundance, and food availability. These findings underscore the importance of the local environmental conditions of glaciers in shaping the spatial distribution of microbes.

S02-4 Diversity and feeding strategy of predatory protist and their application to the control of harmful algal bloom

＊Yingchun Gong (Institute of Hydrobiology, Chinese Academy of Sciences)

Protozoa are generally the major grazers of phytoplankton. We reported one chrysophyte *Poterioochromonas malhamensis* which has potential for controlling algal blooms through rapid grazing of toxic *Microcystis* cells and efficient degradation of microcystin. To achieve the application of this method, high-cell-density heterotrophic cultivation of *P. malhamensis* was established through optimizing the carbon/glucose concentration, C:N ratio, temperature, pH, and dissolved oxygen concentration. Under optimized conditions, the cell concentration of P. malhamensis reached more than 3×10^8 cells mL^{-1}, which exceeds that reported in other studies by more than an order of magnitude. The ability of the chemoheterotrophic *P. malhamensis* to graze unicellular *Microcystis* cells was comparable to that of autotrophic and phagotrophic *P. malhamensis*. A controlled field experiment showed that chemoheterotrophic *P. malhamensis* could live in the aquatic environment with a *Microcystis* bloom and decrease the *Microcystis* biomass on the surface of the water by promoting the sedimentation of colonial *Microcystis* cells. This study offers an opportunity to drive the development of methods to control *Microcystis* blooms using predatory *P. malhamensis*.

S02-5 Simulating the response of freshwater plankton communities to climate change in Republic of Korea

＊Hyun-Woo Kim (Sunchon National University, ESK), Hyo Gyeom Kim (Korea Environment Institute), Gea-Jae Joo (Pusan National University)

Understanding how climate change alters planktonic community interactions is essential for predicting ecosystem responses to environmental variability. While previous studies have demonstrated the direct effects of warming and nutrient shifts on plankton dynamics, fewer have addressed how climate-induced changes restructure species interactions. In this study, we applied windowed correlation analysis and dynamic Bayesian network (DBN) modeling to long-term time series data of phytoplankton and zooplankton communities in a temperate river in Korea. We accounted for physical discontinuities in sampling dates and fil-

tered outobservations with over 30-day gaps to ensure temporal integrity. By incorporating environmental variables—namely water temperature (WT), average air temperature (Ave_temp), and other meteorological factors—into our models, we quantitatively evaluated their conditional influences on planktonic interaction strength over time. Our results show that temperature plays a dual role: it directly influences individual taxa abundances and indirectly modulates the interaction structure between phytoplankton and zooplankton. Notably, DBN analysis revealed that DateDiff combined with WT had stronger explanatory power for interaction variability than with Ave_temp alone, supporting the role of in-situ water conditions over broader climatic indicators. These findings are consistent with prior work in both marine and freshwater systems demonstrating that warming reconfigures bottom-up processes. This study provides empirical evidence that climate variability not only shifts species abundances but also transforms the ecological interactions that define community structure. Future ecosystem models must therefore account for dynamic interaction networks that are sensitive to both physical and chemical environmental change.
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S02-6 Interpreting long-term changes of food web structure of fish community in brackish water along environmental gradients

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Food web structure reflects the trophic positions and interactions among organisms and serves as a foundation for understanding food web functioning, including resource diversity and energy transfer efficiency. In dynamic estuarine ecosystems, environmental heterogeneity, driven by spatial and temporal gradients, can lead to considerable variability in food web structure.
We examined temporal variations in the carbon and nitrogen stable isotope ratios of three functionally distinct fish species-Chelon haematocheilus (peripheral freshwater detritivore fish), Carassius carassius (primary freshwater omnivore fish), Synechogobius hasta (peripheral freshwater carnivore fish)-in the brackish lake Saemangeum (Korea) over the period 2016-2024. Isotopic niche-based trophic structure and environmental conditions (e.g. water quality, feeding environment) were quantitatively assessed to identify the key determinants of trophic niche size and resource diversity of fish community.
We assessed the direction and magnitude of isotopic shifts to characterize temporal dynamics in fish isotopic composition using stable isotope trajectory analysis. The results indicated notable variability in isotopic trajectories over time, suggesting that isotopic shifts of fish are influenced by dynamic environmental fluctuations. In particular, trophic niche size and resource diversity were correlated with environmental gradients, including water temperature and feeding environment such as macroinvertebrate diversity and relative abundance of primary prey species (e.g. shrimp, polychaetes).

S02-7 Cold-water fish distribution responds to horizontal heterogeneity in dissolved oxygen, potentially restructuring offshore lake food webs

＊Ryosuke Katayose (National Institute for Environmental Studies/United Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology, ESJ), Taku Kadoya (National Institute for Environmental Studies)

Global climate change is warming surface water and simultaneously reducing bottom oxygen, bringing a critical crisis for offshore lake ecosystems. Cold-water fish, as mobile ectotherms, face oxythermal habitats limited by high surface temperatures and low bottom oxygen. The warming of surface water occurs relatively uniformly across the offshore zone, but low-bottom oxygen often develops heterogeneously. This spatial heterogeneity of the dissolved oxygen may lead to the biased distribution of cold-water fish and spatially uneven food web structures. However, although vertical limitations due to hypoxia and horizontal movements of specific cold-water fish species have been studied, the spatial distribution of specific cold-water fish species in relation to the oxygen conditions and food resources such as zooplankton across the entire offshore zone remains poorly understood. To address this knowledge gap, we investigated how cold-water fish distributions respond to seasonal dissolved oxygen dynamics in a small lake in Japan. We assessed the fish distribution and water quality at two sites. Each site was located in the centers of lake basin divided by unique ridge topography. Fish density distributions were assessed using hydroacoustic system, and relative abundances of kokanee and rainbow trout were estimated using environmental DNA. Additionally, we examined the relationship among cold-water fish density, zooplankton density, and phytoplankton density to evaluate potential top-down cascading effects. Our results showed that the surface high temperatures and bottom low oxygen during the summer limited the oxythermal habitat of the cold-water fishes in spatially heterogeneous ways. We also found that zooplankton density responded to the spatial variation in cold-water fish distribution. Based on those results, we argue that spatial heterogeneity of dissolved oxygen can concentrate predator fish in particular areas, potentially restructuring offshore food webs through spatially heterogeneous predation pressure.

S02-8 How to improve longitudinal connectivity of aquatic ecosystem: Current status of fish passages in South Korea

＊JuDuk Yoon (National Institute of Ecology, ESK), Dongwon Kang (National Institute of Ecology)

Maintaining longitudinal continuity is essential for sustaining a healthy aquatic ecosystem. However, countries where agriculture is a primary industry, structures such as weirs and dams play an important role by ensuring a stable water supply to agricultural fields. Although Korea is now a highly developed nation, agriculture remains a significant sector on the Korean Peninsula. Consequently, the construction of weirs has continued across a wide range of water bodies, from small streams to major rivers. Despite this widespread installation, fish passages have been incorporated into only a limited number of weirs, and most of these lack proper management. As a result, Korea's streams and rivers have become highly fragmented, and fish migration

has been severely impeded. In response, the Ministry of Korea conducted a nationwide investigation to assess the status and problems of existing fish passages. As of 2022, a total of 33,888 weirs had been installed, equating to one weir approximately every 0.8 km of stream length nationwide. Of these, fish passages were constructed in only 4,839 weirs, representing a mere 14.3% installation rate. Among the installed passages, vertical slot (30.8%) and channel-type (26.7%) designs were the most common, most of which date back to the 1970s and 1980s. More recently, Ice-harbor (13.3%) and rock ramp (3.9%) designs have become more prevalent. Only 21.0% of the assessed fish passages were rated as being in "good" condition, while 56.7% were found to require urgent repair. Only 35.2% of the structures met the nationally recommended slope criteria (1:20). Most of problems are related discharge, poor entrance, breakage and sedimentation. With these structural problems, discontinuous installation of fish passages generates poor continuity of streams. Currently, to improve stream connectivity many projects from Korean government are now conducting and preparing, and additionally development of fish passages specialized for Korean fishes are required.

S03-1 Asymmetric response of aboveground and belowground temporal stability to nitrogen and phosphorus addition in a Tibetan alpine grassland

＊Yonghui Wang (Inner Mongolia University, ESC), Wenhong Ma (Inner Mongolia University)

Anthropogenic eutrophication is known to impair the stability of aboveground net primary productivity (ANPP), but its effects on the stability of belowground (BNPP) and total (TNPP) net primary productivity remain poorly understood. Based on a nitrogen and phosphorus addition experiment in a Tibetan alpine grassland, we show that nitrogen addition had little impact on the temporal stability of ANPP, BNPP, and TNPP, whereas phosphorus addition reduced the temporal stability of BNPP and TNPP, but not ANPP. Significant interactive effects of nitrogen and phosphorus addition were observed on the stability of ANPP because of the opposite phosphorus effects under ambient and enriched nitrogen conditions. We found that the stability of TNPP was primarily driven by that of BNPP rather than that of ANPP. The responses of BNPP stability cannot be predicted by those of ANPP stability, as the variations in responses of ANPP and BNPP to enriched nutrient, with ANPP increased while BNPP remained unaffected, resulted in asymmetric responses in their stability. The dynamics of grasses, the most abundant plant functional group, instead of community species diversity, largely contributed to the ANPP stability. Under the enriched nutrient condition, the synchronization of grasses reduced the grass stability, while the latter had a significant but weak negative impact on the BNPP stability. These findings challenge the prevalent view that species diversity regulates the responses of ecosystem stability to nutrient enrichment. Our findings also suggest that the ecological consequences of nutrient enrichment on ecosystem stability cannot be accurately predicted from the responses of aboveground components and highlight the need for a better understanding of the belowground ecosystem dynamics.

S03-2 Microbial Network Complexity of Biocrusts and Its Role in Ecosystem Restoration in Arid Regions

＊Guang Song (Xi'an University of Architecture and Technology, ESC)

Biocrusts are widely distributed in global drylands and play a crucial role in ecosystem restoration. In this study, we investigated bacterial and fungal community structures, network complexity, and their succession dynamics in a 65-year vegetation restoration site at the southeastern edge of the Tengger Desert. Our results showed that bacterial diversity and network complexity in both biocrusts and subsoil layers gradually increased with vegetation succession, particularly showing significant enhancements in network complexity and stability in the subsoil. Fungal communities exhibited lower richness but higher resilience in early successional stages, promoting the decomposition of recalcitrant organic matter and soil aggregation. In later stages, fungi shifted to symbiotic relationships, further enhancing soil stability and nutrient cycling. Ecological network analysis indicated that complexity and cooperation within fungal and bacterial networks in biocrusts significantly increased with succession, emphasizing the critical role of microbial network stability in ecosystem function recovery. Structural Equation Modeling (SEM) further demonstrated that vegetation restoration indirectly increased microbial network complexity through promoting biocrust development, significantly enhancing soil stability, nutrient cycling, and overall ecosystem functionality. This research highlights the essential role of microbial networks in biocrusts during long-term ecosystem restoration, providing a theoretical foundation for ecological restoration management in drylands.

S03-3 The effects of fine roots and arbuscular mycorrhizal fungi on soil macropores

＊Ying Zheng (Chang'an University, ESC)

Soil macropores are crucial to assess soil stability and control erosion as an essential component of soil structure. The variations in soil macropores with vegetation succession remain largely unclear, and the regulatory mechanism is still poorly understood. Plant fine roots and arbuscular mycorrhizal fungi (AMF) have been supposed to be dominant determinants of soil structure, but their separate effects on soil macropores remain underappreciated, let alone the effects of their interactions. This study used quantified imaging techniques to explore the effects of plant fine roots and AMF on soil macropores along a 55-year vegetation restoration chronosequence on the Loess Plateau. We found that soil macropore properties, such as macroporosity, connectivity, fractal dimension, and tortuosity, were all ignificantly improved with vegetation succession. Fine root density properties significantly increased, whereas morphological properties decreased along the restoration chronosequence with a shift to a conservative root resource usage strategy. Furthermore, duration of vegetation succession had a positive effect on AMF community structure and mediated the root chemical properties indirectly. Plant fine roots affected macropores directly with the positive effects of root density properties, whereas the morphological properties and chemical properties had negative effects. By comparison, the influence of the AMF community structure (i.e., AMF species composition) on macropore features was indirectly mediated through root chemical properties. Overall, this study investigated how plant fine roots and AMF separately and/or

jointly affected soil macropores via direct and indirect mechanisms. Thus, this study may greatly contribute to restoration by assisting vegetation configuration to improve soil structure and enhancing the ecological function of afforestation.

S03-4 Shrub encroachment reduces herbaceous diversity via enhancing light competition in grasslands

＊Yao Xiao (Lanzhou University, ESC)

Grasslands are critical ecosystems but are threatened by shrub encroachment, due to human activities. However, the mechanisms by which shrub encroachment affects herbaceous diversity across climate and soil fertility gradients, remain unclear. Here, we surveyed 101 grasslands with shrub encroachment, spanning 4,000 kilometers across China, covering annual temperature and precipitation gradients of -4℃ to 10℃ and 109 mm to 1007 mm, respectively. We found that that light competition between the herbaceous species was greater in wetter, more fertile regions and was further enhanced by shrub encroachment. Shrub encroachment generally favored fast growing herbaceous species and excluded slow growing ones, leading to a loss of diversity. Shrub encroachment also caused individual species to grow taller and thinner. Thus, shrub encroachment can amplify diversity loss driven by light competition under increasing precipitation and eutrophication. Our findings suggest that the common practice of shrub planting for grassland restoration may reduce natural grassland diversity.

S03-5 Microbial community succession during soil development in an arid land

＊Yaping Liu (Peking University, ESC), Kazuo Isobe (Peking University), Zhihua Bao (School of Ecology and Environment), Yaru Wei (School of Ecology and Environment)

Background
During the process of soil development, microbial community change substantially. In particular, shifts in microbial interactions are thought to play a critical role in promoting soil development itself. However, because soil development occurs over extremely long timescales and interactions are time-varying, capturing these changes remains a major challenge.
Methods
In the Mu Us Desert of china, stages of soil development are spatially distributed along a continuous gradient. Taking advantage of this natural gradient, we conducted systematic sampling to capture different stages of soil development. We performed quantitative amplicon sequencing of soil microbial communities to track structural changes during soil development. In addition, we applied nonlinear time series analytical methods to quantify interactions among microbial taxa and to examine how these interactions change along the soil development gradient.
Results
As soil development progressed, microbial abundance, taxonomic diversity, and phylogenetic diversity all increased. The taxonomic composition of microbial communities also shifted: in early-stage soils, stress-tolerant taxa such as Crenarchaeota, Firmicutes, Actinobacteria, Ascomycota, and Glomeromycota were dominant, reflecting adaptation to dry and nutrient-poor conditions. In contrast, late-stage soils were enriched in Proteobacteria, Bacteroidota, Planctomycetota, Mortierellomycota, and Basidiomycota, taxa commonly associated with efficient litter decomposition and nutrient acquisition.
Interaction analysis further revealed that both the number and total strength of microbial interactions increased with soil development, indicating a shift from relatively simple networks to more complex and densely connected ones. Notably, interactions between bacteria and fungi, as well as among fungal taxa, became more intense during this process.
Conclusion
This study demonstrates temporal shifts in microbial community composition, diversity, and interactions during the process of soil formation. In my presentation, I will discuss how these interaction dynamics—viewed from a functional perspective, including nutrient cycling, organic matter decomposition, and symbiotic associations—may actively contribute to the progression of soil development.

S03-6 The response of greenhouse gases to global change in a temperate desert steppe

＊Ping Yue (Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, ESC)

Global warming is an indivisible fact, and the imbalance of greenhouse gas emissions is the most important cause of global warming. Dryland cover nearly 40% of the world's land area and are important sinks of atmospheric greenhouse gases. However, understanding of how greenhouse gas emissions in arid regions respond to global change is still limited. Therefore, this study simulated the impact of precipitation change, elevated atmospheric nitrogen deposition and climate warming on GHG emissions in desert steppe in northwest China. The results showed that deserts and desert grasslands were an important sink of atmospheric methane and a weak source of nitrous oxide. Increasing precipitation and low nitrogen input promoted methane uptake and ecosystem respiration, while high nitrogen input inhibited methane uptake and ecosystem respiration. However, it did not significantly change the annual flux of N2O emission in desert and desert steppe, which was mainly attributed to soil nitrogen limitation. Ecosystem respiration was mainly affected by soil temperature and root biomass, methane uptake was mainly affected by soil void water content and plays an important regulatory role, and nitrous oxide emission was mainly affected by soil ammonium nitrogen and nitrogen conversion function microorganisms. In conclusion, the three greenhouse gases have different responses to global change, which may significantly affect the intensity of source and sink of greenhouse gases in deserts and desert grasslands, and have a profound impact on climate change.

S03-7 The effects of precipitation changes on the stability of plant communities in arid desert steppe ecosystems

＊Xiaoan Zuo (Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science, ESC), Ping Yue (Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science)

Deserts and grasslands cover approximately 40% of the Earth's land surface and play critical roles in regulating global climate, maintaining biodiversity, sustaining ecosystem productivity, and delivering essential ecosystem services. In this study, we conducted a comparative analysis of natural precipitation changes and simulated precipitation manipulation experiments in desert grassland ecosystems of northern China. We found that species richness and above-ground biomass (AGB) in desert and steppe linearly increased with increasing precipitation along the natural gradient and in experiment. Grass communities responded to precipitation changes through the shifts of single trait, while shrub communities responded to precipitation changes through the variation of single-trait and multi-traits. Precipitation affected AGB by altering species diversity and functional traits in grass communities, while in shrub community by altering species diversity, functional traits and soil properties. Increasing precipitation increased AGB stability by increasing species stability and asynchrony in grass community. In contrast, soil properties determined AGB stability in shrub community. Our studies highlight that the importance of precipitation changes in shaping plant community diversity, biomass and ecosystem stability in desert steppe ecosystems, with shrub and grass communities exhibiting distinct adaptive strategies and stability maintenance mechanisms in response to changing precipitation patterns.

S03-8 Biodiversity Patterns and Near-Natural Restoration of Urban Vegetation in Arid and Semi-Arid Regions, Shaanxi Province, China

＊Tianyi Chen (College of Architecture, Xi'an University of Architecture and Technology, ESC), Yuandong Hu (College of Landscape Architecture, Northeast Forestry University), Liangjun Da (Institute of Ecological Science and Engineering for Arid and Semi-Arid Zones, Xi'an University of Architecture and Technology)

Under the dual background of global climate change and urbanization, urban ecosystems in cold and arid regions are facing severe challenges of biodiversity decline and functional stability. Based on our research on urban ecology in Japan, Shanghai City and other places, we selected 10 cities in Shaanxi Province as the study area based on climatic vegetation zones and the gradient of anthropogenic disturbances in the arid and semi-arid ecologically fragile regions of Northwest China, and systematically analyzed the patterns of urban vegetation diversity and its driving mechanism, and explored the paths of near-natural restoration and reconfiguration. The study focuses on the impacts of environmental filtering effects and the intensity of anthropogenic disturbances on urban vegetation, and explores the phenomena of relictization and luxurization at the species level and the characteristics of homogenization and its formation mechanism at the community level, and by constructing a "near-natural" restoration framework and simulating the succession dynamics of zonal vegetation, this study proposes a sustainable pathway that integrates the enhancement of ecological resilience with the supply of high-quality ecological products. The research results not only provide a theoretical basis for the maintenance mechanism of urban biodiversity in arid and semi-arid zones, but also provide a paradigm for improving the resilience of urban ecosystems of the same type in the world and intelligent management, which is of great practical significance for realizing the construction of "Sustainable Cities".

S03-9 Navigating the biogeography of wide-spread short-forests in global drylands

＊Ning Chen (Lanzhou University, ESC), Xiaoxue Dong (Lanzhou University), Changming Zhao (Lanzhou University)

Canopy height is pivotal in sustaining carbon cycling and upholding ecological functions, especially in relative short dryland forests that have adapted to tolerate a highly variable and limited water supply and play an outsized role in dryland carbon cycling. Here, we developed a novel protocol to define dryland short-forests as forests with heights of less than 40% of their biophysical potential, based on an assumption that short-forests tend to be more likely influenced by abiotic factors relative to their tall counterparts. We found that short-forests have a mean canopy height of 8.45 ± 2.27 m and occupy 1.04 million km^2 (29.37% of global dryland forests). Importantly, we find that these forests are characterized by remarkable ubiquity, and broader environmental tolerance compared to tall-forests. Both short-forests and tall-forests share ecological determinants, involving climate (solar radiation, aridity index), soil (pH, total nitrogen), topography (roughness), and disturbance (drought and human activities), all of which yet elicit divergent regional responses and exert opposing directional effects. Projections under all climate change scenarios indicate that ≥5% of current dryland forests will transition to short-forests by 2100, with conversion rates accelerating under high-emission scenarios. This work provides a quantitative framework to define short-forests and highlights their widespread occupancy and adaptability shedding lights on managing dryland forests for climate adaptation and for conserving their carbon sequestration potential.

S03-10 Impacts of climate change on plant species distribution range and richness in drylands

＊Ying Sun (Lanzhou University, ESC)

The warming global climate is threatening terrestrial ecosystem stability, including plant community structure and diversity. However, it remains unclear how distribution, richness and turnover of plant species are impacted by warming and wetting in drylands. Here, the species distribution models were applied to predict the spatial distribution of 5,111 plant species based on 111,071 occurrence records across China's drylands. Additionally, variations in species richness and turnover rates were predicted for 2100 under three scenarios. The results indicated that approximately 70% of plant species will expand in their distribution, resulting in an increase in species richness. These changes will be driven mainly by temperature seasonality (TSN), annual precipitation (MAP), and mean temperature of coldest quarter (MTCQ). However, about 30-40% of species will face extinction risks including a considerable number of endemic and Red-Listed species, and suitable habitat loss (LSH) will exceed 30%.

Narrow-ranging species are more likely to lose a larger portion of their suitable habitats than wide-ranging species, highlighting their sensitivity to environmental changes. Importantly, it emerged that species turnover rates will increase linearly with ecological vulnerability at the grid level, indicating that community structure and species composition are easily affected by climate change in ecologically vulnerable areas. Therefore, regions exhibiting both high species turnover and significant ecological vulnerability, as well as biodiversity hotspots in the southern drylands with high species richness, should be prioritized for conservation. These findings provide insights into how species composition and richness in plant communities vary with global climate change and provide effective ecological conservation and management strategies in drylands.

S04-1 Assessing Anthropogenic Pressures and Habitat Suitability for Farmland Birds in Taiwan: Insights from Chiayi Region

＊Chen-Fa Wu (National Chung Hsing University), Tzu-Yao Liu (National Chung Hsing University), Chih-Peng Tsou (National Chung Hsing University), Luu Van Thong Trac (National Chung Hsing University)

Understanding how anthropogenic pressures shape farmland bird communities is essential for developing biodiversity-friendly agricultural landscapes in East Asia. This study investigates the impacts of agricultural intensification and land-use changes on bird diversity and habitat suitability in Chiayi County and City, Taiwan. Drawing on data from the Taiwan Breeding Bird Survey (2009-2016), we analyzed 119 farmland bird species grouped by functional traits (omnivores, insectivores, granivores, frugivores, and carnivores) to assess community dynamics about landscape variables.
Using Partial Least Squares (PLS) regression, we evaluated the influence of pressures such as field integrity, field size, building and road density, and proximity to grassland, bare land, and water bodies. Results indicate that increased bare land and grassland densities significantly negatively impacted most bird groups, while field integrity and moderate building density were associated with positive responses. These findings underscore the complexity of land-use impacts and highlight the importance of habitat structure and spatial configuration. To assess potential habitat distribution, we employed ensemble Species Distribution Models (SDMs) using the BIOMOD2 package in R. Most bird groups were predicted to inhabit areas of moderate suitability. At the same time, frugivores and carnivores had relatively larger shares of low-suitability areas. These results point to critical gaps in habitat quality for specific groups, signaling the need for targeted conservation measures.
This study provides empirical evidence to inform the design of biodiversity-friendly farmland strategies in Taiwan. We identify key pressures and spatial patterns affecting bird communities by integrating trait-based bird monitoring, spatial analysis, and predictive modeling. Our findings support landscape-level conservation planning that balances agricultural productivity with avian biodiversity in East Asia's rapidly changing rural environments.

S04-2 Enhancing the Occurrence of Reintroduced Oriental Storks with Wildlife-friendly Rice Paddy Managements

＊Mina Izaki (University of Hyogo/Toyooka Municipal Government, ESJ), Yota Imai (Kobe City College of Technology), Hiromune Mitsuhashi (Museum of Nature and Human Activities), Tomohiro Deguchi (University of Hyogo/Hyogo Park of the Oriental White Stork)

Rice paddies occupy the majority of farmland in Asia and are recognized as alternative wetlands that support a diversity of bird species (Ramsar Resolution X.31). However, bird species dependent on rice paddies have declined, as shown in recent surveys in Japan (Japan Breeding Bird Atlas 2021). This trend has continued since the rise of modern agriculture after World War II (Katayama et al. 2015). In fact, Japan experienced the extinction of the Oriental Stork (*Ciconia boyciana*) population in 1971, which mainly inhabited rice paddies (HPOWS 2011). Reintroduction of the Oriental Stork started in 2005, and at the first release sites, wildlife-friendly paddy management methods were introduced to secure their foraging habitats. Nevertheless, the effectiveness of these methods in benefiting storks has not been sufficiently evaluated. In this study, we assessed these methods for storks, which primarily inhabit rice paddies. In 2021, we conducted surveys and recorded 95 stork occurrence points within rice paddy landscape. We applied a Maxent model to evaluate five types of rice paddy: Stork-friendly farming (reduced or no agrochemical use), Biotope (year-round flooded paddies), conventional farming, and abandoned paddies were studied across three seasons: pre-breeding, breeding, post-breeding. The result showed that storks occurred more frequently in Stork-friendly farming paddies during the breeding period, and in Biotope paddies during the post-breeding period, which demonstrate the effectiveness of methods introduced for the conservation of Oriental stork habitat. These findings provide the first evidence, based on the occurrence frequency of reintroduced storks across a large area of study sites, identifying the most suitable management methods. The closely related White Stork (*Ciconia ciconia*) has been identified as an indicator of farmland bird diversity (Tobolka et al. 2012). Therefore, enhancing rice paddy habitats suitable for the Oriental Stork could benefit other farmland bird species as well and contribute to future conservation efforts.

S04-3 Monitoring Population Trajectories of Wild Animals through Low-Cost Conservation Actions in Agricultural Landscapes of Taiwan

＊Da-Li Lin (Taiwan Biodiversity Research Institute, ESJ)

Farmland expansion is widely recognized as a major threat to biodiversity; however, in Taiwan, farmland loss has become a more pressing issue due to limited land availability and intense land-use competition among sectors. To mitigate the negative impacts of agricultural management and support biodiversity, we implemented a set of low-cost, farmer-friendly conservation actions in working landscapes. These included installing raptor perches, creating frog pools, and planting native herbs in orchards. The installation of raptor perches in rice paddies attracted more raptors, which contributed to a noticeable decline in granivorous bird populations, potentially reducing crop damage. In pomelo orchards, the construction of small frog pools provided additional breeding and foraging habitats, resulting in increased frog abundance. Additionally, the introduction of herba-

ceous vegetation in orchard understories enhanced floral resources, leading to greater diversity and abundance of Lepidoptera pollinators. All three interventions showed observable ecological responses within approximately two years and were feasible for adoption by individual farmers with minimal cost and training. These findings suggest that practical, small-scale conservation actions can be integrated into existing agricultural practices to improve local biodiversity and contribute to sustainable landscape management in Taiwan.

S04-4 Does organic farming promote soil fauna diversity? Lessons from earthworms in subtropical pomelo orchards in Taiwan

＊Chih-Han Chang (Department of Life Science, National Taiwan University/Institute of Ecology and Evolutionary Biology, National Taiwan University), Hui-Ming Zhong (Institute of Ecology and Evolutionary Biology, National Taiwan University), Da-Li Lin (Taiwan Biodiversity Research Institute), Zeng-Yei Hseu (Department of Agricultural Chemistry, National Taiwan University), Pei-Ling Wang (Institute of Oceanography, National Taiwan University)

Organic agriculture is widely recognized for its potential to promote biodiversity relative to conventional practices. While numerous studies have examined the effects of organic farming on earthworm abundance and community composition, these have largely focused on annual cropping systems. Research on perennial orchards remains limited, particularly in subtropical and tropical regions, where knowledge gaps persist. Most existing studies center on temperate orchards such as apple, kiwifruit, and olive, predominantly in Mediterranean or temperate climates. In this study, we assessed earthworm communities in four conventional and four organic *Citrus maxima* (pomelo) orchards in eastern Taiwan between 2022 and 2023. Across all sites, we identified 15 species, which were classified into four ecological groups using stable isotope analysis of ^{13}C and ^{15}N in earthworm tissues. Species richness per orchard ranged from 4 to 11, and mean densities were comparable between organic and conventional systems (84 and 80 individuals m^{-2}, respectively). Results of generalized linear mixed models, which incorporated both farming system and soil properties as independent variables, indicated that organic farming was significantly associated with higher earthworm density and biomass. Community composition and ecological group structure also differed significantly between farming systems. In particular, the density of mesohumic endogeic species was significantly lower in organic orchards, while polyhumic endogeic species tended to be more abundant, though the difference was not statistically significant. These patterns appear to be driven largely by the increased abundance of the pantropical invasive species *Pontoscolex corethrurus* in organic systems, likely in response to higher organic matter inputs from organic fertilizers. Altogether, our results suggest that organic management in subtropical orchards may modestly increase earthworm abundance, consistent with findings from temperate regions. However, the observed benefits may favor invasive species, underscoring the need for region-specific assessments of biodiversity outcomes under organic management.

S04-5 Impact of Solar Power Generation on Habitat Management in Rice-Paddy Wetlands

＊Ji Yoon Kim (Kunsan National University, ESK), Woong-Bae Park (Kongju National University), Miharu Nakatani (Tokyo Metropolitan University), Kota Tawa (National Institute for Environmental Studies), Shohei Tsujimoto (Meijo University), Yuna Hirano (National Institute for Environmental Studies), Akira Noda (Tokyo Metropolitan University), Yuno Do (Kongju National University), Hyun-Woo Kim (Sunchon National University)

The rapid expansion of solar power generation facilities, particularly in regions with rice-paddy wetlands, poses challenges to habitat conservation. This study investigates the impact of solar power generation on habitat management within rice-paddy wetlands in Republic of Korea and Japan. In 2024, we conducted field surveys at solar power plant sites in both countries to assess habitat management practices. Additionally, GIS analysis was employed to examine the complex influence of locational factors—including surrounding land use, population density, land price, and distance from urban area—on management decisions. A large number of solar power plants are being installed on agricultural land, including rice paddies. Our findings revealed distinct patterns in vegetation management within solar facilities. In South Korea (n=298 sites), mowing was the most prevalent practice (47.7%), followed by 'No Management' (20.5%), plastic sheeting (8.7%), and herbicide use (2.0%). In Japan (n=183 sites), mowing also predominated (48.1%), followed by 'No Management' (23.5%), plastic sheeting (14.8%), 'Other' (7.1%), and herbicide use (6.6%). Notably, the GIS analysis indicated a trend where solar power plants situated further from urban area were more likely to utilize intensive habitat-degrading methods, such as extensive ground coverage with plastic sheeting or gravels. The overall results reveal an interdependent link between socio-economic and geographical factors and the habitat management strategies employed in solar power facilities. It is therefore imperative to develop and implement ecological management guidelines to mitigate negative impacts and enhance biodiversity within solar power plants situated in or near agricultural wetland ecosystems.

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S04-6 Challenges and opportunity for biodiversity conservation in Japanese rice ecosystems

＊Naoki Katayama (NARO, ESJ)

Japanese Agroecosystems have undergone significant changes in land use and management practices over the past few decades. I summarised previous studies on how agricultural intensification and land abandonment have changed farmland biodiversity in Japan. A review and meta-analysis showed that while both agricultural intensification and abandonment can threaten farmland biodiversity, abandonment may provide an opportunity to restore some wetland and grassland species of conservation concern. To halt the decline in farmland biodiversity, the Ministry of Agriculture, Forestry and Fisheries has supported management practices such as organic farming, low-input farming and winter flooding. Nationwide field surveys and systematic review showed that these practices had higher species richness or abundance of several taxa (e.g. plants, invertebrate and birds)

than conventional rice farming. However, there were a trade-off between rice productivity and biodiversity, indicating the need to find ways to better balance agricultural productivity and biodiversity conservation. Enhancing ecosystem services such as pest controls by providing non-crop habitats for natural enemies may be one such option.

S04-7 Field margin grasslands as a key to enhancing crop pollination services in smallholder agricultural landscapes

＊Yuta Nagano (Kobe University/The University of Tokyo, ESJ), Tadashi Miyashita (The University of Tokyo)

Identifying crop pollinators and the environments that support their diversity is crucial for sustaining crop pollination services. In East Asia, agricultural landscapes are characterized by small-sized fields with a high density of field margin grasslands, which may support pollinator diversity. Although the roles of pollinator diversity and wild vegetation in sustaining pollination services are well studied, most research has focused on diurnal insects, largely overlooking nocturnal insects. Buckwheat is a self-incompatible species with distylous flowers, which is globally cultivated. We recently found that nocturnal moths contribute to the seed set of buckwheat, as well as diurnal insects. In this study, we aimed to clarify (1) the role of field margin grasslands for diurnal and nocturnal insects visiting buckwheat, and (2) how these insects contribute to buckwheat pollination services. We selected 12 buckwheat fields in June and September 2024 in Iijima Town, Nagano Prefecture, central Japan. Diurnal (09:00 - 12:00) and nocturnal (19:00 - 22:00) flower-visiting insects were collected, and seed set was measured. We collected 1,439 diurnal insects belonging to four orders (Hymenoptera, Diptera, Lepidoptera, Coleoptera) and 541 nocturnal moths from five families (Noctuidae, Crambidae, Pyralidae, Geometridae, Sphingidae). Vegetation height of field margins increased the abundance of diurnal and nocturnal insects visiting buckwheat. Seed set was positively correlated with both diurnal and nocturnal insect abundance. Moreover, an interactive effect of diurnal and nocturnal insects was observed, with nocturnal moths making a greater contribution to seed set when diurnal insects were scarce. Therefore, field margin grasslands play a key role in sustaining crop pollination services via temporal complementarity among diurnal and nocturnal pollinators.

S04-8 Advantages and Challenges of Access to Newly Developed Climate-Resilient Varieties: Case Study on Rice in Asia

＊Kenichi Imai (Osaka University of Economics and Law, ESJ)

This study aims to explore the advantages and challenges associated with the availability of newly developed climate-resilient crop varieties, using rice in Asia as a case study. Climate change has significant impacts on crop production, affecting both the quality and quantity of yields. To address these problems, new varieties that can withstand heat and flooding have been developed. The pace of such developments appears to be accelerating in response to increasingly severe climate conditions and threats to global food security.

However, several studies report that while these new varieties offer benefits, they also present challenges. Two major concerns are frequently cited. The first is the increased cost of crop production associated with accessing these new varieties, which can heavily impact small-scale farmers. The second is the loss of native (local) varieties as farmers shift from traditional to modern varieties. This loss poses concerns since native varieties serve as essential genetic resources for future breeding efforts.

This study investigates the current state of these two issues and explores their underlying causes through a case study on rice in Asia. Many Asian countries, where rice is a staple food, exhibit relatively high rice self-sufficiency compared to other regions. The methodology adopted in this study includes: (1) analyzing the impact of increased adoption of climate-resilient varieties on crop yields and production costs, particularly for small-scale farmers in Asian countries; and (2) examining the challenges related to breeder's rights, especially conflicts between developing countries – home to native varieties – and developed countries or large seed companies. This research contributes to a deeper understanding of the benefits and drawbacks associated with the use of climate-resilient crop varieties.

S05-1 Implementation and accessibility of modeling methods for production of Essential Biodiversity Variables

＊Jamie M Kass (Tohoku University, ESJ)

The Essential Biodiversity Variables (EBVs) are a globally standardized set of variables that describe multiple aspects of biodiversity at different spatial, temporal, and ecological scales. Especially for EBVs that rely on *in situ* data, predictive models are often needed to make estimates at the regional level and update them over time. For example, species distribution and abundance models can generate estimates and maps for the *Species populations* EBV class, and macroecological models can do the same for biodiversity indices like taxonomic, phylogenetic, and trait diversity in the *Community composition* class. Referencing published examples for East Asia and the globe, this talk will overview modeling methods like these to calculate and map EBVs for species and communities and discuss their data needs and limitations. It will also include descriptions of new approaches and open-source applications that hold great promise for integrating different data types, handling big data, and in general increasing accessibility to cutting-edge modeling methods. The talk will conclude with ideas for how these models and tools can be leveraged to produce EBV datasets for East Asia.

S05-2 Advancing Essential Biodiversity Variables in Japan and Asia: fostering regional collaboration for effective implementation

＊Yayoi Takeuchi (Biodiversity Division, National Institute for Environmental Studies/Graduate School of Science, Osaka Metropolitan University, ESJ), Lea Végh (Biodiversity Division, National Institute for Environmental Studies), Jamie M. Kass (Macroecology Lab, Graduate School of Life Sciences, Tohoku University)

Essential Biodiversity Variables (EBVs) provide a standardized yet flexible framework for informing biodiversity change and

supporting national and global conservation goals. While the EBV framework is designed to be globally applicable, its effective implementation requires regional strategies that account for variations in data availability, ecological conditions, and socio-cultural contexts. Asia, with its high biodiversity and cultural diversity, faces particular challenges in implementing EBVs due to linguistic, institutional, and political barriers, as well as discrepancies between regional context and global standards. In this presentation, we introduce the progress and challenges of EBV implementation in Japan and Asia, highlighting how comparative analyses with other regions such as Finland and Europe can reveal key differences and inform regionally appropriate strategies.
We first provide an overview of the EBV framework, discuss its relevance for national-scale biodiversity monitoring, and assess the availability of primary data for Japan's terrestrial ecosystems. Our analysis shows that Japan has medium to high data availability in several EBV classes, especially in species distributions, phenology, and disturbance regimes, but faces significant gaps in genetic composition, species traits, and ecosystem structure. However, we emphasize that current EBVs may not fully account for biodiversity maintained in traditionally managed landscapes prevalent in Asia. To improve implementation, we propose region-specific EBV priority lists and enhanced cross-country collaborations. Our findings underscore the importance of adapting EBVs to regional contexts and fostering cooperative networks to support robust biodiversity monitoring across Asia, which will ultimately contribute to global biodiversity conservation efforts.

S05-3 Assessment of habitat suitability for endangered species in South Korea using MaxEnt models

＊Sangdon Lee (Ewha Womans University, ESK)

Climate change and other anthropogenic threats from human activities alter the structure and function of global ecosystems. Those factors cause habitat destruction or fragmentation and restrict species' spatial distribution. Endangered species are particularly vulnerable to the rapid environmental changes, necessitating effective management strategies including habitat monitoring and conservation. This study aims to perform ecological niche modeling for endangered species in South Korea. We used MaxEnt models to predict potential distribution for 15 endangered mammals, birds, amphibians and reptiles. Species presence data and environmental data were used as input data. Environmental variables influencing habitat distribution were categorized into topography, distance, land cover, climate, and vegetation and 14 variables were selected for the models following PCA and Pearson correlation analysis. The models used 25% of the occurrence points as test data to validate the results and were repeated 10 times for each species. The MaxEnt model outputs indicated the probability of species occurrence with the average test AUC ranging from (1) 0.643 to 0.948 for mammals; (2) 0.710 to 0.749 for birds; (3) and 0.718 to 0.985 for amphibians and reptiles. Most mammals and birds showed a nationwide distribution around forest areas, whereas amphibians and reptiles had smaller distribution areas, likely due to relatively sparse occurrence data compared to other taxa. This study demonstrates the utility of MaxEnt models in predicting the potential distribution of endangered species in South Korea, providing critical insights for habitat conservation strategies. The study results of habitat suitability assessment can be useful for conservation planning and ecological research, aiding in the preservation of biodiversity amidst ongoing environmental changes.

S05-4 Spatiotemporal factors driving the distribution of the river otter (*Lutra lutra*) in South Korea using high-resolution imagery

＊Hyomin Park (The Hwaseong Institute/Ewha Womans University), Sangdon Lee (Ewha Womans University)

The Eurasian otter (*Lutra lutra*), a semi-aquatic mammal of the family Mustelidae, is highly sensitive to changes in riverine environments and is widely recognized as an indicator species representing the ecological health of freshwater ecosystems. Although it was once broadly distributed throughout South Korea, its population has significantly declined in recent decades, highlighting the urgent need for continued monitoring and conservation efforts. This study aims to identify otter occurrence sites through field surveys and analyze the environmental characteristics of those sites using high-resolution drone imagery. The study was conducted along the Gyechon Stream in Pyeongchang-gun, Gangwon-do, South Korea, with five survey sessions carried out between August 2022 and September 2023. Environmental variables were extracted from drone images to characterize the microhabitats at otter occurrence points. Based on this data, habitat preference analysis was performed to determine key factors influencing otter presence. The findings of this study provide baseline information for the effective and continuous monitoring of otter populations and offer insights into the microhabitat preferences of this endangered species in Korea. Ultimately, this research contributes to establishing conservation strategies aimed at preserving suitable habitats and ensuring the long-term survival of *Lutra lutra* in the region.

S05-5 From Data to Decisions: Connecting EBVs to Biodiversity Policy through Citizen Science and Cutting-Edge Technology

＊Chanho Park (Chonnam National University, ESK)

Effective conservation policies are crucial to combat rapid biodiversity loss. Integrating citizen science and environmental DNA (eDNA) with the Essential Biodiversity Variables (EBV) framework offers a transformative way to enhance data collection and inform stronger policies. Citizen science enables large-scale data gathering and public engagement, though managing data quality and potential biases is important. Concurrently, eDNA technology presents a non-invasive, efficient assessment tool, but requires standardized analytical methods and significantly improved reference databases for optimal use. Fusing these innovative approaches with the established EBV framework allows for more comprehensive and timely biodiversity data acquisition. In Korea, strategically coordinating these efforts with the National Biodiversity Strategy and Action Plan (NBSAP) and related natural conservation plans is vital. This alignment fosters powerful synergies, boosting national monitoring capabilities while streamlining the allocation of natural capital. Key challenges and opportunities lie in ensuring high standards of data quality, de-

veloping and implementing standardized protocols, improving biodiversity data access, and strengthening collaboration among diverse stakeholders, including researchers, policymakers, and the public. Moreover, close coordination between EBV implementation and national conservation strategies will enable more efficient and responsive policy actions to emerging biodiversity threats. This report provides specific recommendations to connect scientific data with practical policy, aiming for evidence-based and inclusive biodiversity governance. It offers valuable insights for policymakers and conservation managers, stressing the critical importance of integrating these advanced methodologies with Korea's existing conservation framework to help secure a sustainable future for its biodiversity.

S05-6 Improving the forecast for redistribution of marine biodiversity in East Asia under climate change

＊Zhixin Zhang (South China Sea Institute of Oceanology, Chinese Academy of Sciences, ESC), Xin Wang (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Meng Qu (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Geng Qin (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Jiahui Xu (South China Sea Institute of Oceanology, Chinese Academy of Sciences), Qiang Lin (South China Sea Institute of Oceanology, Chinese Academy of Sciences)

Climate change represents one of the direct drivers of global biodiversity loss, and it is critical to assess species vulnerability to climate change. Species distribution models (SDMs) represent the most widely used approach to assess species vulnerability to climate change and have been successfully applied in a number of taxa. Despite its popularity, correlative SDMs heavily rely on abiotic predictors, while largely overlooking intraspecific variations, biotic interactions, and physiological information. To improve the forecast for biodiversity under climate change, multiple sources of knowledge must be incorporated into SDMs. Here, using marine organisms as case studies, we demonstrated the importance of genetic, physiology, and biotic interactions in assessing vulnerability of marine species to climate change. Our findings highlight the importance of incorporating multiple sources of knowledge when assessing species vulnerability to climate change.

S06-1 The important role of soil microbes in carbon and nitrogen cycling

＊Edith Bai (Northeast Normal University, ESC)

Soil microbes as the driver of carbon and nitrogen cycling, their primary role is decomposer of soil organic matter. However, they have a secondary role as the contributor of soil organic matter via the formation of microbial necromass. The soil carbon use efficiency, decomposition rate of microbial necromass and physical protection of microbial necromass are important to the stablity of microbial necromass. The modeling of microbial driven soil carbon cycling therefore should consider the multiple roles of soil microbes in order to predict the carbon cycling more precisely.

S06-2 Capacity of foliar NO2 uptake and turnover of assimilated N from a tree seedling leaf-15NO2 feeding study

＊Ronghua Kang (Institute of Applied Ecology, Chinese Academy of Sciences, ESC), Meng Yao (Institute of Applied Ecology, Chinese Academy of Sciences)

Forest canopy nitrogen dioxide (NO2) uptake is widely recognized as a potentially important forest nitrogen (N) input. However, the amount of foliar NO2 uptake and allocation of assimilated NO2 in different tree organs under various environmental conditions has not been well quantified. In this study, we conducted a 15NO2 fumigation experiment using 3-year-old saplings of Fraxinus mandshurica, Pinus koraiensis, Quercus mongolica, and Larix gmelinii, in which the former two species were fumigated in the dark and light, while the latter two species were fumigated in the light after continuous soil N addition for 2 years.
Total 15N recovery ranged from 9% to 74% in the light and varied with species. With soil N addition, 15N recovery increased in Q. mongolica but decreased in L. gmelinii, which we attributed to opposite responses of stomatal density and leaf area in these two species to soil N addition. These indicate that the amount of foliar NO2 uptake is likely associated with tree N demand. Leaves were always the dominant sink for N derived from 15NO2 and accounted for 60%-97% of total recovery, suggesting that most foliar-assimilated NO2 is initially stored in leaves.
Our study indicates that tree canopies could assimilate 0.51 ± 0.07 kg N ha-1 y-1 atmospheric NO2, which would provide references for model estimates of canopy NO2 uptake at large scales. These data provide constraints for the contribution of canopy NO2 uptake to tree N pools.

S06-3 Effects of long-term high nitrogen deposition on tropical forest ecosystems

＊Xiankai Lu (South China Botanical Garden, Chinese Academy of Sciences, ESC)

Anthropogenic nitrogen (N) deposition has accelerated terrestrial N cycling at regional and global scales, causing nutrient imbalance in many natural and semi-natural ecosystems. How long-term N deposition affects ecosystems where N is already abundant, remains poorly understood. Here, we conducted an experiment employing N additions for more than 10 years to examine ecosystem responses to added N in three typical tropical forests with contrasting land use history, including a plantation, a secondary forest, and a primary forest. We found that these tropical forests were acid sensitive ecosystems, and long-term N addition decreased soil buffering capacity in the primary forest rather than the secondary forests. Additional N inputs significantly decreased understory diversity but increased soil carbon sequestration. We further found that tropical tree plants can acclimate to excess N inputs, and suggested a hypothesis that cation-deficient plants can adjust to elevated N deposition by increasing transpiration and thereby maintaining nutrient balance, indicating long-term elevated N deposition can alter hydrological cycling in N-rich forest ecosystems. It is necessary to explore the long-term ecological and environmental effects of continuous high N deposition in the tropics in the future.

S06-4 The key processes of soil C and N response to landuse change in tropics

＊Wenjun Zhou (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences, ESC), D. Balasubramanian (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences), Yunting Fang (Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110016, China/University of the Chinese Academy of Sciences), Ping Ding (Guangzhou Institute of Geochemistry, Chinese Academy of Sciences), Liqing Sha (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences), Qinghai Song (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences), Yiping Zhang (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences/University of the Chinese Academy of Sciences)

To elucidate the effects of land-use change on soil carbon and nitrogen processes in tropical regions, we have conducted long-term studies since 2003 comparing tropical rainforest and rubber plantation soils. Our findings reveal that: (1) Soil CO_2 and CH_4 emissions did not significantly differ between land-use types, likely due to shifts in controlling factors and C sources. In rubber plantations, CO_2 and CH_4 emissions were primarily regulated by leaf area index and soil moisture, whereas in rainforests, soil moisture, temperature, and fine root dynamics were key drivers. The divergence in CO_2 and CH_4 fluxes was attributed to differences in soil temperature and fine root turnover, suggesting altered microbial substrate utilization under land-use change. (2) Soil organic matter composition and origin were modified after rainforest conversion. Scanning electron microscopy indicated that rubber plantations accumulated partially decomposed litter, increasing $\delta^{13}C$ values. Fertilization and altered litter decomposition likely contributed to ^{15}N depletion. Additionally, ^{14}C data revealed older C in rubber plantation soils (0-20 cm) more than tropical rainforest, implying microbial C utilization shifts. (3) N_2O emissions were higher in fertilized rubber plantations, with nitrification dominating. Nitrate and organic N additions similarly affected microbial gene abundances (except *nirK1*), correlating positively with N_2O flux. Under ammonium addition, N_2O emissions correlated only with *nosZ* and *amoA*, with soil temperature regulating nitrifier and denitrifier abundances. During the wet season, N additions significantly altered microbial communities, particularly in nitrification and dissimilatory nitrate reduction pathways. (4) Nitrogen-fixing *Rhizobium* populations increased across all N treatments, demonstrating high responsiveness to N inputs. This study provides a scientific basis for enhancing soil C stability and mitigating greenhouse gas emissions in tropical land-use systems.

S06-5 Climate warming reduces carbon sequestration of coastal wetlands: Evidence from the Yellow River Delta, China

＊Guangxuan Han (Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, ESC)

Coastal wetlands are an important carbon (C) reservoir storing a large amount of soil organic carbon (SOC), but little is known about the fate of these C sequestration under climate warming. Here we present results from an 8-year (2014-2022) wetland warming experiment in the Yellow River Delta, revealing that wetland SOC storage responds to warming in a phase-dependent manner. We found that warming initially reduced both carbon input and output but did not change SOC storage. However, SOC storage abruptly decreased by 21.4% in 2020, which persisted over the following 2 years. This occurred mainly due to shifts in the biomass of dominant plant species (*P. australis*) under warming, reducing carbon input, increasing microbial carbon degradation, and resulting in microbial necromass carbon loss. Additionally, warming rapidly altered plant community structure by increasing the dominance of low-canopy species. Then, warming reduced the resistance and resilience of vegetation productivity to a 72-cm flooding event. Furthermore, we detected slower post-flooding carbon processes, such as gross ecosystem productivity, soil respiration, and soil methane emission, under the warming treatment. The carbon sequestration capacity of Yellow River Delta is projected to decline persistently under future warming scenarios. Our findings underscore the necessity to elucidate the coupled effects of climate warming on wetland plant traits, community structural characteristics, ecosystem carbon exchange functions, and soil carbon sequestration capacity, which will enable more accurate projections of coastal wetland carbon sink dynamics under future climate change scenarios.

S06-6 Disproportional community structure and abundance of ammonia-oxidising archaea and bacteria decipher the heterogeneity of fertilizer-induced N_2O emissions in long-term conservation tillage soils

＊Weiyan Wang (Northwest A&F University, ESC), Xiaoxia Wen (Northwest A&F University)

Ammonia-oxidising microorganisms are important sources of nitrous oxide (N_2O) in dry farmland soil. The contribution of N_2O from the nitrification pathway (NP) to the total emissions is highly heterogeneous across regions, and its relationship with ammonia-oxidising bacteria (AOB) and archaea (AOA) requires further clarification. This study aimed to elucidate N_2O emissions from NP and their relationship with ammonia-oxidising microorganisms under long-term conservation tillage (zero [ZT] and chisel-plough tillage [CPT]) and conventional tillage (i.e. plough tillage (PT)). Long-term conservation tillage significantly reduced the contribution of nitrification N_2O to total N_2O emissions. Compared to PT, the average fluxes of N_2O emissions from NP in the CPT and ZT significantly decreased by 59.32% and 34.78%, respectively. Furthermore, ZT and CPT decreased the AOA-to-AOB ratio and increased the richness, diversity, and evenness of AOA and AOB communities during the peak N_2O emission period. The relative importance of the deterministic assembly process of the AOA community increased gradually with increasing tillage intensity, whereas that of the AOB community in conservation tillage during the peak N_2O emission period was higher than that of the plough-tilled soil. Partial least squares path model indicated that 10 and 20 cm soil moisture, NO_3^-, pH, AOA abundance, and AOA-to-AOB ratio were the key factors affecting N_2O emission from NP. Long-term conservation tillage significantly decreased N_2O emissions from NP by increasing the AOA-to-AOB ratio and enriching the key node species in the co-occurring network. These findings can improve agroecosystem productivity and reduce greenhouse gas emissions, particularly considering future climate change.

S06-7 Effects of water and straw management on nitrous oxide emission during rice cultivation

＊Chuan Fu Kao (National Taiwan University), Shan Li Wang (National Taiwan University)

Rice cultivation is vital for global food security but contributes significantly to greenhouse gas (GHG) emissions, particularly methane (CH_4) and nitrous oxide (N_2O). This study, conducted in 2024 at the Ankeng Experimental Farm, National Taiwan University, examined the interactive effects of straw management and irrigation regimes on GHG emissions using a multichannel automated chamber system for continuous greenhouse gas emissions monitoring. Three straw management treatments which is rice straw removal (-RS), straw incorporation (+RS), and straw cover (RS cover) were combined with two irrigation regimes continuous flooding (CF) and alternate wetting and drying (AWD). Results showed that N_2O emissions peaked 3-7 days after fertilization, particularly following the second topdressing and during mid-season drainage. The RS cover treatment exhibited the highest N_2O fluxes across both irrigation regimes. Porewater analysis indicated higher total nitrogen and ammonium concentrations under -RS, whereas RS cover had the lowest values. Straw return treatments increased soil total carbon, nitrogen, dissolved organic carbon, and porewater carbon content, highlighting potential long-term fertility benefits. However, elevated GHG emissions associated with RS cover emphasize trade-offs between soil health and environmental impact. These findings provide critical insights into the temporal dynamics of GHG fluxes in response to straw and water management, informing critical insights for developing sustainable rice production systems that balance agronomic productivity with climate change mitigation.

S06-8 The Impact of Land Use Changes on Greenhouse Gas Emissions in Wetlands: A Case Study of the Sun and Moon Lake peatland

＊Cheng Chun He (Agricultural Net-Zero Carbon Technology and Management Innovation Research Center, College of Bioresources and Agriculture, National Taiwan University), Po-Neng Chiang (The Experimental Forest, College of Bio-Resources and Agriculture, National Taiwan University), Shan-Li Wang (Agricultural Net-Zero Carbon Technology and Management Innovation Research Center, College of Bioresources and Agriculture, National Taiwan University/Department of Agricultural Chemistry, College of Bioresources and Agriculture, National Taiwan University)

Peatlands, although comprising merely 3% of the Earth's terrestrial area, harbor 44% of the global carbon reservoir. This study employed a grid approach in the Toushe Basin to analyze the effects of various land-use types on peatlands. The region has been drained for agricultural use, revealing considerable amounts of peat to the atmosphere, leading to notable greenhouse gas emissions. The site comprises three land-use classifications: orchards, leisure areas, and dryland agriculture. This study examined ten areas, collecting soil samples to a depth of one meter and measuring greenhouse gas emissions. The findings revealed that farmers had earlier deposited a 40-50 cm layer of external soil over the land. The content of soil organic carbon ranged from 12.75 to 54.04 kg-C/m^2, with a C/N ratio between 7.7 and 52, surpassing that of typical agricultural regions in Taiwan. Methane (CH4) fluxes varied from 2.16 to 790 nmol/m^2/s, with maximum emissions seen in recreational zones devoid of soil cover. Nitrous oxide (N2O) emissions ranged from 0.01 to 371 nmol/m^2, with maximum amounts detected in areas cultivated with sponge gourds.

S07-1 Eddy covariance observations of terrestrial carbon flux in Asia: recent development of AsiaFlux

＊Ryuichi Hirata (National Institute for Environmental Studies, ESJ), Hiroki Iwata (Department of Environmental Science, Shinshu University), Masahito Ueyama (Graduate School of Agriculture, Osaka Metropolitan University), Takashi Hirano (Research Faculty of Agriculture, Hokkaido University,), Shuli Niu (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences), Minseok Kan (National Center for AgroMeteorology, Seoul National University), Guan Xhuan Wong (Sarawak Tropical Peat Research Institute), Lulie Melling (Sarawak Tropical Peat Research Institute)

The eddy covariance technique is fundamental for evaluating ecosystem-scale carbon fluxes. Here, CO_2 and CH_4 flux observations across the diverse Asian terrestrial ecosystems and climate zones were compiled for meta-analysis. Spatial variations in annual net ecosystem production (NEP), gross primary production (GPP), and ecosystem respiration (RE) were analyzed using annual CO_2 flux values observed across 74 sites in Asia. GPP and RE increased from boreal, temperate to tropical, whereas NEP increased from boreal to temperate and reached a maximum in the subtropical region, before decreasing drastically in tropical regions. Dry regions demonstrated the smallest NEP. Spatial variations in annual GPP and RE of forests were strongly controlled by annual air temperature, while those of grasslands were driven by annual precipitation. Further focus was paid to how terrestrial ecosystems respond to anomalous weather conditions, and how carbon fluxes are changed by artificial and natural disturbances to help inform terrestrial carbon management. Recently, CH_4 flux studies using the eddy covariance technique have been increasing with the introduction of the open-path CH_4 analyzer in 2009. Here, CH_4 flux studies were reviewed from 11 sites in the literature, including wetlands, paddy fields, upland forests, and tropical peatlands. As a whole, flux studies using the eddy covariance technique have been advanced by the development of hardware/software and data accumulation/distribution for > 50 years.

S07-2 Energy-Water-Carbon Coupling Analysis in a Rice Paddy Field at the Naju Observation Site

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Rice paddy fields represent a dominant agroecosystem that plays a critical ecological role beyond rice production in East Asia.

Their seasonal alternating states of flooding and drying contributes to ecological dynamics in the region. The objective of this study was to investigate the land-atmosphere coupling processes related to energy, water, and carbon fluxes in a rice paddy ecosystem. The observation site (NRK: Naju/Rice/Korea) in the rice paddy field is situated at the Jeollanam-do Agricultural Research and Extension Services, located in Naju-si, Jeollanam-do, Republic of Korea (35.027°N, 126.822°E). The 30-minute average fluxes of CO2, H2O, sensible heat, and latent heat from the year 2019 were calculated using 10 Hz data collected by an open-path CO_2/H_2O gas analyzer (LI-7500A; LI-COR Inc.) and a three-dimensional sonic anemometer (CSAT3; Campbell Scientific Inc.). In addition, CH_4 emission was observed from May 2023 using an open-path CH_4 gas analyzer (LI-7700; LI-COR Inc.) and sonic anemometer (CSAT3; Campbell Scientific Inc.). A hyper-spectrometer (FloX, JB Hyperspectral Devices) was mounted in the nadir direction for the observation of various vegetation indices and sun-induced fluorescence (SIF). In a flooded paddy field, sufficient water supply and increased wind speed can maximize transpiration, leading to latent heat flux exceeding net radiation. As a result, sensible heat becomes negative in the afternoon, contributing to surface cooling. Since plants regulate transpiration and photosynthesis via stomata to control water-use efficiency (WUE), the gross primary productivity (GPP) of rice is linked to the surface energy balance. In addition, the CH_4 emissions from flooded rice paddies were significantly correlated with both temperature condition and the amount of rice GPP.

S07-3 Withdrawn

S07-4 Estimating forest carbon stock and changes using multi-scale satellite imagery

＊Jaebeom Kim (Department of Environmental Science, Kangwon National University, ESK), Minkyu Moon (Department of Environmental Science, Kangwon National University)

Accurate estimation of forest carbon stock and its temporal dynamics is critical for understanding the role of terrestrial ecosystems in the global carbon cycle and for informing climate change mitigation policies. This study presents a remote sensing-based approach to quantify aboveground biomass (AGB) and detect changes in forest carbon stock using multi-scale satellite imagery. By integrating high-resolution (e.g., PlanetScope), medium-resolution (e.g., Sentinel-2, Landsat), and long-term archive datasets, we develop a scalable framework that captures both spatial detail and temporal trends. The approach leverages spectral and phenological metrics derived from multi-source imagery, calibrated with ground-based forest inventory data, to generate AGB estimates at resolutions ranging from 3 to 30 meters. Preliminary results demonstrate strong agreement with field observations and highlight the potential for monitoring forest degradation, regrowth, and carbon sequestration over time. This framework contributes to improved national carbon accounting and supports the development of science-based forest management and climate policies.

S07-5 Widespread Greening Significantly Enhanced Evapotranspiration in Chinese Terrestrial Ecosystems

＊Le Xin Ma (Key Laboratory of Ecosystem Network Observation and Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, ESC), Zhi Chen (Key Laboratory of Ecosystem Network Observation and Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)

Terrestrial greening has emerged as a significant ecological hallmark of the Anthropocene, with China exhibiting a vegetation greening rate nearly triple the global average since the late 20th century. Vegetation greening exerts complex effects on regional hydrology, enhancing transpiration while simultaneously altering atmospheric circulation and precipitation regimes. Leveraging flux observations from 96 ChinaFLUX sites, this study applied 25 machine learning algorithms to construct a high-resolution, two-decade evapotranspiration (ET) dataset across Chinese terrestrial ecosystems. The results reveal a marked southeast-northwest ET gradient aligned with hydrothermal availability. Temporally, most ecosystems showed a significant upward ET trend, averaging ～2 mm yr^{-1}, with the steepest increases in the Northeast Plain, Loess Plateau, and southern Yunnan-Guizhou Plateau. Attribution analysis indicates that vegetation greening-rather than climatic variability-is the predominant driver of ET increases, with stronger effects in arid regions. These findings highlight the central role of vegetation dynamics in shaping water-carbon interactions and provide a valuable benchmark for ecosystem modeling and water resource management under climate change.

S07-6 Comparative assessment of methane ebullition in a rice paddy by chamber and eddy covariance methods

＊Minseok Kang (Gangneung-Wonju National University, ESK), Sung-Won Choi (National Center for AgroMeteorology), Seungwon Sohn (National Center for AgroMeteorology), Sungsik Cho (National Center for AgroMeteorology/Seoul National University), Juhan Park (National Center for AgroMeteorology)

Methane (CH_4) emissions from rice paddies occur through multiple pathways, with ebullition (i.e., bubble release from water body) being a significant but hard-to-quantify component. A robust understanding of ebullitive flux is vital for accurate greenhouse gas budgets. We conducted a comparative field study at a single rice paddy site to evaluate CH_4 ebullition contributions using two techniques. The first approach employed a portable trace gas analyzer (Model LI-7810, LI-COR, Inc., USA) coupled with an automated chamber system (Model Smart Chamber, LI-COR, Inc., USA). This setup provided high temporal resolution measurements and allowed direct differentiation of CH_4 transport pathways by capturing discrete ebullition events. The second approach utilized an eddy covariance (EC) system with high-frequency CH_4 and H_2O measurements, applying a scalar similarity method (following Iwata et al., 2018, Boundary-Layer Meteorology) to partition total fluxes into ebullitive and diffusive components. The chamber method yielded detailed, plot-scale flux data and clear separation of ebullition vs. plant-mediated emissions, whereas the EC method offered continuous monitoring over a broader spatial footprint. Both methods consistently revealed pro-

nounced seasonal variation in ebullition-derived CH_4. Ebullition fluxes were elevated during early rice growth under continuous flooding, and markedly suppressed during the mid-season drainage period. After re-flooding, ebullitive emissions resumed in tandem with plant growth, with both methods capturing congruent timing and relative magnitude of these changes. The agreement in temporal patterns and trends between the chamber and EC measurements provides strong cross-validation of ebullition estimates. This comparative approach improves understanding of CH4 ebullition in rice paddies and strengthens confidence in pathway-specific flux estimates, supporting more accurate GHG budgeting and CH4 mitigation strategies.
* This work was supported by ME (2022003640002) and by MSIT and NRF (NRF-2022K2A9A2A10019122) of Korea.

S07-7 Interpretable Machine Learning Empowers the Study of Soil Respiration Dynamics under Climate Change

＊Fubo Yu (Institute of Geographic Sciences and Natural Resources Research, CAS, ESC), Zhi Chen (Institute of Geographic Sciences and Natural Resources Research, CAS)

Soil respiration (R_s) is the largest terrestrial carbon source to the atmosphere, playing a critical role in global carbon cycles and greenhouse gas emissions. Understanding its response to environmental changes is essential for predicting carbon budget and informing carbon neutral strategies. In this study, we introduce an interpretable machine learning framework—the Tree-Based Random Forest Feature Importance and Interaction Analysis (TBRFA)—to disentangle key drivers and spatial patterns of R_s across climate zones. Taking into account various environmental factors, TBRFA and geospatial sensitivity analysis identified the coupling actions among temperature, precipitation, and evapotranspiration shape the distribution and sensitivity patterns of R_s. TBRFA opens the "black box" of machine learning models by mitigating biases introduced by traditional feature importance analysis, thereby enhancing interpretability and revealing a bias in the importance of temperature, indicating spatial heterogeneity in its driving role on soil respiration (R_s). In the tropical zone, temperature is the predominant driver of R_s, while the boreal and arid zones demonstrated comparable hydro-driven trends in R_s. Temperate zone, exemplified by Northeast Asia, are co-regulated by temperature, precipitation, and evapotranspiration, and exhibit low sensitivity to climate change. Future projections indicate a significant increase in global R_s, with rises exceeding 30% in arid and boreal zones, driven primarily by hydrological factors rather than temperature, while the increase in Northeast Asia remains relatively moderate. This increase highlights the risk of accelerated soil organic carbon decomposition and emphasizes the need for integrated water-carbon management strategies to mitigate environmental risks.

S07-8 Remote Sensing of GPP and Methane Emissions via Solar-Induced Fluorescence in a cool - temperate bog in Japan

＊Kanokrat Buareal (Research Faculty of Agriculture, Hokkaido University/Graduate School of Global Food Resources, Hokkaido University), Tomomichi Kato (Research Faculty of Agriculture, Hokkaido University/Global Center for Food, Land, and Water Resources, Research Faculty of Agriculture, Hokkaido University), Tomoki Morozumi (National Institute for Environmental Studies (NIES)), Naohisa Nakashima (Department of Agro-Environmental Science, Obihiro University of Agriculture and Veterinary Medicine), Kitpanuwat Tanatarakeree (Research Faculty of Agriculture, Hokkaido University), Masahito Ueyama (Graduate School of Agriculture, Osaka Metropolitan University), Takashi Hirano (Research Faculty of Agriculture, Hokkaido University)

Solar-induced chlorophyll fluorescence (SIF) has proven to be a valuable remote sensing indicator of gross primary productivity (GPP), which provides the carbon substrates essential for methane emissions in recent years. Wetlands, as major contributors to the global carbon cycle, play key roles in carbon sequestration and methane emissions. Investigating SIF offers a potential proxy for methane emission in the ecosystem. Thus, in this study, we explored the potential of SIF to capture seasonal variations in GPP and vegetation growth, as well as to estimate methane emissions in wetland ecosystems. This ecosystem is diverse in composition, consisting of graminoids, sedges, and shrubs growing among sphagnum moss (*Sphagnum papillosum*). SIF was obtained in the red band (687 nm; SIF_{red}) and far-red band (760 nm; $SIF_{far\text{-}red}$) in a cool-temperate bog in Hokkaido, Japan, using high-resolution spectra.
SIF_{red} and $SIF_{far\text{-}red}$ exhibited a nonlinear relationship with GPP and a strong linear correlation with absorbed photosynthetically active radiation. The fraction of SIF_{red} to $SIF_{far\text{-}red}$ showed a significant negative relationship with vegetation greenness indices, which are associated with chlorophyll content, indicating the reabsorption effect of SIF_{red}. However, the synchronized seasonal patterns of SIF_{red} and $SIF_{far\text{-}red}$ suggest that this reabsorption effect of SIF_{red} had only a minimal impact on its relationship with GPP due to the simple canopy structure of the wetland plant community.
In addition, incorporating SIF in a multivariable regression model, alongside soil temperature and water table depth, improved the estimation of seasonal methane emissions. This model accounted for 76% of the observed variation in methane flux. These findings underscore the utility of both SIF_{red} and $SIF_{far\text{-}red}$, in representing GPP and predicting methane emissions in temperate wetland environments through integration with key environmental variables.

S08-1 Population genetics reveals ontogenetic characteristics of perennial plant populations

＊Yoichi Tsuzuki (University of Tokyo, ESJ)

The life history of plants consists of a series of sequential events, starting from germination, followed by vegetative growth, flowering, and seed production, and ending in death. In the case of perennial plants, since individuals live for more than one year, these ontogenetic processes can occur asynchronously among individuals. For example, some individuals may remain in the juvenile stage while others born prior are flowering in the same year. As a result, populations comprise multiple age or developmental stage classes, each positioned at different points in the life cycle. By comparing the genetic diversity and composition among these age or stage classes, which is often called demographic genetic structure, I have been trying to reveal how a speci-

es' ontogenetic characteristics interact with the genetic dynamics of its population. Firstly, I developed the theoretical model of perennial plant populations incorporating explicit within-population stages to examine how different life history characteristics shape patterns of demographic genetic structure. The model analysis revealed that "absorbing" stages, where individuals tend to stay for many years or retrogress from more mature stages due to limited growth, show higher levels of genetic diversity than other stages, playing a key role in maintaining the overall genetic diversity of the population. Furthermore, by evaluating the annual rate of change in genetic diversity (denoted as η), I found that life history strategies characterized by frequent stasis and retrogression—namely, slow-paced life histories—show high η and are particularly effective in sustaining genetic diversity over time. The coupling of life history processes and population genetics, as presented in this study, would help elucidate crucial life history stages for genetic diversity and population conservation.

S08-2 Behavioral response to humans in urban mammals

＊Kenta Uchida (The University of Tokyo, ESJ)

Human activity is one of the major drivers of behavioral changes in wildlife, particularly in human-dominated environments where wildlife are frequently interact with humans. One common outcome is increasing tolerance to humans, which can lead to increased human-wildlife interactions. Understanding the patterns and consequences of these behavioral responses is critical for effective wildlife conservation and management. In this presentation, I will introduce our ongoing research using urban Eurasian red squirrels *Sciurus vulgaris* in Hokkaido, Japan, looking at how squirrels' behavioral responses to humans in urban areas. We measured flight initiation distance (FID) as the measurement of tolerance to humans. Our studies show that urban squirrels exhibit greater tolerance to humans compared to the rural conspecifics. Moreover, urban individuals could discriminate between humans and potential predators and modulate their FID in response to stimulus differences, indicating their higher behavioral flexibility. We also observed that FID varies among urban parks and correlates with park characteristics, suggesting that local environmental management can influence squirrel behaviors. We also compared squirrels' tolerance levels across different countries -Finland, Germany, Japan, and the UK- and found regional variation. These suggest that while urbanization generally increases tolerance to humans, behavioral response to humans is also regional- dependent. Increased tolerance to humans may have positive and negative ecological and societal consequences. I will discuss the potential outcome and future study of increased tolerance to humans in urban red squirrels.

S08-3 Connecting Landscape (CoLa): A Cutting-Edge Simulation of Connectivity and Gene Flow for the Return of the Clouded Leopard in Taiwan.

＊Yi Feng Leo Wang (Wildlife Conservation Research Unit, University of Oxford), Ivan Orlando Gonzalez (School of Informatics, Computing and Cyber Systems, Northern Arizona University), Patrick Jantz (School of Informatics, Computing and Cyber Systems, Northern Arizona University), Zaneta Kaszta (Wildlife Conservation Research Unit, University of Oxford/Department of Biological Sciences, Northern Arizona University), Samuel A Cushman (Wildlife Conservation Research Unit, University of Oxford), Dawn Burnham (Wildlife Conservation Research Unit, University of Oxford), Andrew J Hearn (Wildlife Conservation Research Unit, University of Oxford), David W Macdonald (Wildlife Conservation Research Unit, University of Oxford)

The potential reintroduction of the clouded leopard (Neofelis nebulosa) to Taiwan has long been discussed, yet assessments of habitat connectivity and long-term genetic viability remain limited. Using the Connecting Landscape (CoLa) framework, which integrates UNICOR and CDPOP, we simulated landscape connectivity and gene flow under current and future LUH2 Shared Socioeconomic Pathways (SSPs). Our results indicate that founding populations of 480-720 individuals could maintain viable population sizes (～200-380) after 200 generations. While allelic richness and heterozygosity decline, values remain within or above the range observed in extant populations. These findings support Taiwan's ecological potential for reintroduction.

S08-4 Evolution of Mating Systems: From Resource Defense to Lekking

＊Ryuichiro Isshiki (Sokendai RCIES, ESJ), Hisashi Ohtsuki (Sokendai RCIES)

Polygyny is a mating system in which a single male mates with multiple females. One form of polygyny is lekking, where males gather in group (lek) and focus solely on displaying to attract mates. Females visit the lek, mate with a chosen male, and then return to their habitat to raise offspring. In this strategy, females receive only genetic benefits from males, without direct benefits such as abundant food or safe territories, which are provided in resource-defense mating systems.

Several hypotheses have been proposed regarding the evolution of leks, particularly based on female mate choice. One key hypothesis suggests that females prefer leks because they can compare multiple males and select those with superior genetic traits. However, alternative explanations exist, such as females using leks to avoid harassment or males aggregating for the dilution effect. The role of female choice in lek evolution remains unclear. This study examines whether the female preference hypothesis can explain the evolution of leks by using a mathematical model that isolates relevant factors.

We assume that both males and females evolve preferences for either lekking or resource-defense territories. Simulations revealed four different evolutionary outcomes: (1) lekking evolves, (2) only resource-defense mating evolves, (3) the two strategies alternate, and (4) both coexist. We find that lekking is more likely to evolve when females can choose high-quality males and gain high genetic benefit from their mates and when the direct benefit from resource-defense males is small. In this presentation, we will discuss the evolutionary stability of those four patterns and their implications for lek evolution dynamics.

S08-5 Effects of roads on animals and mitigation measures in Asia

＊Qilin Li (Hainan Tropical Ocean University), Yun Wang (China Academy of Transportation Sciences), Haotong Su (China Academy of Transportation Sciences)

Asia, the world's largest continent, boasts extensive road networks and rich biodiversity. However, the significant threats that roads pose to Asian ecosystems remain largely unaddressed. This study aims to provide a broad overview and insights into the research status regarding the effects of roads on animals and the implementation of mitigation measures in Asia through a comprehensive literature review. Following a systematic literature search and the establishment of inclusion and exclusion criteria, we included 589 publications; these publications encompassed 36 Asian countries, while an additional 12 countries had no relevant publications included. From the included studies, we identified seven types of effects of roads on animals in Asia: road mortality, barriers to movement, road avoidance, various behavioral and physiological responses, habitat effects, illegal hunting, and road attraction. We consolidated all documented roadkill data from pertinent research, resulting in approximately 208,291 roadkill records, which included 1,048 species, with 148 species classified as above Least Concern (LC) by the International Union for Conservation of Nature (IUCN) (i.e., Near Threatened, Vulnerable, Endangered, or Critically Endangered). Asia has also implemented various mitigation measures. At least 155 species utilized wildlife crossing structures, with 39 species classified as above LC. Despite significant advancements and a considerable body of research in this field, a notable imbalance exists in the geographical distribution of research across Asian countries. We propose several recommendations for future research directions in Asia, with many of these also relevant to future studies globally.

S08-6 The evolutionary record in teeth: diversity and change in plants and dinosaurs

＊Kanna Shobayashi (University of Tsukuba, ESJ)

Plants diversify as an adaptation to food damage and climate stress, and animals evolve in response. The evolution of plants and animals is a mutually influential coevolutionary relationship. In this study, we focused on the tooth morphology of dinosaurs to explore the impact of plant diversification on animal morphology. Teeth are directly related to contact function and are an organ that easily reflects changes in plants. By examining the shape of dinosaur teeth from existing literature and comparing them with those of extant animals, we aim to contribute to our understanding of dinosaur feeding habits.

S08-7 Effects of chronic individuals and infected carcasses on classical swine fever infection dynamics in wild boar

＊Mayuko Uesaka (University of Tokyo, ESJ), Shohei Kawata (National Institute of Genetics), Gaku Takimoto (University of Tokyo)

Classical Swine Fever (CSF), a critical infectious disease in pigs and wild boar, has severe transboundary impacts on the economy, trade, and food security. In Japan, since its 2018 re-emergence, CSF in wild boar spread to 40 prefectures by April 2025, with eradication proving elusive. Infected wild boars pose a persistent transmission risk to domestic pig farms. CSF presents diverse clinical signs and has chronic and acute forms based on its clinical course and host factors. Chronically infected individuals excrete the long-term virus with mild symptoms, significantly contributing to the persistence of infection within the population. Infected carcasses also serve as new infection sources, retaining the virus in the environment and transmitting it upon contact with susceptible individuals. Current countermeasures in wild boar include oral vaccination and culling.
This study quantitatively assessed, via mathematical modeling, the contribution of infections from chronic individuals and inf+-ected carcasses to CSF transmission dynamics. We developed an extended SEIR (Susceptible-Exposed-Infectious-Recovered) model categorizing infectious individuals into chronic infection, acute infection, and infected carcass compartments. Sensitivity analysis of the basic reproduction number (R_0) showed that increased contact rates and transmission probabilities from chronic individuals and infected carcasses, plus a higher wild boar birth rate, significantly increased R_0. Conversely, higher removal rates of infected carcasses and increased wild boar mortality (natural and culling-induced) decreased R_0. These results suggest that prompt detection and appropriate disposal of infected carcasses, as well as increased wild boar mortality, are effective measures for controlling CSF. Furthermore, developing effective oral vaccination strategies to suppress chronic infections and interrupt persistent infection cycles in wild boar populations is crucial.

S08-8 Examining the chemical trait space of dominant native and invasive plant species in Okinawa and their influence on decomposer community assembly

＊Amy Hana Morrell (Okinawa Institute of Science and Technology Graduate University), David Armitage (Okinawa Institute of Science and Technology Graduate University)

Invasive plant species are known to be successful at establishing themselves in non-native habitats due to their rapid growth, high fecundity, and ability to outcompete native species. Another attribute of a successful invader may also come from their capability to produce particular secondary metabolites which can enable them to defend against their native neighbors and regulate stress when acclimating to a new environment. These compounds, when leached into the soil as root exudates or decomposing leaf litter, may alter the soil decomposer community and thus have an effect on the breakdown of organic material and nutrient cycling. To approach these questions on the impacts invasive plants have on the belowground community, we propose to first evaluate the chemical profiles of both native and invasive species that dominate the landscape at various sites throughout Okinawa's main island. By observing the chemical trait space, we can assess the chemical diversity of dominant plants in a community and see how this diversity differs between native and invasive species. Next, we can investigate how impactful invasive species are on soil decomposer communities by examining community assemblage and processes (e.g. decomposition rate) by use of metabarcoding and the Tea Bag Index methodology, respectively. Further understanding on the influence of such com-

pounds and how they may shape soil community structure can give us insight into how processes such as decomposition may be altered with vulnerable habitats succumbing to invasive takeover.

S08-9 Effect of Nitrogen Application Under Drought Treatments on the Growth, Yield, and Grain Quality of Spring Maize

＊Nina Chen (Institute of Atmospheric Environment, China Meteorological Administration, Shenyang, ESC)

An experiment was conducted under moderate drought stress (relative moisture 45% ± 5%) and four nitrogen addition levels of 0, 120, 240 and 270 kg・hm^{-2} at the two key developmental stages (jointing and tasseling) of spring maize (cultivar Danyu 405). We analyzed the responses of spring maize growth, yield component and grain quality to the interaction of drought and nitrogen application. The results showed that compared with the control treatment of suitable water and no nitrogen application, nitrogen application under drought during the jointing stage increased plant height, ear length, bald tip ratio, amino acids content, and crude protein content of spring maize, while decreased leaf area index, biomass, ear diameter, 100-kemel weight, theoretical yield, grain water content, fat content, and starch content of spring maize. The effects of nitrogen application under drought during the tasseling stage were similar to that during the jointing stage, but with negative impact on ear length. Compared with the nitrogen application under drought during the jointing stage, leaf area index, bald tip ratio, grain water content, fat, starch, amino acids, and crude protein content were increased by 18.5%, 116.7%, 4.9%, 8.6%, 1.4%, 8.8%, and 28.0% during the tasseling stage, respectively, while plant height, biomass, ear length, ear diameter, 100-kernel weight, and theoretical yield were decreased by 2.9%, 2.4%, 20.1%, 7.7%, 4.3%, and 40.8%, respectively. With increasing nitrogen application levels under drought, plant height, biomass, ear length, bald tip ratio, grain water content, and starch content increased, while leaf area index, ear diameter, 100-kemelweight, theoretical yield, fat, amino acids, and crude protein content decreased. The yield components of spring maize were negatively correlated with grain quality. Nitrogen application had an inhibitory effect on maize yield under drought, but improved grain quality to a certain extent. Our results provide scientific basis for the production management and stress control of spring maize in Liaoning Province.

S08-10 Invasion and Spatial Genetic Structure of *Humulus japonicus* in Korean Riparian Zones

＊Haeji Shin (Gwangju Institute of Science and Technology, ESK), Eunsuk Kim (Gwangju Institute of Science and Technology)

Humulus japonicus is an annual invasive vine species known for its rapid and extensive growth, which can disrupt native riparian ecosystems. Its long, thorny vines climb over and cover surrounding vegetation, negatively impacting riparian plant communities. In recognition of its ecological threat, *H. japonicus* was designated as an invasive species by the Korean Ministry of Environment in 2019. Our previous research investigated the differences in biotic and abiotic environmental characteristics between *H. japonicus*-invaded and uninvaded riparian sites. Building on these findings, we further analyzed the spatial genetic structure of *H. japonicus* using restriction site-associated DNA sequencing (RAD-seq). Leaf samples were collected from the Yeongsan River and the Hwangnyong River, which merges with Yeongsan River at the midsection of the river system. For the sustainable management of riparian invasive plants, it is essential to develop effective ecological management strategies to prevent the spread of invasive vines such as *H. japonicus*. The findings of this study provide critical insights into the dispersal and invasion processes of *H. japonicus* and are expected to contribute to the development of effective management strategies for this species.

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (RS-2025-00558787).

S08-11 Enhancing migrants' subjective well-being through ecosystem services perceptions in the context of hydropower resettlement

＊Xiaoyin He (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Ranhao Sun (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

Understanding hydropower migrants' perceptions of local ecosystem services and their links to subjective well-being is essential for informing resettlement policies that enhance overall welfare outcomes. However, how migrants' ecosystem service perceptions affect SWB remains poorly understood. To fill this gap, this study conducted an empirical investigation of migrants relocated by the Wudongde and Baihetan hydropower stations in Southwest China, collecting a total of 682 survey responses capturing migrants' retrospective evaluations of ecosystem services perceptions and SWB before and after resettlement. Our findings indicate that (1) migrants' perceptions of provisioning services showed the most pronounced decline after resettlement, compared to regulating and cultural services. (2) The notable changes in migrants' SWB included an increase in basic materials and a decrease in social relations after resettlement, while the domains of security, health, and freedom of choice and action remained relatively stable. (3) Before resettlement, perceptions of cultural services had the greatest impact on SWB, whereas after resettlement, the role of regulating services significantly increased, with both regulating and cultural services influencing SWB. Moreover, the influence of ecosystem service perceptions on SWB differed between ethnic minorities and Han, and the effect was stronger in young groups than in the elderly. Our research findings imply that preserving the ecological environment of resettled communities, promoting ecological industry projects, and enhancing vulnerable migrants' ecological awareness.

S09-1 Tracing Biodiversity: eDNA Insights from Philippine Mangrove Ecosystems

＊Venus Empron Leopardas (Mindanao State University at Naawan)

Philippine mangrove ecosystems rank among the world's most vibrant and biologically diverse coastal habitats. However,

knowledge of the entirety of life that they harbor has been a challenging issue to pursue due to some constraints in conventional biodiversity assessment procedures. Environmental DNA (eDNA) has developed as a high-potential instrument for capturing total biodiversity portraits by identifying genetic residues left by organisms in aquatic and terrestrial surroundings. The evolution of eDNA-based methods for mangrove ecosystems is interdisciplinary and collaborative by its very nature. It can unite molecular biologists, ecologists, conservation professionals, local communities, and government organizations to construct a framework for accessible and scalable biodiversity monitoring. Such collaborations facilitate the bridging of gaps between advanced science and on-the-ground conservation, enabling knowledge sharing and capacity development across sectors. This talk discusses how the use of eDNA research in Philippine mangroves is creating new avenues for ecological study, conservation planning, and people's participation. In addition, this will describe how international partnerships and small-scale collaborative local activities establish and develop the foundation of eDNA research in mangrove areas of the Philippines.
Applying eDNA in tropical mangroves is faced with special challenges, including logistic challenges in far-flung field work, unavailability of reference databases for some local species, environmental conditions influencing DNA persistence, and the necessity of strong data interpretation frameworks. Moreover, consolidating eDNA outcomes into current policy and management programs needs cautious synchronization with conservation objectives and regulatory models. Looking forward, this presentation addresses the avenues for enhancing eDNA applications in mangrove ecosystems: growing reference libraries, establishing local sequencing and analysis capacity, creating standardized protocols, and fostering sustained, cross-sector partnerships. Through collaboration, innovation, and flexibility, eDNA can revolutionize the way we monitor and conserve mangrove biodiversity—not just in the Philippines, but throughout the greater Indo-Pacific region.

S09-2 Expanding eDNA Applications through Epigenetics: Spawning Monitoring Focus

＊Itsuki T Hirayama (Kobe Univ., ESJ), Toshifumi Minamoto (Kobe Univ.)

Environmental DNA (eDNA), originating from various organisms and found in environments such as water and air, has emerged as a useful tool for monitoring species distributions without direct observation. While sequence-based eDNA analysis is effective for identifying species presence, it is constrained by the unchanging nature of DNA sequences, which do not reflect physiological or behavioral states. To address this limitation, we focused on DNA methylation, an epigenetic modification that regulates gene expression. By analyzing the methylation status of eDNA, it should be possible to infer biological conditions such as reproductive activity, beyond simple species detection. In this study, we developed a method to screen for reproductive eDNA (sperm derived eDNA) by targeting methylation signatures associated with germline cells. Targeting the small cyprinid species *Hemigrammocypris neglectus*, we conducted field validation. Our results showed that the method could identify the onset and end of the spawning season, as well as diel peaks in spawning activity, from just a single liter of water. In this presentation, we introduce how eDNA methylation analysis can expand the scope of conventional eDNA approaches and offer new possibilities for non-invasive monitoring of fish reproductive ecology.

S09-3 Understanding urban ecosystem structure through species composition: insights from eDNA research in Korea

＊Youngkeun Song (Seoul National Univ.), Heejung Sohn (Seoul National Univ.), Yujin Kang (Seoul National Univ.)

eDNA metabarcoding is a powerful tool for assessing species diversity in urban streams and ecological parks, offering a more efficient alternative to traditional survey methods. A study on the Anyang stream network in Korea demonstrated that eDNA identified 12 of 17 historically recorded species (70.6%) and 12 of 18 species (66.7%) detected through conventional surveys. Land use significantly impacted fish diversity: urban, forest, and grassland areas positively influenced abundance and richness, while agricultural areas had a negative effect. Sensitive species were less common, and tolerant species were more frequent in lower-order streams, emphasizing the need for detailed local monitoring.
Another study applied eDNA to monitor mammal and bird species in Gildong Ecological Park, Seoul. Water samples collected from marsh, forested mountain, and a rural learning center across five sessions detected 73% of mammal and 67% of bird species identified through traditional surveys. Despite species variations across seasons, no significant differences emerged due to the park's small size and high activity levels, highlighting eDNA's potential in urban ecological monitoring.
A third study aimed to detect Eurasian otters in an urban stream. Metabarcoding did not detect otters, but qPCR identified them at varying frequencies in April (42.9%-85.7%) and October (100%), indicating a broader range in October. Metabarcoding successfully captured fish species, with Cyprinidae dominating across seasons, illustrating the need to select appropriate eDNA techniques based on research goals—qPCR for specific species and metabarcoding for broader ecosystem assessments.
Based on these research findings, we will discuss the significance and potential of applying environmental DNA (eDNA) technology, particularly in urban ecosystems.

S09-4 Community and evolutionary dynamics in the wild ecosystems and their connections: Exploring eco-evolutionary feedback using an arboreal eDNA approach

＊Fugen Okuma (Graduate School of Env. Science, ESJ), Shunsuke Utsumi (Faculty of Env. Earth Science)

The eDNA has made remarkable progress and is used in various studies (e.g. community, population, genotype). Since the eDNA approach makes it possible for us to non-invasive and comprehensive investigations, the feasibility of studies that were thought impossible has been high. One of them is eco-evolutionary feedback (EEF). EEF is the reciprocal interactions between ecology (e.g. community structure and population size) and evolution. In previous studies, EEF has been studied in theoretical and/or closed experimental systems. EEF is a critical concept for understanding mechanisms for the maintenance of species/genetic biodiversity and stabilization of population/community in the ecosystem. However, the previous EEF studies focused on the one-directional influence in regulated experimental systems, the wild EEF is still unclear. There are three gaps for those rea-

sons; 1) the conventional methods of community and population survey need much cost, 2) it is difficult to obtain trait-related genes and frequency data in wild non-model species, and 3) repetitive investigations may influence community and evolutionary dynamics.
Therefore, we accepted the eDNA approach to solve these gaps. Recently, eDNA has been shown to not only community information but also genotype frequency information in a short time scale as rapid evolution occurs. If the eDNA approach can observe changes in community composition and rapid evolution simultaneously, we might be able to elucidate EEF in the wild.
In this study, we aimed to elucidate EEF in willow-associated arthropod communities in the wild and performed weekly eDNA sampling at some willow riparian forests in Sapporo, Hokkaido. Secondly, ecology and evolutionary time-series data were obtained by metabarcoding for the arthropod community and willow leaf beetles' (*Plagiodera versicolora*) feeding trait-related SNP. Subsequently, causality estimation was performed with both time-series data to examine the EEF in the wild ecosystems. In this presentation, we will discuss the results.

S09-5 Empirical Dynamic Modeling of Environmental DNA Time Series Identifies Temperature-Caused Community Assemblages and Their Stability Drivers

＊Sangwook Scott Lee (Hong Kong University of Science and Technology (HKUST), ESK), Masayuki Ushio (Hong Kong University of Science and Technology (HKUST))

Prokaryotic communities play fundamental roles in biogeochemical cycling and ecosystem functioning in marine environments, yet how their dynamics respond to temperature variation with a long-term view remains underexplored. Here, we analyzed 10-year long, weekly collected environmental DNA (eDNA) samples using empirical dynamic modeling (EDM) to investigate temperature-driven dynamics in coastal prokaryotic communities. This approach enabled the detection of causal relationships and nonlinear interactions between water temperature and microbial communities. We identified a distinct assembly of Amplicon Sequence Variants (ASVs) whose abundances exhibited statistically significant causal links with temperature fluctuations. These ASVs received strong causal influences from temperature, which in turn intensified their temporal variability. Furthermore, we found that elevated influences from temperature among these temperature-responsive taxa were associated with greater instability at the community level. These results suggest that intensified influences from temperature—although potentially beneficial for some species—may render microbial communities more unstable and sensitive to environmental perturbations. By integrating long-term eDNA monitoring data and EDM-based causality inference, our study provides a mechanistic understanding of how temperature shapes microbial dynamics through interaction strength and population variability. This work highlights the potential of interaction-based frameworks for assessing microbial stability under climate-driven change in marine ecosystems.

S09-6 From Headwaters to Mangroves: eDNA-Based Insights into Fish Biodiversity in the Urauchi River, a Subtropical UNESCO World Heritage Site

＊Bernadeth Grace Suerte Pananganan (United Graduate School of Agricultural Sciences, Kagoshima University/Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Marizka Grafane Juliano (United Graduate School of Agricultural Sciences, Kagoshima University/Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Yukinobu Isowa (Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Maria Daniela Artigas Ramirez (Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus), Tadashi Kajita (United Graduate School of Agricultural Sciences, Kagoshima University/Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus)

Urauchi River, the longest river in the Ryukyu Archipelago on Iriomote Island, a UNESCO World Natural Heritage site, supports a rich diversity of ecosystems, including numerous endemic and endangered fish species. Despite its ecological significance, up-to-date biodiversity assessments using advanced molecular techniques have been limited. This study utilized environmental DNA (eDNA) metabarcoding with MiFish 12S primers to assess fish diversity along the river gradient from freshwater headwaters to marine-influenced mangrove estuaries. A total of 47 surface water samples were collected from 11 sites in 2021 and 2024. DNA was filtered with Sterivex cartridges, extracted with Qiagen PowerWater Kit, and sequenced on the Illumina NovaSeq 6000 platform. Bioinformatic analysis identified 352 Molecular Operational Taxonomic Units (OTUs) across 70 families and 186 genera, including six Critically Endangered (CR), three Endangered (EN), five Vulnerable (VU), and two Near Threatened (NT) species listed on Japan RedList 2020. Biodiversity increased downstream, with mangrove-associated areas showing the highest richness, highlighting their role as ecotones. The detection of cryptic, pelagic, and deep-sea taxa also suggests strong marine-estuarine-freshwater connectivity. NMDS ordination revealed distinct community compositions (stress = 0.098), while dbRDA ($p < 0.001$) and PERMANOVA ($p = 0.001$) analyses identified salinity, temperature, and vegetation as key factors shaping fish assemblage structure. These environmental drivers collectively explained variation in species composition, with location and salinity having the greatest influence. This research underscores the importance of mangrove and freshwater habitats for biodiversity and highlights the potential of eDNA as a tool for long-term ecological monitoring and conservation.
(This presentation is performed as a JSPS Core to Core Seminar. Program No. JPJSCCB20240006)
Keywords: Fish biodiversity, Urauchi River, eDNA Metabarcoding, Mangrove ecosystems

S09-7 ANEMONE Global: Building an Inclusive Network for eDNA-Based Aquatic Biodiversity Monitoring.

＊Imane Sioud (Tohoku University, ESJ), Michio Kondoh (Tohoku University), Yuki Minegishi (University of Tokyo), Tadashi Kajita (University of the Ryukyus), Yukinobu Isowa (University of the Ryukyus)

ANEMONE Global is an international initiative advancing biodiversity monitoring through environmental DNA (eDNA) tech-

niques. Launched in 2019 as the All-Nippon Environmental DNA Monitoring Network in Japan, ANEMONE has evolved from a nation-wide into a global collaboration connecting researchers, marine stations, and communities to support standardized, long-term monitoring across diverse aquatic ecosystems.
The first international survey, conducted in late 2024, brought together 17 groups from 12 countries, focusing primarily on fish. While the results are still preliminary, this coordinated effort marks a key step toward harmonized, scalable biodiversity assessments. Sampling sites have been established at regular intervals to foster local participation while maintaining global methodological consistency. Currently, samples are processed centrally in Japan, with plans to expand sequencing capabilities to regional hubs, strengthening both capacity and local ownership.
Beyond scientific goals, ANEMONE Global emphasizes inclusivity and long-term impact. Communities, NPOs, and youth are actively engaged through workshops, outreach, and citizen science, fostering local stewardship of aquatic environments. The initiative also promotes open data sharing and transparency, expanding access to biodiversity information for researchers, policymakers, and conservation stakeholders worldwide.
Through its growing network and phased approach, ANEMONE Global is establishing a platform for collaborative research, knowledge exchange, and capacity building. As biodiversity faces mounting pressures from climate change and human activity, the project provides practical, scalable tools to better understand and protect aquatic life across both local and global contexts, strengthening not only data but also relationships that support sustainable environmental action.
Keywords: eDNA; biodiversity monitoring; collaboration.

S09-8 The Research Progress of environmental DNA in China

＊Junjie Wang (South China Normal University, ESC)

Environmental DNA (eDNA) technology has emerged as a powerful biological monitoring tool, demonstrating remarkable potential for ecological conservation and biodiversity research in China. This innovative approach analyzes genetic material collected from environmental samples (water, soil, and air) to detect species presence, assess distribution patterns, and monitor ecosystem status, offering distinct advantages including non-invasiveness, high sensitivity, and operational efficiency. Chinese researchers have achieved significant breakthroughs across multiple dimensions of eDNA technology, spanning fundamental research, methodological innovation, and practical implementation. Their work has established a comprehensive research framework encompassing diverse applications from aquatic ecosystem monitoring to terrestrial endangered species conservation, along with important advances in technical standardization and quantitative analytical methods. Here we will systematically review the historical development, key technological breakthroughs, representative applications, and future challenges and directions of environmental DNA (eDNA) technology in China.

S10-1 Variations of growth strategies and environmental adaptations among diverse canopy tree species in temperate natural forests of Japan

＊Kyaw Kyaw Htoo (Kyoto University, ESJ), Masanori Onishi (Kyoto University/DeepForest Technologies Co., Ltd), Md. Farhadur Rahman (Kyoto University/Bangabandhu Sheikh Mujibur Rahman Agricultural University), Ryuichi Takeshige (Kyoto University/National Institute for Environmental Studies), Kaoru Kitajima (Kyoto University), Yusuke Onoda (Kyoto University)

Understanding tree growth variations and ecological strategies across diverse environments is important for comprehending forest dynamics and environmental adaptations. In plant growth analysis, relative growth rate (RGR, growth rate/biomass) is decomposed into net assimilation rates (NAR, growth rate/leaf area) and leaf area ratio (LAR, leaf area/biomass), providing insights into growth strategies. Using projected crown area as a proxy for leaf area, a new analytical approach, in which RGR is partitioned to space use efficiency (SUE, growth rate/crown area) and space occupation efficiency (SOE, crown area/biomass), was developed and applied in 23 Japanese temperate natural forests (1 ha plot each). The study encompassed 103 species from 3,747 canopy individuals from wide environmental gradients (mean annual temperature (MAT), photosynthetically active radiation (PAR) and snow) and evaluated differences among major functional types (evergreen conifer, evergreen broadleaf and deciduous broadleaf) in terms of growth strategies and environmental adaptations. Evergreen species, exhibited higher SUE but lower SOE compared to deciduous broadleaf even though RGRs were similar. Differences in growth strategies (SUE and SOE) were found to be correlated with environmental factors - SUE increased with increasing MAT and PAR while SOE increased with decreasing MAT and PAR. These findings are driven by lengths of growing season - deciduous species in cold and low-light areas experience shorter growing season requiring to maximize light capture by spreading their crowns, while evergreen species in warmer sites tend to achieve higher growths due to prolonged growing season. Snow loading modulated these emerging patterns and two contrasting strategies to reduce damages from snow were found - deciduous broadleaf species maintaining higher SOE across snow-depth gradients whereas evergreen conifers had low SOE. Newly developed framework allows comparative assessments on variations of canopy tree growth strategies and offers a novel perspective on interspecific variations in environmental adaptations among dominant tree species in natural forests.

S10-2 In situ nitrogen uptake preference and regulating mechanisms by dominant tree species in northeast China

＊Feifei Zhu (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

Nitrogen (N) is a major plant nutrient that influences the productivity, composition and function of forests. However, it remains unclear if there exist a universal pattern of N uptake preference for forest trees across a large geographic scale. Our group developed the 15N paired labeling technique to quantify forest tree N preference in situ, and observed high nitrate contribution to tree N use by 4 typical conifer species in northern China and by Mao bamboo in southern China. In the proposed project, we will

select in total 52 dominant tree species from 17 forests in northern and southern China, including typical temperate forest on southeast Tibetan Plateau, employ the in situ 15N paired labeling technique to explore their N uptake preference, and to check if nitrate utilization are common for these species. The principle objective of the study is to answer if forest trees show N uptake preference, if nitrate use are common for these conifer and broadleaf species, and underlying mechanisms.

S10-3 Tree species turnover along soil nutrient gradients sustains forest productivity in tropical ecosystems

＊Ryota Aoyagi (Kyoto University, ESJ), Richard Condit (Individual Researcher), Benjamin L. Turner (Gyeongsang National University)

Tree species turnover along soil phosphorus (P) gradients is widely observed in tropical forests. The ecological adaptation to low and high P environments might contribute to the maintenance of ecosystem productivity if trees adapted to low P can alleviate the negative impacts of infertility on growth and survival through physiological mechanisms such as enhanced P uptake capacity. However, an ecological paradigm predicts that plant species adapted to low resource availability grow slower and live longer than those adapted to high resource availability when growing together, suggesting that tree species adaptation to low resource availability does not necessarily contribute to improving ecosystem productivity.
We tested this by using hierarchical Bayesian analysis to quantify variations in growth and mortality of ～ 40,000 individual trees from > 400 species in response to limiting resources in the tropical forests of Panama. In contrast to theoretical expectations of the growth-mortality paradigm, we find that tropical tree species restricted to low-P soils simultaneously achieve faster growth rates and lower mortality rates than species restricted to high-P soils on low P soils. We also examine potential physiological traits that underpin tree species specialization to low-P and high-P soils by showing that species adapted to low-P soils allocate more resources to produce phosphatase enzymes that decompose more complex P forms (i.e., phosphodiesterase and phytase). These results demonstrates that adaptation to P limitation in diverse plant communities modifies the growth-mortality trade-off, which has important implications for understanding how regional-scale plant diversity influences ecosystem properties.

S10-4 How tree diversity affects soil carbon accumulation?

＊Xinli Chen (Zhejiang A&F University, ESC), Scott X. Chang (University of Alberta), Masumi Hisano (Hiroshima University), Anthony R. Taylor (University of New Brunswick), Peter B. Reich (University of Michigan), Han Y.H. Chen (Lakehead University)

Increasing soil carbon storage is essential for mitigating climate change and maintaining long-term ecosystem function. Although biodiversity-manipulation experiments suggest that higher plant diversity enhances soil carbon sequestration, it remains uncertain whether these findings apply to natural forests. Using data from Canada's National Forest Inventory and structural equation modelling, we show that greater tree diversity is consistently associated with increased soil carbon storage across natural forest ecosystems. Specifically, higher species evenness increases carbon accumulation in the organic horizon, while greater functional diversity promotes carbon storage in the mineral horizon. These relationships become stronger under conditions of higher light, water, and soil nutrient availability, suggesting that environmental context plays a key role in mediating biodiversity effects. Our results highlight that conserving and promoting functionally diverse tree communities, particularly in resource-rich environments, can enhance the carbon sink capacity of forest soils and contribute meaningfully to climate change mitigation.

S10-5 The contribution of photodegradation to aboveground carbon loss along latitude

＊Qing-Wei Wang (Institute of Applied Ecology, Chinese Academy of Sciences, ESC), Juanjuan Zhang (Institute of Applied Ecology, Chinese Academy of Sciences), Hiroko Kurokawa (Kyoto University)

Photodegradation is a key factor in litter decomposition and aboveground carbon (C) loss, yet its variation pattern and mechanisms are unclear due to biome heterogeneity. We conducted an in-situ spectral-attenuation experiment along a latitudinal gradient from south-subtropic to temperate zones using two tree species. After 319 days, litter mass loss was highest in the south and lowest in the middle. Photodegradation's contribution to decomposition decreased from south to north, mainly driven by UV-A radiation and blue light. In the south, soil conditions promoted photofacilitation via microbes, while in the north, low moisture and high UV led to photomineralization. These results show a shift in photodegradation mechanisms with latitude. It highlights the critical role of spectral composition and climatic conditions in regulating C cycling across environmental gradients, providing new insights into the complex interactions between climate and aboveground C loss in various biomes.

S10-6 Withdrawn

S10-7 Legacy over a thousand years: Canopy soil of old-growth Yakusugi forest fosters rich and unique invertebrate diversity

＊Ikuyo Saeki (University of Osaka/Tokyo Metropolitan University, ESJ), Sho Hioki (Kobe University), Wakana A Azuma (Kobe University), Noriyuki Osada (Meijo University), Shigeru Niwa (Japan Wildlife Research Center), Aino T Ota (National Museum of Nature and Science), Hiroaki Ishii (Kobe University)

Canopy ecosystems are known to contain extensive biodiversity, but because they are difficult to access, knowledge about their conservation is limited. Forest ecosystems have a gigantic, complex, three-dimensional structure, and available biodiversity data

are strongly biased towards the portion near the ground. Consequently, knowledge related to conservation of canopy ecosystems is extremely limited, especially for old-growth forests that contain high species richness but are declining rapidly at a global scale. Yakushima World Heritage Site in Japan is characterized by old-growth forests with huge Japanese cedars, *Cryptomeria japonica*. Canopy soil, originating from litter, is present in the cedars' crowns and offers habitat for abundant epiphytes. We hypothesized that the canopy soil supports rich invertebrate communities that would be distinct from those on the ground. We climbed five retained (>1000 years old) and four regenerated (ca. 300 years old) *C. japonica* trees, the latter established after intensive logging in the 17th century. We investigated the taxonomic composition of invertebrates in canopy and ground soil samples by DNA metabarcoding analysis. In total, invertebrates in 33 orders and 183 families were detected. Invertebrate taxonomic richness identified from the canopy soil of retained trees was similar to that from ground soil, but taxonomic composition differed markedly. Canopy soil of retained trees was deeper and more developed than that of regenerated trees and held a higher number of taxonomic groups per soil sample area. The results imply that canopy soil of old trees contains rich and unique invertebrate diversity that has not recovered from logging, even after 300 years. Our findings confirm that protected areas with old-growth forests that exclude human disturbance are important for conservation of biodiversity in canopy ecosystems. We recommend elongation of harvest cycles and a tree retention approach in forestry areas to minimize the impact of logging disturbance.

S11-1 Integrated plant-soil-microbiome systems constrained by microbial metabolism across forests in Japan

＊Kazuo Isobe (Peking University, ESJ), Yaping Liu (Peking University), Nobuhito Ohte (Kyoto University)

Soil microbiomes are known to be highly sensitive to environmental change. They play essential roles in nitrogen (N) cycling, regulating both the rate of N transformation and the allocation of N—whether it is retained by microbes or released into the soil as mobile N—in forest ecosystems. However, how microbiome responses to environmental variation translate into N-cycling outcomes remains poorly understood, largely due to the context-dependent and interactive effects of multiple microbiome components.

We present data from a comprehensive field survey of 40 forest sites across Japan, spanning broad gradients in climate, soil type, and vegetation. By integrating rRNA gene sequencing and quantification, 15N-based process measurements, and shotgun metagenomics, we demonstrated that soil pH—shaped by vegetation type—structured the taxonomic composition and metabolic capabilities of the microbiome. These microbiome characteristics drove differences in N allocation patterns across forest soils—patterns that were consistent with vegetation N uptake strategies. Specifically, microbiomes in near-neutral pH soils exhibited enhanced nutrient acquisition and respiratory N metabolism, promoting N release, while those in acidic soils prioritized stress tolerance and internal conservation, leading to stronger N retention. These shifts in microbiome strategy reflected a community-level tradeoff between nutrient acquisition and stress tolerance, influencing N allocation.

Our findings provide a trait-based, mechanistic framework that explains divergent N cycling patterns observed across forest types and highlights the role of microbiome metabolism in mediating the effects of environmental change on nutrient availability. Based on these findings, we will discuss integrated plant-soil-microbiome systems in forest ecosystems.

S11-2 National Ecosystem Survey System and Its Role in Analyzing the State of National Ecosystem

＊Seung Se Choi (National Institute of Ecology, ESK), Tae Woo Yi (National Institute of Ecology), Ju-Kyeong Eo (National Institute of Ecology)

The National Ecoystem Survey is the largest and oldest ecosystem survey in Korea that began in 1986 and continues to the present. The purpose of survey is to establish an efficient management system for biodiversity and provide basic data for establishing natural environment conservation measures. This survey project researches the status of biological habitats in nine fields: major geomorphological landscapes, vegetation, flora, birds, mammals, Herptile (amphibians and reptiles), insects, benthic macroinvertebrates, and fish and fish distributed across the country. The country was divided into 824 map sheets and surveyed, and the 5th survey was conducted over 37 years. As a result of the survey to date, 2.66 million ecological data have been accumulated, and the Ecosystem and Nature Map has been constructed and updated. In addition, in order to increase the efficiency of the national natural environment survey and increase citizen awareness, a citizen participation survey in which 720 citizens participated was conducted, and approximately 20,000 ecological data of 2,534 species were obtained. The results of survey will be used as important data in promoting national natural environment conservation and biodiversity conservation policies.

S11-3 Monitoring Seabird Populations using UAVs and Deep learning

＊Yunkyoung Lee (National Institute of Ecology, ESK)

Time-series data are vital for seabird conservation and management. Since 2019, unmanned aerial vehicles (UAVs) have been employed to monitor breeding populations of Larus crassirostris on Chilsando, Korea. In 2024, convolutional neural networks (CNNs) were applied for automated counts, achieving >92% accuracy, demonstrating high potential for large-scale population monitoring.

S11-4 Deep Learning Meets Ecology: Advancing Camera Trap Data Processing for Wildlife Conservation

＊Youngmin Kim (National Institute of Ecology/Pusan National Universuty, ESK), Anya Lim (National Institute of Ecology), Cheol-Han Kim (Sphere AX), Chang-Seob Yun (Sphere AX), Geajae Joo (Pusan National Universuty)

Recent advances in deep learning have significantly enhanced the capacity to process and interpret large-scale camera trap image data, offering new opportunities for automated wildlife monitoring. This study presents Eco. AI, an integrated deep

learning-based system designed to streamline the detection, classification, and management of camera trap images for ecological research and conservation. Leveraging real-time object detection models such as YOLO and open-source frameworks like MegaDetector, Eco. AI automates the identification of wild-animals, humans, and vehicles, substantially reducing the need for manual image filtering. The system incorporates species classification modules based on convolutional neural networks (CNNs), achieving high accuracy across multiple target categories: wild boar (94.0%), deer (96.4%), goral (97.6%), and other species (99.2%). These results demonstrate the practical applicability of AI in ecological workflows and highlight the potential of deep learning to improve the efficiency, accuracy, and reproducibility of biodiversity monitoring and wildlife conservation efforts.

S11-5 Transfer of long-chain polyunsaturated fatty acids between aquatic and terrestrial ecosystems via animal movements

＊Ayano Medo (Center for Ecological Research, Kyoto University, ESJ), Takuya Sato (Center for Ecological Research, Kyoto University)

The availability of n-3 long chain polyunsaturated fatty acids (n-3 LC-PUFA), such as DHA and EPA, is increasingly recognized as essential for survival, somatic growth, and reproduction. These fatty acids are primarily synthesized by aquatic primary producers (e.g., diatom and cryptophyte) and are largely absent in terrestrial producers. Consequently, riparian terrestrial consumers acquire n-3 LC-PUFA from aquatic invertebrates that feed on algae. Although some studies have found EPA retention in riparian terrestrial invertebrates, the extent to which these invertebrates provide EPA to aquatic consumers remains unclear. Here, we explored potential transfer pathways of EPA from terrestrial to aquatic ecosystems by examining (1) EPA content in riparian invertebrates and (2) EPA intake by stream-dwelling salmonids through consumption of terrestrial invertebrates.
Fieldwork was conducted in 2024. Aquatic invertebrates (e.g., Ephemeroptera, Plecoptera, and Trichoptera) were collected in April from the Takahara River, while terrestrial invertebrates (e.g., camel crickets, earthworms, ground beetles, and grasshoppers) were sampled in May from the Tomakomai Experimental Forest and in August from the Takahara River. EPA content in invertebrates was determined by gas chromatography. In addition, we estimated the daily area-based EPA uptake by charr from camel crickets and aquatic invertebrates using EPA content data and previously published stomach content data from the Totsu River.
EPA was detected in some terrestrial invertebrates (e.g., camel crickets, ground beetles, and earthworms) but not in grasshoppers. Furthermore, our model estimated that charr obtained approximately five times more EPA from camel crickets than from aquatic invertebrates in late summer to autumn, when aquatic prey availability declines. These findings suggest that the biological or physical movements of terrestrial invertebrates (e.g., via host manipulation or flooding) may provide an important seasonal source of EPA for riverine consumers.

S11-6 Assessing plant microbial interaction in rhizosphere across forests in north China

＊Wen Guo (Peking University), Kazuo Isobe (Peking University)

Plants can enhance their resistance to pathogens by regulating their associated microbial communities, and this mechanism contributes to the ecological adaptability and potential application of afforestation species. However, the plant microbial interaction in rhizosphere of afforestation species and their potential implications for pathogen remain unclear. In this study, we analyzed the microbiome structure and functions in the root, rhizosphere soil, and bulk soil of major afforestation species in northeastern China (Larch, *Larix principis-rupprechtii*; Poplar, *Populus davidiana* Dode; Birch, *Betula platyphylla*) using amplicon sequencing of bacterial and fungal communities. Particularly, we examined bacterial and fungal community diversities, as well as the relationships among pathogenic, ectomycorrhizal (EcM), and saprotrophic fungal taxa in the soil and roots, to identify the factors influencing the abundance of pathogenic fungi in roots. The microbial community compositions of the root, rhizosphere soil, and bulk soil in the larch forests differed markedly from those in the birch and poplar forests. In the rhizosphere soils, the relative abundance of EcM fungi was negatively correlated with that of pathogenic fungi in the birch and larch forests but not in the poplar forests. A higher proportion of EcM fungal taxa were shared between the rhizosphere soil and roots, and a greater influx of bacterial and fungal taxa from the rhizosphere to the roots was observed in the larch forests compared to the birch and poplar forests. These results suggest that EcM fungi in the rhizosphere, along with their colonization of roots, may contribute to reducing the abundance of pathogenic fungi in roots, particularly in larch. These findings reveal that tree species influence host health by regulating rhizosphere microbes, providing a scientific basis for optimizing the selection of afforestation species and enhancing the resistance and stability of plantation forests.

S11-7 Garlic mustard (*Alliaria petiolata*) Invasion Reshapes Soil Microbial Communities and Network Structures in South Korea

＊Yousuk Kim (Gwangju Institute of Science and Technology (GIST)/University of Minnesota/Institute for Basic Science (IBS), ESK), Eunsuk Kim (Gwangju Institute of Science and Technology (GIST)), Byungwook Choi (University of Minnesota), Seorin Jeong (Institute for Basic Science (IBS)), Tae-min Kim (Gwangju Institute of Science and Technology (GIST))

Garlic mustard (*Alliaria petiolata*) is a recently introduced invasive species in South Korea, yet its ecological impacts remain unclear. We assessed how garlic mustard invasion modifies soil microbial communities and chemical properties as part of potential plant-soil feedback mechanisms. Soil samples were collected from invaded and adjacent uninvaded sites within three regions—Samcheok, Suwon, and Incheon—where garlic mustard has been reported. We analyzed soil bacterial and fungal communities and measured water-soluble ion concentrations to evaluate associated biotic and abiotic changes. Microbial diversity was significantly altered by invasion across all sites, but functional shifts in microbial communities were observed only at the Samcheok sites. Specifically, the abundance of chemoheterotrophic bacteria increased, while phototrophic and nitrogen-fixing groups de-

clined. Fungal communities in Samcheok also exhibited a decrease in ectomycorrhizal fungi and an increase in pathogenic fungi. Constrained ordination (db-RDA and CCA) revealed that Samcheok was the only region where microbial communities were strongly correlated with soil chemistry. pH emerged as a key driver of both bacterial and fungal communities, with NH_4^+ and NO_3^- further contributing to the differentiation between invaded and uninvaded bacterial communities. These patterns suggest that altered nitrogen availability and acidity may underlie the compositional and functional changes observed in this region. Based on the 100 most abundant taxa, network analysis consistently showed greater connectivity and density in bacterial communities of invaded soils across all regions, indicating enhanced structural stability. In contrast, the fungal network remained unchanged. These findings suggest that garlic mustard invasion alters microbial community structure and interactions, with consistent shifts in bacterial network structure and region-specific environmental associations, possibly reflecting differences in invasion stage.

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S12-1 High-altitude adaptations of a keystone zooplanktonspecies on the Tibetan Plateau

＊Mingbo Yin (Fudan University)

The genomic changes associated with adaptation to high-altitude environments in a keystone aquatic invertebrate remains unknown. To fill this gap, we provide a high-quality chromosome-level genome assembly (~133 Mb, scaffold N50 11.3 Mb) of a water flea *Daphnia sinensis*, and investigated genomic variation in 52 clones from two different geographic regions (high-elevation and lowland) in China. Our ecological-niche model suggested that the historic distribution of *D. sinensis* in China was significantly affected by Quaternary climate fluctuations, which have potentially driven population diversification. We detected pronounced genomic divergences between high-elevation and lowland *D. sinensis* populations. Further analyses revealed that genes likely under positive selection in high-elevation *D. sinensis* populations were associated with the HIF-1 signaling pathway, lipid metabolism and cellular response to DNA damage stimulus, suggesting a potential genetic basis underlying high-altitude adaptation of *Daphnia*. Interestingly, individuals of the high-elevation clones had higher fitness than those of lowland clones, when grown at low temperatures (at both 4 ℃ and 10 ℃) or exposed to UV radiation, but this was not the case under "standard" conditions (20 ℃ and without UV radiation). Our findings give insights into differentiation and natural selection of *D. sinensis* in China, and increase our understanding of the genetic basis of high-altitude adaptation for aquatic organisms.

S12-2 The fascinating world of riverine insects: insights from phylogeography

＊Masaki Takenaka (University of Tsukuba)

One mechanism of biodiversity is not only speciation but also the coexistence of closely related species that have recently speciated. Additionally, when organisms expand their distribution range, adaptation to new environments becomes an important evolutionary event. River systems are an ideal field for conducting such evolutionary study. Environmental conditions in river systems undergo continuous and substantial changes from upstream to downstream. These changes lead to species replacement within the same genus along the river course. Using multiple mayfly species to investigate species distribution within rivers, we found that species distribution varies according to the environment rather than simply the distance from the river mouth. Furthermore, the spatial patterns of habitats influence the genetic structure of organisms. A comprehensive study of 13 insect species across six rivers in the Muroto Peninsula of Shikoku revealed a tendency for greater genetic differentiation in upstream regions. However, unexpectedly, species adapted to the wet rock environments, which are positioned at the most upstream areas, were genetically homogeneous. This trend resembles the characteristics of still water environments like ponds compared to flowing water environments like rivers. Although species replacement occurs according to the environment within river systems, species such as *Baetis thermicus* inhabit areas from upstream to downstream. However, our study based on the mitochondrial gene have revealed genetic differentiation according to the environment. Also, genome-wide SNPs analyses further clarified that lineages differentiated by environment did not distribute widely across the Japanese archipelago but adapted parallelly to each environment within each region. These makes river ecosystems an ideal field for evolutionary study. Through intriguing case studies, this presentation will explore the charm of river ecosystems and their importance in evolutionary study.

S12-3 Phylogeographic consequences of land-locked life history evolution in freshwater shrimps

＊Yusuke Fuke (Setsunan University, ESJ)

Habitat shifts from marine to freshwater environments are one of the factors driving speciation. The degree of freshwater adaptation forms a gradient, ranging from a diadromous life history, where specific life stages depend on the sea, to a land-locked life history that occurs entirely in freshwater. Investigating the patterns and processes of freshwater adaptation in aquatic organisms enhances our understanding of speciation and macroevolution.

Crustaceans show repeated evolution of freshwater species from marine or diadromous ancestors across various taxa. Even among freshwater species, there is significant variation in their dependence on freshwater. Therefore, crustaceans represent a good model system for examining how differences in life history patterns influence phylogeographic consequences.

Freshwater shrimp provide a compelling case study, as multiple land-locked species with varying degrees of freshwater dependence and different ancestral life histories inhabit various regions in Japan. Three species derived from amphidromous ancestors have expanded across wide areas of Japan and oceanic islands (i.e. the Bonin Islands), and their larvae retain salinity tolerance. In contrast, four species derived from landlocked ancestors are restricted to western Japan and continental islands (i.e. the Ryukyu Islands). These species likely colonized these areas during periods when land connections existed with the continent; however, further dispersal has likely been limited by geographic barriers such as mountains and seas. These findings sug-

gest that both the ancestral life history and the degree of freshwater dependence play important roles in shaping the distribution of landlocked species. In my talk, I will also present detailed research on several species, focusing on their population structure and the evolutionary trajectories of their life history strategies.

S12-4 Insights into the evolutionary history of Japanese amphibians from genetic data

＊Atsushi Tominaga (University of the Ryukyus)

Amphibians are one of the major target animal groups in island biology because of their limited capacity for overseas dispersal. Recent studies have revealed substantial genetic differentiation among populations on the islands of the Ryukyu Archipelago and detected the relict lineages in some species groups in this archipelago, which provides new insights into the faunal formation process of this region. Meanwhile, population genetic studies of amphibians in mainland Japan suggest that reticulate evolution and hybridization have played significant roles in shaping their present diversity. In this presentation, I will first introduce the diversification process of narrow-mouthed toads (genus *Microhyla*) of the Ryukyu Archipelago. Then, I will present new findings on hybrid zone and reticulate evolution in the fire-bellied newt (genus *Cynops*).

S12-5 Revealing hidden species interaction via bird banding: foraging and dispersal

＊Masanori Tatani (Graduate School of Life Sciences, Tohoku University, ESJ)

Since species interactions, such as predation, competition, symbiosis, and dispersal, often shape adaptive evolution and/or community dynamics, revealing them in nature is crucial for understanding ecology and evolution in freshwater systems. Birds play an important role in species interactions in freshwater systems, especially because of their diverse foraging ecology, larger home ranges, and long-distance dispersal ability (LDD). Bird banding (or ringing) is one of the best ways to understand species interactions between birds and other organisms because of its cost-effectiveness and low invasiveness, which allows us to obtain samples from larger numbers of birds. In bird banding, banders capture birds alive, mark them with bands and release them to collect basic ecological statistics of birds such as movement, demography, mortality, population dynamics, systematics and morphology. Among various samples obtained during bird banding, fecal samples are especially informative because information on prey-predator interactions, food-niche competition among bird species, symbiosis, and dispersal of other organisms can be retrieved. I have collected more than 800 fecal samples during bird banding over seven years to analyze them using DNA metabarcoding and phylogenetic analysis. To date, I have revealed prey-predator interactions between freshwater snipes and freshwater invertebrate animals, and revealed inter-continental dispersal of a freshwater snail attached to a snipe using genetic analysis. In many Asian countries, there is growing interest in bird banding and many bird banders are being trained. It is vital to seek potential collaborations between such ornithologists and other freshwater researchers to uncover species interactions and understand ecology and evolution in freshwater systems.

S12-6 New insights into the evolutionary history of the freshwater fishes in Japan, focusing on Lake Biwa, based on nuclear genome information

＊Ryoichi Tabata (Lake Biwa Museum, ESJ)

The origins of endemic fishes in Lake Biwa and the formation process of its unique fish fauna represent highly intriguing research topics. To date, studies have primarily utilized mitochondrial DNA; however, in recent years, research employing nuclear genome analyses has become increasingly prevalent. Studies based on nuclear genomic information have enabled the elucidation of evolutionary phenomena involving polyploidization, phylogenetic evolution considering discrepancies between mtDNA and nuclear genomes, patterns of secondary contact and gene flow, detailed historical demography, and the genetic basis of adaptive evolution, which were previously difficult to investigate. The accumulation of such data and advances in research have contributed to a better understanding of how endemic fishes in Lake Biwa evolved and how its fish fauna was formed. The acquisition and application of comprehensive whole-genome data will enable a deeper and more detailed elucidation of the natural history of Lake Biwa.

S12-7 Evolution and biogeography of freshwater molluscs in East Asia

＊Takahiro Hirano (University of the Ryukyu's, ESJ)

East Asia is a hotspot of freshwater biodiversity, and mollusks are no exception. For example, Lake Biwa is not only the largest lake in Japan but also one of the few ancient lakes in the world. As such, it harbors many endemic species and serves as an intriguing field site for evolutionary research. Mollusks, with their hard shells that fossilize readily, also provide excellent models for studying evolutionary processes. In this presentation, I will introduce my research on the evolution and phylogeography of freshwater mollusks, taking advantage of the unique characteristics of both the region and the organisms. My focus is on freshwater gastropods in the family Viviparidae. While Lake Biwa is home to endemic genera of this family, closely related species are widely distributed across Japan and can be found even in familiar environments such as rice paddies and irrigation ponds. Despite their accessibility, evolutionary studies of this group have been limited, and the diversification processes of viviparids in East Asia remain poorly understood. To address this gap, I have conducted research to uncover the evolutionary history of Japanese viviparids. Molecular phylogenetic analyses have revealed that evolutionary radiations in ancient lakes occurred independently in various parts of East Asia, accompanied by repeated evolution of similar morphologies and reproductive strategies. Population genetic analyses suggest that speciation within Lake Biwa's viviparids largely coincided with the formation of the modern lake, and the estimated timing also matches the age of their fossil records. These findings suggest that ancient lakes play a key role in molluscan evolution, potentially due to factors such as niche diversity, long-term environmental stability, and

species interactions.

S12-8 Diversity and geographic distribution of parasitic trematodes in the freshwater snails in the genus *Semisulcospira*

＊Osamu Miura (Kochi University, ESJ)

The host-parasite system provides valuable insight into the process of species diversification. The freshwater snails in the genus *Semisulcospira* are known as hosts of various larval trematode parasites. However, the diversity of larval trematodes is often underestimated due to their restricted morphology. I used molecular genetics to evaluate the accurate diversity of larval trematodes in the *Semisulcospira* snails and determine their geographical distribution in Japan. I identified over fifty genetically delimited species from nineteen morphologically distinguishable larval trematodes. Although a single species, *Semisulcospira libertina*, dominates the riverine habitat in Japan, the ancient Lake Biwa harbors nineteen endemic *Semisulcospira* species radiated within the lake. I also applied molecular genetics to the larval trematodes infecting these endemic *Semisulcospira* species and found that nine genetically delimited trematode species only infected the Lake Biwa endemic *Semisulcospira* species. These trematodes could be diversified due to co-speciation with the Lake Biwa endemic *Semisulcospira* species or host switch events after the divergence of the riverine and lacustrine *Semisulcospira* species. This study highlights the usefulness of the host-parasite system in studying species diversification in the freshwater habitat.

S13-1 Biodiversity and climate-friendly forest ecosystem conservation and restoration

＊Shirong Liu (Chinese Academy of Forestry, ESC)

Biodiversity conservation and climate change mitigation share common foundations and must be addressed in tandem. "Forests are the dominant terrestrial ecosystems, currently covering 4.06 billion hectares globally, accounting for one-third of the Earth's land area. With diverse forest types and rich biodiversity, their composition, formation, and maintenance form a vital foundation for ecosystems to deliver benefits to humanity. To achieve the Kunming-Montreal Global Biodiversity Framework targets, natural forests should be prioritized for protection, restoration, and sustainable management, while artificial forests require close-to-nature transformation and multi-functional management. This dual approach enhances terrestrial ecosystem carbon sequestration capacity while maintaining and improving biodiversity. However, global natural forest resources, particularly in tropical regions, are declining continuously. Natural forests in China, a crucial component of its terrestrial ecosystems, have seen significant improvements in area, stock volume, and coverage through the implementation of the Natural Forest Protection Program in recent years. By halting commercial logging entirely, natural forests have been granted opportunities to recover and regain biodiversity. Nevertheless, many natural forests remain degraded." China currently has 131.4 million mu (approximately 8.76 million hectares) of planted forests, accounting for 38% of the nation's total forest area. While ensuring timber production, future efforts should prioritize enhancing carbon sequestration and biodiversity. Through species selection and silvicultural practices, the biodiversity of forest stands can be significantly increased. By strategically configuring forest patches, diverse ecosystems can be integrated into landscapes, improving both landscape-level ecosystem and forest community diversity while contributing to regional biodiversity enhancement.

S13-2 Distribution patterns of weeds/spontaneous plant community along urban wastelands and main affecting factors in Tibet Autonomous Region, China

＊Liangjun Da (Xi'an University of Architecture and Technology, ESC), Lin He (Xi'an University of Architecture and Technology), Yao Yao (Xi'an University of Architecture and Technology), Luyi Lan (Xi'an University of Architecture and Technology), Zhiwen Gao (East China Normal University), Jiao Chen (Xi'an University of Architecture and Technology)

The Tibet, known as the third pole of the world, is a globally significant ecological region due to its unique biodiversity, fragile environment, and sensitivity to climate change and rapid urbanization. Urban wastelands, which experience relatively low anthropogenic disturbances, provide critical habitats for spontaneous plants, serving as refugia and stepping-stones for species dispersal. However, the mechanisms driving plant diversity in these habitats are poorly understood. In 2024, we systematically investigated spontaneous plant communities across 14 cities in the Tibet to examine their distribution patterns, diversity determinants, and habitat relationships across natural geographic zones and urbanization gradients. We found that: (1) Native species dominated the flora of urban wastelands, while invasive species constituted over half of non-native species, indicating these sites function as both biodiversity refugia and potential invasion hotspots; (2) Natural geographic conditions primarily governed community diversity patterns, with mean annual precipitation positively influencing total species richness and native species richness, but negatively affecting non-native and invasive species richness; (3) Urbanization factors exerted stronger effects on other diversity indices (Shannon, Simpson, evenness). This study elucidates the formation mechanisms of spontaneous plant communities in the Tibet's urban wastelands, providing theoretical and practical insights for biodiversity conservation and management in ecologically fragile regions under escalating anthropogenic and climatic pressures. Given the increasing pressures of urbanization and climate change, protecting these habitats is vital for maintaining biodiversity resilience and mitigating invasion risks in this ecologically sensitive region.

S13-3 Embedding Biodiversity Conservation in Local Problem-Solving: Lessons from Nature-based Approaches in Japan

＊Jun Nishihiro (National Institute for Environmental Studies, ESJ)

Biodiversity conservation can be achieved not only through initiatives that explicitly aim to conserve biodiversity, but also as an unintended yet beneficial outcome of efforts addressing other social or environmental challenges. This perspective aligns with the concept of Other Effective Area-based Conservation Measures (OECMs), which recognizes areas that are not formally designated as protected but nonetheless contribute to biodiversity conservation through various forms of human activity, such as community initiatives or business operations.
In my presentation, I will introduce two case studies from wetland ecosystems in Japan that illustrate this approach. The first is the Asahata-retarding reservoir, a flood control reservoir that also serves as a public park. In this case, routine activities conducted by park users—such as vegetation management and small-scale soil disturbance—have unintentionally supported the maintenance of wetland habitats. The second case is from Chiba Prefecture, where abandoned rice paddies are being managed through mowing and levee repair. Although the primary objectives are rural revitalization, urban-rural exchange, and water quality improvement, these efforts have also led to the conservation of habitats for various wetland plant species, including some that are nationally endangered.
Both examples show how actions not directly aimed at conservation can nonetheless result in significant ecological benefits. These cases highlight the potential of integrating biodiversity outcomes into broader social initiatives and underscore the importance of developing frameworks that can recognize and support such contributions. I will discuss the potential and challenges of promoting biodiversity conservation as a co-benefit of local problem-solving, especially through cross-sector collaboration and community engagement.

S13-4 Relationship of tree species diversity and soil organic carbon under climate change

＊Hui Wang (Ecology and Nature Conservation Institute, Chinese Academy of Forestry, ESC)

Higher tree species richness generally increases the storage of soil organic carbon (SOC). However, less attention is paid to the influence of varied tree species composition on SOC storage. Recently, the perspectives for the stronger persistence of SOC caused by the higher molecular diversity of organic compounds were proposed. Therefore, the influences of tree species richness and composition on the molecular diversity of SOC need to be explored. In this study, an index of the evenness of diverse SOC chemical components was proposed to represent the potential resistance of SOC to decomposition under disturbances. Six natural forest types were selected encompassing a diversity gradient, ranging from cold temperate to tropical forests. We examined the correlations of tree species richness, composition, and functional diversity, with the evenness of SOC chemical components at a molecular level by 13C nuclear magnetic resonance. Across the range, tree species richness correlated to the evenness of SOC chemical components through tree species composition. The negative correlation of evenness of SOC chemical components with tree species composition, and the positive correlation of evenness of SOC chemical components with tree functional diversity were found. These indicate the larger difference in tree species composition and the lower community functional diversity resulted in the higher heterogeneity of SOC chemical components among the communities. The positive correlation of the evenness of SOC chemical components with the important value of indicator tree species, further revealed the specific tree species contributing to the higher evenness of SOC chemical components in each forest type. Soil fungal and bacterial α-diversity had effect on the evenness of SOC chemical components. These findings suggest that the indicator tree species conservation might be preferrable to simply increasing tree species richness, for enhancing the potential resistance of SOC to decomposition.

S13-5 Quantifying ecosystem respiration and nitrous oxide emissions from greenhouse cultivation systems via a novel whole-greenhouse static chamber method

＊Zhi Quan (Institute of Applied Ecology, Chinese Academy of Sciences/Weifang Institute of Modern Agriculture and Ecological Environment, ESC), Xue Li (Institute of Applied Ecology, Chinese Academy of Sciences), Yunting Fang (Institute of Applied Ecology, Chinese Academy of Sciences)

Greenhouse cultivation has expanded rapidly over the past three decades, significantly contributing to global food security and diversity. However, greenhouse gas (GHG) emissions from these systems remain poorly quantified due to methodological limitations. Here, we introduce a novel framework treating the greenhouse as a large static chamber to infer GHG emissions via nighttime gas accumulation. This approach was validated using two monitoring systems: automated 16-chambers soil flux measurements and whole-greenhouse concentration monitoring over 70 days. Mean soil carbon dioxide (CO_2), methane (CH4), and nitrous oxide (N_2O) fluxes were 29.2 ± 12.9kg C ha-1 day-1, -1.08 ± 2.31g C ha-1 day-1, and 105.3 ± 65.6 g N ha-1 day-1 (mean ± SD), respectively. Although CH_4 flux was negligible, CO_2 and N_2O fluxes were significant with high spatiotemporal variability, driven primarily by chamber location and soil temperature. Whole-greenhouse CO_2 concentrations accumulated steadily at night and declined rapidly under daylight, whereas N_2O concentrations rose continuously, with ventilation events driving release. Nighttime accumulation between 18:00-24:00 provided robust estimates of ecosystem respiration (Re) and N_2O emissions, minimizing biases from temperature fluctuations. Validated across 15 greenhouses, this method yielded annualized emissions of 17.8 ± 8.0 Mg C ha−1 yr−1 (Re) and 21.3 ± 19.7 kg N ha−1 yr−1 (N_2O). This highlighted N_2O as the dominant direct GHG after accounting for photosynthetic recapture of Re. By bridging spatial heterogeneity and diurnal variability, the whole-greenhouse static-chamber approach advanced GHG quantification in controlled agricultural systems and offered a scalable framework for optimizing management practices and mitigating climate impacts.

S13-6 How to Maximize the Multiple Benefits of Ecosystem Restoration under Cost Constraints

＊Jiaquan Duan (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

Ecosystem restoration, as a crucial strategy for mitigating climate change and curbing biodiversity loss, has attracted substantial attention from researchers in recent decades. However, ecological restoration often encounters two major challenges: limited budgets that restrict the scope of restoration efforts, and trade-offs among the diverse restoration goals of different stakeholders. It remains unclear how to optimize the fulfillment of multiple objectives for various stakeholders within a constrained budget. To address these issues, this study uses the Yangtze River Delta area as a case study, integrating cost-benefit analysis and multicriteria approaches to guide and optimize ecological restoration efforts. The findings reveal that: (1) Ecological restoration costs and benefits exhibit significant spatial heterogeneity. Prioritizing the restoration of 20% of degraded or transformed land in key ecological restoration areas can achieve 26.82% of the ecological benefits and 33.02% of the climate change mitigation benefits under using 15.09% total cost. (2) The restoring of different land types has varying levels of importance. Grassland restoration provides the greatest climate change mitigation benefits, while restoring multiple land types in combination is essential for achieving multi-objective ecological restoration. (3) Optimizing spatial allocation using multi-criteria methods, cost-effectiveness can enhance cost-effectiveness by 1.4 times, underscoring the critical role of spatial planning. This study provides practical insights for ecological restoration in the Yangtze River Delta and offers a new perspective on cost-benefit analysis in ecological restoration research through multicriteria algorithms.

S13-7 Latitudinal pattern of leaf P fractions sheds physiological insights into large-scale plant P-use strategy

＊Qingquan Meng (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University, ESC), Zhengbing Yan (Institute of Botany, Chinese Academy of Sciences), Zhijuan Shi (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University), Tingting Dong (Institute of Botany, Chinese Academy of Sciences), Jia Wang (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University), Hnas Lambers (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University/School of Biological Sciences, The University of Western Australia), Wenxuan Han (Key Laboratory of Plant-Soil Interactions, Ministry of Education, College of Resources and Environmental Sciences, China Agricultural University)

Phosphorus (P) is a key element of life; the biogeography and underlying mechanisms of plant P have long attracted the interest of researchers, including those in ecology, biogeography, and biogeochemistry. Three major hypotheses aim to explain latitudinal trends of leaf P concentration: the Temperature-Plant Physiological Hypothesis (TPH), Soil-Nutrient Hypothesis (SNH), and Evergreen-Deciduous Hypothesis (EDH). However, these hypotheses only address leaf total P, preventing a deeper insight into the underlying physiological mechanisms. We extended these hypotheses to include variations in leaf P fractions (metabolite P, inorganic P, nucleic acid P, lipid P, residual P) with different physiological functions (extended TPH, SNH, and EDH, respectively). By integrating the data of leaf P fractions obtained from the literature and field measurements. We analysed latitudinal variation in leaf P fractions and their correlations with mean annual temperature, soil total P concentration, and leaf habit. We found that leaf total P and P-fraction concentrations all significantly increased with increasing latitude in the Northern Hemisphere, with metabolic P increasing most. The concentrations of all leaf P fractions, higher in deciduous than in evergreen plants, increased with decreasing mean annual temperature and increasing soil total P concentration. The proportion of metabolic P was higher at low mean annual temperature and in deciduous plants, while that of residual P increased with increasing soil total P concentration. Temperature had a much stronger influence than other factors on leaf P fractions, especially for their allocation proportions. Our results predominantly supported the extended TPH, but also generally supported the other two hypotheses, highlighting eco-physiological mechanisms underpinning the macroecology of plant P-use strategy.

S14-1 Human activities further amplify the cooling effect of vegetation greening in Chinese drylands

＊Yangjian Zhang (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, ESC)

Vegetation change can provide strong feedback to climate system, but there is a severe shortage of understanding regarding how biogeophysical (BGP) processes related to vegetation changes and their impact on local temperature in arid and semi-arid regions of China (ASAC), a unique region where large-scale ecological engineering projects have been implemented. To address this knowledge gap, this study aims to investigate the BGP effects of vegetation changes (including growth change and type conversion) and elucidate the BGP mechanisms that link vegetation and surface temperature (Ts) through integrating the Intrinsic Biophysical Mechanism (IBM) method and pairwise comparison analysis. The findings reveal that vegetation change slows down climate warming rate of Ts in ASAC, with a cooling magnitude of -0.0096 K/year (Non-radiative forcing: -0.0114 K/year; Radiative forcing: 0.0018 K/year) from 2000 to 2018, embodied as cooling in summer-autumn and warming in winter-spring. Vegetation-induced BGP effects in ASAC are dominated by non-radiative mechanisms. During the study period, compared to the stable land use/land cover (LULC), cropland expansion and grassland restoration usually led to cooling exceeding -0.05 K and -0.01 K, respectively. However, afforestation and urbanization generally cause warming about 0.02 K and 0.04 K, respectively. From a BGP point of view, avoiding large-scale afforestation in extremely arid regions is an effective strategy. This study highlights the importance of land use/ land cover change (LULCC) in regulating regional climates, and emphasizes the necessity of fully considering the multiple effects of LULCC in the formulation or evaluation of climate change mitigation policies.

S14-2 Impacts of multi-year extreme drought on grasslands at regional and global scales

＊Qiang Yu (Beijing Forestry University, ESC)

The severity and frequency of extreme droughts have increased dramatically due to global change, often causing devastating consequences because of their high intensity. Grasslands, which cover approximately 40% of Earth's surface and provide essential resources and services to humanity, are particularly sensitive to changes in precipitation. With models predicting a rising probability of drought events in many regions worldwide, it is increasingly crucial to understand their impacts on grassland ecosystems to accurately assess ecosystem resistance to climate change and predict future ecosystem functionality. While previous studies have shown that extreme droughts often lead to significant declines in grassland productivity, key questions remain unanswered: What are the overarching patterns at larger spatial scales? How do these responses evolve over time? And how do grasslands recover after extreme drought events? To address these questions, we conducted a coordinated, distributed experiment to explore the relationship between productivity sensitivity to drought and mean annual precipitation, the multi-year effects of extreme drought on grassland productivity, and the resilience of productivity in the aftermath of extreme drought.

S14-3 Monitoring the Impacts of Climate Change and Assessing Adaptation in the Mongolian Grasslands

＊Qinxue Wang (National Institute for Environmental Stuides), Tomohiro Okadera (National Institute for Environmental Stuides), Tadanobu Nakayama (National Institute for Environmental Stuides)

The Mongolian grasslands, which cover more than 80% of the country's territory, represent one of the world's largest and most climate-sensitive terrestrial ecosystems. These grasslands are crucial for supporting traditional livestock-based livelihoods, sequestering carbon, and maintaining regional ecological stability. However, recent decades have witnessed intensified degradation driven by climate change and anthropogenic pressures such as overgrazing, mining, and urban expansion. This study provides an integrated assessment framework to monitor the impacts of climate change and evaluate adaptation strategies across Mongolia's grasslands.

Using multi-year ground-based observations, satellite remote sensing, and advanced ecological modeling, we analyze key indicators including permafrost degradation, forage productivity, carbon flux dynamics, and water resource shifts. We introduce a novel modeling approach for estimating Carrying Capacity (CC) and Relative Stocking Density (RSD), validated with national meteorological datasets. Results show distinct spatial disparities: permafrost degradation is most pronounced in steppe ecosystems, while overgrazing is concentrated in central regions near urban hubs such as Ulaanbaatar. From 1990 to 2019, significant changes in land use and livestock density have further stressed ecosystem thresholds.

Scenario-based analyses under varying climatic and socio-economic conditions demonstrate that climate-smart grazing (CSG)—including rotational grazing, biodiversity conservation, and water-use efficiency—can effectively enhance ecosystem resilience and pasture recovery. The study concludes with actionable proposals for integrating early warning systems, adaptive pasture planning, and ICT-based livestock management.

This research contributes to both scientific understanding and practical policy by quantifying ecological limits and offering evidence-based adaptation strategies for sustainable grassland governance in Mongolia. It underscores the urgency of coordinated action among researchers, policymakers, and local communities to safeguard pastoral ecosystems under accelerating climate risks.

Keywords: Grassland Degradation, Carrying Capacity (CC), Relative Stocking Density (RSD), Climate-Smart Grazing (CSG)

S14-4 Plant litter loss exacerbates drought influences on grasslands

＊Yongfei Bai (Institute of Botany, the Chinese Academy of Sciences/College of Resources and Environment, University of Chinese Academy of Sciences, ESC)

Droughts, which impose large and long-lasting negative impacts on terrestrial ecosystems, are projected to become more frequent and severe in the future. This is particularly true in grassland ecosystems, which are extremely water-limited and known to experience major reductions in primary production in response to droughts. Previous studies have demonstrated that plant litter can modulate soil temperature, moisture, and nutrient retention, and help to regulate plant community structure and dynamics. This suggests that anthropogenic disturbances and climate change, such as fire, grazing and drought, can substantially reduce plant litter production and thereby exacerbate the negative effects of droughts. However, the effects of reductions in plant litter on ecosystem function are often confounded with many other effects of these disturbances. Therefore, it is critical to understand how plant litter loss influences the ability of grasslands to respond to droughts. Using a 7-year litter removal experiment in a semiarid grassland, here we examined how litter removal interacts with a two-year drought to affect soil environments, plant community composition, and ecosystem function. Our results demonstrate that litter loss exacerbates the negative impacts of drought on grasslands. Litter removal increased soil temperature but reduced soil moisture and nitrogen mineralization, which substantially increased the negative impacts of drought on primary productivity and the abundance of perennial rhizomatous graminoids. Moreover, complete litter removal shifted plant community composition from grass-dominated to forb-dominated, and reduced species and functional group asynchrony, resulting in lower ecosystem temporal stability. These results suggest that ecological processes that lead to reduction in litter, such as burning, grazing, and haying, may render ecosystems more vulnerable and impair the capacity of grasslands to withstand drought events. Plant litter protection appears to buffer soil temperatures, preserve soil moisture and nitrogen, trap and retain snow, and thereby mitigating the negative impacts of climate change.

S14-5 Temporal and spatial variability in aboveground net primary production of boreal steppe of Mongolia

＊Ariuntsetseg Lkhagva (National University of Mongolia)

Rangeland management difficulties include understanding landscape-scale aboveground net primary production (ANPP) temporal variability. Due to its high latitude (51°N), the cold and dry boreal steppe of Northern Mongolia, one of the climate change hotspots, has little understanding of how livestock grazing and landscape affect ANPP temporal variability. The southern frontier of continuous permafrost distribution is the steppe, which borders Siberia boreal forest and Central Asian Steppe. For 9 years (2003-2012, excluding 2006) and 2022, we examined temporal variability in boreal steppe ANPP along a topographical gradient crossing south-facing upper and lower slopes, riparian zone, and north-facing lower slope in relation to climatic factors and livestock grazing. In the ungrazed north-facing lower, mean annual plant biomass was 121 g m-2, while in the grazed lower, it was 23 g. The remaining three landscape positions had similar mean annual plant biomass during peak biomass period across grazing levels. Over 9 years, plant biomass decreased in the ungrazed north-facing slope. Strong positive temporal autocorrelations at lag 1 in the ungrazed north-facing lower and south-facing lower indicated that previous year's plant biomass affects subsequent year's plant production. Grazed landscapes had larger total plant biomass temporal variability than ungrazed landscapes. Along the grazed landscape gradient, biomass spatial heterogeneity decreased. Our climate factors explained more of the temporal variability in total plant biomass in the grazed area. It may indicate that climate factors dominate overall plant biomass in grazed landscapes rather than internal vegetation restrictions. Warmer, drier (less frequent rainfall) environment may effect boreal steppe production more than animal grazing.

S14-6 Enhancing the resilience of drylands to global change

＊Takehiro Sasaki (Yokohama National University, ESJ)

Drylands provide a range of ecosystem services to human communities, including livestock production, tourism, and landscape aesthetics, supporting the livelihoods of over 2 billion people across the globe. The primary goal of dryland management is to optimize the use of ecosystems for sustainable livestock production while maintaining ecosystem function and stability in the face of global change. However, increasing aridity, a major facet of current and future climate change in drylands worldwide, can adversely affect biodiversity, functioning and stability of drylands. Another important threat to drylands is the increasing livestock population worldwide associated with increased global demand for livestock products. To address these multiple global change threats, we have been integrating large-scale field observations, manipulative experiments, and long-term monitoring across Mongolian grasslands. In this presentation, we will share recent insights gained from our large-scale observational programs and manipulative experimental studies. We highlight how improved understanding of biodiversity and ecosystem functioning under global change can guide dryland management strategies to enhance ecosystem resilience.

S14-7 The impact of herding strategies on dry rangeland resilience: insights from mathematical modelling

＊Toyo Vignal (Okinawa Institue of Science and Technology/Maxwell Institute), Mara Baudena (National Research Council (CNR-ISAC)), Angeles Garcia Mayor (Universidad Complutense de Madrid), Jonathan Sherratt (Maxwell Institute)

The Mongolian Plateau is one of the world's major dry rangelands. It is home to approximately 120 million livestock animals, supporting the livelihood of millions of low-income pastoralists. However, unsustainable animal husbandry can lead to land degradation, threatening both ecological and socio-economic stability.

To explore how grazing practices affect the resilience of dry rangelands, we developed a general mathematical model capturing the dynamics between vegetation, water availability, and livestock density. Our model consists of two coupled differential equations representing key dryland processes, such as a strong Allee effect in the vegetation dynamics. The resulting system exhibits bistability between a productive vegetated state and a hardly reversible degraded state.

We use mathematical analysis to examine how different management strategies, namely the stocking density and the degree of adaptivity of destocking in response to forage availability, influence a system's ability to recover from drought.

Three key findings emerge:

Increasing livestock density reduces ecosystem resilience, in an expected trade-off between productivity and sustainability.

There is a maximum sustainable livestock density—common to all management strategies—beyond which the system inevitably degrades.

Greater flexibility in reducing herd size during forage scarcity increases resilience, allowing ecosystems to recover from more intense droughts, without compromising long-term productivity.

These findings support the use of adaptive destocking strategies to provide a sustainable path forward for dry rangelands such as the Mongolian Plateau.

S14-8 Soil texture regulates climate-vegetation-soil carbon relationships in semi-arid grasslands

＊(Frank) Yonghong Li (Inner Mongolia University, ESC)

The Mongolian Plateau is covered by vast steppes and deserts under arid and semiarid climate. Here we examines the effects of soil texture on climate-vegetation-soil carbon relations, with a focus on the "inverse texture effect" of soil on vegetation in arid and semi-arid regions, taking the steppes on the Mongolian Plateau as study case. We analyzed the soil texture effect on vegetation using the remotely sensed vegetation data (MODIS/NDVI) and the Chinese soil profile texture data at 6851 sites in temperate grasslands of China. We found, first, soil carbon was more closely associated with soil texture than with precipitation, putting up a caution on the methods of predicting soil carbon stocks using climate or vegetation data; second, a strong inverse texture effect, i.e., a higher NDVI on coarse- (>50 % sand) than fine-textured soil in low precipitation areas, was found, and the precipita-

tion threshold (P θ) below which the inverse texture effect occurs (P θ) was variable with annual precipitation and averaged 260 mm in the steppe region. Third, we proposed a novel method to use the loam soil as a benchmark against which to quantify the effect of various textured soils, and determine P θ as the point on precipitation gradient where the soil texture effect shift from positive to negative or vice versa. As such, P θ decreased with soil coarseness, and increased with precipitation; and the texture effect decreased from positive to negative for sandy soils, whereas it increased from negative to positive for silt or clay soils, on the gradient of precipitation increase. Forth, soil texture and bulk density were sensitive indicators for grazing-induced ecosystem changes. Our results provide new insights into the regulation roles of soil texture on the climate-vegetation-soil carbon relations, and a method for quantifying and comparing soil texture effect across ecosystem types.

S14-9 Progress and prospects of Geography in promoting the United Nations Sustainable Development Goals: A discussion on the theoretical framework of Sustainable Geography

＊Wenwu Zhao (Beijing Normal University, ESC), Caichun Yin (Beijing Normal University)

Sustainable development is a significant scientific issue of global concern. Geography, as a comprehensive discipline focusing on the coupled relationship between human and nature, provides systematic research and solutions for achieving the United Nations Sustainable Development Goals (SDGs). However, there is currently a lack of comprehensive reviews. Here we summarize the theoretical framework and research progress of Geography supporting the SDGs and explore its future key research areas. This work indicates that: (1) Geography, in conducting integrated research on human-nature systems and serving regional and global sustainable development processes, has innovatively proposed and developed theoretical frameworks such as social-ecological systems, pattern-process-service-sustainability, metacoupling, and Classification-Coordination-Collaboration. These research frameworks include elements of human-environment system interconnections, process coupling, spatial coupling, and systematic regulation oriented towards SDGs, forming a comprehensive theoretical framework supporting sustainable development research in Geography, also referred to as "sustainable geography theoretical framework". (2) Geography and sustainable development-related research mainly focus on climate-ecological crisis response, sustainable utilization of food-energy-water resources, regional development and planning, human well-being and social governance, and the construction of SDG assessment indicators and databases. (3) In future research, there is a need to innovate and develop sub-disciplines of Sustainable Geography, optimize the construction of SDGs indicator systems, develop SDGs assessment and decision-making models, strengthen artificial intelligence geography, deepen research on human-nature system coupling, and promote regional and global sustainable development in the process of advancing innovation in the discipline of Geography. The Inner Mongolia Plateau, characterized by ecological fragility, faces challenges such as grassland degradation, desertification, and water scarcity. Using the frameworks outlined above, researchers can systematically analyze the spatial distribution of natural resources, the environmental impact of human activities, and the sustainability of socio-economic development. Such analyses can provide a scientific basis and policy guidance for land use optimization, ecological conservation, and coordinated regional development.

S15-1 Seasonal and annual heterogeneity in the genetic structure of a *Daphnia* population in a small mountain lake

＊Jotaro Urabe (Tohoku University/Yokohama National University, ESJ), Keisuke K. Yamaki (Tohoku University)

Daphnia, common zooplankton in freshwater ecosystems, maintain their populations through parthenogenetic reproduction. Under favorable conditions, they reproduce parthenogenetically, while under unfavorable conditions, they produce resting eggs to survive harsh seasons, such as winter, when temperatures are low and food is scarce. These resting eggs, produced via sexual reproduction, lead to the emergence of different genotypes, contributing to high genetic and phenotypic diversity in subsequent years. As favorable conditions vary across genotypes, the genetic structure of the population is likely to change seasonally. However, it remains unclear whether new genotypes form distinct populations each year, or whether the same seasonal changes in population genetic structure occur year after year.

In this study, we examined the seasonal changes in genetic structure of *Daphnia dentifera*, a common species in Japan, over six years in a mountain lake. We observed that the density of *D. dentifera* increased from spring to summer each year. Then, genetic analysis was conducted using multilocus genotyping (MLG) based on eight microsatellite loci. It identified a total of 412 MLGs from 2,574 individuals examined for the six-year study period. Most MLGs occurred fewer than three times and had low densities, with only nine MLGs appearing at least 10% of the time, with an average occurrence density greater than 0.1 individuals/L. These results suggest that most MLGs produced through sexual reproduction have low fitness. Additionally, the dominant MLGs did not vary seasonally within years but persisted across consecutive years, indicating that genotypes with higher fitness overwintered as planktonic individuals. Furthermore, the dominant MLGs differed between the first and second halves of the study period, with replacement occurring every few years. Finally, we discuss the mechanisms behind these annual changes in genetic structure, with particular focus on the potential influence of parasitic organisms.

S15-2 How population genetic structure is developed? Observation using lake sediment and *Daphnia ephippia*

＊Yurie Otake (Center for Ecological Research, Kyoto University, ESJ), Yuka Onishi (University of Tokyo), Masato Yamamichi (National Institute of Genetics), Jotaro Urabe (Tohoku University), Takehito Yoshida (University of Tokyo)

How population genetic structure is determined is one of the central topics in Ecology. One factor limiting our knowledge about it is the difficulty of observing long-term population genetic dynamics from the early colonization stage in natural ecosystems. Cladocera diapausing eggs preserved in lake sediment and Paleolimnological analysis allow us to overcome this limitation with retrospectives. In this study, to get an observation knowledge about the formation process of population genetic structure, we reconstruct long-term population genetic dynamics of *Daphnia pulex* in 6 lakes and ponds. *Daphnia pulex* living in Japan consists of 4 genetically different lineages. We focused on 2 lineages of them (JPN1, JPN2), and analyzed long-term population ge-

netic dynamics in 6 ponds and lakes (Hataya Onuma, Adachinuma, Nakayama-tameike, Eginuma, Hyon-ike, Fukami-ike) where the 2 lineages coexistence was reported before.
The sediment core samples collected in six ponds and lakes were sliced in 1 cm. We conducted the following analyses: year-estimation; Total phosphorus dynamics; Chl.a dynamics; Chaoborus dynamics as an indicator of planktivorous fish; and population genetic analysis using diapausing eggs. For population genetic analysis, we conducted PCR-RFLP to reveal the abundance change of 2 lineages. In addition, genotyping with mitochondrial DNA was conducted.
In 4 ponds and lakes in all 6, we observed the coexistence of 2 lineages. In Hataya Onuma, Nakayama-ike, and Hyon-ike, both 2 lineages coexisted since the old period and JPN1 dominated in recent. On the other hand, in Fukami-ike, where the population was formed by JPN2 and JPN1 appeared 10 years later, JPN2 dominated through the research period. RDA analysis showed Chaoborus and TP are positive to JPN2 and JPN1 each other. However, variation partitioning showed that 69% of population genetic dynamics couldn't be explained with those 2 factors. We will try finding factors that make differences in population genetic dynamics between populations.

S15-3 Phenotypic integration and plasticity in invasive populations: insights from Daphnia pulex under variable environmental conditions

＊Xiaofei Tian (Zhejiang Ocean University, ESC), Wenping Feng (Zhejiang Ocean University), Xiumei Zhang (Zhejiang Ocean University)

Environmental variability significantly impacts evolutionary processes, driving organisms to develop diverse coping strategies. Phenotypic variation, plasticity, and integration are crucial for adaptive capacity, yet their complex interplay remains poorly understood. This study investigated these concepts using five genotypes of the Daphnia cf. pulex JPN1 lineage, exposed to varying temperature and food conditions. Our results demonstrated that phenotypic integration plays a pivotal role in mediating adaptive plasticity. Higher integration levels were associated with greater plasticity, particularly under specific environmental stressors such as high food availability and temperature extremes. Notably, genetic distance did not significantly influence phenotypic traits like variation, plasticity, and integration, suggesting that environmental factors may play a more dominant role in shaping these traits than genetic differences alone. Furthermore, we observed differential plasticity among traits, which significantly altered phenotypic correlations across environments. This flexibility in phenotypic integration highlights the dynamic nature of trait relationships in response to environmental changes. Our findings provide new insights into evolutionary ecology by emphasizing the importance of phenotypic integration and plasticity in maintaining ecological stability and enhancing evolutionary potential. These results are particularly relevant for understanding the adaptive strategies of invasive species and asexual populations with limited genetic diversity, offering valuable perspectives on how species cope with global environmental changes. This research underscores the role of phenotypic traits in facilitating adaptation and promoting ecological success in variable environments.
Keywords: adaptive plasticity, *Daphnia pule*x, genetic distance, genotype-environment interactions, phenotypic integration, phenotypic plasticity

S15-4 Body Size-Based Assessment of Zooplankton Community in a Brackish Lake: Ecological Function and Food Web Perspectives

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The question of what constitutes a 'good community' is an ongoing issue in developing biological indices for ecosystem management. The concept of biotic integrity, which offers the closest answer, defines a 'good community' as one that maintains its original structure and function, and its consequent ability to sustain its natural state over a certain period of time. Based on this concept, various taxa have been used to select evaluation indicators to develop indices for practical management purposes. However, since these evaluation indices are constructed through relative comparisons with the reference conditions presumed to represent an intact community, they may depend on regional community characteristics. Moreover, when the validity of an index is assessed based on its degree of consistency with physicochemical indicators (e.g., water quality), the significance of biological community-based assessments may become diminished. To overcome such gaps, an absolute definition of a 'good community' must precede. In this study, considering the role of zooplankton in transferring energy as higher-level consumers within the food web, we assumed that a community with a high biomass proportion of large-sized species—those with high energy transfer efficiency to higher trophic levels—constitutes a 'good community'. Based on this hypothesis, the ecological health of zooplankton communities in brackish lake, which exhibit wide variation in species size, was evaluated. To develop an index capable of evaluating community health, we conducted a framework to extract indicator species and taxa that can represent the body-size distribution in the community. By comparing a body-size-based index developed from the food web perspective with a water quality response index constructed by procedures currently applied in management (EPA), we considered the direction of biological indices that can assess community responses to environmental changes in the context of the structure and function of the community.

S15-5 Effects of acid stress on life history traits of the perennial calanoid copepod *Eodiaptomus japonicus* from Lake Biwa, Japan

＊Xin Liu (Guangxi Academy of Sciences, ESC), Huanan Gao (Tsinghua University), Yasushi Iseri (Wenzhou University), Aimin Hao (Wenzhou University), Min Zhao (Wenzhou University), Syuhei Ban (The University of Shiga Prefecture)

Human activities induce acidification, posing a significant threat to biodiversity and productivity in aquatic ecosystems. Cope-

pod, dominant zooplankton in aquatic ecosystems, play a crucial role in linking primary producers to higher trophic levels and acts as an important biological pump in carbon recycling. Due to their sensitivity to environmental stressors, copepods serve as valuable bioindicators of environmental changes. Understanding the impact of acid stress on copepods is essential for assessing and predicting healthy, sustainable aquatic ecosystems. In this study, we evaluated the life history traits of the perennial calanoid copepod *Eodiaptomus japonicus* under acid stress conditions with sufficient food supply. Our aim was to assess how freshwater copepod population dynamics respond to acidification. We determined somatic growth and reproduction under three pH conditions: 6.0, 6.8, and 7.8, representing strong, weak, and in situ proton stress levels, respectively. Observations showed similar post-embryonic development times and prosome lengths in *E. japonicus* until adulthood, even under intense acid stress. However, acid stress significantly reduced survival rate. For instance, 46% of copepods survived to adulthood at pH 7.8, compared to 17% at pH 6.8, and only 12% at pH 6.0. Naupliar stages were more vulnerable to acid stress than copepodid stages. Male-dominated sex ratios under acidic conditions created unfavorable conditions for population growth. Copepod reproduction responded negatively to acid stress, with prolonged embryonic development times and inter-cultch durations, leading to reduced egg production rates. Population growth rates declined significantly with decreasing pH, primarily due to lower egg production. *E. japonicus* appears to allocate energy toward somatic growth and survival rather than offspring production. Our analysis revealed that the population growth rate of *E. japonicus* decreased by 3% for every 0.1-unit drop in pH, even with sufficient food supply.

S15-6 Divergence of the zooplankton community dynamics driven by ontogenetic omnivores

＊Hiromichi Suzuki (Tohoku University, ESJ), Jamie Michael Kass (Tohoku University), Jotaro Urabe (Tohoku University)

Cyclopoid copepods are dominant zooplankton in lentic ecosystems, exhibiting a complex life history in which their feeding habits shift from algivorous to omnivorous among ontogenetic stages. As a result, they serve as both trophic competitors and predators of cladocerans, another dominant zooplankton in lentic habitats, which drives complexity in zooplankton community dynamics. Recent research has shown that cyclopoid copepods are more sensitive than other zooplankton to imidacloprid, a widely used pesticide, which makes it a useful tool to investigate their ecological role in aquatic communities. We hypothesized that communities with cyclopoid copepods would show less predictable dynamics and more diverse responses to imidacloprid disturbance compared to communities without them. To test this hypothesis, we cultured communities of two cladoceran species (*Daphnia* cf. *pulex* and *Ceriodaphnia* cf. *smirnovi*) with and without cyclopoid copepods (*Cyclops vicinus*) and observed the differences in temporal dynamics between communities with the same species composition (replications) and those with different species compositions (treatments) during 12 weeks after imidacloprid exposure. The results showed that communities with cyclopoid copepods showed higher temporal variability among replications compared to communities consisting solely of cladocerans. Furthermore, communities with cyclopoid copepods had higher temporal variability among replications when exposed to moderate disturbance. These results support our hypothesis that cyclopoid copepods can introduce complexity in zooplankton community dynamics that makes forecasting difficult due to their life history traits and vulnerability to pesticides, highlighting the importance of considering this group in aquatic community research.

S15-7 Morphological traits of common rotifer species (*Keratella cochlearis*) as an ecological index: implications for the responses of zooplankton structure to lake environments

＊Yerim Choi (Kyung Hee University, ESK), Hye-Ji Oh (Nara Women's University), Geun-Hyeok Hong (Kyung Hee University), Dae-Hee Lee (Kyung Hee University), Geung-Hwan La (Eco-lab Gongsaeng), Hyun-Woo Kim (Sunchon National University), Min-Ho Jang (Kongju National University), Kwang-Hyeon Chang (Kyung Hee University)

Environmental changes not only lead to change zooplankton community composition but also induce morphological variations among same and/or similar species. Such morphological trait changes are often considered as adaptive responses to the presence of predators, feeding environment, temperature fluctuations, and eutrophication. *Keratella cochlearis*, commonly found in freshwater ecosystems, can be an optimal model for studying these morphological trait changes. *K. cochlearis* is one of the common and dominant rotifer species and is widely known to exhibit diverse morphological forms depending on environmental factors, such as water temperature, presence of predators, and degree of eutrophication. These morphological variations include changes in lorica size, the presence or absence of posterior spines, and spine length.

In this study, zooplankton samples, with biotic and abiotic parameters (e.g., predator abundance, water quality, lake size), were collected from 36 lakes and reservoirs during spring, summer, and autumn. In each zooplankton sample, morphological traits—including lorica length, spine length, and the proportion of *tecta*-type individuals—were measured for 5 to 50 *K. cochlearis* individuals. Based on these measurements, we calculated the mean values, seasonal standard deviations, and individual-level variation in the lorica and spine lengths. In addition, the proportion of *tecta*-type individuals was examined in relation to the overall zooplankton community composition. The results revealed that average spine length tended to decrease with shallower water depth, elevated temperature, and lower predator density. The mean lorica length of *tecta* individuals increased with rising water temperature and higher predator abundance. Furthermore, individual variation in both spine and *tecta* lorica lengths was found to increase as predator density declined. While many previous studies have examined morphological responses in a limited number of lakes or under controlled conditions, this study complements those efforts by incorporating field data from a broad range of freshwater systems with diverse environmental characteristics across the country.

S15-8 Ecological trait-based grouping of rotifers and its response to lake characteristics

＊Hye-Ji Oh (Nara Women's University, ESJ), Kwang-Hyeon Chang (Kyung Hee University), Nan-Young Kim (Konkuk University), Soon-Jin Hwang (Konkuk University), Min-Ho Jang (Kongju National University), Izumi Katano (Nara Women's University)

Rotifers function as key intermediaries linking the grazing food web and the microbial loop in aquatic ecosystems, thereby playing an important role in regulating energy flow. Their community composition and density are influenced by multiple environmental factors, including trophic status, food availability, competition and predation pressure. Although taxon-based approaches have been commonly used to study rotifer communities, they usually fail to capture functional differences among taxa in response to environmental variation. In contrast, trait-based approaches, which consider ecological traits such as growth, feeding, and survival, offer a functional perspective for interpreting community dynamics and predicting ecological responses more quantitatively. Despite increasing interest in rotifer functional group classifications, there remains a lack of systematic comparisons to determine which trait-based classification schemes best reflect environmental gradients and which functional groups dominate under specific conditions. In this study, we analyzed water quality data and plankton community composition from 83 freshwater lakes exhibiting diverse environmental characteristics (e.g., size, pollution level, trophic status, food environment, competition, and predation pressure) with a particular focus on rotifers. We first compared the explanatory power of various ecological trait-based classification schemes of rotifers in relation to lake environmental characteristics. Then, based on the most explanatory scheme, we evaluated how the selected rotifer functional groups varied in their response patterns across environmental gradients. The findings of this study can serve as a valuable foundation for quantitatively evaluating the ecological functions and biotic interactions of freshwater ecosystems, with a focus on rotifer communities.

S16-1 Current status of wild bee pollination service in Japan

＊Tomoyuki Yokoi (Institute of Life and Environmental Sciences, University of Tsukuba, ESJ)

In Japan and many countries, the production of crops that rely on pollen mediation has traditionally involved the use of managed bumblebees and honeybees, as well as wild bees and other pollinators. Their presence is crucial not only for the pollination of crops in agricultural fields but also for the pollination of wild plants in natural ecosystems, contributing significantly to both. However, the global decline of insects has become a cause for concern, making it urgent to assess the current status of these pollinators. In Japan, it is suspected that the population of pollinating insects is declining, but the extent of this decline remains unclear. This presentation will focus on the use of *Osmia* bees in Japan. In apple orchards in Fukushima Prefecture, *Osmia* bee-mediated pollination has been practiced for decades. Farmers in the Ouchi-juku region, where traditional thatched-roof houses are preserved several kilometers away from the orchards, set up substrates for *Osmia* bees to nest. The farmers bring the nesting substrates back to their orchards in early April of the following year. By providing nesting sites and food resources to *Osmia* bees, sustainable pollination services can be maintained. However, in recent years, nesting rates of *Osmia* bees have declined in multiple regions, raising concerns about their impact on pollination. Continuous monitoring surveys at utilization sites have been largely absent. To conserve wild pollinators and ensure their sustainable use, it is essential to collect information from various perspectives, including annual fluctuations in wild populations, plant species actually visited, pollen nutrition, genetic diversity of bee populations, and evaluations of the surrounding environment. In this presentation, I will introduce findings related to the diversity and nutritional components of pollen resources utilized by *Osmia* bees.

S16-2 Pollinator diversity in fruit crop orchards in Korea and possible impacts of large scale disturbance

＊Chuleui Jung (Gyeongkuk National University, ESK), Gwanhee Lee (Gyeongkuk National University), Ehsan Rahimi (Gyeongkuk National University)

Pollinators play a critical role in the productivity and quality of fruit crops. In Korea, the intensification of agriculture and recent large-scale environmental disturbances, such as climate anomalies and wild fire have raised concerns about pollinator health and diversity. This study investigates the composition and diversity of pollinator communities across major fruit crop orchards in Korea, including apple, pear, and peach farms. Field surveys were conducted during the peak flowering seasons in multiple regions, and pollinator species were identified and quantified. Our findings reveal that native pollinator species, particularly solitary bees and syrphid flies, contribute significantly to pollination services alongside managed honey bees (Apis mellifera). Pollination abundance was highly associated with the fruit quantity and quality factors. Further wild fire had significant impacts on pollinator diveristy. In addition, we provide the theoretical background of the disturbance effects on pollinator diversity. Our results underscore the need for integrated conservation and land management strategies to sustain pollination services in Korean orchards under increasing environmental stress.

S16-3 Ant pollination in common buckwheat and its implication in agriculture

＊Kae Natsume (University of Tokyo, ESJ), Tadashi Miyashita (University of Tokyo)

Wild insects, including non-bee insects, have been increasingly recognized as crop pollinators in the past decades. However, some pollinators like ants are still underrepresented. Ants visit flowers frequently, yet they are often assumed to be ineffective pollinators for their relatively short moving distances, small body size, grooming behavior and many other reasons. Here, we show the effectiveness of ants as pollinators of common buckwheat *Fagopyrum esculentum*. Common buckwheat is a distylous crop that relies almost completely on insect pollinators.

We conducted ant-exclusion experiments and quantified the number of pollen grains on ant body. The study sites were located in Nagano prefecture in the central Japan. Exclusion experiments were conducted in the periphery of nine buckwheat fields in

two different growing seasons. The seed set of ant-excluded buckwheat was significantly lower than the control plants by 30% on average. To confirm the pollen-carrying ability of ants, two species of ants (Formica japonica and Camponotus japonicus) foraging on buckwheat flowers of different morphs were sampled and pollen grains were counted in the laboratory. We found that they carry pollen from compatible flower morphs. In addition, we quantified the pollination efficiency per visit for various pollinator species and found that ants were effective on a single-visit basis. We also found that ants respond to weather conditions mildly in comparison to other pollinator groups, which highlights their ability to sustain pollination service under varying weather conditions.
Our findings suggest that ants can play a significant role in agricultural production. However, due to their limited moving distance, they can only pollinate flowers within 5-10 m from the field edge. This implies that the expansion of field sizes might decrease the productivity of common buckwheat.

S16-4 Withdrawn

S16-5 Withdrawn

S16-6 Detecting flowering phenology using high-resolution satellite imagery

＊Sukyung Kim (Kangwon National University/Seoul National University, ESK), Minkyu Moon (Kangwon National University), Hyunjae Lee (Kangwon National University), Jaebeom Kim (Kangwon National University), Hyun Seok Kim (Seoul National University)

Monitoring flowering phenology of temperate forest tree species remains challenging due to sparse in-situ observations and the diversity of flowering traits across species. High-resolution satellite imagery is a promising tool, but its effectiveness for detecting species-specific flowering in temperate forests has rarely been evaluated. We tested if 3 m PlanetScope imagery can detect flowering of *Prunus yedoensis* (early spring), *Robinia pseudoacacia* (late spring), and *Castanea crenata* (early summer)—all key nectar sources—stands in Chuncheon, South Korea, using flowering and greenness indices. For *R. pseudoacacia* and *C. crenata*, combining flowering and greenness indices produced time-series signals aligned with their respective flowering periods. *P. yedoensis* showed a short flowering signal (about one week in early spring before leaf-out) that was effectively captured using the flowering index alone, with minimal interference from emerging leaves. This study demonstrates that high-resolution PlanetScope imagery, when paired with species-tailored combinations of flowering and greenness indices, can successfully monitor flowering phenology of temperate tree species. Our framework enables spatiotemporally continuous mapping of species-specific flowering dynamics, supporting ecological research and climate-change impact assessment in temperate forest ecosystems.

S17-1 Evolutionary rescue of *Chlorella vulgaris* under temperature and salinity stress

＊Shohei Kawata (National Institute of Genetics, ESJ), Shota Shibasaki (Doshisha University), Masato Yamamichi (National Institute of Genetics)

Rapid environmental changes impose strong stress on organisms and increase their risk of extinction. Evolutionary rescue is a process in which a population avoids extinction by rapidly adapting to such environmental changes. Population size at the onset of environmental change is crucial for whether evolutionary rescue succeeds; larger population sizes increase the probability of evolutionary rescue because it is more likely that individuals adapting to the environmental stress emerge. There is often a threshold population size above which evolutionary rescue becomes possible; populations below this threshold typically go extinct before adaptation occurs. Environmental stress includes multiple types, such as temperature and salinity. The likelihood of evolutionary rescue may differ under each environmental stress because different adaptive traits would be selected for. However, few studies have systematically compared how evolutionary rescue is influenced by both population size and the type of environmental stress. In this study, we investigated the potential for evolutionary rescue in the green alga *Chlorella vulgaris* under either temperature or salinity stress, varying their initial population sizes. The threshold population size required for rescue is expected to differ depending on the type of stress. The time available for adaptation may also vary between stress types. In this presentation, I will focus on discussing the results based on our data so far.

S17-2 Unpacking laws of spatial directionality in urban expansion morphology and carbon emissions

＊Chengwei Li (NYU Shanghai/ECNU, ESC), ChengHe Guan (NYU Shanghai)

Implementing spatial planning measures for compact cities requires examining the most carbon emission-efficient urban forms. Past studies on urban form metrics have primarily focused on patterns, neglecting the directional aspects of urban expansion. This study examines building footprint data within urbanized regions from 90 cities and 850 counties across China, investigating the relationship between urban forms and carbon emissions. The results show that urban built-up areas have predominantly expanded in the direction of elongation rather than sprawl from 2000 to 2018. Representing the interbuilding distance, urban mean distance showed accelerated growth (94.6%), but slowed down significantly after 2010 (9.22%), with ongoing polycentric growth nationally. Urban shape and footprint indexes scale sub-linearly, polycentricity and population size scale linearly, and urban mean distance scales sub-linearly with carbon emissions. More than sprawl, elongation significantly influences carbon emissions at the city level, while county-level results show the opposite trend. GTWR and MGWR analyses further confirm the significant contribution of sprawl over elongation, measured at 17.12% compared to elongation's 14.02% at the county level. An observed threshold effect correlating urban mean distance with carbon emissions, with values of 2.83 and 3.0, corresponds to a significant

decrease in carbon emissions by 1.44% and 5.58%, respectively, while 3.44 shows a significant increase of 0.66%. The study illustrates the sensitivity disparities in the relationship between urban form and carbon emissions in different city types. Urban directional expansion in fixed extension leads to diverse urban morphologies, resulting in spatiotemporal heterogeneity in the locking effect on carbon emissions.

S17-3 The adaptive characteristics of growth and reproduction of *Phragmites australis* community in the Yangtze River estuary wetland and its environmental influencing factors

＊Chao Zhang (Schoof of Geographical Sciences, East China Normal University, ESC), Qi Zhang (Schoof of Geographical Sciences, East China Normal University)

Phragmites australis is the dominant plant in China's coastal salt marshes and plays a crucial role in providing ecological services. Understanding how *P. australis* adapts to the highly heterogeneous habitat conditions of coastal wetlands is a key scientific issue in current coastal wetland conservation and ecological restoration efforts. This study focuses on *P. australis* communities in the Yangtze River estuary wetlands. Through a multi-scale, synchronous regional network observation under *in-situ* conditions (land-sea gradient, different intertidal zone elevations, and different plant growth periods), we examined plant morphology, organ biomass, reproductive characteristics, and environmental factors (air temperature, tidal flooding duration, and soil physical and chemical properties). Additionally, laboratory experiments were conducted to systematically explore the adaptive characteristics of *P. australis* growth and reproduction across different spatial scales (land-sea gradient and intertidal zone elevation) and how these characteristics vary over time.
We found *P. australis* has developed significant adaptive characteristics (along the land-sea gradient and intertidal zone) in morphology, biomass accumulation and allocation, and reproduction, which are consistent across growth periods of the plant. Finally, by analyzing site-specific environmental factors, we identified that inundation time and soil TN, TP, TC, and soil bulk density represent the critical environmental factors affecting the growth and reproduction of the *P. australis* community in this region. This study enriches our understanding of the adaptive characteristics of globally distributed *P. australis* communities species and provides a scientific basis for the conservation of coastal *P. australis* wetlands and the ecological restoration of coastal salt marshes wetlands in China.

S17-4 Balancing multiple protected objects and cost in national park planning

＊Zhenhua Zang (Research Center for Eco-Environmental Sciences, Chinese Academy Sciences, ESC)

The inadequate representativeness and management effectiveness of protected areas limit their performance in alleviating species extinction risks and maintaining ecosystem services. To improve the performance of the existing protected areas in conserving multiple targets on ecosystem, species, and natural landscapes, China proposed to establish a national park system. We compiled the available data on the pilot Nanshan National Park, a typical pilot area whose range is not enough to represent the multiple protected objects, and developed an optimization approach that balances multiple protected objects and cost. We defined and calculated the importance index of species, ecosystem services, natural landscapes, and composite indicator that reflects the priority of comprehensive protected objects for each watershed in the study area. We also defined and calculated the cost for each watershed based on land ownership, land development intensity, and land management intensity. We identified the appropriate parameters values of planning models to ensure the performance, and analyzed the target-area relationships among multiple protected objects. The findings revealed that ecosystem services required much more land than species and natural landscapes to achieve the same conservation targets. Moreover, the planning solutions focused solely on a composite indicator may compromise the representativeness of the specific protected object. We proposed optimization plans for Nanshan National Park under pragmatic (18%) and ambitious (30%) land supply scenarios. Compared with the pilot area, in the optimized areas, the protected species habitats increased by 89.0% and 2.3 times, the protected key areas of comprehensive regulating ecosystem services increased by 1.6 and 2.7 times, and the protected tourist attractions increased by 2.9 and 3.0 times, with 18.0% and 40.2% increase in cost per unit area. Our findings pinpointed the critical need of enhancing the trade-off efficiency between the conservation target and cost in protected areas plannings.

S17-5 Carbon balance of post-harvest stage of forestry: Approach evolution and assessment

＊Xiaobiao Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

Sustainable use of harvested wood products (HWPs) under better forest management results in larger climate change mitigation potential of forestry, compared to mature and over-mature forests where no wood was harvested. We systematically reviewed the evolution of the approaches used to assess carbon balance and removals of HWPs in the past 30 years, including Simple Decay Approach, Production Approach, Stock-Change Approach, and Atmospheric Flow Approach. Using the Stock-Change Approach, we estimated that China's HWPs accumulated a carbon stock of 4.46 $GtCO_2e$ from 1900 to 2015. These HWPs provided a carbon sink of 0.27 $GtCO_2e\ yr^{-1}$ from 2011 to 2015, which is as much as one-third of China's forest carbon sink or a carbon credit offsetting nearly the carbon emission of France in the same period. In the review of the existing four approaches, we concluded that these approaches were insufficient to link HWP trade flows among countries worldwide, which accounted for 40% of global HWP production. We therefore developed a new and generalizable Trade-Linked Approach (TLA) to fill the gap. Our global-scale study linked HWP-producing countries to end-using countries and then estimated that global HWPs consumed as five end uses, namely, construction, furniture, other solid HWPs, sanitary and household paper, and other paper products, accumulated 5.46, 0.98, 3.26, 0, and 1.07 $GtCO_2e$ from 1992 to 2015, respectively. Our China-specific TLA-based study across the whole life cycle showed that, the trade partners supplied 22% (1.43 $GtCO_2e$) of the raw materials China consumed, consumed 13% (0.69 $GtCO_2e$) of the HWPs China made, and provided 13% (0.57 $GtCO_2e$) of the total HWP carbon stocks from 1990 to 2020.

The HWPs consumed overseas also provided a carbon sink of 0.04 $GtCO_2e\ yr^{-1}$ (15% of the total), a figure larger than the forestry carbon credit transacted globally. We therefore suggest a need to developed a global HWP-based payment scheme to incentivize all the countries involved in HWP supply chain to increase carbon removal.

S17-6 Climate-induced shifts in sulfate dynamics regulate anaerobic methane oxidation in a coastal wetland

＊Jaehyun Lee (Korea Institute of Science and Technology, ESK), Yerang Yang (Korea Institute of Science and Technology)

Anaerobic methane oxidation (AMO) is a key microbial pathway that mitigates methane (CH_4) emissions in coastal wetlands, but the response of AMO to changing global climate remains poorly understood. Here, we assessed the response of AMO to climate change in a brackish coastal wetland using a five-year field manipulation of warming and elevated CO_2 (eCO_2). Sulfate-dependent AMO (S-DAMO) was the predominant AMO process at our study site due to tidal inputs of sulfate (SO_4^{2-}). However, SO_4^{2-} dynamics responded differently to the treatments; warming reduced SO_4^{2-} concentration by enhancing SO_4^{2-} reduction, while eCO_2 increased SO_4^{2-} concentration by enhancing SO_4^{2-} regeneration. S-DAMO rates mirrored these trends, with warming decreasing S-DAMO rates and eCO_2 stimulating them. These findings underscore the potential of climate change to alter soil AMO activities through changing SO_4^{2-} dynamics, highlighting the need to incorporate these processes in predictive models for more accurate representations of coastal wetland CH_4 dynamics.

S17-7 Impacts of Livestock Spatial Distribution under Different Resource Conditions on Grassland Health and Quality

＊Yunxiang Cheng (Inner Mongolia University)

The health and quality of grassland ecosystems' response to grazing disturbances is a complex and important issue. By analyzing the differences in resource conditions across different family farms, the current study explored the response of grassland health and quality to grazing disturbance. In farms with abundant resources, the negative impact of cattle and sheep grazing was mainly reflected in the decline of grassland health, and the reduction in biomass and coverage, while there was no significant negative impact on most of the nutritional indicators of the grassland.

In contrast, in farms with scarce resources, grazing by cattle and sheep not only significantly reduced the above-ground biomass, coverage, height, and other community characteristics, but also showed a strong negative impact on various nutritional indicators of the grassland. From the perspective of livestock types, cattle grazing mainly had negative effects on grasslands in terms of reduced biomass and coverage, while sheep grazing primarily negatively impacted grasslands by decreasing the nutritional content of the forage. This study revealed the impact of livestock spatial distribution under different resource conditions on grassland health and quality, providing scientific evidence for improving grazing management efficiency and promoting the sustainable use of grassland resources.

S17-8 *In situ* nitrogen uptake from inorganic and organic sources by the fine-root systems of five alpine tree species

＊Ryunosuke Suwa (Graduate School of Science and Technology, Shinshu University, ESJ), Naoki Makita (Graduate School of Science and Technology, Shinshu University)

Alpine forests are characterized by cold conditions and poor nutrient availability, making it crucial to study nitrogen (N) uptake by fine roots to understand survival strategies in severe environments. We aimed to characterize the tree species specificity regarding inorganic and organic N uptake rates and root traits in five dominant alpine tree species. For measuring N uptake from fine roots, we selected five species: the ectomycorrhizal (ECM) species *Pinus pumila* and *Alnus maximowiczii*, along with the ericoid mycorrhizal (ERM) species *Empetrum nigrum var. japonicum*, *Rhododendron aureum*, and *Vaccinium vitis-idaea*. After excavating the entire root systems of the seedlings, we calculated inorganic and organic N uptake rates using the solution-depletion method. Additionally, root traits such as diameter, specific root length, root tissue density, and root N concentration were determined through morphological and chemical analysis of the incubated roots. Total N uptake rates were higher in ERM species, particularly in *Vaccinium vitis-idaea*. The proportion of inorganic N uptake was greater in ECM species than ERM species, while the proportion of organic N uptake was generally higher in ERM species. Root diameter was the best predictor of N uptake rates, and specific root length and root tissue density were linked to preferences for inorganic and organic N, respectively. Thus, alpine trees influenced N uptake and preference by modifying root traits, potentially promoting N niche acquisition in competition among species or mycorrhizal types and enhancing plant survival in the alpine zone.

S17-9 Effect of Bacilius velezensis CE 100 and shading on physiological and flowering characteristics of *Platycodon grandiflorum*

＊Juhyun Kim (Department of Agriculture, Forestry and Bioresources, Seoul National University, ESK), Umashankar Chandrasekaran (Department of Biological Sciences, Kangwon National University), Mega Trishuta Pathiassana (Department of Agriculture, Forestry and Bioresources, Seoul National University), Sanghee Park (Department of Agriculture, Forestry and Bioresources, Seoul National University), Kunhyo Kim (Department of Agriculture, Forestry and Bioresources, Seoul National University), Hye young Yoo (Department of Agriculture, Forestry and Bioresources, Seoul National University), Yunhee Park (Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University), Ahrem Yun (Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University), Jiwon Baek (Department of Agriculture, Forestry and Bioresources, Seoul National University), Handoo Shin (Department of Agriculture, Forestry and Bioresources, Seoul National University), Jeonghyun Hong (Department of Agriculture, Forestry and Bioresources, Seoul National University), Seongjun Na (National Institute of Forest Science), Jimin Park (National Institute of Forest Science), Hyun Seok Kim (Department of Agriculture, Forestry and Bioresources, Seoul National University/Interdisciplinary Program in Agricultural and Forest Meteorology, Seoul National University/Research Institute for Agriculture and Life Sciences, Seoul National University)

Bees play a crucial role in pollination, but their populations are declining, likely due to climate change. In Korea, honey production depends largely on *Robinia pseudoacacia* L., yet shifting climate patterns now threaten its flowering and yield, prompting the search for alternative melliferous species. As a promising melliferous species, *Platycodon grandiflorum* was evaluated under three shading regimes (0%, 35%, 55%) and microbiome treatment (Control, C; Liquid medium, MD; Liquid medium with Bacillus velezensis CE 100, MB). Flowering under 35% and 55% shading proved insufficient for nectar sampling. Therefore, attention is restricted to the flowering characteristics of the three non-shaded (0% shading) plots. Flower production under full light was highest in MD, with 71.4 ± 8.8 flowers per plant over 93 days—more than double the 33.0 ± 3.5 flowers per plant over 80 days in C and 36.6 ± 3.7 flowers per plant over 100 days in MB. Nectar volume per flower peaked at 6.5 ± 0.3 μL in MD, yielding an estimated 38.6 ± 0.8 kg ha^{-1} of honey, versus 4.7 ± 0.2 μL and 11.6 ± 0.9 kg ha^{-1} in C and 4.6 ± 0.2 μL and 14.0 ± 0.3 kg ha^{-1} in MB. Although Maximum net CO_2 assimilation rate, Stomatal conductance, and Transpiration rate did not differ among treatments, MD significantly increased soil exchangeable K and available P ($p < 0.05$) and boosted root dry biomass by ～20 %. These findings demonstrate that nutrient enrichment under full-light significantly enhances nectar production and root development in P. *grandiflorum,* reinforcing its potential as a supplementary melliferous plant.

Keywords: *Platycodon grandiflorum*, alternative melliferous plant, honey production
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S17-10 Predator-specific prey defense stabilizes predator coexistence despite fitness differences

＊Gaku Takimoto (University of Tokyo, ESJ), Shinji Kobayashi (University of Tokyo)

Understanding the mechanisms maintaining species diversity is central to contemporary ecology. Although many factors have been proposed to mediate the coexistence of competing species, little theory exists about how prey defense can affect the coexistence of competing predators. In this talk, we introduce a novel coexistence mechanism by which predator-specific prey defense stabilizes the coexistence of predators competing for single shared prey and enables their coexistence even when there exist their fitness differences. Predator specificity in prey defense makes intraspecific competition stronger than interspecific competition, creating stabilizing niche differences for coexistence. Higher environmental productivity is predicted to favor coexistence when predator specificity is high. Prey defense can also induce facilitation among competing predators, but facilitation is less likely than coexistence. Given the widespread nature of predator specificity in prey defenses, our coexistence theory might be broadly applicable to a variety of ecological communities.

S18-1 Joint effects of multiple natural and anthropogenic drivers on soil nitrogen cycling

＊Xiaoli Cheng (Yunnan University, ESC), Yong Zhang (Yunnan University)

Global soil nitrogen (N) cycling remains poorly understood due to its complex driving mechanisms. Here, we present a comprehensive analysis of global soil $\delta^{15}N$, a stable isotopic signature indicative of the N input-output balance, using a machine-learning approach on 10,676 observations from 2,670 sites. Our findings reveal prevalent joint effects of climatic conditions, plant N-use strategies, soil properties, and other natural and anthropogenic forcings on global soil $\delta^{15}N$. The joint effects of multiple drivers govern the latitudinal distribution of soil $\delta^{15}N$, with more rapid N-cycling at lower latitudes than at higher latitudes. In contrast to previous climate-focused models, our data-driven model more accurately simulates spatial changes in global soil $\delta^{15}N$, highlighting the need to consider the joint effects of multiple drivers to estimate the Earth's N budget. These insights contribute to the reconciliation of discordances among empirical, theoretical and modeling studies on soil N cycling, as well as sustainable N management.

S18-2 The Global Biodiversity Standard ---an Assess and Guidance for Science-Based Forest Restoration

＊Xiangying Wen (South China Botanical Garden, Chinese Academy of Sciences/Botanic Gardens Coservation International (BGCI), ESC), David Bartholomew (Botanic Gardens Coservation International (BGCI))

Biodiverse ecosystems supply oxygen, clean air and water, ensure sustainability for all life forms, and are more resilient to a

changing climate or other disasters. However, the world is currently facing a biodiversity crisis. At least 17500 of the world's tree species are threatened with extinction, representing over a third of all tree species (ca. 61000).
This crisis is being accelerated by well-intentioned solution to climate change such as tree planting schemes. By promoting the planting of non-native species that displace or damage biodiversity, the approach is accelerating the extinction of species and in many cases is increasing CO2 emission. The Global Biodiversity Standard (GBS), coordinated by Botanic Gardens Conservation International (BGCI), officially launched at Convention on Biological Diversity (CBD) COP-16 at Cali of Colombia in October 2024, has been designed to halt this crisis, promote, protect and enhance a more biodiverse and climate resilient natural world. This presentation will briefly introduce why GBS is needed, how it works and what is its progress so far etc.

S18-3 The effect of inundation depth on carbon fluxes and fraction in the Yellow River Delta Wetland, China

＊Mingliang Zhao (Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, ESC), Guangxuan Han (Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences)

Inundation is an important hydrological regime within wetlands, which significantly alters carbon input and output, further alters soil organic carbon (SOC) storge. However, how the increase in inundation depth regulates the carbon fluxes and SOC fraction in wetlands are poorly understood. Here, a 6-year field experiment with different inundation depths (0, 5, 10, 20, 30 and 40 cm) were conducted in the Yellow River Delta wetland, China. Our results showed that increasing inundation depth significantly increased plant shoot density, leaf area index, plant shoot height, aboveground and belowground biomass of the dominant grass Phragmites australis. Meanwhile, inundation depth increased NEE, which could be attributed partly to the increased plant productivity (shoot density, WLAI, WHeight, biomass). Reco or NEE exhibited parabolic responses to inundation depth. Additionally, inundation depth decreased soil CH4 emissions but increased ecosystem CH4 emissions. Plant-mediated CH4 transport from P. australis accounted for 99% of total ecosystem CH4 emissions under different inundation depths. Furthermore, increasing inundation depth substantially enhanced POC, MAOC and SOC. The contribution of microbial necromass carbon (MNC) to SOC significantly increased with inundation depth, but it had no significant impact on the contribution of plant lignin phenols to SOC. Although plant lignin phenols increased with increasing inundation depth, the main source of SOC was the accumulation of MNC rather than plant lignin phenols under different inundation depths, because the contribution of MNC to SOC was considerably greater than that of plant lignin phenols. Our findings highlight that increasing inundation depth not only affected the total amount of SOC, but also altered the contribution of plant and microbial residues to SOC, which may influence the stability of organic carbon. Overall, the importance of hydrological regimes (e.g. inundation depth) on SOC sources should be taken into consideration when assessing the SOC stability in the future global wetland changes.

S18-4 Forest soil carbon sequestration and its responses to climate changes

＊Wu Fuzhong (College of Geographic Sciences, Fujian Normal University, ESC), Lin Xiaohao (College of Geographic Sciences, Fujian Normal University)

Global climate change is primarily driven by rising atmospheric concentrations of greenhouse gases (such as CO_2), with soil carbon sequestration (SCS) representing a critical mechanism for removing excess CO_2 from the atmosphere. Forest ecosystems serve as vital carbon sinks, storing approximately 45% of their organic carbon in soils. Nevertheless, the mechanisms underlying forest soil carbon sequestration and its responses to climate change remain insufficiently understood. To elucidate the sources of soil organic carbon, we analyzed a global dataset comprising 286 microbial residue samples (including fungal and bacterial biomarkers) from 30 forest ecosystems. The results revealed a significant increase in microbial residue content with soil depth, peaking at 72.5%, primarily driven by bacterial residues. Notably, fungal residues dominate bacterial residues in surface soils (< 20 cm depth), whereas bacterial residues prevail in deeper layers (>20 cm). Furthermore, we identified distinct controls on organic carbon stabilization: mineral association governs deep soil carbon pools, while microbial turnover regulates surface carbon accumulation. Complementing this meta-analysis, we conducted long-term field investigations in western Sichuan, Sanming, and other regions. Through systematic investigation of litterfall production, dynamics, carbon and nutrient fluxes combined with controlled humification and decomposition experiments, we elucidated key mechanisms governing soil carbon sequestration in forest ecosystems. Key findings reveal that litter humification facilitates substantial organic carbon incorporation into soils, with pronounced humus accumulation occurring during initial decomposition phases. This challenges the conventional paradigm that humus formation occurs primarily during late-stage decomposition. By comprehensively resolving the spatiotemporal dynamics of litterfall production and identifying distinct regulatory mechanisms governing different decomposition stages, our study establishes an empirical foundation for constructing a staged litter decomposition model.

S18-5 Soil property recovery following restoration of abandoned sugarcane plantation

＊Po-Neng Chiang (Experimental Forest, National Taiwan University), Jui-Chu Yu (Experimental Forest, National Taiwan University), Yen-Jen Lai (Experimental Forest, National Taiwan University)

This study investigates soil property recovery following the restoration of an abandoned sugarcane plantation through lowland afforestation with different tree species. From 2011 to 2016, an experimental afforestation project was conducted at Wanlong Farm, Taiwan Sugar Corporation, in Pingtung. A 100-hectare site was established and divided into 16 plots. Annual assessments included tree growth (height and diameter at breast height), litter accumulation, and survival rates, alongside soil sampling to evaluate changes in bulk density and soil organic carbon (SOC) stocks.
By 2016, afforested plots showed significant improvements in soil conditions. SOC increased at an average rate of 0.67 tC ha^{-1} yr^{-1}, indicating gradual recovery of soil carbon pools. Tree height and DBH averaged 9.03 ± 3.06 m and 11.88 ± 5.29 cm, respectively, contributing to an estimated forest carbon stock of 25.95 tC ha^{-1}. The fast-growing tree species were positively correlated

with higher SOC accumulation, suggesting that species selection can influence the pace and extent of soil recovery.
These findings highlight the potential of afforestation as an effective strategy for rehabilitating degraded agricultural lands, particularly in terms of enhancing soil carbon sequestration and improving soil physical properties. This research offers valuable guidance for future land restoration and climate mitigation efforts.

S18-6 TBC

＊Faming Wang (South China Botanical Garden, Chinese Academy of Sciences, ESC)

TBC

S18-7 Microbial necromass dominates particulate and mineral-associated organic carbon accumulation in calcareous soil following afforestation

＊Zihong Zhu (Institute of Subtropical Agriculture, Chinese Academy of Sciences, ESC), Dejun Li (Institute of Subtropical Agriculture, Chinese Academy of Sciences)

1. Soil organic carbon (SOC) dynamics pronouncedly influence global carbon cycle and climate feedbacks. Though afforestation is widely recognized as a critical strategy for enhancing SOC sequestration, how the practice impacts the dynamics of lignin and microbial necromass carbon and their role in soil particulate (POC) and mineral-associated organic carbon (MAOC) accumulation remains unclear.
2. This study selected 14 pairs of maize fields and plantation forests in a karst region of southwest China, with the soil being calcareous. Using lignin phenols and amino sugars as biomarkers along with multiple biotic and abiotic soil variables, the mechanisms underlying the effects of afforestation on POC and MAOC as well as their components were explored.
3. Afforestation increased POC by 265% and MAOC by 136% compared to maize fields. Soil microbial necromass carbon increased by 224% in POC and 96% in MAOC, surpassing lignin increases (100% in POC; 66% in MAOC) upon afforestation. Afforestation promoted soil POC and MAOC accumulation through three synergistic pathways: enhancing lignin accumulation via increased plant residue input and reduced lignin oxidation, promoting microbial necromass carbon accumulation driven by stimulated microbial biomass, and strengthening mineral protection resulting from increased soil calcium content. However, multiple lines of evidence corroborated that microbial necromass carbon contributed disproportionately more to POC and MAOC accumulation than lignin.
4. Synthesis and applications. Our findings demonstrate similar accumulation mechanisms between soil POC and MAOC, indicating their coupled changes during the karst afforestation. The current study also confirms the important role of microbial carbon pump in SOC sequestration and emphasizes the implication for improving Earth system models by integrating microbial-mediated carbon accumulation processes.

S18-8 Mechanisms of synergistic regulation of soil organic matter transformation by climatic and pedogenesis processes

＊Zhijian Mou (South China Botanical Garden, Chinese Academy of Sciences, ESC), Zhanfeng Liu (South China Botanical Garden, Chinese Academy of Sciences)

Dissolved organic matter (DOM) plays a central role in terrestrial carbon and nutrient cycling, underpinning essential ecosystem functions. Despite its importance, the mechanisms affecting long-term DOM dynamics during ecosystem development remain elusive due to complex variation in pedogenesis-associated nutrient status and biological activities. Here, we investigated the concentrations, optical properties, and compositional attributes of soil DOM across two 2-million-year coastal dune chronosequences under contrasting climatic conditions in southwestern Australia. Using fluorescence excitation-emission matrix spectroscopy coupled with parallel factor analysis, we elucidated distinct effects of climate and pedogenesis on DOM properties. Cooler and wetter climates were associated with greater DOM humification and accumulation. During the progressive phase of ecosystem development, both chronosequences exhibited greater topsoil DOM concentrations and proportions within soil organic matter (SOM), accompanied by a greater abundance of microbial-derived protein-like substances, which enhance DOM availability to microbes. Conversely, the retrogressive phase was characterized by lower DOM concentrations and proportions within SOM, alongside a transition to plant-derived humic substances and greater humification, suggesting increased DOM stability in old soils. Our findings highlight the dual role of DOM in providing bioavailable nutrients during the progressive phase and promoting soil carbon and nutrient accu mulation during the retrogressive phase. These insights contribute to our understanding of the changing role of DOM during long-term ecosystem development and future climatic conditions.

S19-1 Comparison of carbon flux in larch plantation and secondary forests over complex terrains by using Qingyuan-Ker Towers

＊Jiaojun Zhu (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

The measurement theory of eddy covariance (EC) method for forest carbon flux faces great challenges in complex terrains, leading to significant underestimation of nocturnal carbon fluxes and substantial increases in random errors. Furthermore, post-processed carbon flux data exhibit high proportions of missing values, constraining the annual estimation accuracy of net ecosystem carbon exchange (NEE). This study conducted continuous carbon flux observations in temperate secondary forests (Mixed broadleaf deciduous forest, MBF; Mongolian oak forest, MOF) and larch plantation forests (LPF) using world's first watershed-scale flux towers ——the Qingyuan Ker Towers, with inventory method serving as independent validation.
The results demonstrated significant differences in turbulence characteristics among three flux towers, leading to terrain-

complexity-dependent variations in nocturnal carbon flux filtering. The optimized u_* filtering method with terrain complexity index showed 4.2% ± 3.3% discrepancy in nocturnal NEE filtering compared to conventional u_* filtering, while reducing data exclusion by 5.4%-15.3%. There is a significantly strong positive correlation (r>0.79, R^2>0.63, P<0.01) between the high-quality half-hourly NEE measured from the three towers. The annual sum of NEE of MBF, MOF, and LPF, were −1.89 ± 0.66, −1.85 ± 0.88, and −2.38 ± 0.62 t C ha^{-1} yr^{-1}, respectively. This advanced framework not only reduces the measurement uncertainties associated with the carbon sinks compared to a single tower, but also accurately quantifies the watershed carbon sequestration rate at 1.95 ± 0.35 t C ha^{-1} yr^{-1}, validated by ground monitoring data with <5% relative difference. The annual net carbon sequestration rate in planted forests exceeded that in secondary forests by 0.49 to 0.53 t C ha^{-1} yr^{-1}, indicating a significant enhancement in carbon sink capacity after the replacement of secondary forests with larch plantations. These findings confirm the operational reliability and practical feasibility of employing the multi-tower system for forest carbon sink assessments in complex terrains.

S19-2 Effects of warming and snow changes on phenology, growth and physiology of two co-existing seedlings in a temperate forest

＊Qiaoling Yan (Institute of Applied Ecology, Chinese Academy of Sciences/Qingyuan Forest CERN, National Observation and Research Station, ESC), Junfeng Yuan (Qingyuan Forest CERN, National Observation and Research Station/Key Laboratory of Vegetation Restoration and Management of Degraded Ecosystems, South China Botanical Garden, Chinese Academy of Sciences), Jiaojun Zhu (Institute of Applied Ecology, Chinese Academy of Sciences/Qingyuan Forest CERN, National Observation and Research Station)

Seedling establishment of dominant tree species can determine the regeneration direction, and seedling stage is the most sensitive to environmental conditions (e.g., temperature and water) in the plant life cycle.
Warming in the growing season have been concurrent throughout this century in most temperate regions (e.g., Northeast China) and have increased risk to the growth, migration, or mortality of tree seedlings. On the other hand, many studies have found that the warming during the non-growing season is greater than that during the growing season. Warming during the non-growing season can alter snow depth and properties, yet the response of seedling phenology and growth to these changes under warming remains poorly understood.
Coexisting tree species with different functional traits in temperate forests may have inconsistent responses to both warming and changes in snow, which could result in a species distribution shift and change in community dynamics. Unfortunately, little is known about the growth and physiological responses of coexisting species to the changes in these meteorological elements.
Thus, we selected seedlings of two coexisting species in a temperate secondary forest of Northeast China (water conservation forest): *Quercus mongolica* (drought-tolerant species) and *Fraxinus mandschurica* (drought-intolerant species) to analyze the spring and autumn phenology, growth and physiology of seedlings under two experiments: 1) constantly elevated 2 ℃ in the surface soil above control plots at Qingyuan Forest CERN in the growing season; and 2) simulating six conditions of snow changes under warming (normal snow depth, twice snow depth, no snow cover; control, snow compaction, formation of ice layers in the snowpack) in the non-growing season.
Our results can fully understand the responses of two co-existing seedlings to warming in growing and non-growing season, and predict the development direction of temperate secondary forest under the background of global changes.

S19-3 Hydraulic functionality as a key determinant of the productivity of major afforestation tree species in Northeast China

＊Guangyou Hao (Institute of Applied Ecology, Chinese Academy of Sciences, ESC), Guang-You Hao (Institute of Applied Ecology, Chinese Academy of Sciences), Jing-Jing Guo (Institute of Applied Ecology, Chinese Academy of Sciences), Yong-Jiao Zhou (Institute of Applied Ecology, Chinese Academy of Sciences), Shen-Hao Song (Institute of Applied Ecology, Chinese Academy of Sciences), Xiao-Han Yin (Institute of Applied Ecology, Chinese Academy of Sciences), Da Yang (Institute of Applied Ecology, Chinese Academy of Sciences), Jia Song (Institute of Applied Ecology, Chinese Academy of Sciences)

Xylem water transport is crucial for the growth of terrestrial plants and the study of tree hydraulics and related physiology are pivotal to the understanding of forest productivity. Based in the forested areas of Northeast China, we investigated the physiological mechanisms related to productivity of the main tree species from the aspect of xylem water transport and the tightly coupled carbon economics. We measured related key functional traits in roots, stems, and leaves, as well as quantified the radial growth rate of each species through tree-ring analyses. We found that hydraulic related functional traits play a key role in the construction of "fast-slow economics spectrum" across species. There is a significant functional coordination between xylem water transport, photosynthetic carbon assimilation, and tree radial growth. Higher hydraulic efficiency is a key characteristic of species with high radial growth rates; however, species with high water transport efficiency are more sensitive to embolism induced by drought and/or freeze-thaw cycles. The embolism induced by freeze-thaw cycles over the winter has a significant impact on tree environmental adaptation in this area of relatively high latitudes, and different functional groups have different adaptive strategies to cope with winter embolism. Some tree species can generate positive pressure before sprouting in spring, which is very effective in embolism repair. Nevertheless, this process requires investment of a considerable amount of carbohydrates. Temperate tree species with strong winter embolism restoration capacity often have slower growth rates, indicating a significant trade-off between productivity and stress resistance mediated by hydraulics. The results indicate that hydraulic related functional traits have a significant impact on productivity of temperate tree species and studies on this aspect have important significance for understanding the productivity of temperate trees and informing the sustainable management of temperate forests.

S19-4 Assessing farmland shelterbelts in combating soil erosion, carbon storage and crop yields

＊Xiao Zheng (Institute of Applied Ecology, Chinese Academy of Sciences, ESC)

Farmland shelterbelts, as vital components of agroecosystems, play a multifaceted role in mitigating soil erosion, enhancing carbon sequestration, and modulating crop productivity. This study evaluates the effectiveness of shelterbelts in reducing water-driven soil degradation, improving carbon sequestration capacity, and increasing crop yields at a regional scale. Key findings include:

1. **Soil erosion control**: Well-designed shelterbelt systems reduce topsoil loss by 20-27%, increase soil organic matter content by 1.00-3.00%, and decrease gully erosion by 20-30%.
2. **Carbon sequestration**: Shelterbelts aged 10 years significantly enhance soil organic carbon (SOC) within 0.5H (where H is the average shelterbelt height), while those aged 20 and 30 years exhibit pronounced SOC improvements at 1 H.
3. **Crop yield enhancement**: Shelterbelts contribute to maize yield increases of 4.68%, 4.28%, and 9.45% in high, medium, and low climatic potential productivity zones, respectively.

However, trade-offs such as shading effects, root-mediated water competition, and management costs may reduce crop productivity in edge areas. Strategic species selection, spatial configuration optimization, and integrated management are recommended to balance ecological and agricultural objectives. Long-term monitoring and site-specific adaptations are critical to maximizing shelterbelts' synergistic benefits in sustainable land-use systems. This research highlights shelterbelt networks as nature-based solutions for climate-resilient agriculture and soil conservation.

S19-5 TBC

＊Yirong Sun (Institute of Applied Ecology Chinese Academy of Sciences, ESC)

TBC

S19-6 Near real-time monitoring of carbon effects from continuous forest change in rapidly urbanizing region of china

＊Dou Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences/Zhejiang Sci-Tech University, ESC)

Forest carbon sinks are crucial for mitigating urban climate change. Their effectiveness depends on the balance between gross carbon losses and gains. However, quantitative and continuous monitoring of forest change/disturbance carbon fluxes is still insufficient. To address this gap, we integrated an improved Spatial Carbon Bookkeeping (SBK) model with the Continuous Change Detection and Classification (CCDC) algorithm, long-term Landsat observations, and ground measurements to track carbon emissions, uptakes, and net changes from forest cover changes in the Yangtze River Delta (YRD) of China from 2000 to 2020. The SBK model was refined by incorporating heterogeneous carbon response functions. Our results reveal that carbon emissions (-3.88 **TgC yr^{-1}**) were four times greater than carbon uptakes (**0.93 TgC yr^{-1}**) from forest cover changes in the YRD during 2000-2020**, despite a net forest cover gain of** 10.95×10^4 ha. This indicates that the carbon effect per hectare of forest cover loss is approximately 4.5 times that of forest cover gain. The asymmetric carbon effect suggests that forest cover change may act as a carbon source even with net-zero or net-positive forest cover change. Furthermore, carbon uptakes from forest gains in the YRD during 2000-2020 could only offset 0.28% of energy-related carbon emissions from 2000-2019. Urban and agricultural expansions accounted for 37% and 10% of carbon emissions, respectively, while the Grain for Green program contributed to 45% of carbon uptakes. Our findings underscore the necessity of understanding the asymmetric carbon effects of forest cover loss and gain to accurately assess the capacity of forest carbon sinks.

S19-7 Molecular characterization of soil organicmatter across forests in northeastern China

＊Xiangxia Yang (Institute of Ecology, Peking University, ESC), Xiaoding Lin (Institute of Ecology, Peking University), Le Chang (Institute of Ecology, Peking University), Kazuo Isobe (Institute of Ecology, Peking University)

Soil organic matter (SOM) represents the largest terrestrial carbon pool and plays a critical role in ecosystem carbon cycling. In forest soils, SOM stocks generally decrease with depth due to reduced organic inputs and microbial activity. The molecular composition of SOM is known to influence its stability and decomposition rate; however, it remains unclear how SOM composition changes with soil depth, and whether such patterns are consistent across different forest types.

In this study, we collected soil samples from three depths (0-10 cm, 10-20 cm, and 20-30 cm), as well as litter samples, from the forests dominated by each of three major tree species widely distributed in northeastern China: *Betula platyphylla* (birch), *Populus davidiana* (poplar), and *Larix gmelinii* (larch). We then characterized the molecular composition of soil organic matter (SOM) using pyrolysis gas chromatography-mass spectrometry (Py-GC/MS), and analyzed both depth-dependent and inter-forest variation in SOM composition. We detected a total of 2,158 unique molecular compounds, including benzenoids, lipids and lipid-like molecules, and organic acids and their derivatives. We first compared SOM composition across soil depths within each forest type—birch, poplar, and larch—and found that, in all three forest types, the diversity of molecular compounds decreased with increasing soil depth, and SOM composition became more similar among forest stands within each type in deeper layers. In contrast, when comparing among different forest types at each depth, we observed that differences in SOM molecular composition became larger with increasing depth, with particularly clear distinctions emerging in the 20-30 cm soil layer.

These results suggest that SOM dynamics may be governed by microbial processes shared across stands of the same tree species, while differing among different tree species. In my presentation, I will highlight these patterns and discuss the relationship between SOM composition and soil microbial communities.

S20-1 Withdrawn

S20-2 Exploring the Microbiome of Acropora digitifera in the Sesoko Region

＊Kodai Gibu (University of Tokyo/National Institute of Advanced Industrial Science and Technology, ESJ), Hiroki Kise (National Institute of Advanced Industrial Science and Technology), Yuki Yoshioka (National Institute of Technology Okinawa College), Naoki Saito (National Institute of Advanced Industrial Science and Technology), Yuichi Nakajimka (National Institute for Environmental Studies), Kazuhiko Sakai (University of the Ryukyus), Atsushi Suzuki (National Institute of Advanced Industrial Science and Technology), Nina Yasuda (University of Tokyo), Akira Iguchi (National Institute of Advanced Industrial Science and Technology)

Coral reef ecosystems are among the most biodiverse on Earth, with reef-building corals (hereinafter "corals") serving as foundational species. Corals maintain their life cycle as coral holobionts—symbiotic units composed of corals and microorganisms—by forming relationships with zooxanthellae, bacteria, and microeukaryotes. Zooxanthellae are vital for coral survival, supplying photosynthetic products and enhancing thermal stress tolerance. Recent studies show that coral-associated bacterial communities shift in response to environmental stressors like temperature changes, and some bacteria protect zooxanthellae. These findings have increased interest in symbiotic prokaryotes.

DNA metabarcoding is a powerful tool for comprehensively analyzing microbial communities and is widely used to study coral symbionts. Japan's diverse marine environments along a latitudinal gradient offer a unique opportunity to explore interactions between coral-associated microbes and their environment. However, few studies have addressed the geographical variation of coral microbial communities. We therefore investigated the symbiotic microbial communities of *Acropora digitifera* inhabiting the coastal regions of the Nansei Islands and Sesoko Island.

To examine latitudinal effects, sampling was conducted at seven sites across the Nansei Islands. To assess local environmental variation, additional sampling was done at six sites around Sesoko Island. Genomic DNA was extracted, and metabarcoding targeting zooxanthellae and prokaryotes was performed. Analysis revealed region-specific microbial community structures along the latitudinal gradient. Around Sesoko Island, the same zooxanthellae genotype dominated all sites, while prokaryotic diversity varied by location.

This presentation will summarize and discuss factors driving the geographical variation in these microbial communities.

S20-3 The Evolution and Functional Roles of Olfactory Receptors in Starfish: Insights from the Genus Acanthaster

＊Masumi Kamata (The University of Tokyo/Geological survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST), ESJ), Rei Kajitani (Institute of Science Tokyo), Takehisa Ito (Institute of Science Tokyo), Kodai Gibu (The University of Tokyo/Geological survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST)), Yoshihito Niimura (University of Miyazaki), Nina Yasuda (The University of Tokyo)

Coral reef ecosystems provide a variety of ecosystem services that benefit humanity, but they are at risk of collapse due to anthropogenic, environmental, and biological factors. One of the major factors contributing to the decline of coral reef ecosystems is the chronicle population outbreaks of coral-predator crown-of-thorns starfish (COTS, *Acanthaster* spp.). While the predation by COTS has been a cause for concern, the molecular mechanisms underlying how COTS recognize and consume corals remain largely unclear. Elucidating this mechanism using a gene identification method based on chemical communication and whole-genome information could contribute to developing effective countermeasures based on COTS foraging mechanisms.

In this study, we identified 'olfactory receptor-like genes' potentially involved in chemical reception from the whole genome of 15 individuals including COTS, its close relative *Acanthaster brevispinus*, Linckia genus starfish inhabiting coral reef areas like COTS, and various other starfish with different habitats and diets. Moreover, we examined the expansion of these genes through phylogenetic analysis and investigated their actual expression in tissues.

The results showed that COTS and the *Acanthaster brevispinus* possess approximately 500 olfactory receptor-like genes, and the actual expression of these identified genes was confirmed in the sensory tentacles of organs related to chemical reception. The number of genes is similar among starfish species, and this is thought to be due to differences in ecology (diet, etc.). Phylogenetic analysis revealed that there are homologous genes in COTS and *Acanthaster brevispinus*, genes unique to COTS or *Acanthaster brevispinus*, and genes duplicated only in COTS. Additionally, in *Acanthaster brevispinus*, olfactory receptor-like genes showed higher expression levels in external organs such as tube feet and spines compared to internal organs (gonads and stomach).

Future research will focus on confirming whether these chemoreceptor genes, whose expression has been confirmed, contribute to the perception of coral chemical cues.

S20-4 Non-Invasive Detection of Coral Stress Responses via Environmental RNA (eRNA)

＊Anna Rudyk (The University of Tokyo), Hyuga Houtoku (The University of Tokyo), Mikito Murakami (The University of Tokyo), Fei Xia (The University of Tokyo), Nina Yasuda (The University of Tokyo)

Coral reefs face severe threats from rising sea temperatures, necessitating novel, minimally invasive techniques to track coral health. We developed an environmental RNA (eRNA)-based approach to detect coral stress responses without direct tissue sampling. In laboratory experiments, Acropora solitaryensis fragments were gradually exposed to elevated temperatures of 27°C, 29°C, and 31°C to simulate varying heat stress levels. We assessed photosynthetic performance using pulse-amplitude modulated (PAM) fluorometry, which measured changes in photosynthetic efficiency over time. We simultaneously collected water samples surrounding each coral fragment to evaluate stress-linked gene expression in eRNA. Our data revealed distinct upregu-

lation of stress-related genes at 29°C and 31°C, paralleling findings from tissue-based measurements but with a noticeable time lag in peak expression. Additionally, mild stress conditions promoted genes involved in repair and metabolic pathways, while the highest temperature induced apoptosis-associated transcripts. Recovery was observed once temperatures returned to lower levels, indicated by a shift in gene expression patterns. Analysis of symbiotic dinoflagellates showed considerable variability, and no consistent differentially expressed genes were detected between tissue and water samples. Our findings suggest that eRNA-based monitoring can provide a non-invasive overview of thermal stress impacts on corals, although differences in gene expression profiles between tissue and water samples highlight the need for further refinement. This study underscores the potential of eRNA as a complementary tool for coral reef conservation, offering an avenue for real-time assessment of coral stress and resilience under changing environmental conditions. Capturing gene expression shifts at temperature increments can enhance early detection of coral stress.

S20-5 Monitoring Coastal Plankton Communities in Northeast Japan through Metagenomics and Epigenomics in the PlanDyO Project

＊Takeshi Obayashi (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Graduate School of Information Sciences, Tohoku University), Toyonobu Fujii (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Onagawa Field Center, Graduate School of Agricultural Science, Tohoku University), Akane Kitamura (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University), Gaku Kumano (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Asamushi Research Center for Marine Biology, Graduate School of Life Sciences, Tohoku University), Minoru Ikeda (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University/Onagawa Field Center, Graduate School of Agricultural Science, Tohoku University)

The Sanriku Coast of northeastern Japan is a region of exceptional biological productivity formed by the confluence of the Kuroshio, Oyashio, and Tsugaru Warm Currents. At its southern edge, Onagawa Bay provides a valuable site for long-term ecological observation. To better understand how plankton communities respond to seasonal and oceanographic changes, we launched the PlanDyO project, which integrates monthly sampling with high-throughput metagenomics and epigenomics using Nanopore sequencing.

The project now encompasses additional sites: Mutsu Bay and Ishinomaki Bay, selected for their contrasting oceanic influences and aquaculture practices. These diverse conditions enable comparative analyses of community composition, functional potential, and physiological states of plankton.

The prototype PlanDyO database currently includes metagenomic profiles for about 500 genera, alongside DNA methylation data that serve as molecular indicators of environmental response. Ongoing developments aim to incorporate seasonal methylation dynamics, CTD data, and quantitative plankton imaging.

We will present early findings, including site-specific seasonal patterns in phytoplankton and aquaculture-associated species, and demonstrate how integrating epigenomic signals can reveal processes such as bloom status and stress responses. Through this approach, PlanDyO contributes to our understanding of coastal ecosystem resilience and offers a foundation for nature-positive management strategies under shifting climate and ocean conditions.

S21-1 Evolutionary history and climate-driven range shifts in the cold-adapted beetle genus *Platycerus* in East Asia

＊Kohei Kubota (Heisei International University, ESJ), Xue-Jiao Zhu (South China Agricultural University), Tao Ma (South China Agricultural University), Xiu-Jun Wen (South China Agricultural University), Sheng-Nan Zhang (Anhui Agricultural University)

The genus *Platycerus* is a low-dispersal and cold adapted taxon. In East Asia, 10, one, and 32 species are known in Japan, Korea, and China, respectively. *Recent studies of Platycerus have revealed the divergence pattern in Japan and South Korea.* We conducted a phylogenetic and biogeographical study of *Platycerus* in East Asia, including China. Although the introgression of mitochondrial genes had been known in Japanese *Platycerus*, the essential contradiction was not recognized between the phylogenetic trees of nuclear genes and *COI* in Chinese *Platycerus*. In the *COI* tree, the Japanese clade and Asian continental clade diverged around 10.84 million years ago. For the shape of the posterolateral corner of the *Platycerus* pronotum, sharp (S)-type species are distributed in higher latitudinal and lower altitudinal areas than round (R)-type species in the Asian continent. S-type species have evolved from R-type species at least three times in more northerly areas, where the annual amplitude of temperature change is large. The genus *Platycerus* has been differentiated and speciated by a process unique to South Korea, Japan, and China, according to regional topography.

We also predicted the distribution of 10 *Platycerus* species in Japan based on species distribution models (SDMs). We generated three SDMs based on environmental variables without dispersal constraint and incorporating two alternative dispersal constraint scenarios. We compared these three models with respect to SDM performance. Using the best models among three SDMs, we predicted range shifts under climate change. Our results revealed that models incorporating dispersal constraints had better predictive performance. Most *Platycerus* taxa in 2070 were predicted to lose large portions of present suitable areas under the climate change. Incorporating dispersal ability to better understand the effects of climate change on the species ranges is a crucial step towards developing policies for insect management and conservation of vulnerable species.

S21-2 Evolutionary History of Yeast Symbionts in *Platycerus* and *Prismognathus* Beetles

＊Shengnan Zhang (Anhui Agricultural University, ESC)

Xylose-fermenting yeasts of the genus *Scheffersomyces* have recently been discovered from the mycangia of stag beetles. In this symbiotic system, *Platycerus* species in Japan and their associated yeasts exhibit patterns of incomplete co-evolution (Kubota et al. 2020). In Japan, whereas most *Platycerus* species and *Prismognathus angularis* possess yeast symbionts belong-

ing to Clade I and III in IGS sequences, *Platycerus viridicuprus* possesses Clade II yeasts. In Korea, *Platycerus hongwonpyoi* and *Prismognathus dauricus* share Clade II yeasts (Zhu et al. 2020). Ueki et al. (2021) suggested that Clade II yeasts were horizontally transmitted from *Pr. dauricus* to *Pl. viridicuprus* in Kyushu during the last interglacial period. To investigate the evolutionary history of this symbiotic system across East Asia, 19 *Platycerus* and three *Prismognathus* species collected from 17 sites from China and some other species of the outgroup were analyzed. ITS and IGS sequences of yeast symbionts, and mitochondrial COI sequences of host lucanid beetles were examined. Phylogenetic analyses revealed that yeast symbionts from *Platycerus* (China, Korea, and Japan) and *Prismognathus* (China and Korea) form a monophyletic group, while the symbionts of *Pr. angularis* from Japan diverged into a distinct lineage. IGS-based results suggest a shared ancestral yeast lineage in China, followed by geographic divergence. A lineage of *Prismognathus* (Clade III) likely dispersed to Japan, where its yeasts evolved independently. Subsequently, Clade I and Clade II diverged within China, with Clade I becoming specialized to *Platycerus* and Clade II shared across genera. Dispersal of Clade I yeasts to Japan led to the formation of Clade Ia. Finally, secondary contact between *Pl. viridicuprus* and Korean *Pr. dauricus* near the Tsushima Islands (probably in Kyushu) was likely to facilitate horizontal yeast transmission via shared host wood. These findings provide new insights into the historical biogeography and host-symbiont co-evolution in lucanid beetles across East Asia.

S21-3 Latitudinal variation and environmental dependence in the genital size of Eucarabus ground beetles in Korean Peninsula

＊Yutaro Nakao (Kobe University, ESJ), Tae-Woong Jang (Kangwon National University), Yong-Hwan Park (Kobe University/ Kangwon National University), Jong-Kuk Kim (Kangwon National University), Jun-Lark Kim (Uiduk University), Kohei Kubota (Heisei International University), Yasuoki Takami (Kobe University)

Sexual selection promotes the diversification of reproductive traits, and may reduce inter-population mating compatibility and promote speciation. The morphology of genitalia is considered to play a critical role in speciation, highlighting the importance of elucidating its diversification mechanisms for understanding the evolutionary process of biodiversity.
Given that sexual selection varies with environmental conditions, reproductive traits are expected to covary along with environmental clines. Latitudinal clines of reproductive traits are the most prominent case. However, few studies have investigated this pattern and yet addressed its underlying mechanisms. In this study, we examined a latitudinal cline in the male genital size of Eucarabus ground beetles across the Korean Peninsula and assessed the influence of environmental factors as well as sexual selection.
Multiple linear regression analyses revealed that populations in lower latitudes had larger male genitalia. In addition, a positive allometric relationship was observed between body size and male genital size, suggesting that male genital size evolved more rapidly than body size.
To further evaluate the contribution of sexual selection to the observed latitudinal cline in genital size, we conducted a path analysis including indicators of environmental variation and sexual selection. We used testis size as a proxy for sexual selection intensity, as it reflects the extent of female multiple mating. Annual mean temperature had significant positive and negative effects on body size and testis size, respectively. Contrary to the expectation, however, testis size had no significant effect on male genital size, whereas body size had a significant positive effect.
These findings suggest that sexual selection is not the primary driver of the geographical diversification of male genital size in this group of insects. Further studies are warranted to understand the underlying mechanisms linking environmental factors and evolutionary processes of the observed latitudinal cline in the reproductive trait.

S21-4 Reproductive character displacement in the shape and physical property of the male genitalia in *Ohomopterus* ground beetles in central Japan

＊Maemura Toon (Kobe University, ESJ), Takami Yasuoki (Kobe University), Inoue Mari (Kobe University), Nishimura Taira (Kobe University)

Secondary contact between allopatrically differentiated species results in maladaptive interspecific interactions such as hybridization. Natural selection favors trait divergence that can reduce the costs of interspecific interactions, thereby reproductive character displacement (RCD) can evolve and speciation can proceed. Evidence for RCD in genital morphology has been increasing in recent years, supporting the lock-and-key hypothesis of genital evolution. However, the mechanisms by which displaced genitalia decrease the cost of interspecific mating remain poorly understood.
Ohomopterus ground beetles are endemic to the Japanese archipelago, and exhibit striking species-specific divergence in the morphology of the male and female genitalia. Mismatches between male copulatory piece (CP) and female vaginal appendix (VA) in interspecific mating are known to function as a reproductive isolating barrier. The sister species *Carabus maiyasanus* and *C. iwawakianus* are distributed parapatrically, and male CP size in *C. maiyasanus* shows a geographical variation consistent with RCD. Thus, this system provides an ideal model for investigating RCD-associated speciation.
In this study, we examined variation in size, shape, and physical properties of the male CP of *C. maiyasanus* among eight populations: four are allopatric to, two are parapatric with, and two are isolated within the range of *C. iwawakianus*. Isolated populations in the closest contact with *C. iwawakianus* exhibited significantly larger, slenderer, and more elastic CP than others, suggesting RCD in the physical property in addition to the morphology of the CP. The slenderer CP was more elastic in one isolated population, and the CP was entirely elastic in the other. These characterstics may represent adaptations that can reduce the risk of genital damage in interspecific mating. The correlation between shape and elasticity may facilitate rapid genital evolution and diversification, because natural selection on either trait may drive correlated evolution of the other.

S21-5 Did the adaptation and subsequent isolation into mountainous forests contribute to multiple degeneration of flight ability in ground beetles?

＊Takashi Shimizu (The University of Tokyo, ESJ), Hiroshi Ikeda (The University of Tokyo), Kôhei Kubota (The University of Tokyo/Heisei International University)

Flight is one of the major means of insect dispersal. However, the loss of flight ability is also common in insects, including beetles. The flight traits of beetles degenerate in order of flight muscles and hind wings. Intraspecific polymorphisms in these traits occur over the course of each degeneration step. Research on polymorphic species could reveal the degeneration process and its factors in detail.

In general, stability and/or isolation are considered to promote the degeneration of flight ability in beetles, and mountainous forest is a typical habitat with these characteristics. Thus, the degeneration of flight ability is likely to occur in beetles isolated into mountainous forests.

The genus *Synuchus* is the common carabid beetles in Japan. Several species exhibit intraspecific polymorphisms in flight traits, and the degeneration stages vary among species. Most species are forest dwellers, and those restricted to mountainous forests have completely degenerated flight traits. Therefore, this genus is suitable to examine relationships between degeneration of flight ability and habitat environment. Here, we investigated whether species isolated into mountainous forests have more degenerated flight traits.

We constructed a phylogenetic tree based on two mitochondrial and three nuclear genes from 23 species. Ancestral state reconstruction revealed that the degeneration of flight ability occurred in multiple lineages. Phylogenetic comparative analyses based on climatic and topographical variables indicated that the degenerated species showed narrow habitable environmental ranges and were distributed in discontinuous habitats. In addition, ancestral area reconstruction and phylogenetic comparative analysis based on distribution records demonstrated that the degenerated species had narrow geographical distribution ranges, and the degenerated lineages were isolated into mountains of west Japan. These results suggest that the advance and subsequent isolation into mountainous forests have driven the multiple degeneration of flight ability in this genus.

Poster with Award Entry
Poster core time July 20, Sun 18:00-19:30

Yayoi Auditorium Annex

Evolution, mathematical ecology, animal population, life history of animals

P001 Sex Identification in The Raccoon Dog (*Nyctereutes procyonoides*) Using Genetic Tools

＊Negin Eslamibidgoli (Center for Ecological Research (CER), Kyoto University, ESJ), Wanyi Lee (Center for Ecological Research (CER), Kyoto University), Hiroyuki Tanaka (Center for Ecological Research (CER), Kyoto University), Goro Hanya (Center for Ecological Research (CER), Kyoto University)

P002 Evaluation of relationships between Norway rat (*Rattus norvegicus*) occurrence and garbage collection methods: A case study of a drinking district in Japan

＊Nanami Shimamura (Graduate School of Life Sciences, Toyo University, ESJ), Kazutaka M. Takeshita (Graduate School of Life Sciences, Toyo University)

P003 The effect of swimming cells of marine green algae on the growth of marine ciliates.

＊Katsuhiro Kawaguchi (Marine Biosystems Research Center, Chiba University, ESJ), Kosei Mochizuki (Marine Biosystems Research Center, Chiba University), Yusuke Horinouchi (Tokyo University of Marine Science and Technology), Tomonori Kikuchi (Marine Biosystems Research Center, Chiba University), Tatsuya Togashi (Marine Biosystems Research Center, Chiba University)

P004 A theoretical study on the evolution of filamentous cyanobacteria under size-selective predation

＊Hikari Kai (Tokyo Metropolitan University, ESJ), Yuuya Tachiki (Tokyo Metropolitan University)

P005 Clarification of the life cycles of a phoretic nematode *Acrostichus* sp. in the invasive *Sagra femorata* in Japan

＊Takuto Shikanai (Graduate school of Bioresources, Mie University, ESJ), Yosuke Matsuda (Graduate school of Bioresources, Mie University), Yudai Kitagami (Graduate school of Bioresources, Mie University)

P006 Impact of cave types and distribution on the Eastern Bent-winged bats' distributional changes since the LGM in Japan

＊Rei Akiyama (Graduate School of Agricultural and Life Science, The University of Tokyo, ESJ), Yuuto Kane (Graduate School of Agricultural and Life Science, The University of Tokyo), Susumu Goto (Graduate School of Agricultural and Life Science, The University of Tokyo), Dai Fukui (Graduate School of Agricultural and Life Science, The University of Tokyo)

P007 Why do egg sacs show color variation from transparent to opaque in the Japanese black salamander?—A comparison with a related species who spawns only transparent egg sacs—

＊Shona Yasuda (The University of Tokyo, ESJ), Ryota Morii (The University of Tokyo), Hiroshi Ikeda (The University of Tokyo)

P008 Environmental Factors Influencing Green-Brown Polymorphism in the Migratory Locust (*Locusta migratoria*)

＊Keiryu Hirota (The United Graduate School of Agricultural Sciences-Iwate University), Ryohei Sugahara (Hirosaki University)

P009 A Trial Reconstruction of Temporal Changes in Fish Stocks over the Past 6,000 Years Using Sedimentary DNA

＊Naoto Horie (Ehime University), Michinobu Kuwae (Ehime University), Masanobu Yamamoto (Hokkaido University), Tomohisa Irino (Hokkaido University), Ken Ikehara (Advanced Industrial Science and Technology), Keitaro Yamada (Yamagata University), Tsurayuki Ohmori (The University of Tokyo), Keiji Takemura (Kyoto University), Tsuyosi Haraguchi (Tohoku University), Hikaru Takahara (Kyoto Prefectural University), Misaki Shimada (Kyoto Prefectural University), Akira Hayashi (Doshisha University), Katsuaki Suzuki (Advanced Industrial Science and Technology), Narumi Tsugeki (Matsuyama University)

P010 Life history strategy of toads against urbanization

＊Sena Irie (Tokyo University of Agriculture and Technology, ESJ), Kenta Owaku (Tokyo University of Agriculture and Technology), Reina Kumada (Tokyo University of Agriculture and Technology), Tomoaki Murakami (Tokyo University of Agriculture and Technology), Noriko Iwai (Tokyo University of Agriculture and Technology)

P011 Seasonal and interannual changes in tree cavity use of *Diplothrix legata* (Muridae: Rodentia) in Okinawajima Island, Japan: Insights from five years of monitoring

＊Teppei Higashi (University of the Ryukyus, ESJ), Shun Kobayashi (University of the Ryukyus)

P012 Life cycles of trematodes in mollusks on the coast of Japan

＊Hakuyu Sekine (Toho University, ESJ), Masanori Taru (Toho University Tokyo Bay Ecosystem Research Center), Tomohito Ojima (Research Group of Aquatic Life in Port of Tokyo), Masako Ojima (Research Group of Aquatic Life in Port of Tokyo), Hiroaki Fukumori (Research Center for Marine Biology Graduate School of Life Sciences Tohoku University), Toshio Furota (Toho University Tokyo Bay Ecosystem Research Center), Sho Toshino (Kuroshio Biological Research Foundation), Soma Okamoto (Fukui Coastal Nature Center), Masato Nitta (Japan Fisheries Research and Education Agency), Tsukasa Waki (Toho University)

P013 The Insect Fauna of Fruit-Piercing Stink Bugs (*Pentatomidae*) at Otemae Takamatsu Junior and Senior High School

＊Chisa Aoki (Kobe College/Otemae Takamatsu Junior & High School, ESJ), Akira Murota (Otemae Takamatsu Junior & High School), Yu Sueyoshi (Otemae Takamatsu Junior & High School), Mao Tamura (Otemae Takamatsu Junior & High School)

Yayoi Auditorium Annex

Landscape ecology, biodiversity, conservation, education and popularization of ecology

P014 Relationship between anurans density and landscape factors in paddy field using environmental DNA analysis

＊Akinori Ogura (Kobe University Graduate School of Human Development and Environment, ESJ), Qianqian Wu (Kobe University Graduate School of Human Development and Environment), Ryohei Nakao (Kobe University Graduate School of Human Development and Environment/Yamaguchi University Graduate School of Science and Technology for Innovation), Atushi Ushimaru (Kobe University Graduate School of Human Development and Environment), Toshifumi Minamoto (Kobe University Graduate School of Human Development and Environment)

P015 Impact of farmland abandonment on survival of a small salamander (*Hynobius setouchi*) using environmental DNA analysis

＊Nana Matsumoto (Kobe University, ESJ), Masayuki K. Sakata (Hokkaido University), Yuta Kunimasa (Kobe University), Yuna Yamamoto (Kobe University), Toshifumi Minamoto (Kobe University)

P016 Detection of Chinese White Dolphin in Hong Kong waters using environmental DNA analysis

＊Robinson Okoth Kisero (The Hong Kong University of Science and Technology), Masayuki Ushio (The Hong Kong University of Science and Technology), Takamitsu Ohigashi (The Hong Kong University of Science and Technology), Eszter Matrai (Ocean Park), Lindsay Porter (Southeast Asia Marine Mammal Research), Satsuki Tsuji (Kyoto University)

P017 Applying D-Loop Haplotype Analysis in Grouper Population Studies

＊Ming Wai Li (Hong Kong University of Science and Technology Ocean Science Department, ESC)

P018 Applicability of single-factor models in assessment of habitat suitability—A case study of wetland bird habitats

＊Xiuzhi Wang (Department of Biology, Hong Kong Baptist University/Department of Life Sciences, Beijing Normal-Hong Kong Baptist University, ESC), Siu-Tai Tsim (Department of Life Sciences, Beijing Normal-Hong Kong Baptist University/Guangdong Provincial/Zhuhai Key Laboratory of Interdisciplinary Research and Application for Data Science, Beijing Normal-Hong Kong Baptist University), Jian-Wen Qiu (Department of Biology, Hong Kong Baptist University), Lingzi Liang (Department of Biology, Hong Kong Baptist University/Department of Life Sciences, Beijing Normal-Hong Kong Baptist University), Jungong Guo (Zhuhai Bird Watching Society)

P019 Ecosystem Condition: Concept, Accounting Methods and Case Study

＊Yu Zhao (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Lingxiao Ying (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences), Guanshi Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

P020 Determinants and Action Pathways for Enhancing Ecological Security from a Complex Systems Perspective: A Case Study of Yellow River Basin, China.

＊Jiayin Li (School of Management, Lanzhou University/Data Intelligence Laboratory of Tibetan Plateau Humanistic Environment/Emergency Management Research Center, Lanzhou University), Cuorong Chai (School of Management, Lanzhou University/Data Intelligence Laboratory of Tibetan Plateau Humanistic Environment/Emergency Management Research Center, Lanzhou University), Wenhao Fu (School of Management, Lanzhou University/Data Intelligence Laboratory of Tibetan Plateau Humanistic Environment/Emergency Management Research Center, Lanzhou University)

P021 From Spawning Grounds to Feeding Fronts: Assessing Climate Change Vulnerability of Pacific Bluefin Tuna (*Thunnus orientalis*) Migration Pathways in the North Pacific Ocean

＊Matthew Durant (Tohoku University, ESJ), Jamie M Kass (Tohoku University)

P022 Associations among three types of nature connections and their consequences for human well-being and conservation behaviours

＊Yutaro Aota (The University of Tokyo/Forestry and Forest Products Research Institute, ESJ), Yusuke Yamada (Forestry and Forest Products Research Institute), Satomi Mitsui (Forestry and Forest Products Research Institute), Yuichi Yamaura (Forestry and Forest Products Research Institute), Masashi Soga (The University of Tokyo)

P023 Approaches to Enhancing the Detection Sensitivity of *Schistosoma mansoni* eDNA

＊Yuna Yamamoto (Kobe University, ESJ), Qianqian Wu (Kobe University), Evans Asena Chadeka (Nagasaki University/Kenya Medical Research Institute (KEMRI)), Benard Ngetich (Maseno University), George Ododa Sonye (Ability to solve by Knowledge (ASK) Community Based Organization), Sachiyo Nagi (Tokyo Women's Medical University), Kyoko Futami (Nagasaki University), Ayako Hyuga (Nihon University), Sammy Njenga (Kenya Medical Research Institute (KEMRI)), Collins Ouma (Maseno University), Shinjiro Hamano (Nagasaki University), Toshifumi Minamoto (Kobe University)

P024 The Rapid Shrinkage of China's Tidal Flat (2000-2023): Trends, Drivers, and Ecological Impacts

＊Qiqi Huang (State Key Laboratory of Regional and Urban Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

P025 Effectiveness of an online quiz-based birdsong training tool "TORI-TORE": Changes in participants' birdsong identification skills and interest in birds

＊Yui Ogawa (University of Tsukuba/National Institute for Environmental Studies, ESJ), Keita Fukasawa (National Institute for Environmental Studies), Akira Yoshioka (National Institute for Environmental Studies), Nao Kumada (National Institute for Environmental Studies), Akio Takenaka (Unaffiliated), Takashi Kamijo (University of Tsukuba)

P026 Comparison of butterfly communities among land use types and topographic conditions in the agricultural landscape of Hokkaido, northern Japan

＊Gakuto Nihei (Mie University, ESJ), Munehiro Kitazawa (National Institute for Environmental Studies), Noriyuki Suzuki (Mie University), Futoshi Nakamura (Hokkaido University)

P027 Modeling the potential distribution of the golden eagle in Japan and investigating its relationship with satoyama landscapes

＊Ryo Nishida (Macroecology Lab, Graduate School of Life Sciences, Tohoku University, ESJ), Everton Miranda (Macroecology Lab, Graduate School of Life Sciences, Tohoku University), Jamie Michael Kass (Macroecology Lab, Graduate School of Life Sciences, Tohoku University)

P028 Visualizing the Invasion Stage of *Bufo formosus* on Hachijo-jima Island Using SDMs and Field Surveys

＊Yusuke Magome (University of Tsukuba, ESJ), Kiyoto Sawada (University of Tsukuba), Kohei Suzuki (Tokyo university of agriculture), Takashi Kamijo (University of Tsukuba)

P029 Effects of urbanization and related environmental factors on soil microbial communities in the Seoul Metropolitan Area, South Korea

＊Jaeyeon Lee (Konkuk University, ESK), Haegeun Chung (Konkuk University), Deageun Ko (Konkuk University), Ana Mitcov (Konkuk University), Kwanyoung Ko (Konkuk University), Jaeho Kim (Konkuk University)

P030 National Desert Parks and Dryland Sustainability

＊Yueming Pan (Graduate School of Environmental Studies, Nagoya University, ESC), Takafumi Miyasaka (Graduate School of Environmental Studies, Nagoya University), Hao Qu (Key Laboratory of Ecological Safety and Sustainable Development in Arid Lands, Urat Desert-grassland Research Station, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences)

P031 Urban Policy and Mangrove Change: A Remote Sensing Assessment of Hong Kong's Coastal Regulations (2013-2025)

＊Sum Yee Luk (Hong Kong Baptist University/University of Hong Kong School of Professional and Continuing Education), Shoko Sakai (Hong Kong Baptist University), Muhammad Sajjad (University of Hong Kong)

P032 Ontogenetic differences in food resource use by invasive channel catfish (*Ictalurus punctatus*) in the outlet of Lake Biwa, central Japan

＊Keita Takasaku (Kindai University Graduate School/Kindai University/Shiga Prefectural Fisheries Experimental Station, ESJ), Tomonori Yoshikawa (Kindai University Graduate School), Yuta Kishiwaki (Kindai University), Kohei Oda (Kindai University), Kazuma Suehiro (Kindai University), Akane Iwasaki (Kindai University), Daisuke Ishizaki (Shiga Prefectural Fisheries Experimental Station), Nobuyuki Oue (Shiga Prefectural Fisheries Experimental Station), Yasushi Mitsunaga (Kindai University), Toru Kobayashi (Kindai University), Takeshi Kikko (Kindai University)

P033 Effect of nutrient levels on the growth of the invasive alga *Micrasterias hardyi* isolated from Lake Biwa

＊Fuji Xie (Center for Ecological Research, Kyoto University, ESJ), Naoki Fujiwara (Lake Biwa Environmental Research Institute), Kenya Iwamoto (Lake Biwa Environmental Research Institute), Arata Kawakami (Lake Biwa Environmental Research Institute), Shin-ichi Nakano (Center for Ecological Research, Kyoto University)

P035 Remote Sensing Based Classification of Abandoned Paddy Fields Reveals Successional Impacts on Insect Biodiversity

＊Jaeyeon Kim (Seoul National University, ESK), Youngkeun Song (Seoul National University), Seungwoo Han (Seoul National University), Jiweon Yun (Seoul National University), Seunghyeon Lee (Seoul National University)

P036 Integrating Spatiotemporal Dynamics and Landscape Connectivity to Improve Ecosystem Service Supply-Demand Imbalances: A Dual Perspective on Quantity and Space

＊Tian Hang (Seoul National University, ESK), Youngkeun Song (Seoul National University)

P037 Analyses of the effects of microplastics and warming on soil microorganisms

＊Juyeon Park (Konkuk University, ESK), Jaeho Kim (Konkuk University/Korea Institute of Industrial Technology), Jaeyeon Lee (Konkuk University), Daegeun Ko (Konkuk University), Haegeun Chung (Konkuk University)

P038 The Current Status and Relationship Between Bitterlings and Freshwater Mussels, and Challenges for Their Conservation

＊Ruka Shikenya (Otemae Takamatsu Junior and High School, ESJ), Chisa Aoki (Otemae Takamatsu Junior and High School/Kobe College), Naoto Ogawa (Otemae Takamatsu Junior and High School), Ryota Kanai (Otemae Takamatsu Junior and High School)

P039 Detecting the presence of *Ursus thibetanus ussuricus* using airborne eDNA through various sampling methods in a controlled environment

＊Hyensoo Kim (Graduate School of Environmental Studies, Seoul National University, ESK), Yujin Kang (Environmental Planning Institute, Seoul National University), Gawoo Kim (Environmental Planning Institute, Seoul National University), Seungwoo Han (National Natural Heritage Center), Youngkeun Song (Graduate School of Environmental Studies, Seoul National University)

P040 Ploidy-Dependent Establishment and Expansion of Hybrid Dandelions in Japan

＊Toru Jogaki (Osaka Metropolitan University/Osaka City University, ESJ), Tenuen T (Osaka City University), Satoshi Nanami (Osaka Metropolitan University), Akira Itoh (Osaka Metropolitan University)

P041 Decline of seagrass and seaweed beds in marine protected areas due to high water temperatures: A case study of the Bungo Channel, Japan

＊Shojiro Amano (University of Tokyo, ESJ), Mitsutaku Makino (University of Tokyo/Atmosphere and ocean research institute)

P042 Quantifying functional redundancy and resilience in bumble bees using species distribution models and hypervolumes

＊Megan Mei Yan Low (Tohoku University, ESJ), Yukari Suzuki-Ohno (Tohoku University/Center for Sustainable Society), Jamie Michael Kass (Tohoku University)

P043 Threat to the genetic integrity of the Japanese allotetraploid spined loach, *Cobitis sakahoko*, population in the Sendai River in southern Kyushu, Japan

＊Hayato Oka (Graduate School of Agriculture, Kindai University, ESJ), Tadao Kitagawa (Graduate School of Agriculture, Kindai University)

P044 DNA Analysis Of *Orcaella brevirostris* In Malaysia

＊Nuqman Maher (Centre for Ecological Research, Kyoto University/Institute of Biological Sciences, University Malaya), Zulqarnain Mohamed (Institute of Biological Sciences, University Malaya), Song Looi Sze (Institute of Biological Sciences, University Malaya)

P045 Estimate Plant Species Richness in Forested Isolated Wetlands: A Spatial Modeling Approach

＊Yoonjeong Heo (Seoul National Unuversity, ESK), Minwoo Oh (National Institute of Ecology), Hyun Tak Shin (Korea National Arboretum), Jongbin An (Korea National Arboretum), Eun Ju Lee (Seoul National Unuversity)

P046 Effects of exotic tree species extermination on vegetation in planted sites on artificial islands

＊Souta Okuyama (Graduate School of Agricultural Science, Kobe University), Naoto Kawata (Graduate School of Agricultural Science, Kobe University), Keita Kashiwagi (Graduate School of Agricultural Science, Kobe University), Hiroaki Ishii (Graduate School of Agricultural Science, Kobe University)

P047 Ecological and genetic characteristics of the endangered tree species *Pyrus ussuriensis* var. *aromatica*

＊Shiho Fujita (Graduate School of Agricultural Science, Kobe University, ESJ), Naoka Nagayama (Graduate School of Agricultural Science, Kobe University), Hironori Katayama (Graduate School of Agricultural Science, Kobe University), Hiroaki Ishii (Graduate School of Agricultural Science, Kobe University)

Yayoi Auditorium Annex

Plant ecology, succession and regeneration

P048 Fine root distribution and soil water uptake concentrated to shallow layer rather than the deep layer under rainfall exclusion treatment in a black locust plantation in Loess Plateau, China

＊Mei-Jun Liu (College of Forestry, Northwest A&F University/State Key Laboratory of Soil and Water Conservation and Desertification Control, Northwest A&F University, ESC), Sheng Du (State Key Laboratory of Soil and Water Conservation and Desertification Control, Northwest A&F University/Institute of Soil and Water Conservation, Chinese Academy of Sciences and Ministry of Water Resources), Guoqing Li (State Key Laboratory of Soil and Water Conservation and Desertification Control, Northwest A&F University/Institute of Soil and Water Conservation, Chinese Academy of Sciences and Ministry of Water Resources), Le Chang (College of Forestry, Northwest A&F University/State Key Laboratory of Soil and Water Conservation and Desertification Control, Northwest A&F University), Qiu-Wen Chen (College of Forestry, Northwest A&F University/School of Geographical Sciences, Southwest University)

P049 Interspecific hybridization and microhabitat niche shift in sympatric *Ixora* species: A mechanism for increasing species diversity in Bornean rainforest

＊Takeru Kawaratani (Osaka Metropolitan University, ESJ), Seiya Okuno (Osaka Metropolitan University), Natsuki Komada (Hiroshima University), Takafumi Mizuno (Kyoto University), Sylvester Tan (ForestGEO), Mohizha Mohamad (Forest Department Sarawak), Melvin T. Gumal (Sarawak Forestry Corporation), Hayato Tokumoto (Osaka Metropolitan University), Shizue Yoshihara (Osaka Metropolitan University), Akira Itoh (Osaka Metropolitan University)

P050 Do leaf traits differ between deciduous and evergreen species in Cambodian seasonally dry tropical forest?

＊Hiroki Hosokawa (Nagoya University, ESJ), Sopheak Thav (Nagoya University/Royal University of Agriculture), Sophors Chea (Royal University of Agriculture), Hiiragi Katsuura (Japan International Research Center for Agricultural Sciences), Naoko Matsuo (Mie University), Michiko Nakagawa (Nagoya University)

P051 Comparison of ecological characteristics between dioecious and cosexual species of Japanese *Acer* species

＊Takuma Kato (Osaka Metropolitan University, ESJ), Satoshi Nanami (Osaka Metropolitan University), Seiya Okuno (Osaka Metropolitan University), Atsushi Nagano (Nagoya University/Keio University), Akira Itoh (Osaka Metropolitan University)

P052 Tree adaptation to temperature: a reciprocal experiment of eight woody species across a latitudinal gradient

＊Xin Wang (Kyoto University, ESJ), Haruhiko Taneda (University of Tokyo), Masahiro Nakamura (Hokkaido University), Hideki Sugiura (Kyoto University), Yusuke Onoda (Kyoto University)

P053 Ocean currents, dispersal traits, and historical factors shape the genetic structure of three coastal plant species in eastern Japan

＊Kanako Akimoto (Ochanomizu University, ESJ), Madoka Kodama (Ochanomizu University), Keisuke Tanaka (Tokyo University of Information Sciences), Tetsuo I. Kohyama (The University of Tokyo), Kei Matsubayashi (Rakuno Gakuen University), Shingo Akita (Hokkaido University), Takaya Iwasaki (Ochanomizu University)

P054 Intra- and interspecific relationships between sprouting ability and functional traits of woody species in a Japanese beech forest

＊Kotaro Masuda (Niigata University, ESJ), Rei Shibata (Niigata University)

P055 Advancing Leaf pH Measurement: Optimizing Pretreatment, Preservation, and Non-Grinding Methods

＊Jiashu Chen (China Agricultural University, ESC), Wenxuan Han (China Agricultural University), Sining Liu (China Agricultural University/Sichuan Agricultural University), Yan Luo (Xinjiang University), Yufei Hou (China Agricultural University)

P056 Spatial Patterns of Disease Infection in Barley: A Genotypic Neighborhood Perspective

＊Iqra Akram (Graduate School of Environmental Science, ESJ), Yasuhiro Sato (Graduate School of Environmental Science)

P057 UAV-based seasonal vegetation mapping and habitat characterization in an abandoned paddy wetland

＊Youngeun Yang (Seoul National University, ESK), Jiseon Ro (Seoul National University/Suwon Research Institute), Youngkeun Song (Seoul National University)

P058 Distribution Change of *Suaeda japonica* and *Phragmites communis* Using Time-Series Vegetation Indices in Suncheon Bay

＊GapSeong Jekal (Seoul National University, ESK), Young Keun Song (Seoul National University), Yong Hwan Kim (Seoul National University), Ji Weon Yun (Seoul National University), Do Hee Kim (Seoul National University), Ji Seon Ro (Seoul National University), Dae Yeol Kim (Seoul National University), Seung Hyeon Lee (Seoul National University), Young Eun Yang (Seoul National University), Jae Yeon Kim (Seoul National University)

P059 Forest Dynamics Under the Combined Influence of Climate Change and Deer Herbivory

＊Ai Obata (The University of Tokyo, ESJ), Gen Kusakabe (The University of Tokyo), Tsutom Hiura (The University of Tokyo)

P060 Population Dynamics of the Korean Endemic Monotypic Genus *Coreanomecon hylomeconoides* Nakai Using an Integral Projection Model

＊Hong-Geun An (Department of Environment and Energy Engineering, Gwangju Institute of Science and Technology, ESK), Eunsuk Kim (Department of Environment and Energy Engineering, Gwangju Institute of Science and Technology), Dongyeob Lee (Department of Environment and Energy Engineering, Gwangju Institute of Science and Technology), Hyungsoon Jeong (Invasive Alien Species Team, National Institute of Ecology)

P061 The overlooked importance of small-scale flowering in dwarf bamboos: Multiple cases of seedling recruitment

＊Risa Ogawa (Yamagata University/Akita Prefectural University, ESJ), Yuzu Sakata (Yokohama National University/Akita Prefectural University), Akifumi Makita (Akita Prefectural University), Hiroshi Tomimatsu (Yamagata University)

P062 Functional Trait-Based Comparison of Aquatic Plant Life Forms

＊Migyeong Jung (Department of Biological Science, Kunsan National University, ESK), Ji Yoon Kim (Department of Biological Science, Kunsan National University), Ran-Young Im (Center for Convergent Agro-Bioengineering, Kunsan National University)

P063 Why are flower colors geographically fixed? An integrative analysis of color polymorphism in Campanula punctata

＊Ruiqi Zhang (Tohoku University/Sado Island Center for Ecological Sustainability, Niigata University, ESJ), Harue Abe (Sado Island Center for Ecological Sustainability, Niigata University), Megan Mei Yan Low (Tohoku University), Jamie Michael Kass (Tohoku University)

P064 The response of plant nitrogen resorption to restoration in Inner Mongolia, China

＊Xiang Li (Nagoya University, ESJ), Takafumi Miyasaka (Nagoya University), Hao Qu (Urat Desert-grassland Research Station, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences)

P065 Elevated CO_2 Alters Competitive Dynamics between Endemic *Aster koraiensis* and Alien *Coreopsis lanceolata*: Physiological Responses and Future Distribution Projections

＊Ji Yeong Hwang (Seoul National University, ESK), Eun Ju Lee (Seoul National University), Youngsung Joo (Seoul National University)

Yayoi Auditorium Lobby

Animal-plant interaction, animal community

P066 Comparison of moth communities in semi-natural grasslands in central Honshu and northern Kyushu and their relationship with the site environment

＊Hisashi Tajima (Shinshu Uni., ESJ), Kumiko Okubo (Shinshu Uni.)

P067 Urbanization and habitat diversity promote endozoochorous seed dispersal by raccoon dogs (*Nyctereutes procyonoides*) within forest fragments in Tokyo

＊Harsh Yadav (Yokohama National University, ESJ), Yuki Iwachido (Yokohama National University), Shyam S. Phartyal (Mizoram University), Takehiro Sasaki (Yokohama National University)

P068 Influence of flower predation by Yakushima macaques on the reproduction of *Camellia japonica*

＊Fumiya Kakuta (Kyoto University, ESJ), Miori Fukuda (Tokyo University of Agriculture), Haruka Kameda (Tokyo City University), Rentaro Kimpara (Kyoto University), Chihiro Nakato (Hiroshima University), Madoka Satake (Utsunomiya University), Shiori Tezuka (Tokyo University of Agriculture and Technology), Goro Hanya (Kyoto University)

P069 Does the local extinction of Japanese macaques affect the seed dispersal distance of *Morella rubra*?

＊Ayane Watanabe (Nagoya University, ESJ), Nobuhiro Tomaru (Nagoya University), Goro Hanya (Kyoto University), Michiko Nakagawa (Nagoya University)

P070 Shifts in Land Use Consistently Alter Aquatic Size Structures in Japanese Streams

＊Giovanna Collyer Resende (The University of Tokyo, ESJ), Victor Saito (Federal University of Sao Carlos), Terutaka Mori (Public Works Research Institute), Takehito Yoshida (The University of Tokyo)

P071 How to monitor pollinators: Comparision among conventional and eDNA metabarcoding methods

＊Eimi Nagahama (Kobe University, ESJ), Gaku Hirayama (Kobe University), Tomoya Yoshihara (Kobe University), Kazuya Takeda (Mount Fuji Research Institute), Toshifumi Minamoto (Kobe University), Atushi Ushimaru (Kobe University)

P072 Fish communities monitoring using eDNA metabarcoding considering seasonal and depth variations

＊Ryota P. Kitani (Kobe University, ESJ), Rikuto Yazawa (Yaizuchuo High School), Towa Masuda (Yaizuchuo High School), Yo Kurazono (Ogaki Minami Senior High School), Yuichi Yaoi (Yaizuchuo High School), Toshifumi Minamoto (Kobe University)

P073 Evolution of secondary metabolites, morphological structures and associated gene expression patterns in galls among four closely-related aphid species

＊Mayu Mizuki (Tokyo Univ., ESJ), Yohei Kaneko (FIHES), Yoshitaka Yukie (Tsuguro Satoyama Nature Field), Yoshihisa Suyama (Tohoku Univ.), Shun Hirota (Fukushima Univ.), Shinichiro Sawa (Kumamoto Univ.), Minoru Kubo (NAIST), Akira Yamawo (Kyoto Univ.), Michiko Sasabe (Hirosaki Univ.), Hiroshi Ikeda (Tokyo Univ.)

P074 Pollination mutualism between *Chrysosplenium* ser. *Macrostemon* and *Nipponorhynchus* sawflies: Ecological and evolutionary perspectives

＊Marika Yamaguchi (The University of Tokyo/National Museum of Nature and Science, ESJ), Hideo Takahashi (Independent Researcher), Namiki Kikuchi (Toyohashi Museum of Natural History), Takahiro Yoshida (Ehime University Museum), Noriaki Murakami (Museum of Nature and Human Activities), Yudai Okuyama (The University of Tokyo/National Museum of Nature and Science)

P075 How does floral scent control the pollinator diversity of *Asarum* sect. *Heterotropa*?

＊Anna K Valchanova (Graduate School of Science, University of Tokyo, ESJ), Satoshi Kakishima (Department of Botany, National Museum of Nature and Science/The Mt. Fuji Institute for Nature and Biology, Showa Medical University), Kanako Sekimoto (Graduate School of Nanobioscience, Yokohama City University), Jui-Tse Chang (Department of Life Science, National Taiwan Normal University), Yudai Okuyama (Graduate School of Science, University of Tokyo/Department of Botany, National Museum of Nature and Science)

P076 Factors Determining Partners in *Xiphydria* Woodwasp-Fungus Symbiosis: Fungal Growth is Better on Wasp's Host-Tree Species

＊Ryu Takagi (Graduate School of Bioagricultural Science, Nagoya University, ESJ), Hisashi Kajimura (Graduate School of Bioagricultural Science, Nagoya University)

P077 Isotope enrichment trends of aquatic fish parasites in Lake Biwa

＊Kei Kinoshita (Kyoto Univ. CER/Fukushima Univ., ESJ), Yuji Onishi (RIHN), Ketaro Fukushima (Fukushima Univ.), Keisuke Koba (Kyoto Univ. CER)

P078 The relationship between fruit preference and fruit traits in seed dispersal by crows

＊Shogo Shimada (Niigata Univeresity, ESJ), Shoji Naoe (Forestry and Forest Products Research Institute Tohoku Research Center), Rei Shibata (Niigata Univeresity)

P079 Does the microbial loop link to the grazing food chain in Lake Biwa?: Predation by the Calanoid Copepod *Eodiaptomus japonicus* on protists

＊Madoka Inoue (Center for Ecological Research, Kyoto university), Syuhei Ban (University of Shiga Prefecture)

P080 Ecological Resilience and Species Balance in Mutualistic communities

＊Gohki Kasahara (Tohoku University, ESJ), Yutaka Osada (Tohoku University), Michio Kondoh (Tohoku University)

Yayoi Auditorium Lobby

Fungi and microbes, material cycling

P081 Spatial distributions of *Burmannia championii* and its *association with* arbuscular mycorrhizal *fungi in Cryptomeria japonica plantations*

＊Yuka Onishi (Graduate school of Bioresources, Mie University), Yudai Kitagami (Graduate school of Bioresources, Mie University), Yosuke Matsuda (Graduate school of Bioresources, Mie University)

P082 Resilience of ectomycorrhizal fungal communities in coastal Japanese black pine forests to salt stress

＊Riku Murakami (Tokyo University of Agriculture, ESJ), Takahiko Koizumi (Tokyo University of Agriculture)

P083 Developments of species-specific primers for the detection of endangered *Rhizopogon togasawarius*

＊Hirofumi Shimizu (Faculty of Bioresources, Mie University, ESJ), Keita Henry Okada (Graduate School of Sciences and Technology for Innovation, Yamaguchi University), Yudai Kitagami (Graduate school of Bioresources, Mie University), Masao Murata (Forestry Research and Training Center, Akita prefecture), Kazuhide Nara (Graduate School of Frontier Sciences, Tokyo University), Yosuke Matsuda (Graduate school of Bioresources, Mie University)

P084 Does *Dorcus striatipennis* have different strains of yeast symbionts depending on their habitats?

＊Taiga Hashikawa (The University of Tokyo, ESJ), Gaku Ueki (The University of Tokyo/Shinshu University), Hiroshi Ikeda (The University of Tokyo), Kohei Kubota (The University of Tokyo)

P085 Divergent soil P status and tree nutritional strategies in carbonate rock ecosystems in Japan
＊Rimato Shiba (Kyoto Univ. Forest Ecology, ESJ), Yusuke Onoda (Kyoto Univ. Forest Ecology), Ryota Aoyagi (Kyoto Univ. Forest Ecology/Hakubi center)

P086 Taxonomic study of the genus *Tulasnella* (Fungi, Basidiomycota) in Japan focusing on its teleomorph
＊Kosuke Nagamune (UGSAS, Tottori University, ESJ), Nitaro Maekawa (Faculty of Agriculture, Tottori University), Naoki Endo (Faculty of Agriculture, Tottori University), Akira Nakagiri (Faculty of Agriculture, Tottori University), Dai Nagamatsu (Faculty of Agriculture, Tottori University)

P087 Poplar Root-Microbe Interactions Drive Soil Nutrient Cycling and Micro-Food Web Stability in Degraded Mollisols
＊Jia Yang (Northeast Forestry University, ESC), Hui Yan Gu (Northeast Forestry University)

P088 Dynamics and grazing responses of plant nitrogen use strategies are driven by plant nitrogen demand and resource availability
＊Lin Wu (School of Ecology and Environment, Inner Mongolia University, ESC), Frank Yonghong Li (School of Ecology and Environment, Inner Mongolia University)

P089 Context-Aware Marine Plankton Classification with Multimodal Large Language Model and Retrieval-Augmented Generation Reasoning
＊Jaronchai Dilokkalayakul (Graduate School of Information Sciences, Tohoku University), Akane Kitamura (Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University), Takeshi Obayashi (Graduate School of Information Sciences, Tohoku University/Advanced Institute for Marine Ecosystem Change (WPI-AIMEC), Tohoku University)

P090 Effects of deer-induced understory degradation on soil mesofauna community via changes in soil properties in beech forests: comparison between Kyushu and San-in
＊Erika Kawakami (Kyushu University, ESJ), Takuo Hishi (Fukuoka University), Ayumi Katayama (Kyushu University)

P091 Crushed ALC as a Functional Substrate Material for Green Roofs: A Pilot Study with AMF Inoculation
＊Tsukasa Iwata (Graduate School of Horticulture, Chiba University, ESJ), Kiyoshi Umeki (Graduate School of Horticulture, Chiba University), Terumasa Takahashi (Graduate School of Horticulture, Chiba University), Ryosuke Shimoda (Graduate School of Horticulture, Chiba University)

P092 Slope aspects affect stability of soil respiration to drying-rewetting disturbance in a cool-temperature forest
＊Fangzheng Fu (Okayama University, ESJ), Takuo Hishi (Fukuoka University), Fujio Hyodo (Okayama University)

P093 An effective transfer learning method for automatic fine root extraction using ARATA and fine-root dynamics in a 100-year-old Chamaecyparis obtusa forest.
＊Hinata Yoshida (Nagoya University, ESJ), Ryota Yanase (Nagoya University), Takuto Yamagata (University of Hyogo), Rimpei Yoshie (Nagoya University), Toko Tanikawa (Nagoya University), Mizue Ohashi (University of Hyogo), Hidetoshi Ikeno (The University of Fukuchiyama), Ryota Hayashi (Nagoya University), Yasuhiro Hirano (Nagoya University)

Yayoi Auditorium Lobby

Animal reproduction, behavior

P094 Formation of large oocytes and planulae in *Aurelia coerulea* (Cnidaria, Scyphozoa) as an adaptive strategy to low water temperatures
＊Satauki Takauchi (Graduate School of Marine Biosciences, Kitasato University, ESJ), Hiroshi Miyake (Graduate School of Marine Biosciences, Kitasato University)

P095 Anti-predator defenses of adult weevils: how do they escape predation by frogs?
＊Uran Sumi (School of Agricultural Science Faculty of Agriculture Kobe University, ESJ), Shinji Sugiura (School of Agricultural Science Faculty of Agriculture Kobe University)

P096 The coevolution of mating behavior between male and female driven by sexual conflict in leaf beetles (Chrysomelidae)
＊Hiromu Nakaegawa (The University of Tokyo, ESJ), Hiroshi Ikeda (The University of Tokyo)

P097 What do spines function for diving beetles?—Focused on walking, swimming and flight—
＊Kengo Hide (The University of Tokyo, ESJ), Ryota Morii (The University of Tokyo), Shona Yasuda (The University of Tokyo), Hiroshi Ikeda (The University of Tokyo)

P098 Monogamous Tanganyikan cichlid with biparental offspring use vocal signals to maintain social bonds: novel evidence of fish vocal communications?
＊Ryoichi Inoue (Osaka Metropolitan University, ESJ), Ryo Hidaka (Osaka Metropolitan University), Kento Kawasaka (Niigata University), Shun Satoh (Kyoto University)

P099 Dominant breeders punish idle helpers depending on group size and spatial proximity in a cooperatively breeding cichlid fish: First evidence in non-human animals

＊Ryo Hidaka (Osaka Metropolitan University, ESJ), Ryoichi Inoue (Osaka Metropolitan University), Chisaki Hosoda (Osaka Metropolitan University), Yuto Kitamukai (Osaka Metropolitan University), Satoshi Awata (Osaka Metropolitan University)

P100 Comprehensive evaluation and optimization strategy of ecological resilience on the Qinghai-Tibet Plateau

＊Wenhao Fu (School of Management, Lanzhou University/Data Intelligence Laboratory of Tibetan Plateau Humanistic Environment/Emergency Management Research Center, Lanzhou University), Cuorong Chai (School of Management, Lanzhou University/Data Intelligence Laboratory of Tibetan Plateau Humanistic Environment/Emergency Management Research Center, Lanzhou University), Jiayin Li (School of Management, Lanzhou University/Data Intelligence Laboratory of Tibetan Plateau Humanistic Environment/Emergency Management Research Center, Lanzhou University)

P101 Ejaculation volume is not influenced by female reproductive potential or mating status, but is adjusted according to sperm stock in the Japanese pygmy squid

＊Ryohei Tanabe (School of Science and Technology, Tokai University/Institute of Oceanic Research and Development, Tokai University, ESJ), Yoko Iwata (Atmosphere and Ocean Research Institute, The University of Tokyo), Noriyosi Sato (Department of Fisheries, School of Marine Science and Technology, Tokai University)

P102 Machine learning of individual identification and age-class classification of wild Japanese macaque vocalizations using mel spectrograms

＊Rentaro Kimpara (Kyoto University), Fumiya Kakuta (Kyoto University), Hiroki Koda (The University of Tokyo), Ikki Matsuda (Kyoto University), Goro Hanya (Kyoto University)

P103 Optimizing camera trap sampling designs in rocky montane environments: Comparing fixed vs rotating placement

＊Fatima Chaudhary (Hokkaido University, ESJ), Junko Morimoto (Hokkaido University)

P104 Mapping Suitable Nest-sites for the Tiger Shrike *Lanius tigrinus* Based on Food Availability and Reproductive Success

＊Koki Tateishi (Graduate School of Science and Technology Niigata University, ESJ), Taito Kamata (Faculty of Agriculture Niigata University), Takuhiko Murakami (Faculty of Agriculture Niigata University), Tsuneo Sekijima (Faculty of Agriculture Niigata University)

P105 The effects of spectrally distinct artificial night light on insect development and reproductive traits in urban and rural populations

＊Ryushin Takamoto (Chiba university, ESJ), Yuma Takahashi (Chiba university)

P106 Do specialist and generalist ticks respond differently to host odor?

＊Keita Kouno (Department of Graduate School of Agriculture, Tokyo University of Agriculture and Technology, ESJ), Kandai Doi (Department of Wildlife Biology, Forestry and Forest Products Research Institute), Satoshi Koyama (Department of Graduate School of Agriculture, Tokyo University of Agriculture and Technology), Toshiyuki Satoh (Department of Graduate School of Agriculture, Tokyo University of Agriculture and Technology)

Poster without Award Entry
Poster core time July 21, Mon 15:45-17:15

Yayoi Auditorium Lobby

Evolution, mathematical ecology, animal population, life history of animals

P107 Molecular mechanisms underlying diversification of thermal tolerance during embryonic and larval development in sticklebacks

＊Mayu Fukuda (The University of Tokyo, ESJ), Asano Ishikawa (The University of Tokyo)

P108 Resolving the Phylogeographic Inconsistencies among *Onychodactylus* Species in Northeast Asia

＊Hahyun Nam (Interdisciplinary Program in Earth Environmental System Science & Engineering, Kangwon National University, ESK), Min-Woo Park (Interdisciplinary Program in Earth Environmental System Science & Engineering, Kangwon National University), Natsuhiko Yoshikawa (Department of Zoology, National Museum of Nature and Science), Amaël Borzée (Laboratory of Animal Behavior and Conservation, College of Biology and the Environment, Nanjing Forestry University), Jongsun Kim (Department of Science Education, Kangwon National University), Jaejin Park (Department of Science Education, Kangwon National University), Daesik Park (Interdisciplinary Program in Earth Environmental System Science & Engineering, Kangwon National University/Department of Science Education, Kangwon National University)

P109 Evolutionary developmental factors of the exaggerated genital morphology in the *Ohomoputerus* ground beetles

＊Chinami Furumoto (Kobe Univercity, ESJ), Yasuoki Takami (Kobe Univercity), Karen Terada (Kobe Univercity/ Sumiyoshi Junior high school)

P110 A study on the migratory status of Warbler complex in the Republic of Korea using genetic analysis

＊Yun-Sun Lee (Migratory Birds Center, National Institute of Biological Resources, ESK), Eujin Cheong (Migratory Birds Center, National Institute of Biological Resources), Hyun-Ah Lee (Migratory Birds Center, National Institute of Biological Resources), Jae-Woong Hwang (Migratory Birds Center, National Institute of Biological Resources), Wha-Jung Kim (Migratory Birds Center, National Institute of Biological Resources), Chang-Wan Kang (The Korean Association for Bird Protection Jeju), Eun-Hee Jrong (The Korean Association for Bird Protection Jeju), Hee-Man Kang (Jeju Wildlife Research Center), Eun-Mi Kim (Jeju Nature Park), Wee-Haeng Hur (Research Institute of Agriculture and Life Science, Seoul National University), Dong-Won Kim (Migratory Birds Center, National Institute of Biological Resources)

P111 Genetic analysis of the Eastern Buzzard *Buteo japonicus* wintering in the Republic of Korea

＊Eujin Cheong (Migratory Birds Center, National Institute of Biological Resources, ESK), Seung-Gu Kang (Research Center for Endangered Species, National Institute of Ecology), Hyun-Ah Lee (Migratory Birds Center, National Institute of Biological Resources), Yun-Sun Lee (Migratory Birds Center, National Institute of Biological Resources), Dong-Won Kim (Migratory Birds Center, National Institute of Biological Resources)

P112 Quantifying Migratory Connectivity and Spatial Clustering of the Rook *Corvus frugilegus* Using Tracking Data

＊Yu-Seong Choi (National Migratory Birds Center, National Institute of Biological Resources, ESK), Ji-Yeon Lee (National Migratory Birds Center, National Institute of Biological Resources), Mi-Rae Oh (National Migratory Birds Center, National Institute of Biological Resources), Han-I Choi (National Migratory Birds Center, National Institute of Biological Resources), Jin-Hee Yi (Wildlife Ecological Conservation Institute), In-Ki Kwon (Bird Research SaeZiP), Wee-Haeng Hur (Research Institute of Agriculture and Life Science, Seoul National University), Hyun-Ah Lee (National Migratory Birds Center, National Institute of Biological Resources), So-Hyeon Yoo (National Migratory Birds Center, National Institute of Biological Resources), Hyung-Kyu Nam (National Migratory Birds Center, National Institute of Biological Resources), Dong-Won Kim (National Migratory Birds Center, National Institute of Biological Resources)

P113 The study for different feed on the growth performance of larval *Andrias davidianus*

＊Lijian Ouyang (Guizhou University of Engineering Science, ESC)

P114 Temperature modulates the ontogenetic effects of microplastics on amphibian life history.

＊Jun-Kyu Park (Kongju National University, ESK), Woong-Bae Park (Kongju National University), Ji-Eun Lee (Kongju National University), Jun-Sung Kim (Kongju National University), Yuno Do (Kongju National University)

P115 Effects of Group Size and Habitat Disturbance on Intestinal Parasite Load in Free-ranging Proboscis Monkeys

＊Muhammad Nur Fitri-Suhaimi (Wildlife Research Center, Kyoto University, ESJ), Liesbeth Frias (Department of Infectious Diseases and Public Health, City University of Hong Kong), Elke Zimmermann (Institute of Zoology, University of Veterinary Medicine Hannover), Primus Lambut (Sabah Wildlife Department), Joseph Tangah (Sabah Forestry Department, Forest Research Center), Henry Bernard (Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah), Vijay Kumar (Biotechnology Research Institute, Universiti Malaysia Sabah), Ikki Matsuda (Wildlife Research Center, Kyoto University/Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah/Chubu Institute for Advanced Studies, Chubu University)

P116 Roadkill of Terrestrial Vertebrates in the Northern part of Okinawajima Island: Ecological Insights from a Year-Round Survey

＊Yusuke Maruta (Graduate School of Agriculture, University of the Ryukyus, ESJ), Kaori Tsurui-Sato (Faculty of Agriculture, University of the Ryukyus/The United Graduate School of Agricultural Sciences, Kagoshima University), Hiroyuki Shimoji (Faculty of Agriculture, University of the Ryukyus/The United Graduate School of Agricultural Sciences, Kagoshima University), Kazuki Tsuji (Faculty of Agriculture, University of the Ryukyus/The United Graduate School of Agricultural Sciences, Kagoshima University)

P117 Comparison of Population Density and Dynamics of Eurasian Otters (*Lutra lutra*) between Urban and Rural Areas Using a non-invasive Spatially Explicit Capture-Recapture Model

＊Boyoung Lee (Department of Animal Science and Biotechnology, Kyungpook National University, ESK), Jooseong kim (Department of Animal Science and Biotechnology, Kyungpook National University), Seunghyeok Kang (Department of Animal Science and Biotechnology, Kyungpook National University), Oliwia Uche-Eze (Department of Animal Science and Biotechnology, Kyungpook National University/Cardiff University), Chaeho Noe (Department of Animal Science and Biotechnology, Kyungpook National University), Sungwon Hong (Department of Animal Science and Biotechnology, Kyungpook National University)

P118 Evaluating nymphal behavior of *Riptortus pedestris* (Hemiptera: Alydidae) to balance symbiont acquisition and predation avoidance using an individual-based model

＊Jung-Wook Kho (Department of Life Sciences, Gachon University), Joo-Young Kim (Department of Life Sciences, Gachon University), Doo-Hyung Lee (Department of Life Sciences, Gachon University)

P119 Morphological Feminization of Hermit Crab Hosts Induced by Rhizocephalan Parasites

＊Asami Kajimoto (Kanagawa University, ESJ), Aiko Iwasaki (Tohoku University), Tsuyoshi Ohira (Kanagawa University), Kenji Toyota (Kanagawa University/Tokyo University of Science/Hiroshima University)

P120 Impacts of Grazing Intensity on Soil Carbon and Nitrogen Storage in Grasslands of Gannan

＊Meiling Zhang (Gansu Agricultural University), Qiaonan Wang (Gansu Agricultural University), Yarui Zhan (Gansu Agricultural University)

P121 Discrete time population dynamics model for exploitative competition between native and alien predators

＊Akshat Goyal (Tohoku University)

Yayoi Auditorium Annex

Landscape ecology, biodiversity, conservation, education and popularization of ecology

P122 Climate warming-driven expansion and retreat of novel ecosystems-alpine scree in the Third Pole over the past 45 years

＊Guanshi Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences), Lingxiao Ying (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences), Yu Zhao (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

P123 Plant functional groups modulate the effects of landscape diversity on natural predators

＊Zhi Wen (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Hua Zheng (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

P124 Characterization and potential use of citizen science-derived biodiversity data from ten Nature Sanctuaries.

＊Shoma Jingu (Department of Forest Management, Forestry and Forest Products Research Institute, Forest Research and Management Organization, ESJ), Yui Ogawa (Graduate School of Science and Technology, University of Tsukuba)

P125 The spatial pattern of butterfly diversity and its impact factors in Beijing urban green spaces

＊Zhimin Su (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

P126 Construction and optimization of urban ecological network based on bird friendly perspective: a case study of Hefei

＊Dexian Zhao (Anhui Agricultural University, ESC), Yuxin Ding (Anhui Agricultural University), Qian Ma (Anhui Agricultural University)

P127 Traditional management practices sustaining plant species diversity in thatch-producing grasslands in central Japan

＊Hideyuki Ida (Shinshu University, ESJ)

P128 Estimation of conservation importance of tidal flats under different environmental contexts using endangered fish species

＊Ryuya Sakamoto (University of Miyazaki, ESJ), Mika Mukai (Tanabe Kankyo Kougaku Co., Ltd), Atsunobu Murase (University of Miyazaki)

P129 The Current Status and Trends of Natural Capital Accounting in China

＊Chaoqiong Li (State Key Laboratory of Regional and Urban Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Chunquan Zhu (World Economic Forum Beijing Representative Office), Zhiyun Ouyang (State Key Laboratory of Regional and Urban Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

P130 Impact of Global Warming on Lake Biwa Fish: Identifying Climate-Sensitive Species

＊Qianqian Wu (Kobe University, ESJ), Jinxin Zhou (Tokyo University), Yuan Yao (Hokkaido University), Toshiyuki Ishikawa (Shiga University), Daisuke Kitazawa (Tokyo University), Toshifumi Minamoto (Kobe University)

P131 Impact of rainfall on water quality and plankton in the river and lake supplied by reclaimed water

＊Yufen Ren (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

P132 eDNA from Rainfall Runoff Can Provide More Biodiversity Information Than We Anticipate.

＊Keonhee Kim (Konkuk University Human and Ecocare center, ESK), Junghwan Park (PJ Factory Co.)

P133 Trends in Cephalopod Consumption and Ocean Conditions at the Time of Stranding in Risso's Dolphins (*Grampus griseus*) along the Japanese Coast.

＊Makiko Ishikawa (Yamazaki University of Animal Health Technology/Graduate School of Science, The University of Tokyo, ESJ), Ayaka T. Matsuda (Faculty of Fisheries Sciences, Hokkaido University/Stranding Network Hokkaido), Kouhei Iizumi (Yamazaki University of Animal Health Technology), Gaiya Iida (Yamazaki University of Animal Health Technology), Seiya Sato (Yamazaki University of Animal Health Technology), Yuki Otsuka (Yamazaki University of Animal Health Technology), Mizuki Sudo (Yamazaki University of Animal Health Technology), Tsunemi Kubodera (National Museum of Nature and Science), Yuko Tajima (National Museum of Nature and Science)

P134 Validation of acoustic imaging sonar for monitoring submerged aquatic vegetation in small agricultural reservoirs

＊Seong Min Lee (Kunsan National University, ESK), Ji Yoon Kim (Kunsan National University)

P135 Environmental DNA Analysis to Assess Species and Genetic Diversity of Dominant Trees in Riverine Forests

＊Rina Horie (Tohoku University, ESJ), Kodai Hamatsu (Tohoku University), Naoko Ishikawa (Tohoku University), Daiki Takahashi (Kyushu University), Yoshihisa Suyama (Tohoku University)

P136 Assessment of Urban OECM Candidate Sites Using a Biotope Map: A Case Study of Suwon City

＊Sae Mi Lee (Seoul National University, Graduate School of Environmental Studies, ESK)

P137 Taxonomy and Evolutionary Study of Spider-Pathogenic Fungi

＊Mingjun Chen (Anhui Agricultrual University, ESC)

P138 Prioritizing Conservation Areas for the Endangered Long-tailed Goral (*Naemorhedus caudatus*) in South Korea

＊Soyeon Park (Ewha Womans University, ESK), Sangdon Lee (Ewha Womans University)

P139 Monitoring distribution and height of coastal plant communities in the Janghang Songlim wetland using UAV-based LiDAR data

＊Dong Wan Hong (Department of Biological Science, Kunsan National University, ESK), Ji Yoon Kim (Department of Biological Science, Kunsan National University)

P140 Phylogeographic structure of *Podocarpus macrophyllus* in Japan revealed by genome-wide SNPs

＊Wenhan Zhai (Tohoku University, ESJ), Kaho Kumagai (Tohoku University), Daiki Takahashi (Kyusyu University), Yoshihisa Suyama (Tohoku University)

P141 Dispersal and Management of *Coreopsis lanceolata* : Controlling Its Sexual and Asexual Reproduction

＊Eunhee Cho (Dankook University, ESK), Yeongeun Yoon (Dankook University), Minhyo Seo (Dankook University), Deokjoo Son (Dankook University)

P142 Aesthetic ecosystem services of old-growth grassland: Diverse preferences for wildflowers among people

＊Mahoro Tomitaka (Sugadaira Research Station, Mountain Science Center, University of Tsukuba, ESJ), Taiki Inoue (Sunlit Seedlings Ltd.), Gaku S Hirayama (Kobe University), Atushi Ushimaru (Kobe University), Hiroshi S Ishii (University of Toyama), Takehiro Sasaki (Yokohama National University), Tanaka Kenta (Sugadaira Research Station, Mountain Science Center, University of Tsukuba)

P143 Quantifying the effects of land use on wetland biodiversity with consideration of the groundwater cycle

＊Yuna Hirano (National Institute for Environmental Studies, ESJ), Noe Matsushima (National Institute for Environmental Studies), Natsuko I Kondo (National Institute for Environmental Studies), Hiroki Kato (National Institute for Environmental Studies), Hiroshi C Ito (National Institute for Environmental Studies), Jun Nishihiro (National Institute for Environmental Studies)

P144 Withdrawn

P145 Withdrawn

P146 Novel attempt to assess marine mammal dynamics over the past 100 years using sedimentary DNA: An example in finless porpoise

＊Narumi Tsugeki (Matsuyama University, ESJ), Kai Nakane (Ehime University), Hideyuki Doi (Kyoto University), Mari Ochiai (Ehime University/Azabu University), Tomohiko Isobe (National Institute for Environmental Studies), Tatsuya Kunisue (Ehime University), Michinobu Kuwae (Ehime University)

P147 Snapshot Japan: a nationwide camera trap monitoring project in Japan

＊Kana Terayama (National Institute for Environmental Studies, ESJ), Keita Fukasawa (National Institute for Environmental Studies), Yoshihiro Nakashima (Nihon University), Takahiro Morosawa (Tokyo University of Agriculture and Technology)

P148 The novel identification method of the hybrid using environmental DNA

＊Masayuki K. Sakata (Hokkaido University, ESJ), Nanako Yano (Kobe University), Akio Imamura (Hokkaido University of Education), Hiroki Yamanaka (Ryukoku University), Toshifumi Minamoto (Kobe University)

P149 Enhancing Carbon Sequestration Efficiency by Coupling *Halophila beccarii* with Carbon-Based Materials

＊Henan Li (Guangxi Academy of Marine Sciences, Guangxi Mangrove Research Center, ESC), Guanglong Qiu (Guangxi Academy of Marine Sciences, Guangxi Mangrove Research Center)

P150 Assessing Habitat Prediction for Clithon retropictus in South Korea and Japan Using the MaxEnt Model

＊Jiyoung Choi (Research Institute of Agriculture and Sciences, Seoul National University, ESK)

P151 Integrating decision-making preferences into ecosystem service conservation area identification: A case study of water-related ecosystem services in the Dawen River watershed, China

＊Ying Hou (State Key Laboratory of Regional and Urban Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Kai Li (College of Landscape Architecture, Sichuan Agricultural University/ Department of Geoscience and Natural Resource Management, Faculty of Science, University of Copenhagen), Qi Fu (School of Politics and Public Administration, Soochow University), Mark Taylor Randall (Department of Geoscience and Natural Resource Management, Faculty of Science, University of Copenhagen), Peter Stubkjær Andersen (Department of Geoscience and Natural Resource Management, Faculty of Science, University of Copenhagen), Mingkun Qiu (School of Geographical Sciences, South China Normal University), Hans Skov-Petersen (Department of Geoscience and Natural Resource Management, Faculty of Science, University of Copenhagen)

P152 Evaluating the Effectiveness of Management Plans for Protected Areas: A Case Study of Lake Tofutsu Ramsar Site, Hokkaido, Japan

＊Suguru Hirahara (Tokyo University of Agriculture and Technology)

P153 Long-term organic mulching enhances the stability of soil organic carbon in Phyllostachys praecox

＊Zhuangzhuang Qian (Anhui Agricultural University, ESC), Yichen Zhang (Anhui Agricultural University)

P154 Withdrawn

P155 Individual and interactive effects of N and P additions on leaf P fractions in evergreen forests of China

＊Wenxuan Han (China Agricultural University, ESC), Qingquan Meng (China Agricultural University), Zhijuan Shi (China Agricultural University), Zhengbing Yan (Institute of Botany, Chinese Academy of Sciences), Yan Luo (Xinjiang University), Hans Lambers (The University of Western Australia)

P156 Boosting biodiversity monitoring using smartphone-driven, rapidly accumulating community-sourced data

＊Keisuke Atsumi (Biome Inc./Kyoto Sangyo University, ESJ), Yuusuke Nishida (Biome Inc.), Masayuki Ushio (Department of Ocean Science, The Hong Kong University of Science and Technology), Hirotaka Nishi (Toyohashi Museum of Natural History), Takanori Genroku (Biome Inc.), Shogoro Fujiki (Biome Inc.)

P157 Assess the Threatened Risks of Provincially Significant Wetlands by IUCN Red List of Ecosystems—A Case Study of Jiangsu, China

＊Ying Kong (Seoul National University, ESK), Youngkeun Song (Seoul National University)

P158 Preferences and Perceptions of Ecosystem Services and Disservices in Urban Green Spaces of Ulaanbaatar, Mongolia

＊Oyuntselmeg Enkhbat (Department of Sustainable Energy and Environmental Engineering, Graduate School of Engineering, Osaka University, ESJ), Takashi Machimura (Department of Sustainable Energy and Environmental Engineering, Graduate School of Engineering, Osaka University)

P159 Imbalance in lakes variability but not embodying in driving factors on the Qinghai-Tibetan Plateau calls on heterogeneous lake management

＊Xuejing Leng (Jiangsu Key Laboratory of Soil and Water Processes in Watershed, College of Geography and Remote Sensing, Hohai University, ESC), Xiaoming Feng (State Key Laboratory for Ecological Security of Regions and Cities, Research Center for Eco-Environmental Sciences Chinese Academy of Sciences), Mayra Yeerken (Jiangsu Key Laboratory of Soil and Water Processes in Watershed, College of Geography and Remote Sensing, Hohai University), Xin Wang (Jiangsu Key Laboratory of Soil and Water Processes in Watershed, College of Geography and Remote Sensing, Hohai University), Jiarui Wang (Jiangsu Key Laboratory of Soil and Water Processes in Watershed, College of Geography and Remote Sensing, Hohai University), Zhenghao Liu (Jiangsu Key Laboratory of Soil and Water Processes in Watershed, College of Geography and Remote Sensing, Hohai University), Bojie Fu (State Key Laboratory for Ecological Security of Regions and Cities, Research Center for Eco-Environmental Sciences Chinese Academy of Sciences)

P160 Mapping Soil Carbon Stocks in Forests with Complex Terrain Combining Efficiency-Oriented Multipoint Surveys and Machine Learning

＊Hiromasa Nakajima (The University of Tokyo, Graduate School of Agricultural and Life Sciences), Shoji Hashimoto (The University of Tokyo, Graduate School of Agricultural and Life Sciences/Forestry and Forest Products Research Institute), Naoyuki Yamashita (Forestry and Forest Products Research Institute), Akihiro Imaya (Forestry and Forest Products Research Institute), Hiroyuki Muraoka (The University of Tokyo, Graduate School of Agricultural and Life Sciences), Masaya Masumori (The University of Tokyo, Graduate School of Agricultural and Life Sciences)

P161 Restoration of Aquatic Biodiversity Using Ecosystem-Enhancing Wavelength-Specific LED Light Irradiation

＊Aimin Hao (Wenzhou University), Yasushi Iseri (Wenzhou University), Renhui Li (Wenzhou University), Xin Liu (Wenzhou University/Guangxi Academy of Marine Sciences), Tomokazu Haraguchi (Saga University), Koji Asai (Yamaguchi University), Tetsuya Oishi (Civil Engineering Research Institute for Cold Region), Shunsuke Watanabe (Akita Prefectural University), Takahiro Kuba (Kyushu University), Min Zhao (Wenzhou University)

P162 Variation in Microbial Communities Across Reforested and Afforested Mangroves in Arid United Arab Emirates Driven by Forest Age, Physicochemical Properties, and Tidal Gradient

＊Alsayeda Zahra Salman (Kyoto University, ESJ), Henda Mahmoudi (International Center for Biosaline Agriculture), Shunsuke Matsuoka (Kyoto University), Tadashi Ookami (Kyoto University), Hojeong Kang (Yonsei University), Ryunosuke Tateno (Kyoto University)

P163 The Impact of the Rapid Increase in National Nature Parks on Local Vegetation

＊Xiaoying Lu (Graduate School of Environmental Studies, Nagoya University, ESJ), Takafumi Miyasaka (Graduate School of Environmental Studies, Nagoya University), Hao Qu (Urat Desert-grassland Research Station, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences)

P164 Assessing the alien species invasions and their ecological and socio-economic drivers in Japan

＊Risa S Naito (The University of Tokyo, ESJ), Masahiro Aiba (The University of Tokyo), Mifuyu Ogawa (The University of Tokyo), Takehito Yoshida (The University of Tokyo)

P165 Comparing native and non-native species with interstage flow and reproductive-value flow matrices

＊Hiroyuki Yokomizo (National Institute for Environmental Studies, ESJ), John G. Lambrinos (Oregon State University), Keiichi Fukaya (National Institute for Environmental Studies), Takenori Takada (Hokkaido University)

P166 Expansion of the distribution range of glyphosate-resistant *Amaranthus palmeri* in Japanese ports

＊Ayako Shimono (Toho University/Institute for Plant Protection, NARO, ESJ), Naoki Chida (Toho University), Motoaki Asai (Institute for Plant Protection, NARO)

P167 “Namul,” Traditional Wild Eadible Plants: Bridging Ecological Knowledge between Parents and Children

＊Eunjeong Ju (Seoul Naitional University of Education, ESK)

Yayoi Auditorium Annex

Plant ecology, succession and regeneration

P168 Sika deer feeding damage and the effect of deer-proof fences in the wetlands of the Kujyu district, Aso Kujyu National Park

＊Kumiko Okubo (Faculty of Agriculture, Shinshu Uni., ESJ)

P169 Effect of Ligularia sagitta Expansion on Alpine Meadow Vegetation and Soil in the Qinghai-Tibet Plateau

＊Juan Qi (Key Laboratory of Grassland Ecosystem of Ministry of Education, College of Grassland Science, Gansu Agricultural University, ESC), Aolong Zhang (Key Laboratory of Grassland Ecosystem of Ministry of Education, College of Grassland Science, Gansu Agricultural University), Xin Lu (Key Laboratory of Grassland Ecosystem of Ministry of Education, College of Grassland Science, Gansu Agricultural University)

P170 Urbanization and spatial aggregation impair multifunctionality in urban vacant lots

＊Yuki Iwachido (Yokohama National University, ESJ), Himari Katsuhara (Yokohama National University), Kaho Maehar (Yokohama National University), Mahoro Tomitaka (MSC, University of Tsukuba), Kensuke Seto (Yokohama National University), Masayuki Ushio (The Hong Kong University of Science and Technology), Maiko Kagami (Yokohama National University), Takehiro Sasaki (Yokohama National University)

P171 Identifying the distribution of giant panda staple food bamboo by integrating multi-source remote sensing data and deep learning techniques

＊Zhiqiang Guo (Research Center for Eco-Environment Sciences, Chinese Academy of Science, ESC), Weihua Xu (Research Center for Eco-Environment Sciences, Chinese Academy of Science)

P172 Classification of Aquatic Vegetation Cover Using Sentinel-2 Satellite Imagery

＊Jonghun Kim (Kunsan National University, Deapartment of Biological Science, ESK), Ji Yoon Kim (Kunsan National University, Deapartment of Biological Science)

Yayoi Auditorium Lobby

Plant ecology, succession and regeneration

P173 Phylogeographic analysis of *Phellodendron amurense* in Japan based on simple sequence repeat markers and chloroplast DNA sequences

＊Michiko Inanaga (Forest Tree Breeding Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization, ESJ), Eitaro Fukatsu (Forest Tree Breeding Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization), Tomonori Hirao (Forest Tree Breeding Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization), Yuichiro Oribe (Forest Tree Breeding Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization), Naoki Takata (Forest Bio-Research Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization), Ryosuke Sato (Forest Bio-Research Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization), Keiya Isoda (Forest Tree Breeding Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization)

P174 Discrimination of *Bidens pilosa* var. *pilosa* provenances within a single city

＊Hitomi S. Kikkawa (National Research Institute of Police Science, ESJ), Koichiro Tsuge (National Research Institute of Police Science)

P175 Microhabitat analysis on the Genus *Racomitrium* from East Asia

＊Eunhwa Yoo (Semyung University, ESK), Kyounghoon Kim (Semyung University), Jeeeun Koo (Semyung University), Shin-Ho Kang (Semyung University)

P176 Phylogeography of Four Conifer Species With Different Elevational Distributions Reveal Partial Quaternary Origins of Extant Lineages

＊Yuka Iwai (University of Tsukuba, ESJ), Kentaro Uchiyama (Forestry and Forest Products Research Institute), James R.P Worth (Forestry and Forest Products Research Institute), Takaki Aihara (University of Tsukuba), Yoshihiko Tsumura (University of Tsukuba)

P177 Genetic differentiation in the timing of budburst along altitude and its causal factors in *Fagus crenata* populations

＊Kiyoshi Ishida (Hirosaki University, ESJ), Yuki Kondo (Hirosaki University), Mizuho Orui (Tohoku regional Forest Office), Saki Sugimoto (Tohoku regional Forest Office)

P178 Ecological Traits and Plant Growth-Promoting Activities of Endophytic fungi Isolated from *Cymbidium macrorhizon*

＊Jeong Sook Hwang (Department of Biology, Kyungpook National University/Department of Research, Nature and People Co. Ltd., ESK), Jong Hyun Kim (Department of Research, Nature and People Co. Ltd.), Hye Jung Bang (Department of Research, Nature and People Co. Ltd.), Yeon Sik Choo (Department of Biology, Kyungpook National University)

P179 Hidden Forces: Non-Adaptive Urban Evolution in White Clover Phenotypic Clines

＊Yoshinori Miyake (Tokyo Metoropolitan University, ESJ), Yuya Fukano (Chiba University), Koichiro Tamura (Tokyo Metoropolitan University), Yuuya Tachiki (Tokyo Metoropolitan University)

P180 Comparison of root growth costs among rice species in natural habitats with different soil oxygen conditions

＊Motoka Nakamura (Tamagawa University, ESJ), Motoka Nakamura (Tamagawa University)

P181 Black locust developed different water use strategies to acclimatize to semiarid and sub-humid sites in the Loess Plateau, China

＊Sheng Du (Institute of Soil and Water Conservation, Northwest A&F University/Institute of Soil and Water Conservation, Chinese Academy of Sciences and Ministry of Water Resources, ESC), Jinlin Lyu (Institute of Soil and Water Conservation, Northwest A&F University/Institute of Soil and Water Conservation, Chinese Academy of Sciences and Ministry of Water Resources), Mei-Jun Liu (Institute of Soil and Water Conservation, Northwest A&F University/Institute of Soil and Water Conservation, Chinese Academy of Sciences and Ministry of Water Resources), Guoqing Li (Institute of Soil and Water Conservation, Northwest A&F University/Institute of Soil and Water Conservation, Chinese Academy of Sciences and Ministry of Water Resources)

P182 Divergent responses of root traits of nitrogen-fixing and non-nitrogen fixing seedlings to phosphorus addition in southern China

＊Qifeng Mo (South China Agricultural University, ESC)

P183 Nitrogen addition alleviates water loss of Moso bamboo (*Phyllostachys edulis*) under drought by affecting light-induced stomatal responses

＊Xi-pin Wu (Northwest University/International Centre for Bamboo and Rattan, ESC), Xiaomin Gao (International Centre for Bamboo and Rattan/Chinese Academy of Forestry), Ruichang Zhang (Northwest University), Junwei Luan (International Centre for Bamboo and Rattan), Yi Wang (International Centre for Bamboo and Rattan), Shirong Liu (Chinese Academy of Forestry)

P184 Floral trait variation in *Oxalis corniculata* along an urbanization gradient: Shifts in herkogamy without genetic divergence

＊Yusuke Hoshino (Botanical Gardens, Tohoku University, ESJ), Sachiko Horie (Botanical Gardens, Tohoku University), Shoki Murakami (Makino Herbarium, Tokyo Metropolitan University), Ikumi Dohzono (Department of Environmental Sciences, Tokyo Gakugei University), Masayuki Maki (Botanical Gardens, Tohoku University)

P185 Differentiated impacts of light intensity and soil properties on rhizobial and rhizosphere bacterial communities associated with *Sophora davidii* during forest succession

＊Ying Cao (Northwest University, ESC), Ming Yue (Northwest University)

P186 Carbon Emission Reduction and Benefit Analysis of Comprehensive Utilization of Crop Straw in Karst Areas: A Case Study of Guizhou Province

＊Haifeng Nie (College of Ecological Engineering, Guizhou University of Engineering Science)

Yayoi Auditorium Lobby

Animal-plant interaction, animal community

P187 Effect of Early Waterlogging on Aquatic Oligochaete Density and Weed Abundance in the Setouchi District

＊Satoshi Kaneda (Western Region Agricultural Research Center, NARO/Western Region Agricultural Research Center, NARO, ESJ), Hidekazu Kobayashi (Western Region Agricultural Research Center, NARO), Shunsuke Okada (Western Region Agricultural Research Center, NARO)

P188 Nectar Sugar Enhancement in Response to Bee Buzzing in *Rhododendron* x *pulchrum*: Sound-sensing Organs and Sensitivity Range

＊Kokomi Seike (Hyogo Prefectural Kobe High School), Atsushi Tani (Graduate School of Human Development and Environment, Kobe University/Molecular Photoscience Research Center, Kobe University), Gaku S. Hirayama (Graduate School of Human Development and Environment, Kobe University), Atushi Ushimaru (Graduate School of Human Development and Environment, Kobe University)

P189 Possible Pollinator Attraction by Long-chain Hydrocarbonsin Floral Volatiles of *Asimitellaria* Species.

＊Naoko Okui (Department of Biological Sciences, Graduated School of Science, The University of Tokyo, ESJ), Yudai Okuyama (National Museum of Nature and Science Tsukuba Botanical Garden)

P190 Community in the gall: torophic and non-trophic interactions with gall midges

＊Honoka Nagashima (Kobe University, ESJ), Ayman Khamis Elsayed (Saga University), Makoto Tokuda (Saga University), Kaoru Tsuji (Kobe University)

P191 Do spider webs help plants?—Herbivore-mediated indirect effect of spider webs on plants—

＊Sho Mishima (Faculty of Agriculture and Life Science, Hirosaki University, ESJ), Mito Ikemoto (Faculty of Agriculture and Life Science, Hirosaki University/The National Institute for Environmental Studies), Kanta Yokogawa (Faculty of Agriculture and Life Science, Hirosaki University), Koya Hashimoto (Faculty of Agriculture and Life Science, Hirosaki University/The National Institute for Environmental Studies)

P192 Tracking climate impacts on Kuroshio marine fish communities using environmental DNA

＊Jiwei Yang (WPI-AIMEC, Tohoku University, ESJ), Michio Kondoh (WPI-AIMEC, Tohoku University)

Yayoi Auditorium Lobby

Fungi and microbes, material cycling

P193 Community structures of ammonia-oxidizing archaea associated with fine roots of old growth *Cryptomeria japonica* in a pristine forest

＊Yosuke Matsuda (Mie University, ESJ), Raku Oue (Mie University), Yudai Kitagami (Mie University)

P195 Climate change escalates the prevalence of antibiotic resistance genes in Salmonella globally

＊Zhen-Chao Zhou (State Key Laboratory of Regional and Urban Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

P196 Deer carcasses enhance the decomposition by soil microbial communities in evergreen forests

＊Atsushi Takaki (Graduate School of Environmental Sciences, Hokkaido University, ESJ), Chisato Terada (Faculty of Humanities and Human Sciences, Hokkaido University), Masahiro Nakamura (Tomakomai Experimental Forest, Field Science Center for Northern Biosphere, Hokkaido University)

P197 Microbial community responses to non-additive effects in mixed-species litter decomposition

＊Takeaki Yonezu (Graduate School of Bioagricultural Sciences, Nagoya University, ESJ), Kozue Sawada (Graduate School of Bioagricultural Sciences, Nagoya University), jun Murase (Graduate School of Bioagricultural Sciences, Nagoya University), Kanaho Masegi (Graduate School of Bioagricultural Sciences, Nagoya University), Yosuke Matsuda (Graduate School of Bioresources, Mie University/Graduate School of Environmental Studies, Nagoya University), Yasuhiro Hirano (Graduate School of Environmental Studies, Nagoya University), Nagamitsu Maie (Kitasato University School of Veterinary Medicine), Toko Tanikawa (Graduate School of Bioagricultural Sciences, Nagoya University)

P198 Interspecific comparison of substrate mineralization in incubation experiments using artificial soil

＊Kanade Fujiwara (Tohoku University Graduate School of Agriculture, ESJ), Tomoyuki Makino (Tohoku University Graduate School of Agriculture), Toru Hamamoto (Tohoku University Graduate School of Agriculture)

P199 Effects of long-term removal of understory vegetation on litter decomposition : the role of soil fauna in *Quercus crispula* and *Larix kaempferi* forests

＊Tsutomu Enoki (Kyushu University, ESJ), Takuo Hishi (Fukuoka University)

P200 Effects of litter inputs on N2O emissions from a tropical rainforest in southwest China

＊Yiping Zhang (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, ESC), Jinbo Gao (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences), Wenjun Zhou (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences)

P201 A resin-based approach for $\delta^{15}N$ and $\delta^{18}O$ analysis of nitrite in low-nitrite freshwater systems

＊Mengqi Jiang (Center for Ecological Research, Kyoto University, ESJ), Keisuke Koba (Center for Ecological Research, Kyoto University)

P202 Maximized microbial protein production with hydrogen oxidizing bacteria for simultaneous CO2 fixation and Nr recovery

＊Wen Wang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Yongguan Zhu (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

P203 Role of Contour-Felled Logs as a Post-Thinning Treatment on Organic Matter Decomposition in a Cypress Plantation.

＊Kalolaine Kata (Kyushu University), Takuo Hishi (Fukuoka University), Ayumi Katayama (Kyushu University)

P204 Carbon sequestration potential and effects on nitrogen dynamics of biochar applied to forest soils

＊Hiroki Mitsumori (Waseda University, ESJ), Tomoki Tarumi (Waseda University), Mitsutoshi Tomotsune (Tamagawa University), Shinpei Yoshitake (Waseda University)

P205 Soil sulfur accumulation under the influence of domestic and transboundary air pollution

＊Ayumi Shiode (Nagoya University), Hiroyuki Sase (Asia Center for Air Pollution Research), Michiru Yamashita (Hyogo Prefectural Institute of Technology), Masayuki Morohashi (Asia Center for Air Pollution Research), Hiroki Yotsuyanagi (Asia Center for Air Pollution Research/Niigata Prefectural Government), Akifumi Sugiyama (Kyoto University), Shiho Yabusaki (Research Institute for Humanity and Nature), Akihiro Imaya (Forestry and Forest Products Research Institute), Toko Tanikawa (Nagoya University)

P206 Phosphorus fertility regulates microbial carbon use efficiency and SOM decomposition in non-allophanic Andosols.

＊Wako Koizumi (Graduate School of Agricultural Science, Tohoku University, ESJ), Timothy J Clough (Faculty of Agriculture and Life Sciences, Lincoln University), Soichi Kojima (Graduate School of Agricultural Science, Tohoku University), Tomoyuki Makino (Graduate School of Agricultural Science, Tohoku University), Soh Sugihara (Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology), Ryosuke Tajima (Graduate School of Agricultural Science, Tohoku University), Yoshitaka Uchida (Research Faculty of Agriculture, Hokkaido University), Toru Hamamoto (Graduate School of Agricultural Science, Tohoku University)

Yayoi Auditorium Lobby

Animal reproduction, behavior

P207 Medaka begin courtship and spawning behavior from midnight: behavioral observations in natural and semi-natural environments

＊Yuki Kondo (Laboratory of Animal Sociology, Department of Biology, Graduate School of Science, Osaka Metropolitan University, ESJ), Kotori Okamoto (Laboratory of Animal Sociology, Department of Biology and Geosciences, Graduate School of Science, Osaka City University), Ryotaro Kobayashi (Laboratory of Animal Sociology, Department of Biology, Graduate School of Science, Osaka Metropolitan University), Yuya Kobayashi (Laboratory of Animal Sociology, Department of Biology, Graduate School of Science, Osaka Metropolitan University), Yasunori Koya (Department of Biology, Faculty of Education, Gifu University), Satoshi Awata (Laboratory of Animal Sociology, Department of Biology, Graduate School of Science, Osaka Metropolitan University/Laboratory of Animal Sociology, Department of Biology and Geosciences, Graduate School of Science, Osaka City University)

P208 Dietary Soybean Isoflavones improves ewe reproductive performance, immunity, and antioxidant defense capabilities by modulating rumen microbiome across different reproductive stages

＊Ting Jiao (College of Grassland Science, Gansu Agricultural University/Provincial R&D Institute of Ruminants in Gansu, ESC)

P209 Elucidating the reproductive ecology of the genus *Onychodactylus* using environmental DNA

＊Min-Woo Park (Interdisciplinary Program in Earth Environmental System Science & Engineereing, Kangwon National University, ESK), Hahyun Nam (Interdisciplinary Program in Earth Environmental System Science & Engineereing, Kangwon National University), Jaejin Park (Department of Science Education), Jongsun Kim (Department of Science Education), Narae Joo (Interdisciplinary Program in Earth Environmental System Science & Engineereing, Kangwon National University), Jiho Park (Department of Science Education), Jaebeom Jeong (Interdisciplinary Program in Earth Environmental System Science & Engineereing, Kangwon National University), Daesik Park (Interdisciplinary Program in Earth Environmental System Science & Engineereing, Kangwon National University/Department of Science Education)

P210 How Kentish plovers respond to chick vocalizations: A decision-making analysis using Bayesian Network and Random Forest models

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P211 Parasites on parasites on parasites: First Report of Phoresy of Two Cuckoo-Specific Ectoparasites

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P212 Using olfactometers to test dung beetle diel activity and olfactory response

＊Suk Young Hong (Seoul National University, ESK), Minwoo Oh (National Institute of Ecology), Eun Ju Lee (Seoul National University)

P213 Effects of temperature on the symbiont acquisition by the host insect, *Riptortus pedestris* (Hemiptera: Alydidae), from soil environments

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P001 Sex Identification in The Raccoon Dog (*Nyctereutes procyonoides*) Using Genetic Tools

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Genetically monitoring population status is useful for effective wildlife management. However, monitoring population structure (e.g. sex ratio) could be challenging due to some species' elusive lifestyle. The raccoon dog (*Nyctereutes procyonoides*; hereafter referred to as "Tanuki") is a species native to mainland Japan and Hokkaido, while it has been introduced to several places within this country. Therefore, its management is necessary. Since male and female Tanuki have similar morphologies, distinguishing them through camera footage or observation is difficult. Moreover, non-invasive and indirect assessments are often favored in ecological studies due to being cost-effective and less time-consuming. This study aimed to utilize a method for genetically identifying Tanuki's sex using their feces and assess whether samples collected from communal defecation and urination sites, i.e. Latrines, are appropriate for understanding their population structure. Our objectives were to 1) explore the effect of time on the quality of fecal DNA collected through regular latrine checks, and 2) investigate the effect of contamination between samples on the experimental sex ratio compared to reality. We collected samples from captive Tanuki at Higashiyama Zoo and Botanical Gardens in Nagoya, Aichi Prefecture, to discriminate sex using the newly developed multiplex PCR method which simultaneously amplifies the sex-determining gene SRY and ZFX/Y. Our results verified that in using genetic tools to identify Tanuki's sex, 1) the passage of time since defecation could negatively affect the sample quality, meaning that even one-day-old fecal samples might not be usable for such genetic analysis, and 2) the potential contamination occurred at latrines increases the error rate in determining sex ratio. In conclusion, fecal DNA collected under less-controlled conditions is not desirable for genetically identifying individual Tanuki's sex, while in a more controlled setting, a closer sex ratio to reality is achievable by combining data from multiple sampling events.

P002 Evaluation of relationships between Norway rat (*Rattus norvegicus*) occurrence and garbage collection methods: A case study of a drinking district in Japan

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Norway rat (*Rattus norvegicus*) populations in urban environments are of major concern throughout the world owing to their sanitary and economic impacts. Habitat preference of the targeted pest species is one of the essential ecological information to implement effective population control measures under the concept of Integrated Pest Management. In the present study, to evaluate the associations of Norway rat occurrence with collection methods of garbage, a staple food resource for urban rats, we conducted rat count route surveys between August and September 2024 at garbage collection sites in a dense drinking district in Japan. We then compared the number of rat observations among the five garbage collection methods using a zero-inflated Poisson mixed-effects model to address pseudo-absence data in route surveys. The model revealed that garbage collection methods using plastic buckets and plastic garbage bins for beverage cans had an average of few rat observations among the five methods. A method using large-sized waste containers or storage made of wire mesh had a marginally large number of rat observations among the five methods. In addition, the number of rat observations significantly increased when the garbage bins and bags were damaged or adjacent to the rain gutters. Our results imply that the following measures are effective in reducing rat occurrences in dense drinking districts: storing food waste in small and highly shielding garbage bins, maintaining garbage bins so that they are not damaged, and placing garbage bins away from structures where rats can easily obtain water such as rain gutters.

P003 The effect of swimming cells of marine green algae on the growth of marine ciliates.

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We recently discovered a novel trophic pathway whereby ciliates prey on the swimming cells of marine green algae. However, the specific impact of these green algal swimming cells, including gametes and zoospores, on ciliate growth remains poorly understood. In this study, we developed an experimental system with wild-collected ciliates to investigate how the swimming cells of green algae affect ciliate proliferation. We isolated a ciliate strain (*Amphisiella* sp.) from coastal waters in Muroran, Hokkaido, Japan and established a laboratory culture. Using a medium containing microorganisms, we determined the initial cell number and culture temperature suitable for experiments with *Amphisiella* sp. by monitoring temporal changes in cell density under various conditions. To examine the effectiveness of green algal swimming cells as a food resource, we fed *Amphisiella* sp. the gametes of the marine green alga *Monostroma angicava* (Ulvophyceae), collected from the same locality, and tracked changes in ciliate cell density over time. An early increase in ciliate density was observed when the initial cell number was three or more. Under the tested temperature conditions, ciliate density rose markedly at 14°C and above, whereas poor growth was observed at 10°C or below. Subsequently, we conducted feeding experiments with an initial ciliate cell number of five at two temperatures (10°C and 18°C). Our results showed that the group provided with gametes exhibited higher growth rates compared to the group without gametes. The poor growth of *Amphisiella* sp. at or below 10°C was likely due to the reduced proliferation of microorganisms at low temperatures. Given that *Amphisiella* sp. actively proliferated when supplied with *M. angicava* gametes, we conclude that the swimming cells of marine green algae can serve as an effective food resource for marine ciliates.

P004 A theoretical study on the evolution of filamentous cyanobacteria under size-selective predation

＊Hikari Kai (Tokyo Metropolitan University, ESJ), Yuuya Tachiki (Tokyo Metropolitan University)

Some strains of cyanobacteria, oxygen-producing photosynthetic bacteria, exhibit a filamentous form, in which cells are arranged in a single row. The transition between unicellular and filamentous forms has occurred multiple times across independent lineages. The average filament length varies among strains. However, the evolutionary and ecological factors driving the emergence of filamentous forms and determining filament length remain unclear.

In this study, we investigate the conditions under which filamentous forms evolve using a mathematical model. In general, the evolution of multicellular forms leads to a decline in growth rates as body size increases. Conversely, increased body size confers an advantage by reducing predation risk. Zooplankton, predators of cyanobacteria, exhibit size-selective predation, preferring prey of a certain size depending on their own body size and taxonomic group. The further a prey's size deviates from this preferred range, the less likely it is to be consumed. Therefore, we hypothesized that filament length evolves in response to size preferences of predators. To test this, we modeled the population dynamics of cyanobacterial filaments of varying lengths and their predators using a structured population model. In cyanobacteria, filament length is influenced by mutations in genes associated with the cell envelope. Accordingly, we defined cell-cell adhesion as the probability that daughter cells remain attached after cell division and explored its evolutionary consequences within the framework of adaptive dynamics.

As a result, filament length was determined by the balance between the growth rate reduced due to increased body size and predation avoidance. When predators preferentially targeted filaments of intermediate length, the evolutionary trajectory of cell-cell adhesion depended on initial conditions. This suggests that for long filaments to evolve from unicellular forms, they must be exposed to predators that prefer short filaments in the early stage of evolution, followed by gradual exposure to predators that prefer longer filaments.

P005 Clarification of the life cycles of a phoretic nematode *Acrostichus* sp. in the invasive *Sagra femorata* in Japan

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Nematoda is one of the most diverse animals, and some nematode species are carried by insects for their dispersals. Thus, the invasion of exotic insects via international trading can have risks accompanying exotic nematodes. Entomophilic nematodes can be introduced together with invasive insects, which has a potential threat of indigenous species due to niche competition, pathogenicity to other species. In this study, to clarify the life cycle of phoretic nematodes (*Acrostichus* sp.) associated with an exotic insect, *Sagra femorata*, in Japan, we investigated the number of nematodes of different developmental stages associated with insects. Insect galls formed on Pueraria lobata were collected for retrieving insects during November 2023 to October 2024. Collected insects and frass were used for extracting nematodes by the Baermann funnel technique by soaking them in water. Nematodes were counted under a stereomicroscope and divided into 5 developmental stages; adult, dauer, juvenile and egg stages. As results, the nematodes isolated from adult insects were dominated by the dauer stage (67-100%) at all sampling dates, except for ones collected on August 26. Nematodes derived from frass was dominated by the dauer stage (67-100%) from April to July, but adult stage nematodes dominated (41%) in August. The number of nematodes isolated from the frass showed a unimodal pattern increasing from April to October and then decreased thereafter. These results suggest that the nematodes were switched the dauer stage in the insect body. Moreover, the nematodes proliferate at frass in August, and matured nematodes move to the host insect.

P006 Impact of cave types and distribution on the Eastern Bent-winged bats' distributional changes since the LGM in Japan

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Cave-dwelling bats rely exclusively on caves for their day roosts. In Japan, several types of natural caves have been formed due to complex tectonic movements, such as volcanic activity. There are also many artificial caves, which were constructed by human activities, such as mines, war ruins, and abandoned tunnels. In fact, more than half of the day roosts of cave-dwelling bats in Japan are artificial caves. Therefore, it is predicted that the distributional transition of cave-dwelling bats in Japan has been influenced by the distribution patterns of natural caves and the construction of artificial caves.

In this study, we focus on the Eastern Bent-winged bat, a cave-dwelling bat distributed in Honshu, Shikoku, Kyushu, and surrounding islands in the Japanese archipelago. This species has a unique behavior in which up to tens of thousands of females gather to give birth and nurse in specific caves. These nursing caves are geographically restricted, and females exhibit strong philopatry to their natal caves.

First, we gathered information about the types of caves used by Eastern Bent-winged bats through a literature review. Second, we used population genetic methods to estimate the population genetic structure and demographic changes over the last 100,000 years. Finally, we employed the MaxEnt model, a species distribution model, to estimate the current and past (LGM) distributions.

As a result, we found that Eastern Bent-winged bats in Japan rely exclusively on sea caves and artificial caves for nursing. Additionally, using population genetic methods and the MaxEnt model, we discovered that this species has undergone rapid population growth since the LGM, expanding from southern Japan to eastern Japan. This population expansion is suspected to be related to the use of sea caves and the recent increase of availability of artificial caves.

P007 Why do egg sacs show color variation from transparent to opaque in the Japanese black salamander?—A comparison with a related species who spawns only transparent egg sacs—

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Predation pressure often leads to diverse evolutionary outcomes of the prey. Eggs are the most vulnerable stage among all developmental stage, and thus the evolution of defensive traits in eggs is important to increase the survival rate. However, few studies have focused on eggs. *Hynobius nigrescens* egg sacs show geographic color variation from transparent to opaque. Considering that all related species spawn only transparent egg sacs, *H. nigrescens* egg sacs have evolved from transparent to opaque. Opaque egg sacs are probably more defensive against predators, because they have a harder jelly layer.
We surveyed predation pressure on egg sacs, and found that it was strong at the sites where opaque egg sacs were spawned. Next, we provided egg sacs to predators, and counted the number of preyed eggs. The number of preyed eggs was low in opaque egg sacs. Our results suggest that opaque egg sacs have evolved in areas with strong predation pressure.
Unlike *H. nigrescens* egg sacs that do not have outer skin, and are spawned in deep ponds, the egg sacs of all related species who spawn them in shallow ponds have hard outer skin that is probably defensive against predators. From our field experiment, we found that the mortality rate of egg sacs of a related species, *H. lichenatus*, was high, when they were placed in deep ponds. This result suggests that the outer skin is disadvantageous for spawning in deep ponds, where the oxygen level is low, probably because the outer skin prevents the eggs from getting oxygen. In *Hynobius nigrescens,* egg sacs have lost the outer skin, and have probably adapted to the survival in deep ponds. Consequently, in *H. nigrescens,* transparent egg sacs have become vulnerable to predation pressure, and opaque egg sacs have evolved in areas with strong predation pressure.

P008 Environmental Factors Influencing Green-Brown Polymorphism in the Migratory Locust (*Locusta migratoria*)

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The migratory locust (*Locusta migratoria*) exhibits three distinct types of color polymorphism in response to environmental conditions: phase polyphenism, green/brown polyphenism, and homochromy. In both *L. migratoria* and the desert locust (*Schistocerca gregaria*), high humidity has long been considered a primary environmental cue inducing the green morph in green-brown polymorphism. However, recent studies using *S. gregaria* nymphs reared in isolation have suggested that visual stimuli, rather than humidity, play a predominant role, with humidity having minimal influence on green/brown polyphenism. In this study, we investigated the relative contributions of humidity and visual stimuli to green/brown polyphenism in *L. migratoria* nymphs reared in isolation. Second-instar day-0 nymphs were isolated housed in plastic cups covered with yellow green paper and reared under different environmental conditions. Under a 16-hour dark / 8-hour light cycle, high humidity conditions often induced the green morph. In contrast, under a 23-hour dark / 1-hour light cycle, the green morph was less induced even under high humidity, suggesting a crucial role of visual cues in green/brown polyphenism. Furthermore, under the overlap between the food availability and light periods for 12 hours, the green morph was more prominently induced compared to a condition with only a 4-hour overlap. This finding suggests that such a long overlap between food availability and light period exposure significantly influences the expression of the green morph in this species. Two environmental factors, (1) humidity and (2) visual cues during feeding are associated with the regulation of green/brown polyphenism. These regulations may have ecological significance for this species, allowing them to phenotypically adjust to the seasonal and spatial variation in their environment, increasing their chances of survival.

P009 A Trial Reconstruction of Temporal Changes in Fish Stocks over the Past 6,000 Years Using Sedimentary DNA

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Environmental DNA (eDNA) studies have provided valuable insights into the current fish biodiversity and its population dynamics in various environments. Recent advanced eDNA studies in sediments have been developing as a tracking method of fish abundance in the past. However, it has been challenging for evaluating the validation of the reconstruction of fish abundance in the past due to the lack of continuous records over centuries. Understanding the long-term of fish abundance over centuries is essential for sustainable fish management. The Beppu Bay sediments, located in the Seto Inland Sea, Japan, have annual layers that enable high-precision dating due to the oxygen-poor seabed, reflecting minimal biological disturbance to the sediments. The present study aimed to investigate the eDNA of Japanese sardines preserved in the sediments of Beppu Bay, a unique site characterized by anoxic bottom conditions suitable for preserving sedimentary DNA, to explore the fish abundance over the past 6,000 years. We first investigated the concentration of sedimentary eDNA (sedDNA) for the fish in Beppu Bay sediments to clarify their historical abundance. Then we compared the sedDNA concentrations of their fish scale concentrations to assess the degradation effects with time. This study demonstrates the potential of sedDNA as a tool for uncovering marine fish population dynamics over the millennium scale.

P010 Life history strategy of toads against urbanization

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Amphibians that use both aquatic and terrestrial ecosystems are considered particularly sensitive to urbanization, as adverse effects in either ecosystem can lead to a decline in fitness. However, if one ecosystem remains suitable, it may offset the negative effects of the other ecosystem. Since aquatic environments in urban areas are thought to be relatively suitable for amphibians, they may be able to offset adverse effects occurring in terrestrial environments and maintain their overall fitness. We hypothesized that urban amphibians increase their size at metamorphosis to reduce post-metamorphic growth constraints, resulting in adult body size and reproductive traits comparable to those of rural populations. Specifically, we surveyed the Japanese common toad (*Bufo japonicus*) in and around the city of Tokyo to examine size at metamorphosis, growth rate, adult body size, and reproductive traits (egg size and clutch size). We used green cover ratio as an urban indicator. Over the two-year period from 2023 to 2024, size at metamorphosis and adult body size were surveyed at 30 and 16 study sites, respectively, across a gradient of green cover ratio. During the 2025 breeding season, egg size and clutch size were recorded at 10 sites. Individual age was estimated using skeletochronology. We fitted age and body size data into Gompertz growth curve, and estimated maximum growth rates. Our results showed that a lower green cover ratio (higher level of urbanization) was associated with a larger size at metamorphosis and a smaller adult body size. Additionally, male growth rates were lower in urban populations than those in rural ones. These results suggest that urban toads may compensate for reduced post-metamorphic growth rate by attaining a larger size at metamorphosis, although they appear unable to sustain this advantage through to mature size. Additional consideration will be given to variation in reproductive traits.

P011 Seasonal and interannual changes in tree cavity use of *Diplothrix legata* (Muridae: Rodentia) in Okinawajima Island, Japan: Insights from five years of monitoring

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Understanding the patterns of tree cavity usage (characteristics of the tree caverns selected as nesting sites and interannual and seasonal changes in the frequency of tree cavity usage) of mammalian tree cavity users is important to clarify their ecology. Ryukyu long-furred rats *Diplothrix legata* are endemic to the central Ryukyu Archipelago, Japan, and are the largest arboreal rodent in Japan. This study aimed to determine interannual and seasonal changes in tree cavity usage by *D. legata* on Okinawajima Island and to characterize cavities selected as nesting sites. From August 2019 to February 2025, camera traps were installed toward the entrances of 46 tree cavities, and the behavior (e.g. nesting, entering/exiting) of *D. legata* were recorded. In addition, five characteristics (tree species, DBH, tree cavity height, volume, and entrance area) were also recorded for the targeted tree cavities. As a result, *D. legata* were recorded in 16 (34.8%) tree cavities during the study period, and nesting behavior was recorded in 4 (8.7%) tree cavities. Among the 16 tree cavities where *D. legata* was observed, the tree cavities where nesting behavior was observed were located in significantly higher places. Even in the same tree cavity, the recorded frequency of *D. legata* varied annually, and this species never nested in the same tree cavity two years in a row. The recorded frequency was low in the late non-breeding season (June-August), and high in the breeding season (September-February). This species selected high tree cavities to protect itself and its newborns from ground-dwelling predators (snakes). In addition, this species may avoid predators remembering its nesting site, because it did not use the same tree cavity every year. Low record frequency in the late non-breeding season is probably due to the rising temperatures in tree cavities, which make them unsuitable as daytime resting sites.

P012 Life cycles of trematodes in mollusks on the coast of Japan

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Trematodes are one of the major helminth parasites and generally use three hosts in their life cycles. In the life cycles, mollusks act as the first intermediate hosts for most species and limit whether the life cycle completes or not. Although knowing complete life cycles is important to address ecological and evolutionary questions, for most trematodes only the definitive hosts are recorded. Therefore, we investigated trematodes from marine mollusks in Japan and used DNA barcoding to elucidate their life cycles.

We examined 196 mollusk species (6,001 individuals in total) at intertidal zones of 39 sites in the Japanese coast from 2024 to 2025. We also sampled jellyfish, fish, and birds to obtain larval and adult trematodes. Sampled trematodes were used for templates for PCR, and their sequences of COI and 28S rDNA were used for DNA markers. We also used sequences in online databases for comparisons.

The trematode larvae detected from mollusks were divided into 31 OTUs based on the DNA markers. Each OTU was judged to be a single species, and identified to its genus or species levels. The prevalence was highest in the marine snail Umbonium moniliferum at one site (18%), suggesting that the snail population was important intermediate hosts for marine trematodes. Moreover, life cycles were clarified partially or completely in 9 of the 31 trematode species. For example, sporocysts from the snail Purpuradusta gracilis were identified as Prodistomum Type 4, which use the jellyfish Ocyropsis fusca and the marine fish

Scomber spp. as the second intermediate and definitive hosts, respectively. Sporocysts in the snail Nassarius festivus were identified as Pseudozoogonoides ugui which was reported to use Tribolodon hakonensis as the definitive host in a previous study, although its second intermediate host remains unknown. The study highlights the significance of mollusks as intermediate hosts of trematodes.

P013 The Insect Fauna of Fruit-Piercing Stink Bugs (*Pentatomidae*) at Otemae Takamatsu Junior and Senior High School

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This study investigates the insect fauna of fruit-associated stink bugs (*Pentatomoidea*), with a focus on species attracted to citrus-based baits, within the campus of Otemae Takamatsu Junior and Senior High School in Kagawa Prefecture, Japan. The survey was conducted at multiple points across the school grounds using handmade bottle traps from May to June 2025. Each trap consisted of a plastic bottle filled with a bait mixture composed of locally sourced citrus fruits from the Shikoku region—particularly varieties native to Kagawa—combined with sugar and honey. The traps were checked regularly across several collection periods to monitor species diversity and abundance.
Our primary goal was to assess the presence and variety of fruit-piercing or fruit-associated heteropteran insects, particularly stink bugs, in a semi-urban school environment. The choice of attractants was based on previous research indicating that certain stink bug species are strongly drawn to sweet, fermenting fruit odors. Specimens collected were identified to the family and, where possible, species level, with a focus on those within Pentatomidae.
This method proved to be an effective, low-cost way to monitor local stink bug populations and can contribute to understanding the biodiversity of schoolyard ecosystems. The findings may also have implications for integrated pest management

P014 Relationship between anurans density and landscape factors in paddy field using environmental DNA analysis

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Paddy fields have served as an alternative environment to natural wetlands in Japan, providing habitat for anurans. However, the area of paddy fields has been decreasing due to an increase in abandoned farmland caused by a lack of farmers as well as land development. To identify priority habitat for anuran conservation, it is important to understand the relationship between anurans density and landscape factors in paddy fields. Conventional surveys such as capture and visual observation are labor-intensive and difficult to conduct over large areas. Therefore, we investigated the habitat conditions of the paddy anurans, *Pelophylax nigromaculata*, *Dryophytes japonicus* and *Fejervarya kawamurai*, using the environmental DNA analysis method, which only requires water sampling in the field, thus reducing labor costs and allowing extensive surveys in a short period of time. Surveys were conducted in 16 paddy field areas (traditional: 8 areas, consolidated: 8 areas) in the southeastern part of Hyogo Prefecture. In each area, DNA was extracted from samples collected from two paddy fields, two ponds and a single ditch in the summer (June-July) of 2018, and real-time PCR was performed using a newly developed specific detection assay for the target species. A generalized linear mixed model analysis was then performed to estimate factors affecting anurans distribution, considering anthropogenic factors such as paddy field use patterns and natural environmental factors at the landscape scale. A model was constructed and analyzed using the positivity rate of three PCR replicates as the objective variable and paddy field management type (traditional or consolidated), water quality, altitude, land use type and climatic factor as explanatory variables. In this presentation, we will discuss the conservation effects of maintaining and restoring paddy fields at each site based on the differences in anurans distribution trends.

P015 Impact of farmland abandonment on survival of a small salamander (*Hynobius setouchi*) using environmental DNA analysis

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Agricultural ponds in Japanese *Satoyama* landscapes play an important role in biodiversity conservation as refuges for rare species. However, in recent years, agricultural lands including ponds have been abandoned due to the ageing of farmers and lack of successors, which possibly have a negative impact on biodiversity conservation. At present, it is not well understood how the farmland abandonment affects the distribution of small salamanders. Conventional monitoring of salamanders has mainly involved visual and collection surveys. However, these surveys are sometimes destructive to the ecosystem and invasive to the individual salamanders. The aim of this study was to estimate the environmental factors regulating the distribution of the Setouchi salamander (*Hynobius setouchi*) in abandoned farmland in Kobe City, Hyogo Prefecture, Japan, using environmental DNA (eDNA) analysis methods, which is a non-destructive and non-invasive biological monitoring method. Eleven ponds were surveyed once a month for two years to determine the presence or absence of eDNA of the species and to measure water quality parameters. The results showed that eDNA of the species was detected in all ponds. However, statistical analysis using water quality parameters as explanatory variables showed that the probability of eDNA detection of this species significantly decreased as the dissolved oxygen levels in the ponds decreased. This suggests that forestation of the surrounding environment associated with abandonment of cultivation may lead to a decrease in dissolved oxygen, and that abandonment of cultivation

may have a negative impact on the survival of this species.

P016 Detection of Chinese White Dolphin in Hong Kong waters using environmental DNA analysis

＊Robinson Okoth Kisero (The Hong Kong University of Science and Technology), Masayuki Ushio (The Hong Kong University of Science and Technology), Takamitsu Ohigashi (The Hong Kong University of Science and Technology), Eszter Matrai (Ocean Park), Lindsay Porter (Southeast Asia Marine Mammal Research), Satsuki Tsuji (Kyoto University)

The Chinese White Dolphin (*Sousa chinensis,* hereafter CWD), commonly known as the Indo-Pacific Humpback dolphin, is one of four *Sousa* species. These small coastal cetaceans inhabit estuarine habitats with depths of less than 20 meters. In Hong Kong waters, CWDs are primarily found in southern and western Lantau areas. Due to human activities, CWD populations in Hong Kong waters have declined steadily since 2000, leading to their classification as vulnerable by the IUCN. Traditional surveillance techniques for CWDs in Hong Kong waters include vessel surveys, helicopter surveys, photo IDs, and acoustic surveys. However, these methods are time-consuming, labor-intensive, and expensive.
Environmental DNA (eDNA) is DNA extracted from environmental samples commonly used to detect macro-organisms like fish. It's a promising method for monitoring biodiversity more frequently and comprehensively. In this project, we developed an experimental protocol to analyse seawater-derived eDNA of CWDs using species-specific primers. We created CWD-specific primers and TaqMan probe in the CytB region of mitochondrial DNA. Our experimental validation showed the new primers were highly CWD-specific, with a limit of detection of 3.2258 copies/reaction. To test the new primer set under natural conditions, we collected water samples from a CWD sighting location, filtered them, extracted eDNA, and performed qPCR. We successfully detected CWD eDNA. In July 2024 (summer) and January 2025 (winter), we collected 1 1L of water samples from surface and bottom layers at 19 and 20 points in summer and winter, respectively, from the southwest and western Lantau areas. We performed the same qPCR analysis and detected CWD eDNA in six out of 19 summer points and eighteen out of 20 winter points. These results suggest the eDNA technique can map CWD distribution in Hong Kong waters.

P017 Applying D-Loop Haplotype Analysis in Grouper Population Studies

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Groupers (*Epinephelus* spp.) are ecologically and economically important top predators in marine ecosystems, yet many species face overexploitation and habitat degradation. Accurate population monitoring is essential for effective fisheries management and conservation strategies. While environmental DNA (eDNA) has revolutionized non-invasive fish monitoring, primarily relying on eDNA concentration for abundance estimation. However, eDNA concentration are prone to inaccuracies due to factors like stress responses, age, gender, and health conditions, which alter eDNA shedding rates.
To address these limitations, we can apply a novel approach that estimates fish abundance by identifying and quantifying eDNA d-loop haplotypes, which offers a more reliable metric of genetic diversity and even an abundance index. Groupers are ideal candidates for this method due to their high d-loop diversity, characterized by variable numbers of tandem repeats (VNTRs) and base polymorphism identified in Hong Kong grouper (*Epinephelus akaara*) and yellow grouper (*E. awora*) by previous studies. We also find similar VNTRs structure in other grouper species.
Our preliminary study on the Hong Kong grouper demonstrates that even farmed individuals, typically assumed to exhibit low genetic diversity, show significant d-loop diversity and high haplotype counts in tissue samples. Analysis of tissue samples revealed 36 distinct haplotypes among 41 individuals. The VNTRs (132-133bp each) give distinct separation between clades (135-415 sites different). Within each clade, bases can differ by up to 28 sites enabling reliable haplotype identification. Given that grouper restocking programs mainly sourced from fish farms, applying eDNA d-loop haplotype analysis offers a promising avenue for monitoring the genetic diversity of wild populations. We are currently working to apply this approach to natural environments to further validate its utility. By comparing haplotype diversity and abundance metrics from wild populations to those observed in controlled or farmed settings, we aim to assess the robustness and scalability of this method.

P018 Applicability of single-factor models in assessment of habitat suitability—A case study of wetland bird habitats

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With the intensification of urban development, wetlands face significant challenges from habitat fragmentation and loss. Assessing habitat suitability is crucial for effectively supporting wetland restoration and biodiversity conservation efforts. This study aims to validate the accuracy of the habitat quality assessment function of the InVEST model at medium-to-small spatial scales and compare it with habitat suitability evaluations based on integrated wildlife distribution and environmental data. Using Zhuhai City as a case study, the InVEST model was first applied to assess wetland quality as bird habitat, followed by a species distribution model (SDM)-based evaluation of habitat suitability to examine the impact of habitat fragmentation on wetland birds. Field survey data were then used to validate the accuracy of these models. The results showed that both evaluation methods consistently identified reclaimed aquacultural ponds and tidal flats as habitats with higher suitability, likely due to their large area and intact landscape features. For the Black-faced Spoonbill (*Platalea minor*), a globally endangered species with relatively high habitat quality requirements, habitat suitability assessments from both the InVEST model and SDM-based evaluation agreed ($R^2 = 0.47$, $p < 0.01$). However, for other wetland birds, the InVEST model tended to underestimate habitat suitability in

some areas. Previous studies suggest that the InVEST model primarily focuses on land-use types and lacks specific species distribution data, limiting its ability to comprehensively analyze species habitat use strategies. In contrast, the SDM-based evaluation system addresses these limitations effectively, although it requires more extensive preliminary data collection. This study recommends integrating more detailed species distribution and environmental data into habitat conservation management to provide scientifically rigorous references for maintaining regional biodiversity.

P019 Ecosystem Condition: Concept, Accounting Methods and Case Study

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With the growing awareness of ecology and the increasingly close interaction between ecosystems and human society, ecosystems have been recognized as an important part of the total assets of a country or region, supporting sustainable economic and social development. Ecosystem condition (EC) is the synthesis of structural and functional characteristics of ecosystems, reflecting the capacity to provide ecosystem services sustainably. EC assessment is one of the most complex parts in ecosystem accounting. As a new perspective of ecosystem accounting, EC emphasizes both natural and socio-economic attributes of ecosystems, which is highly significant in promoting ecosystem management and realization of the value of ecosystem products. In this study, we systematically summarize the concepts, assessment methods and indicators of EC, followed by a case study conducted in Shenzhen City, a representative urban ecosystem. Indicator systems for both EC and urbanization level (UL) were developed to assess the spatiotemporal dynamics of ecosystems and urbanization over the past four decades. The results indicate: (1) Urban ecosystem in Shenzhen City have undergone a noticeable degradation over the past 40 years, but has shown slow improvement in recent years. (2) Synergistic development between urbanization and ecosystems has not yet been achieved but have improved. (3) The pressure on ecosystems from urbanization continues to decrease, suggesting the effectiveness of ecological policies. Over the past 40 years, the process of urbanization in Shenzhen City has gradually achieved ecological decompression and positive feedback, consequently establishing a more balanced and sustainable relationship between development and nature. These findings can provide scientific insights for the management and enhancement of ecosystems in rapidly urbanizing regions.

P020 Determinants and Action Pathways for Enhancing Ecological Security from a Complex Systems Perspective: A Case Study of Yellow River Basin, China.

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The Yellow River, known as China's "Mother River," plays a vital role in sustainable development and holds unique significance in global ecological governance through its ecosystem management.Under the dual influences of climate change and anthropogenic activities, ecological security risks in the Yellow River Basin have intensified, with proliferating issues including flood disasters and water resource scarcity. While research on ecological security has expanded in recent years, predominant focus remains confined to metric development and connotative assessment, leaving a critical gap in understanding the complex mechanisms of ecological security enhancement through configurational interactions within multi-factor systems. Such investigations remain particularly scarce in ecologically fragile regions. Therefore, scientific measurement and enhancement of ecological security in the Yellow River Basin will facilitate the consolidation of watershed ecological barriers and inform China's green sustainable development strategies. This study first employs exploratory spatial data analysis (ESDA) to investigate spatiotemporal evolution patterns of ecological security across 62 cities in the Yellow River Basin from 2010 to 2020. Subsequently, building upon clarified ecological security status, we adopt the WSR (Wuli-Shili-Renli) methodology framework and fuzzy-set Qualitative Comparative Analysis (QCA) method to decipher critical factors and operational pathways for ecological security enhancement through complex system interactions. The results showed that (1) Ecological security exhibits pronounced dynamic variations with phased low-magnitude growth characteristics. (2) Environmental pressures demonstrate progressively diminishing impacts, while government support and green lifestyles emerge as pivotal determinants for achieving high ecological security. Concurrently, ecological endowment and ecological governance increasingly manifest foundational supporting roles. (3) High ecological security pathways emerge from synergistic interactions of multiple systemic elements, with no single factor constituting a necessary condition. Five enhancement pathways are identified: "Shili-driven approach under Wuli-Renli dual logic", "Tripartite synergy of Wuli-Shili-Renli", "Wuli-Shili co-driven pattern", "Wuli-Renli dual-wheel propulsion", and "Shili-Renli coordinated mechanism".

P021 From Spawning Grounds to Feeding Fronts: Assessing Climate Change Vulnerability of Pacific Bluefin Tuna (*Thunnus orientalis*) Migration Pathways in the North Pacific Ocean

＊Matthew Durant (Tohoku University, ESJ), Jamie M Kass (Tohoku University)

Climate-driven changes in marine ecosystems are reshaping the distribution and migratory behavior of highly mobile species with implications for biodiversity, fisheries sustainability, and regional food security. Understanding species-specific climate risks is therefore essential for guiding adaptive management. Pacific bluefin tuna (*Thunnus orientalis*), a large-bodied, commercially valuable species, undertakes long-distance migrations across the North Pacific Ocean, connecting spawning grounds in the

western Pacific to foraging grounds in the eastern Pacific. These migration routes expose the species to a wide range of environmental conditions and climate stressors. Here, we assessed the climate vulnerability of Pacific bluefin tuna along its North Pacific migratory corridor using a novel climate risk index that incorporates the species' distribution, sensitivity to environmental change, and adaptive capacity under two emission scenarios: high emissions (SSP5-8.5) and high mitigation (SSP1-2.6). By employing a statistical modeling framework that accounted for random spatial effects, we modeled bluefin tuna habitat preferences from 2000-2024 using validated occurrence records with environmental predictors that reflected both surface (epipelagic, <100 m) and deeper (mesopelagic, >100 m) habitat layers. We then predicted current suitable habitat and overlaid future vulnerability estimates to assess risks to habitat persistence along key migration routes. Our results identified climate vulnerability hotspots, particularly in transitional zones such as the East China Sea and central North Pacific migratory corridor. These findings suggest that areas with high climate-induced vulnerability in key transitional zones could disrupt the connectivity between spawning and foraging habitats, impairing migration success and threatening the stability of Pacific bluefin tuna populations and associated fisheries. This work contributes to the understanding of climate impacts on transboundary migratory species and underscores the need for international, ecosystem-based management strategies that account for spatial shifts in migration and habitat use.

P022 Associations among three types of nature connections and their consequences for human well-being and conservation behaviours

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In recent years, connection to nature has received increasing attention as a key factor in promoting public health and biodiversity conservation. This connection can be categorized into three main dimensions: nature exposure (e.g., green space around residences), nature engagement (direct experiences in nature), and nature connectedness (a psychological sense of oneness with nature). Understanding how these three forms of connection influence human well-being and conservation behaviors is essential for building a society that lives in harmony with nature. However, the mechanisms underlying these relationships remain poorly understood.

This study aims to clarify the effects of these three types of nature connection on individual health and conservation behavior. In October 2023, a nationwide online survey was conducted with 6,000 respondents across Japan. The survey measured (1) self-reported physical and mental health, (2) frequency of conservation behaviors, (3) frequency of nature experiences (nature engagement), (4) sense of oneness with nature (nature connectedness), and (5) demographic variables. A land-use analysis was also conducted to calculate the green space area surrounding each respondent's residence, used as an objective indicator of nature exposure. Structural equation modeling (SEM) was applied to analyze the direct and indirect effects of each type of connection on health and conservation behaviors.

Results showed that residential greenspaces positively affected well-being and conservation behaviors, mainly through its indirect influence on nature experiences and connectedness. This suggests that proximity to nature fosters both behavioral and psychological engagement with nature. However, the effects of nature exposure on the other two types of connection were only moderate. The strongest relationship observed was from nature connectedness to nature engagement. This finding implies that even without abundant green space, a strong sense of connectedness to nature can promote pro-conservation behavior directly and improve well-being indirectly.

P023 Approaches to Enhancing the Detection Sensitivity of *Schistosoma mansoni* eDNA

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Schistosoma mansoni, the etiological agent of intestinal schistosomiasis, infects humans through exposure to freshwater containing cercariae-larval forms released by infected specific intermediate host snails. Identifying contaminated water bodies is critical for targeted disease control. However, traditional surveillance methods are costly, labor-intensive, and unsuitable for large-scale and real-time monitoring. This challenge is further complicated by the fact that snail populations can shift rapidly due to rainfall or land-use changes, making it difficult to locate transmission sites in a timely manner.

eDNA analysis has emerged as a promising, non-invasive approach for detecting *S. mansoni* in aquatic environments, offering potential for faster and more scalable surveillance. Nonetheless, turbid tropical waters often clog filters, limiting water volume throughput and reducing eDNA detection sensitivity. Moreover, many endemic areas lack consistent electricity and laboratory infrastructure, underscoring the need for robust, electricity-independent field methods.

In this study, we evaluated two electricity-free filtration techniques—gravity filtration and the QuickConc™ method—in Mbita, a *S. mansoni*-endemic region along the shores of Lake Victoria in Kenya. Water samples were collected and processed at each site using both methods, followed by real-time PCR for *S. mansoni* eDNA detection.

The QuickConc™ method demonstrated superior filtration capacity and a higher detection rate compared to gravity filtration. Furthermore, we assessed the stability of eDNA preserved on QuickConc™ filters with Buffer ATL and found that DNA remained stable for up to one week at 40°C, confirming the method's feasibility for use in tropical field conditions.

In conclusion, the findings demonstrate that the QuickConc™ method is a practical and effective alternative for eDNA-based surveillance of *S. mansoni* in resource-limited, high-transmission settings. Its ability to process larger water volumes, maintain

eDNA integrity under harsh field conditions, and operate independently of power sources makes it a valuable tool for expanding schistosomiasis monitoring and guiding timely public health interventions.

P024 The Rapid Shrinkage of China's Tidal Flat (2000-2023): Trends, Drivers, and Ecological Impacts

＊Qiqi Huang (State Key Laboratory of Regional and Urban Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

Tidal flats are vital coastal ecosystems with significant ecological and economic value. However, in China, they have experienced significant degradation over the past two decades due to anthropogenic pressures and natural processes. This study quantifies the spatiotemporal changes in tidal flat extent for the years 2000, 2011, and 2023 using Landsat imagery and tidal models, revealing a net loss of 28.66%, from 9,576.26 km^2 in 2000 to 8,195.92 km^2 in 2011, and finally dropping to 6,831.83 km^2 in 2023. Based on land use maps, we quantified the contributions of key drivers to tidal flat changes, including natural processes, anthropogenic exploitation, ecological restoration, vegetation restoration, and vegetation degradation. The analysis reveals that while natural processes dominated gross tidal flat fluctuations, the gross loss has been largely offset by the seaward expansion due to deltaic progradation. Ecological restoration efforts have failed to offset tidal flat losses caused by human activities nationwide, and the large-scale conversion from tidal flats to built-up areas can pose critical threats to coastal ecosystems. This study provides an empirical basis for reconciling coastal economic development with ecological conservation and underscores the urgent need for more effective management strategies to protect these critical coastal wetlands.

P025 Effectiveness of an online quiz-based birdsong training tool "TORI-TORE": Changes in participants' birdsong identification skills and interest in birds

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The use of audio recordings for bird monitoring has been recognized as an effective method in citizen science. However, developing participants' skills in identifying birdsong from audio recordings has been challenging. To address this issue, we developed "TORI-TORE", an online quiz-based training tool designed to enhance the skills of birdsong identification. The effectiveness of 1) TORI-TORE, and 2) the advanced TORI-TORE algorithms, on species identification ability (as estimated from test scores) and attitudes (as estimated from questionnaire responses), was examined using a randomized controlled trial in comparison to a conventional method (quiz training where the frequency of question items was uniform across species, hereinafter referred to as "baseline training"). Specifically, we compared two algorithm, "frequency-adjustment algorithm", which presents more of the easy-to-remember species based on data of the previous study (Ogawa et al. 2023), and "interactive algorithm," which allows learners to adjust the question frequency (106 participants, January, September-October 2023). Participants were divided into four algorithm-based groups —the frequency-adjustment group, the interactive group, the frequency-adjustment + interactive group combining the two algorithms, and the baseline group —and underwent four birdsong identification tests, four days of training, and three questionnaires. Results showed that all groups showed a significant increase in scores after the training compared to before. The frequency-adjustment algorithm was significantly more effective in improving scores than the baseline training. On the other hand, no difference in score improvement effects were found between the interactive algorithm and the baseline training. In terms of attitudes, all groups showed a significant increase in interest in birds after the training compared to before. These findings are expected to contribute to further expansion of citizen science and improvement in data quality.

P026 Comparison of butterfly communities among land use types and topographic conditions in the agricultural landscape of Hokkaido, northern Japan

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Butterflies are declining globally due to abandonment of agricultural land. However, evidence regarding the habitat value of abandoned agricultural lands for butterfly communities ranges from negative to positive, which makes developing conservation initiatives difficult. Topography should be a potential driver of spatial variation in habitat value of agricultural land use for butterflies. Here, we surveyed species richness, abundance, and composition of butterfly community in natural lands (wetland and forest), agricultural lands, and abandoned agricultural lands in two topographic settings (hillslope and lowland) in Hokkaido, northern Japan. The species richness and abundance of open-land butterflies tended to be the highest in agricultural lands in both topographic settings. Although the species richness and abundance of communities were lowest in natural lands, such areas had unique species compositions. Topography can be an important factor explaining the variation in species richness and abundance among abandoned agricultural lands. In hillslope areas, abundance of open-land butterflies was lower in abandoned agricultural lands than in active ones. In lowland areas, however, community-level, open-land and forest species richness and abundance of abandoned agricultural lands were comparable to those of active ones. Our results suggest that both topography and land-use type have significant effects on butterfly community composition in agricultural landscapes.

P027 Modeling the potential distribution of the golden eagle in Japan and investigating its relationship with satoyama landscapes

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Traditional Japanese satoyama landscapes—comprising agricultural fields, secondary forests, grasslands, and human settlements—have historically supported diverse wildlife. The golden eagle (*Aquila chrysaetos*), a globally distributed apex predator, depends on heterogeneous environments for foraging. However, in Japan, the species is now imperiled, largely due to the decline of traditional land-use practices. As rural populations age and shrink, active land management has diminished, leading to forest encroachment into formerly open grasslands and reducing suitable hunting areas. This study examines the relationship between satoyama landscape structure and the potential distribution of golden eagles in Japan. Due to limited domestic occurrence data, we constructed species distribution models (SDMs) based on global records and environmental variables using the machine-learning algorithm MaxEnt. We selected an optimal model from candidates built with varying complexity levels and assessed significance of performance metrics using null models. We used this model to project potential distribution estimates, then calculated spatial correspondence with a map of the Satoyama Index, which reflects landscape heterogeneity. The optimal model had high performance (AUC=0.78), which was significantly higher than for null models. The potential distribution of golden eagle in Japan based on global occurrence records showed higher predicted suitability in cooler regions—especially in the Tohoku, Hokuriku, and Hokkaido regions where traditional land-use mosaics are still maintained. We found a positive correlation ($r = 0.58$) between the Satoyama Index and the SDM prediction, indicating that environmentally suitable areas for golden eagles in Japan habitat are associated with heterogeneous landscapes characteristic of satoyama areas. To understand the ecological mechanisms behind this correlation, future research will explore how land-use and demographic changes associated with population decline affect the eagle's distribution. Ultimately, this work contributes to identifying priority areas for conservation and clarifying the ecological implications of socio-demographic transitions in rural Japan, informing more holistic landscape management strategies.

P028 Visualizing the Invasion Stage of *Bufo formosus* on Hachijo-jima Island Using SDMs and Field Surveys

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Invasive alien species can cause significant disruption to native ecosystems. Islands, often considered biodiversity hotspots, are especially vulnerable to biological invasions. Invasive species on islands tend to establish and spread more aggressively than on the mainland, making early detection and immediate countermeasures—such as eradication—critically important. Species Distribution Models (SDMs) provide a valuable tool to visualize and evaluate the invasion stage of a species by relating observed distribution patterns to environmental variables. Applying SDMs to invasive species offers key insights for effective management strategies.

In this study, we investigated the distribution and population density of *Bufo formosus*, a domestic alien frog species, on four islands in the Izu islands (Oshima island, Nii-jima island, Miyake-jima island, and Hachijo-jima island). Our goal was to clarify the current invasion status of this species on each island. We focused in particular on Hachijo-jima island, where long-term eradication efforts have been ongoing, to determine whether the species has spread throughout its potential habitat.

We recorded presence points using GPS and developed SDMs using MaxEnt with eight environmental variables. A total of five models were created: one for each island and one combining all four. Model comparison allowed us to evaluate the invasion stage on each island. For population density, we conducted 10-minute timed searches and recorded the number of individuals observed.

Our results showed that Hachijo-jima island had the fewest presence points and a limited distribution, mainly near water sources. Despite a wide potential habitat, the actual distribution remains localized. Population density on Hachijo-jima island was also lower than on the other islands. These findings suggest that *Bufo formosus* is still in the early stage of invasion on Hachijo-jima island, and that ongoing eradication efforts may be effective in preventing further spread.

P029 Effects of urbanization and related environmental factors on soil microbial communities in the Seoul Metropolitan Area, South Korea

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Urbanization profoundly alters ecosystems by changing soil physical and chemical conditions, thereby affecting microbial communities and their ecological functions. To elucidate these impacts, this study examined soil microbial communities along an urbanization gradient—categorized as urban, semiurban, seminatural, and natural—in the Seoul Metropolitan Area, South Korea, based on the Human Influence Index. Urban soils exhibited higher alkalinity and lower moisture levels. Urbanization significantly reduced enzyme activity, indicating decreased metabolic function or consortium network efficiency in urban soils. High-throughput sequencing revealed distinct microbial community patterns between urban-semiurban and seminatural-natural sites. In urban soils, bacterial communities exhibited greater relative abundances of taxa such as *Myxococcota*, *Nitrospirota*, *Methylomirabilota*, *Gemmatimonadota*, and *Desulfobacterota*, known for critical roles in carbon, nitrogen, and sulfur cycling. This was also supported by an increased proportion of functional groups related to nitrogen cycling in the urban and semiurban soils. Fungal communities exhibited differences in proportions of the most abundant phyla Basidiomycota and Ascomycota. Moreover, higher proportion of fungi assigned to mixed trophic modes were observed, indicating towards the metabolic diversi-

fication of urbanized fungal communities. Soil pH was identified as the sole shaping component of both bacterial and fungal communities. This study suggests the impact of urbanization on the composition and function of soil microbial communities. The specific bacterial taxa including *Myxococcota*, *Nitrospirota*, *Methylomirabilota*, *Gemmatimonadota* and *Desulfobacterota* may serve as effective indicators of urbanization-driven ecological changes, alongside the observed loss of metabolic specificity in fungal communities. Further investigation into these microbial indicators is essential for understanding and managing urban ecological resilience.

P030 National Desert Parks and Dryland Sustainability

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Drylands cover over 45% of the Earth's terrestrial surface, supporting numerous endemic species and one in three people globally. These ecosystems are highly significant but sensitive to climate change and human pressures, which can lead to land degradation (desertification). Various efforts have been made to combat desertification and promote dryland sustainability, with the establishment of protected areas being considered an effective strategy. In China, a project to establish National Desert Parks (NDPs) was initiated in 2013, focusing on both conservation and sustainable use of drylands. A decade has passed since the policy announcement, but the progress and effectiveness have not yet been identified. Therefore, our study aimed to comprehensively review the implementation outcomes of the NDP policy. This involved exploring the progress of all parks approved under the project from public data. We also selected advanced cases for a remote sensing-based evaluation of ecological trends and their responses to climate change. Additionally, we assessed the multiple benefits of ecosystem services provided by a case park and its management status using the questionnaire survey. The study found that, although many NDPs have been designated since the project's inception, only about one-third of these parks have made measurable progress, and their development was uneven. The existence of "paper parks" has significantly hindered the achievement of policy goals, and around 20% of the approved parks have been abandoned during further optimization. However, in terms of the parks that are progressing, the environmental conditions have generally improved, and most have adapted to climatic changes. Moreover, the case study highlighted the multiple benefits that NDP designation has brought to stakeholders, although there is still room for improvement in management practices. The successes and failures observed in this project offer valuable insights into the sustainability of the world's drylands.

P031 Urban Policy and Mangrove Change: A Remote Sensing Assessment of Hong Kong's Coastal Regulations (2013-2025)

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Mangrove forests provide critical ecosystem services including shoreline stabilization, water purification, and biodiversity support. In urban environments, their roles—though ecologically unique—are often undervalued and understudied due to their fragmented distribution and limited carbon storage capacity. In this study, we evaluate the effectiveness of both regulatory (e.g., Environmental Impact Assessment Ordinance, Site of Special Scientific Interest designations) and voluntary (e.g., BEAM Plus green building certification) mechanisms for managing urban mangrove ecosystems in Hong Kong. This study assesses spatial and temporal changes in mangrove cover from 2013 to 2025 using Landsat 8 satellite imagery and a deep learning classification model developed by Esri. A high-resolution (5m) Digital Terrain Model was used to constrain classification to ecologically plausible tidal zones.

Our results show a net gain of 558,900 square meters (approximately 23% increase) in mangrove area, with the most prominent expansion near Mai Po Nature Reserve, a Ramsar-listed wetland under active conservation. In contrast, minor mangrove sites near heavily urbanized coastlines showed stagnation or decline. Areas under statutory protection or with targeted restoration efforts experienced greater mangrove persistence and recovery, while those lacking enforcement or affected by large-scale reclamation saw degradation. Among the policy mechanisms, SSSI designation and proactive habitat restoration appeared most effective, whereas voluntary measures had less observable impact unless paired with strong regulatory oversight.

These findings demonstrate the positive but uneven role of integrated policy frameworks in enhancing mangrove resilience Hong Kong. This study will provide new empirical evidence on the spatial effectiveness of environmental governance in safeguarding coastal ecosystems under urban pressure.

P032 Ontogenetic differences in food resource use by invasive channel catfish (*Ictalurus punctatus*) in the outlet of Lake Biwa, central Japan

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Channel catfish is an invasive fish species originating from North America and has spread all over the world. This species is known as an omnivorous catfish that flexibly utilizes food resources depending on habitat conditions and seasonal changes. However, individual level patterns of resource use shifting from juvenile to adult stages remain poorly understood. Therefore,

we investigated differences in food resource use between juvenile and adult individuals of this species.
From May to August 2024, juvenile (SL < 400 mm; n = 61) and adult (SL ≥ 400 mm; n = 17) channel catfish were collected from the outlet river, Seta River, of Lake Biwa. Stable carbon and nitrogen isotope analyses ($\delta^{13}C$ and $\delta^{15}N$) were conducted on muscle and liver samples which provides long- and short-term diet information due to the different turnover rates, respectively. We estimated the total niche width (TNW), between-individual component (BIC) and within-individual component (WIC) by a multidimensional analysis, using MCMCglmm package in R. We examined the degree of individual diet specialization (WIC/TNW) in both ontogenetic stages.
BIC value of adults was larger than juveniles, on the other hand, WIC value of adults was approximately equal to juveniles. The degree of individual diet specialization (WIC/TNW) was larger in adults than in juveniles, suggesting that each juvenile individuals tended to exploit similar food resources depending on seasonal availability, in contrast, each adult individuals utilized different types of food resources. This species may have been able to successfully invade and establish in various aquatic ecosystems around the world including Japan, due to its flexible dietary habits. Juveniles tend to exploit available food resources collectively in a generalist manner, while individuals exhibit increasing dietary specialization as they grow into adults. Such ontogenetic and population level flexibility in resource use likely contributes to the establishment success of this species.

P033 Effect of nutrient levels on the growth of the invasive alga *Micrasterias hardyi* isolated from Lake Biwa

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Invasive species can significantly alter aquatic ecosystems by affecting biodiversity and community dynamics. The dominance of the green alga *Micrasterias hardyi* in Lake Biwa, Japan, during the last decade has raised serious concerns due to its large cell size (～200 μm), making it inedible to zooplankton and potentially disrupting trophic transfer through food chain. Normally large phytoplankton are typically associated with nutrient-rich environments, as their lower surface area-to-volume ratios limit nutrient uptake efficiency. However, *M. hardyi* successfully dominates in oligotrophic Lake Biwa, raising the question of "whether it possesses physiological traits that enable efficient nutrient acquisition despite its large cell size". Fortunately, access to the strain MH of *M. hardyi*, provided by Lake Biwa Environmental Research Institute, enabled us to address this question under controlled laboratory conditions. In this study, we examined its growth response to varying nitrogen concentrations, determined its half-saturation constant (K_m), and compared it with those of *Staurastrum dorsidentiferum*, an indigenous Lake Biwa species. Our results revealed that the K_m value of *M. hardyi* (0.059 mg N L^{-1}) was lower than that of *S. dorsidentiferum determined* in a previous study (0.091 mg N L^{-1}), suggesting a higher affinity for N by *M. hardyi*. Additionally, chlorophyll content per cell was calculated across nutrient gradients. Notably, *M. hardyi* possessed less chlorophyll per cell under low-nutrient conditions, suggesting a strategy to reduce per-cell resource investment while maintaining population-level biomass. Taken together, these findings suggest that *M. hardyi*'s high nutrient affinity and physiological flexibility in nutrient utilization may contribute to its success in oligotrophic environments such as Lake Biwa.

P035 Remote Sensing Based Classification of Abandoned Paddy Fields Reveals Successional Impacts on Insect Biodiversity

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Abandoned paddy fields (APFs) are increasing due to socio-economic changes, yet their ecological characteristics across spatial scales and taxonomic groups remain poorly understood. Previous studies have largely focused on isolated high-value sites or specific plant communities, limiting broader insights into biodiversity and successional processes. This study aims to classify successional stages of APFs using remote sensing-based ecological indicators and to analyze how these stages influence terrestrial insect diversity and community composition. The research was conducted across 2,269 APF sites in Gyeonggi Province, South Korea, which spans approximately 10,171 square kilometers. Ecological indicators including NDVI, NDWI, and Rao's Q diversity index were derived from Sentinel-2 imagery and used in principal component analysis and K-means clustering to classify successional types. Field surveys were conducted in May 2024 at nine sites, with insects sampled using sweep nets. Diversity indices such as Shannon and Dominance, as well as community composition using NMDS and PERMANOVA, were analyzed. The analysis identified three successional types: Cultivated fields, Herbaceous-woody mixed APFs, and Woody-dominated APFs. Ecological structures differed significantly among these types (PC1: $F = 7224$, $p < 0.001$). Herbaceous-woody mixed APFs had the highest insect diversity (Shannon = 3.38 ± 0.16), while Cultivated fields had the lowest (2.58 ± 0.44, $p = 0.02$). Community composition also varied significantly ($R^2 = 0.49$, $p = 0.004$), with Hemiptera and Orthoptera dominant in Cultivated fields, Lepidoptera and Hymenoptera more common in Woody-dominated fields, and predatory taxa like Mantodea and Odonata enriched in Herbaceous-woody mixed fields. These results confirm the feasibility of using remote sensing to classify ecological structure of APFs and show that successional stages significantly shape terrestrial insect biodiversity.
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P036 Integrating Spatiotemporal Dynamics and Landscape Connectivity to Improve Ecosystem Service Supply-Demand Imbalances: A Dual Perspective on Quantity and Space

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The imbalance between ecosystem service supply and demand has increasingly intensified due to urban expansion and environmental degradation. Therefore, this study proposed a novel framework to address ecosystem service (ES) supply-demand imbalances in the Yangtze River Delta (YRD) by integrating spatiotemporal dynamics and landscape connectivity from both quantitative and spatial perspectives. Firstly, we evaluated ES supply and demand relationships across 2000, 2010, and 2020, focusing on four primary services: biodiversity conservation (BC), carbon storage (CS), water yield (WY), and water purification (WP). Secondly, we identified an ES transmission network to alleviate spatial mismatches in ES flow, improving connectivity between fragmented landscapes. Finally, we pinpointed the priority conservation and restoration areas for improving supply-demand balance. The results reveal that: 1) the quantity and spatial distribution of supply and demand in the YRD have been increasingly imbalanced over the past two decades, with inconsistencies observed across different ecosystem services. 2) 210 ES supply corridors were identified, spanning 4556.80 km and covering an area of 8742.75 km2. The ES supply corridors mainly consisted of cropland and aquatic ecosystems, predominantly located in the central and northern regions of the study area. 3) A total of 115 transmission paths between ES supply and demand were identified, spanning 2518.69 km and covering an area of 6793.84 km2. The transmission paths predominantly traversed cropland, covering an area of 4802.70 km^2 and were mainly concentrated in the cities in the northern, eastern, and central regions of the study area. 4) 232 priority conservation areas were finally pinpointed, covering an area of 1750.11 km2. These priority conservation areas primarily consisted of cropland, aquatic and forest ecosystems, indicating a large spatial gap with existing nature reserves. This study provides valuable insights for policymakers to improve ES supply-demand imbalance, thus supporting sustainable ecological management and resilience in rapidly urbanizing landscapes.

P037 Analyses of the effects of microplastics and warming on soil microorganisms

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Microplastics (MPs), defined as plastic particles smaller than 5 mm, are increasingly recognized as persistent pollutants extensively dispersed throughout terrestrial and aquatic ecosystems. Despite their widespread occurrence, film-shaped MPs derived primarily from agricultural mulching films and packaging materials, remain under-investigated in soil environments. Concurrently, global warming poses complex and unpredictable threats to ecological stability, especially when interacting with co-occurring pollutants. This study aimed to assess the combined effects of film-shaped low-density polyethylene MPs and elevated temperatures on soil microbial communities. A controlled 30-day incubation experiment was conducted, exposing soils to a gradient of MP concentrations (100, 500, and 1000 mg MP kg^{-1} soil) and simulated warming using temperature-regulated chambers with three different temperatures of 22 °C, 25 °C, and 28 °C. During the incubation experiment, extracellular enzyme activities, nitrogen mineralization, and microbial biomass were analyzed. Soil microbial biomass increased significantly under both MP and warming treatments. Acid phosphatase activity per unit biomass decreased under both warming and high MP levels. Enzymatic activity normalized to biomass declined with warming, and interaction effects between MPs and temperature were significant for acid phosphatase on all days except day 5, and for β-glucosidase on day 1 and day 10. Ammonium production increased significantly in early incubation phase (days 1 and 5) under warming, but the effects of warming diminished over time. Interaction effects for nitrogen mineralization were detected primarily in early incubation stages. These results indicate that warming and MP treatments both have independent and interactive effects on microbial functions. Overall, the combined effects of MPs and warming may differ from their individual impacts on soil microbial communities. These findings emphasize the importance of evaluating pollutant-climate interactions in predicting changes in soil ecosystem functions under global environmental change.

P038 The Current Status and Relationship Between Bitterlings and Freshwater Mussels, and Challenges for Their Conservation

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Bitterlings, classified under the Cyprinidae family and the subfamily Acheilognathinae, are freshwater fish native to Japan, which include 11 genera and 28 species. Many of these species are endangered and listed on the Red Lists of the Ministry of the Environment and various local governments. Major causes of their population decline include water pollution, river modification, land reclamation, habitat destruction, predation by non-native species, and competition from other fish.

A unique characteristic of bitterlings is their reproductive behavior: they lay eggs inside freshwater mussels. However, the survival and reproduction of freshwater mussels, which live in rivers and marshes, are also declining due to habitat loss and environmental degradation. Because of this mutual relationship, bitterlings cannot reproduce successfully in the wild without freshwater mussels.

Despite their ecological interdependence, few studies have been conducted on how human activities impact both bitterlings and mussels in specific regions such as Kagawa. To address this, the authors investigated the presence of freshwater mussels in rivers throughout Kagawa, particularly focusing on areas affected by river modifications and changes in land use. Key mussel species such as Pronodularia japanensis, Unio douglasiae, and Anemina arcaeformis were studied.

The decline in mussel populations — especially due to the loss of their host fish, such as gobies — poses a threat to the stability

of the entire ecosystem. If current trends continue, not only mussels but also bitterlings will face extinction, potentially leading to broader biodiversity loss. Therefore, comprehensive conservation strategies are urgently needed. These should include habitat restoration, artificial breeding techniques, and control of invasive species, in addition to ongoing protection and propagation efforts.

P039 Detecting the presence of *Ursus thibetanus ussuricus* using airborne eDNA through various sampling methods in a controlled environment

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Recent progress in environmental DNA (eDNA) has enhanced biodiversity assessments in aquatic ecosystems, stimulating interest in terrestrial applications. In particular, airborne eDNA is a powerful monitoring tool in terrestrial ecosystems. Previous studies, however, still lack comparative analyses of multiple eDNA substrates and evaluations of dynamic environmental influences. This study aims to provide foundational evidence for the emerging airborne eDNA field by comparing airborne eDNA with other eDNA substrates and examining variations in eDNA concentrations across seasons and meteorological variables.
A mesocosm experiment in a zoo enclosure setting, targeting Asiatic black bears (*Ursus thibetanus ussuricus*), was conducted from August to November, sampling airborne particles, spider webs and surface particles. Quantitative PCR using specific primers yielded Cq values for extracted DNA. Statistical analyses employed both Boosted Regression Trees (BRT) to assess variable importance among meteorological factors and Generalized Additive Models (GAM) to examine nonlinear relationships between environmental variables and eDNA concentration.
Results showed that spider webs yielded the highest detection rate, followed by airborne particulates, and surface particulates (Cohen's $d = 0.77$). Seasonal variations in airborne eDNA were non-significant overall but significant in September compared to other months ($p = 0.013$). Statistical modeling indicated that in order of variable importance, temperature (33.9%), wind direction (23.5%), wind gusts (18.4%), PAR integral (15.5%), and humidity (8.6%) significantly affected airborne eDNA detection. In addition, increased temperature correlated negatively with Cq values between 20.87℃-27.83℃ ($p < 0.001$, edf = 4.108, $R^2 = 0.356$).
This study demonstrates that the amount of eDNA differs by substrate type and that airborne eDNA concentration varies markedly under different environmental conditions. These findings contribute to enhancing our understanding of the effective application of terrestrial eDNA substrates. Furthermore, this research at the mesocosm stage suggests a pathway for the methodological standardization of airborne eDNA techniques in future terrestrial ecosystem monitoring.

P040 Ploidy-Dependent Establishment and Expansion of Hybrid Dandelions in Japan

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Hybridization can promote the invasiveness of introduced species. *Taraxacum officinale*, introduced to Japan, has hybridized with native dandelions, and hybrids now outnumber *T. officinale*, suggesting that hybridization has facilitated its establishment and expansion. However, the detailed expansion process and mechanism are not well understood.
In this study, we first conducted genetic analyses of hybrids collected from different regions in Japan using next-generation sequencing GRAS-Di to infer their origin and expansion process. The results revealed contrasting dynamics depending on the ploidy level. Triploid hybrids in each region had genes derived from local native species, indicating multiple independent hybridization events and limited dispersal beyond their birthplace. In contrast, tetraploid hybrids throughout Japan were dominated by a single clone with genes derived from a native species in eastern Japan, indicating wide dispersal after a single hybridization event.
To investigate whether hybridization has altered ecological niches, we analyzed the occurrence data of native species, *T. officinale*, triploid hybrids, and tetraploid hybrids in western Japan obtained through citizen research, combined with climate and land-use variables. Niche analysis showed that native species and *T. officinale* occupied different niches; triploid hybrids occupied niches more similar to those of native species, whereas tetraploid hybrids occupied the most divergent niche.
These results suggest that the establishment and expansion mechanisms of hybrid dandelions differ by ploidy. Triploid hybrids likely adapted to local environments by acquiring region-specific adaptive genes from local native dandelions in the same region through hybridization. Tetraploid hybrids, on the other hand, may have gained increased dispersal ability through polyploidization, allowing a single genotype to expand and dominate over a wide geographic range.

P041 Decline of seagrass and seaweed beds in marine protected areas due to high water temperatures: A case study of the Bungo Channel, Japan

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The conservation of seagrasses and seaweed is essential, as they support coastal biodiversity. However, it has been reported that sea surface temperatures (SST) rise due to climate change also affects seagrass and seaweed at coastal areas. In this study, we focused on Bungo Channel, Japan, and quantitatively evaluated the impact of SST on changes in seagrass and seaweed beds inside and outside marine protected areas (MPAs), using the results of a hearing survey conducted in 1989 and distribution surveys using satellite images conducted in 2017 and 2022. Additionally, we evaluated the current conservation and management status of seagrass and seaweed, and detected spatial gaps. The analysis revealed that seagrass and seaweed beds in the Bungo Channel have decreased by more than 50% from 1989 to 2022. It was also revealed that about 90% of seagrass and seaweed beds

have been lost since 1989 in Ashizuri-Uwakai National Park which is one of the three major MPAs and located in the south part. Furthermore, a multiple regression analysis that examined the influence of MPAs and SST on the change in seagrass bed area from 2017 to 2022 revealed that only SST had significant negative impact. There is a large difference in conservation and management status between the eastern and western coasts of the Bungo Channel, and insufficient monitoring has been carried out, especially on the eastern side where the decline is most severe. This study implied that seagrass and seaweed beds are declining in the Bungo Channel due to rising SST, regardless of the presence of MPAs. Therefore, if climate change continues to accelerate, the natural environment within the MPAs will also change, making it difficult to achieve the original purpose. To accurately evaluate the impact of climate change, it is necessary to expand monitoring.

P042 Quantifying functional redundancy and resilience in bumble bees using species distribution models and hypervolumes

＊Megan Mei Yan Low (Tohoku University, ESJ), Yukari Suzuki-Ohno (Tohoku University/Center for Sustainable Society), Jamie Michael Kass (Tohoku University)

Interspecific morphological variation in bees is related to resource partitioning and flower use which influences the provision of pollination services. As high functional diversity and redundancy contribute to resilience against environmental stressors and anthropogenic changes, it is crucial to map the locations of functional hotspots for pollinators to inform conservation priorities in this era of global change. In this study, we used species distribution models to predict the potential distributions of 17 native bumblebee species across Japan using data primarily from a citizen science database, then compared patterns of predicted species richness and functional diversity calculated with trait data and probabilistic hypervolumes. Functional diversity in bumble bees was mainly driven by traits related to proboscis length and body size. Functional diversity is high along the coastal areas of Honshu, central Honshu, Kyushu, and Shikoku. Except for central Honshu, species richness is low in these areas, demonstrating high incongruence between number of species and their functional diversity. Future work will focus on testing correlations between functional diversity, species richness, and environmental variables. To estimate functional redundancy, we also will run simulations that determine the change in functional diversity of each predicted community per grid cell with species removals. Finally, we also will examine how functional diversity patterns may change with species range shifts under predictions of future climates.

P043 Threat to the genetic integrity of the Japanese allotetraploid spined loach, *Cobitis sakahoko*, population in the Sendai River in southern Kyushu, Japan

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The native range of an endangered Japanese allotetraploid spined loach species, *Cobitis sakahoko* (Cobitidae; hereafter called *Sakahoko,* chromosome number, 2n=90), is limited to some parts of the Oyodo River system and a single upper reach of the Sendai River system in southern Kyushu Island. Populations have been rapidly shrinking owing to predation by non-native carnivorous fish and habitat degradation. Recently, another threat to this species was reported in a tributary of the Sendai River. The establishment of a population of another allotetraploid spined loach (*Cobitis magnostriata,* hereafter called *Magno,* 2n=98), introduced into the Tsuruta Dam Reservoir located downstream of the habitat of *Sakahoko* from Lake Biwa in central Honshu Island, has been confirmed. Although *Magno* mainly inhabits lake environments, it migrates into rivers to spawn, potentially permitting hybridization between the two species. We conducted analyses of chromosome numbers and mitochondrial (cyt*b*) and nuclear (*RAG1* and *IRBP2*) genes via sequencing to clarify the structure of the river population. Only one individual collected from the uppermost sampling site displayed *Sakahoko*-specific characteristics. The other individuals collected from this river exhibited mosaic characteristics derived from both *Sakahoko* and *Magno*, and possessed 98 chromosomes, indicating reciprocal genetic introgression between the two species with displacement of the *Sakahoko* genome by that of *Magno.* An individual with 98 chromosomes was also found in the upstream area beyond the drop structure that should serve as a barrier to migration, suggesting that the genetic integrity *Sakahoko* population in this river is critically endangered, and urgent conservation is required.

P044 DNA Analysis Of *Orcaella brevirostris* In Malaysia

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Orcaella brevirostris (Irrawaddy dolphin) are vulnerable to anthropogenic threats such as illegal fishing, bombing and dynamite testing. Boat usage and improper waste management can also bring a detrimental effect towards their habitat. These dolphins can be found in two different habitats: freshwater and coastal water. This separation can lead to isolation between different dolphin populations. Thus, gene flow can be halted which will lead to genetic drift. Furthermore, its own small population and low reproductive rate may result in poor genetic diversity. As such, *O. brevirostris* is now classified as endangered and critically endangered in some regions. Conservation efforts to save these dolphins is desperately in need but baseline genetic background must be known prior. In this study, we use mitochondrial D-loop universal primer set to determine the genetic variation of *O. brevirostris*. By using known *O. brevirostris sequences from different neighbouring countries (For example: Thailand, Vietnam and Indonesia), we also determined the relationship between the O. brevirostris in Malaysia and the aforementioned neighbouring countries' O. brevirostris.* Based on phylogeny analysis, *O. brevirostris* from Brunei Bay grouped with *O. brevirostris* from Peninsular Malaysia, Vietnam and India in clade A. Two different haplotypes of *O. brevirostris* (Type 3 and 4) from Brunei Bay

grouped with *O. brevirostris* from India (GQ851929) in clade A1 while haplotypes 1, 2, 5, 6, and 7 of *O. brevirostris* from Brunei Bay and Peninsular Malaysia grouped with *O. brevirostris* from Vietnam (JQ814472) in clade A2. Haplotype relationship also showed a deep relationship of the studied *O. brevirostris* and the neighbouring *O. brevirostris* populations, possibly showing there would be potential gene flow between these regions or hints of recent colonization by coastal *O. brevirostris* in freshwater waters.

P045 Estimate Plant Species Richness in Forested Isolated Wetlands: A Spatial Modeling Approach

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Forested wetlands play a critical role in biodiversity conservation by supporting distinct plant communities shaped by both hydrological and topographic isolation. However, spatial patterns of plant species richness in these ecosystems remain understudied at a national scale. The use of secondary data allows for broader-scale ecological analysis while saving time and resources. We compiled, curated, and standardized species occurrence records from the literature, resulting in a final dataset of 558 forested wetland surveys extracted from 27 references across South Korea. Vascular plant richness and associated 29 environmental variables were analyzed using spatial generalized linear models (spGLMs) with a Negative Binomial distribution to account for the characteristic with count and spatial data. Both Moran's I and Geary's C indicated significant spatial autocorrelation in total plant species richness. After fitting the spGLM, spatial autocorrelation was no longer detected in the residuals, confirming the model's adequacy. Richness was positively influenced by wetland area, survey frequency, and precipitation during the driest quarter, while higher elevation and greater climatic variability were associated with lower richness. These results emphasize the importance of habitat size and hydrological stability in maintaining plant diversity in forested wetlands. Our study demonstrates the utility of secondary biodiversity data in large-scale ecological modeling, and highlights the importance of incorporating spatial structure to improve model reliability. This approach offers valuable insights for the conservation and management of forested wetland ecosystems under increasing environmental pressures.

P046 Effects of exotic tree species extermination on vegetation in planted sites on artificial islands

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In recent years, urban ecosystems have attracted attention as urban population increases. Since urban green spaces have more exotic tree species than protected forests, and biodiversity can be improved by increasing the native tree species, we evaluated the effects of extermination of exotic species on the vegetation of planted sites in urban artificial islands using simulation analyses.

In planted sites on urban artificial islands with an abundance of *Cinnamomum camphora*, we conducted four types of simulations: (1) extermination of only invasive exotic species, (2) extermination of all exotic species except *C. camphora*, (3) extermination of half of the *C. camphora* in addition to (2), and (4) extermination of all exotic species, including *C. camphora*.

We evaluated the effects of exotic species extermination by calculating vegetation similarity with three types of protected forests in Hyogo prefecture: climax forest dominated by *Castanopsis cuspidata*, secondary forests, and urban shrine forest dominated by *C. camphora*. We also calculated the change in the biodiversity index.

Without extermination of *C. camphora* (1 and 2), there was no change in vegetation similarity to the protected forests, whereas extermination of *C. camphora* (3 and 4) decreased the similarity to the shrine forest vegetation. Because the planted sites in artificial islands were characterized by specific tree species that were not present in the protected forests, the extermination of exotic species did not increase the similarity to the protected forests' vegetation. In planted sites with high species richness, there was little change in the biodiversity index due to extermination of exotic species, whereas biodiversity index decreased markedly in the sites with low species richness.

For planted sites with high species richness, diversity could be maintained by actively exterminating exotic species, however active management, such as enrichment planting of tree species that characterize the protected forests, is necessary to realize vegetation similar to that of the protected forests.

P047 Ecological and genetic characteristics of the endangered tree species *Pyrus ussuriensis* var. *aromatica*

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Pyrus ussuriensis var. *aromatica* (Iwateyamanashi) is a variant of the Japanese pear, and is classified as an endangered species IB by the Ministry of the Environment Red List 2020. Although over 2,000 individuals grow naturally in northeastern Japan, hybridization with Japanese pear has advanced, and genetically pure populations occur only in limited areas. Thus, urgent conservation of these pure populations is necessary. This study investigated a native pure population in Yabukawa, Morioka City, Iwate Prefecture, to clarify its ecological and genetic characteristics.

In the ecological survey, we examined the population structure and collected tree-ring cores. The results showed that Iwateyamanashi exhibits a typical structure of an early-successional, shade-intolerant tree species that regenerates in cohorts but is currently in poor regeneration condition, with very few seedlings. Tree-ring analysis revealed that the existing trees grew more slowly than the surrounding trees and are less competitive. Moreover, the spatial distribution of existing trees and their age structure suggested that regeneration occurs in disturbed environments under good light conditions. This indicates that cur-

rent regeneration failure is likely due to deterioration of the light environment, and improving light availability is crucial for conservation.
Genetic analysis, including assessments of genetic diversity, parentage, and gene flow, was conducted on 118 individuals from the Karumatsuzawa population and the Mukainosawa population. The findings revealed that genetic diversity tends to be lower upstream and higher downstream. Parentage analysis suggested that parents are mainly upstream and offspring downstream, suggesting seed dispersal via water flow. Furthermore, bidirectional gene flow was observed between the two populations.
In conclusion, this study demonstrated that reduced light availability, as a result of forest succession, hinders regeneration and that water-mediated seed dispersal influences genetic structure. For future conservation, it is necessary to manage surrounding vegetation to improve light conditions and conduct more extensive genetic studies, especially focusing on topographical influences.

P048 Fine root distribution and soil water uptake concentrated to shallow layer rather than the deep layer under rainfall exclusion treatment in a black locust plantation in Loess Plateau, China

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Soil drying is frequently observed in black locust (*Robinia pseudoacacia*) plantations in the semiarid area of Loess Plateau region in China. Overuse of deep soil water and formation of a dried soil layer (DSL) are major concerns over sustainable development of the ecosystems. To clarify the water use mechanism of black locust in response to soil water limitations, we assessed the water-use characteristics with paired plots at a sub-humid site of the Loess Plateau, including a treatment with 30% throughfall exclusion and a control. We comparatively investigated the dynamics of soil water content (SWC) throughout the profile in the two plots after four years of the treatment and determined the contribution of soil water storage (SWS) in each soil layer to water consumption according to the SWS budget. While SWC across the profile in the control plot showed general responses to replenishment and consumption under rainy and dry weather conditions, respectively, the treatment plot had smaller replenishment and consumption in deep layers, causing an aggravated deficiency in SWS and the formation of a temporary DSL at a depth of 55-100 cm. The cumulative decrement in SWS during each dry event in the control plot was significantly correlated with SWC at 100-160 cm, suggesting a substantial contribution of water consumption from this layer. However, the treatment plot showed a major contribution to water consumption from the 0-100 cm soil layer during dry events. The vertical distribution of the root system supports these findings. The distribution of fine root density in the treatment plot was relatively shallower than in the control plot. These findings indicate that soil water deficiency resulted in the formation of DSL, which hindered water consumption and root development deeper in the soil profile.

P049 Interspecific hybridization and microhabitat niche shift in sympatric *Ixora* species: A mechanism for increasing species diversity in Bornean rainforest

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Tropical rainforests have remarkable plant diversity, including many congeneric species on a confined spatial scale. Recent studies suggest that interspecific hybridization is more common in tropical rainforests than previously recognized. Hybridization can rapidly generate new genetic combinations and phenotypic traits, potentially contributing to the high species diversity in tropical rainforests. The acquisition of transgressive habitat niches through hybridization has been well-documented on broad geographic scales. However, less attention has been given to microhabitat niche shift within a narrower spatial range by hybridization between sympatrically co-existing species. To investigate whether hybridization between sympatric species contributes to species diversity through microhabitat niche shift in a tropical rainforest, we estimated the past hybridization among five sympatric small tree species of the genus *Ixora* (*I. blumei*, *I. brevicaudata*, *I. caudata*, *I. concinna*, and *I. glomeruliflora*) in a Bornean rainforest, and examined microhabitat niche partitioning between hybrids and sympatric congeneric species. We used MIG-seq, a next-generation sequencing technique, to analyze past hybridization. To evaluate the microhabitat niches of the five *Ixora* species, we analyzed the spatial distribution of all *Ixora* individuals with a diameter at breast height (DBH) ≥ 1 cm and their relationship to soils and topography in a 52 ha (500 m × 1040 m) plot. Hybridization analysis provided evidence for past introgression between *I. brevicaudata* and *I. caudata*. Microhabitat niche analysis revealed that *I. brevicaudata* had a largely different microhabitat compared to the other four species. These results suggest that the introgression may have contributed to the acquisition of the substantially different microhabitat niche of *I. brevicaudata* within a narrow geographic range (～1 km). This study provides empirical evidence that hybridization between sympatrically co-existing species is one of the mechanisms that may contribute to coexistence among congeneric species on a narrow regional scale, and enhances our understanding of the processes that drive the diversity of tropical rainforests.

P050 Do leaf traits differ between deciduous and evergreen species in Cambodian seasonally dry tropical forest?

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Many studies have examined various leaf traits that are closely related to photosynthetic capacity and a plant's ability to adapt to its environment. In particular, SLA (specific leaf area), LDMC (leaf dry matter content), and LNC / LPC (leaf nitrogen / phosphorus concentrations) are recognized as key indicators of tree growth characteristics, while $\delta^{13}C$ (leaf carbon stable isotope ratio) serves as an indicator of water use efficiency.
In seasonally dry tropical forests with prominent rainy and dry seasons, drought during the dry season imposes major stress on plants, often resulting in leaf shedding by deciduous trees. However, evergreen trees that retain their leaves even during the dry season are also found under similar environmental conditions. Leaf traits may therefore differ between phenological types.
In this study, to clarify leaf trait variations in seasonally dry tropical forests, we compared five traits (SLA, LDMC, LNC, LPC, and $\delta^{13}C$) among trees with different leaf phenology in Siem Reap Province, Cambodia. Five to ten leaves per individual were collected from 328 trees representing 53 species during the rainy seasons of June - July 2023 and July 2024. Fresh and dry weights were measured and leaf area was calculated using a scanner to determine SLA and LDMC. In addition, LNC, LPC, and $\delta^{13}C$ were analyzed using ground leaf samples.
The results showed that SLA, LDMC, LNC, and LPC exhibited similar values between phenological types, but only $\delta^{13}C$ differed significantly between phenological types, with deciduous species exhibiting higher $\delta^{13}C$ values than evergreen species. This suggests that while leaf phenology may not influence carbon acquisition strategies, deciduous species tend to exhibit greater water use efficiency.

P051 Comparison of ecological characteristics between dioecious and cosexual species of Japanese *Acer* species

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Plant sex expression can be generally classified into two categories: cosexuality and dioecy. Cosexual plants produce both pollen and seeds within a single individual, whereas dioecious plants produce either pollen or seeds, but not both. These fundamental differences are associated with variations in traits such as pollen movement and seed dispersal, which may drive divergence in reproductive traits and habitat characteristics between cosexual and dioecious species. Previous studies across diverse taxonomic groups have suggested such patterns; however, comparisons among distantly related taxa are often confounded by ecological differences unrelated to sex expression. In this study, we examined 29 Japanese species of the genus *Acer*, which includes both cosexual and dioecious species, to compare reproductive traits and geographic distribution between the two sex expressions. We first reconstructed the phylogenetic relationships among the 29 species using RAD-seq, and then conducted trait comparisons while accounting for phylogenetic relatedness. The results indicated that dioecy has evolved independently multiple times within *Acer*. Additionally, dioecious species tended to have fewer flowers per inflorescence and were more likely to be distributed in lower-latitude regions compared to cosexual species. The reduced number of flowers per inflorescence in dioecious species may be an adaptive response to the behavior of pollinators, which often visit only a subset of flowers in female inflorescences that do not offer pollen as a reward. Fewer flowers per inflorescence may help reduce the number of unvisited female flowers. The latitudinal distribution bias of dioecious species may support the hypothesis that dioecy evolves more readily under conditions of low pollination efficiency, such as those found in lower-latitude regions with high plant species diversity.

P052 Tree adaptation to temperature: a reciprocal experiment of eight woody species across a latitudinal gradient

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Understanding how trees growth response to temperature is critical for predicting forest resilience and range shifts under global warming. However, most existing studies rely on controlled greenhouse experiments or observational studies of natural populations within their native ranges—approaches that either fail to capture the complexity of natural climates or cannot simulate responses beyond current climatic niches. Reciprocal transplant experiments provide a robust approach to overcoming these limitations.
In this study, we implemented a latitudinal reciprocal transplant experiment across four sites in Japan (Tomakomai, Nikko, Kyoto, Yakushima), spanning a broad climatic gradient [o1]. Uniform nursery-grown seedlings of eight species were reciprocally planted under standardized soil and management, including two boreal conifers, two cool- temperate deciduous broadleaf trees, two warm-temperate deciduous broadleaf trees, and two warm-temperate evergreen broadleaf trees.
In the first year, we systematically quantified seasonal growth patterns (height and diameter increments), leaf functional traits (total leaf area, and specific leaf area [SLA]), and cold tolerance mechanisms through electrolyte leakage analysis. Key findings are: (1) Warm-adapted evergreen broadleaf species grew well even in the coldest site until the end of the first growing season; (2) Leaves of evergreen broadleaf species were severely damaged by the cold temperature in two northern sites. These results suggest that warm-adapted species grow well during the growing season irrespective of sites, but they cannot survive in the freezing winter.
In conclusion, this experimental framework can effectively address critical ecological processes—how tree species adapt to different temperatures—which provide important insights for plant distribution under climate change.

P053 Ocean currents, dispersal traits, and historical factors shape the genetic structure of three coastal plant species in eastern Japan

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Beaches present harsh environments for plants, characterized by nutrient-poor sandy soils, high temperatures, and salt exposure. Coastal plant populations are threatened by urban development, coastal protection measures, and erosion, leading to fragmented distributions. Current-driven seed dispersal plays a key role in maintaining gene flow, yet most previous studies have addressed only broad-scale patterns, leaving fine-scale population dynamics poorly understood. In this study, we investigated three coastal plant species with different dispersal traits along the Pacific coast of eastern Japan: *Calystegia soldanella* and *Lathyrus japonicus*, with high potential for current-driven seed dispersal, and *Ischaemum anthephoroides*, which can disperse for a short period.

We applied Microsatellite Capture Sequencing (MiCAPs) and SSR-seq to examine genetic structure based on nuclear microsatellite loci and flanking regions. No clear genetic structure was observed in *C. soldanella* and *L. japonicus*, whereas *I. anthephoroides* exhibited continuous but distinct regional differentiation—from northern Tohoku to outer Chiba, and from inner Chiba to western Shizuoka and Hachijojima. Seed dispersal simulations based on currents revealed region-specific patterns shaped by the Kuroshio and Oyashio currents. Long-duration (60-day) simulations showed limited southward dispersal in northern populations but broader downstream dispersal in southern ones. In contrast, short-duration (5-day) simulations resulted in highly localized dispersal or no landfall. To assess historical influences, we conducted ecological niche modeling to estimate suitable habitat distributions during the last glacial maximum. Results showed that *L. japonicus* likely persisted across broad areas from Tohoku to Kanto, while suitable habitats for *C. soldanella* and *I. anthephoroides* were restricted to southern Kanto. The clear genetic structure in *I. anthephoroides* likely reflects restricted glacial distribution and limited seed movement, while the genetic homogeneity in *C. soldanella* and *L. japonicus* may result from long-distance dispersal. Our findings highlight how oceanographic conditions, dispersal capacity, and historical biogeographic processes shape interspecific differences in genetic structure.

P054 Intra- and interspecific relationships between sprouting ability and functional traits of woody species in a Japanese beech forest

＊Kotaro Masuda (Niigata University, ESJ), Rei Shibata (Niigata University)

Resprouting is one of the life-history strategies of plants in response to disturbance, and is related to functional traits of leaves and wood. Previous studies have shown that shade-tolerant species, characterized by higher leaf dry matter content (LDMC), leaf thickness, leaf toughness, and wood density, tend to have lower resprouting ability (Shibata et al. 2014). However, it remains unclear whether these relationships hold not only among species but also within species. This study aims to clarify how intraspecific variation in leaf and wood functional traits is related to sprouting ability, and to compare these patterns with interspecific relationships.

The study surveyed 248 individuals of eight woody species in a beech forest in Niigata Prefecture, Japan. In June 2024, we measured the diameter of the stems and then cut them off at the base. At that time, leaf and wood samples were collected to measure LDMC, specific leaf area, leaf thickness, leaf toughness and wood density. In October, we recorded the number, basal diameter and height of all sprouts emerging from each stump. We constructed GLMMs using the probability of sprouting, number of sprouts, total basal area of sprouts, and maximum height of sprouts as response variables. Explanatory variables included stem basal area and functional traits. Species were included as a random effect on both intercepts and slopes.

LDMC and leaf thickness had significant positive effects on the total basal area of sprouts, indicating that individuals with sun-leaf traits such as higher LDMC and thicker leaves tended to produce greater sprouting biomass within species. This pattern is opposite to the interspecific trend, where shade-tolerant species with higher LDMC tend to have lower sprouting ability. These results suggest that the mechanisms influencing sprouting ability differ between intra- and interspecific levels.

P055 Advancing Leaf pH Measurement: Optimizing Pretreatment, Preservation, and Non-Grinding Methods

＊Jiashu Chen (China Agricultural University, ESC), Wenxuan Han (China Agricultural University), Sining Liu (China Agricultural University/Sichuan Agricultural University), Yan Luo (Xinjiang University), Yufei Hou (China Agricultural University)

Leaf pH, as an important functional trait, has been reported to reflect plant responses to environmental variation and leaf nutrient stoichiometry, and potentially to affect litter decomposition. The convenient, accurate and efficient measurement method of leaf pH is valuable for ecological and eco-physiological research. Here, we report our recent works (e.g., Liu *et al.*, 2022; Chen *et al.*, 2022) to discuss protocols for pretreatment, preservation, and measurement of leaf pH, offering practical guidance for diverse ecological research contexts. We systematically evaluated how different pretreatment and preservation methods (refrigeration, freezing, drying) and leaf: water mixing ratios affect leaf pH estimates, based on the conventional grinding method. The results identified freezing as the optimal pretreatment for long-duration field sampling, while refrigeration was recommended for short-term preservation. The leaf: water ratio significantly influences the measured leaf pH; therefore, when comparisons are needed, it is necessary to convert leaf pH measured under different leaf: water ratios. Building on these, we further developed a non-grinding measurement method of leaf pH which can minimizes leaf damage. By comparing leaf pH measurements obtained through grinding and non-grinding methods, along with a dilution experiment, we demonstrate that leaf pH measured with the non-grinding method is expected to be much closer to those of leaf sap in vivo. Thus, the non-grinding method is particularly

suited for detecting dynamic changes or instant responses of leaf pH to environmental fluctuations. Our studies provide conversion equations to establish connections among the leaf pH determined by different pretreatment, preservation, and measurement methods. We anticipate that standardized and robust measurement methods will advance researchers' comprehension of leaf pH and facilitate its integration into ecological studies at various scales.

P056 Spatial Patterns of Disease Infection in Barley: A Genotypic Neighborhood Perspective

＊Iqra Akram (Graduate School of Environmental Science, ESJ), Yasuhiro Sato (Graduate School of Environmental Science)

In real world field conditions, spatial heterogeneity in pest and disease damage is frequently surveyed among individual plants, though it is discussed as experimental noise in crop breeding. Genetic factors leading to such heterogeneity are still unknown. In this study we used barley cultivars from the CIMMYT Australia ICARDA Germplasm Evaluation (CAIGE) dataset to quantify spatial variation in disease infection and to examine its link with neighboring genotypes. To accomplish this, we applied two methods: Spatial Analysis of Field Trials with Splines (SpATS) and Neighbor Genome-Wide Association Study (Neighbor GWAS). First, SpATS analysis of three disease phenotypes (net form net blotch, spot form net blotch and scald) showed significant phenotypic variation but some of the spatial trends remain unexplained. This implied the presence of some other biotic factors directing us to explore neighboring effects. Neighbor GWAS revealed that neighbor genotypes described 10 to 30 percent of the phenotypic variation in three disease phenotypes. Moreover, two significant or marginally significant genetic loci were identified on chromosome 7H linked with neighbor effects on net form net blotch and scald. These genetic loci were anticipated to reduce disease damage via favorable allelic mixtures. Our findings demonstrate the significance of neighbor genotype interactions determining the spatial disease trends, suggesting that using variety mixtures could offer a promising approach to reduce the pest and disease damage in barley and other field crops.

P057 UAV-based seasonal vegetation mapping and habitat characterization in an abandoned paddy wetland

＊Youngeun Yang (Seoul National University, ESK), Jiseon Ro (Seoul National University/Suwon Research Institute), Youngkeun Song (Seoul National University)

In recent years, abandoned paddy wetlands have steadily increased, driving demand for precise vegetation classification and condition assessment to support effective monitoring. However, determining the optimal seasonal window for UAV image acquisition remains challenging, and studies on vegetation-hydrology relationships in such wetlands are limited. This study aimed to classify vegetation in an abandoned paddy wetland using multi-temporal UAV imagery and machine learning and analyze its relationship with hydrological conditions. We also explored the seasonal dynamics of key spectral and structural variables to assess the utility of multi-temporal UAV data in habitat discrimination. UAV imagery was acquired at three phenological stages (October and November 2023, March 2024) to classify 11 plant communities, open surface water, and bare land. A total of 20 variables were derived and used in a supervised Random Forest classification model. The classification achieved a maximum OA 90% and Kappa 0.888. The fen-type habitat (*Carex dimorpholepis-Salix koreensis*) remained inundated year-round except in June, with an average water level of 4.1 cm and a fluctuation range of 13.9 cm. In contrast, zones mixed with swamp-type (*Persicaria thunbergii-Salix koreensis*) and upland-type (*Populus tomentiglandulosa*) were situated 5.4 cm below the surface and were intermittently inundated during summer floods. The top four most important variables were CHM and GRDI from October and March. CHM captured structural habitat differences, while GRDI reflected dominant species' life-history traits. Combining October and March imagery improved OA by 11.9% compared to October alone, while adding the November data yielded only a 2.2% improvement. These results suggest that early spring is a phenologically critical period for monitoring abandoned paddy wetlands. Integrating multi-temporal UAV imagery that includes this period can significantly enhance the precision of vegetation distribution mapping and habitat condition analysis.

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P058 Distribution Change of *Suaeda japonica* and *Phragmites communis* Using Time-Series Vegetation Indices in Suncheon Bay

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Phragmites communis and *Suaeda japonica* are dominant halophytes in Korean coastal wetlands, serving as ecological indicators and blue carbon reservoirs. In Suncheon Bay, *Suaeda* populations have exhibited irregular fluctuations in recent years, while *Phragmites* has gradually expanded, prompting concerns about ecosystem shifts. Most previous studies relied on single-time field surveys, lacking insights into seasonal and long-term vegetation dynamics. This study analyzed the spatial and temporal distribution of *Phragmites* and *Suaeda* from 2019 to 2024 using Sentinel-2 satellite imagery across four months (March, April, October, November). Time-series NDVI, MNDWI, and SSVI indices were calculated for representative training areas. Results indicate that *Suaeda* coverage declined significantly—by 55.0% from 8.91 ha in 2019 to 4.01 ha in 2022—with a slight recovery to 4.74 ha in 2024, still 46.8% below the 2019 level. As of 2019, 50.97% of the distribution area of *Suaeda* in 2024 had disappeared. 45.34% demonstrated changes in distribution by year, and 3.69% showed a continuous pattern. The *Suaeda* community that disappeared was located in the area adjacent to lower intertidal zone. This pattern is likely attributable to the ecological characteristics of *Suaeda*, which are sensitive to growth cycle, salinity, and soil moisture conditions. On the other hand, *Phragmites* exhibited a stable distribution without large changes in the distribution area, and gradually spread to the area where

Suaeda was distributed in the past. The results of this study indicate that time-series satellite images can identify the dynamics of vegetation communities.
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P059 Forest Dynamics Under the Combined Influence of Climate Change and Deer Herbivory

＊Ai Obata (The University of Tokyo, ESJ), Gen Kusakabe (The University of Tokyo), Tsutom Hiura (The University of Tokyo)

Climate change threatens the carbon storage capacity of forests by altering population dynamics and species composition. Tree mortality is increasing under higher temperatures and drier conditions, but responses to warming vary among forest biotic and abiotic conditions. Moreover, the interactions of climatic stress and other biotic or abiotic factors in determining tree survival and mortality remain unclear.
We analyzed recruitment, mortality, and relative growth rates using long-term forest inventory data from a 20-year field survey across 50 plots spanning a wide latitudinal range in the Japanese archipelago. Our analysis showed increasing trends in mortality regardless of size class. However, these trends were not consistent across forest sites. In some cases, the observed reduction in mortality may reflect that cold and short growth duration environments have become more favorable for tree growth under climate change.
We then examined the interaction between climate change and deer browsing. Forests impacted by deer exhibited lower recruitment rates compared to deer-free forests. This suggests deer prevent forests from adapting climate change through altering species composition. These findings suggest that herbivory and climatic stress may synergistically undermine forest stability

P060 Population Dynamics of the Korean Endemic Monotypic Genus *Coreanomecon hylomeconoides* Nakai Using an Integral Projection Model

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Coreanomecon hylomeconoides Nakai is a perennial herb of a monotypic genus, found only in the southern regions of Korea. Its small population size, restricted geographic range, and unique taxonomic status make it more vulnerable to habitat disturbance, climate change, and other anthropogenic impacts than other comparable species. Therefore, understanding population dynamics of *C. hylomeconoides* is critical for revealing underlying mechanisms of population responses to varying environmental conditions and informing conservation strategies. Here, we characterize the population dynamics of *C. hylomeconoides* using an Integral Projection Model (IPM) and Life Table Response Experiment (LTRE), based on demographic data collected from 2022 to 2024 at seven sites covering its entire distribution range. Vital rates (survival, growth, and fecundity) were modeled as size-dependent functions to construct the IPMs. We then calculated population growth rates (λ) and elasticities. Furthermore, population outcomes were decomposed into the contributions of each vital rate to determine which parameters were responsible for spatial and temporal variation. Our results showed an overall decrease in the population size of *C. hylomeconoides* ($\lambda < 1$), suggesting that conservation efforts and management are urgently needed. Growth and survival made the largest contributions to the variation in λ, and survival was negatively correlated with summer precipitation, which may reflect physical disturbance caused by the summer monsoon in Korea. The negative correlation between survival and summer precipitation may be attributed to their tendency to inhabit steep slopes near ravines, where individuals were often observed being dislodged and swept away during intense rainfall in the field. In addition, elasticity analysis highlighted that population viability largely depends on medium- and large-sized individuals, implying that actions to enhance their survival against heavy summer rain are necessary as a key component of conservation strategies.
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P061 The overlooked importance of small-scale flowering in dwarf bamboos: Multiple cases of seedling recruitment

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Dwarf bamboos are generally considered monocarpic plants that flower and die gregariously after more than a century of vegetative growth. Although small-scale flowering events (partial flowering of one or few individuals within small areas in years distinct from gregarious flowering) are also observed, the ecological significance of this phenomenon has largely been overlooked. In this study, we explored the potential for seedling recruitment resulting from small-scale flowering in *Sasa senanensis*.
We surveyed the occurrence of small-scale flowering events and subsequent seedling emergence in Akita and Sapporo City from 2023 to 2024. Small-scale flowering was identified at 19 sites, and seedling emergence was confirmed at 13 of these sites. The density of seedlings aged 1-3 years ranged from 0.001-0.39 individuals/m^2. To examine whether seedlings could survive for an extended period and contribute to regeneration, we tracked seedling population dynamics over 11 years after a small-scale flowering event in Akita. We also compared seedling growth under different light conditions in a common garden. Of the seedlings that germinated in the year following the small-scale flowering event (N =1,006), 80% died within two years but 5.7% survived for 11 years. Individuals with higher initial growth rates and higher heterozygosity exhibited higher 10-year survival

rates. Although seedling growth was slow in the dark forest understory, in the common garden, they showed high survival and growth rates under bright conditions. These results suggest that small-scale flowering is relatively common and can contribute to successful seedling regeneration more than previously recognized. We discuss the implications of this phenomenon for understanding the ecology and evolution of dwarf bamboos.

P062 Functional Trait-Based Comparison of Aquatic Plant Life Forms

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Functional traits help explain plant survival, distribution, and adaptability while also supporting predictions of species patterns based on environmental and community factors. Among these traits, leaf nitrogen and phosphorus contents indicate growth and morphology. This study analyzed functional traits of 28 aquatic plant species to examine their ecological strategies and adaptation patterns. Field surveys were conducted in major wetlands across South Korea during a three-month growing season in 2024. Plant height was measured in the field or supplemented with data from the National Institute of Biological Resources (NIBR) and the Korea National Arboretum (KNA). Specific leaf area (SLA) was calculated as leaf area per unit dry mass. Total nitrogen (TN) was measured with an elemental analyzer, and total phosphorus (TP) with the molybdenum blue colorimetric method. Pearson correlation and principal component analysis (PCA) were conducted using RStudio to explore trait patterns. The N:P ratio increased significantly with plant height ($r = 0.451$, $p = 0.005$), indicating increased nitrogen demand in larger plants. SLA was negatively correlated with TN ($r = -0.158$, $p = 0.025$), indicating a trade-off where higher leaf nitrogen is linked to lower SLA. Submerged plants exhibited the highest SLA, indicating an acquisitive strategy, while emergent plants showed the lowest, indicating a conservative strategy. Floating-leaved plants showed high SLA and TN, and submerged plants had the lowest TP. PCA showed that SLA and TN aligned with a resource acquisition axis, while plant height and N:P ratio represented a growth strategy axis (PC1+PC2 explained 74% of variance). Submerged plants were clearly separated from other life forms, likely due to differences in photosynthesis, nutrient uptake, and gas exchange mechanisms. Building on these findings, future research will expand the analysis to further examine functional diversity and strategies in aquatic plants, providing a basis for trait-based classification by ecological role.

P063 Why are flower colors geographically fixed? An integrative analysis of color polymorphism in Campanula punctata

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Floral color polymorphism in plants is shaped by a complex interplay of abiotic environmental filtering, pollinator-mediated selection, and spatial genetic structure. However, most previous studies have categorized flower color qualitatively (e.g., "purple" or "white"), limiting our understanding of the ecological and evolutionary drivers behind spatial color variation. Particularly, few studies have quantitatively evaluated floral coloration under natural conditions using image-based or visual modeling approaches. *Campanula punctata*, a perennial herb pollinated by bumblebees and broadly distributed across Japan, exhibits striking flower color variation from vivid purple to pure white. These color morphs are geographically fixed and do not co-occur, suggesting strong region-specific selection pressures. To investigate why, we first used an ecological niche model to predict relationships with environmental variables for each categorical color morph and found that pigmented morphs tend to occupy seasonally hot and dry environments, while white morphs occur in nitrogen-rich and thermally stable habitats. To delve deeper, we sought to determine the importance of different factors in explaining continuous flower color values (HSV) quantified from citizen science photos and summarized via principal component analysis. We selected explanatory variables representing environmental, spatial, genetic, and pollinator-related factors and compared their relative importance using a variance partitioning approach. Preliminary results show that spatial and environmental effects are intertwined, while genetic and pollinator influences are minimal. Future work includes projecting flower color values onto bumblebee visual space to determine differences in contrast for pollinators, as well as fieldwork on pollinator visitation and reproductive success to test whether visual salience translates into higher relative fitness.

P064 The response of plant nitrogen resorption to restoration in Inner Mongolia, China

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Planting shrubs and trees has been proven to restore understory vegetation and soil properties in semiarid degraded grassland. Nutrient resorption is a key strategy for plants to survive in nutrient-poor environments. However, it remains unclear how nitrogen resorption efficiency (NRE) varies during the restoration process. To address this knowledge gap, this study measured leaf NRE, other plant properties, and soil nutrients in shrub-planting sites maintained for 20 and 40 years and a tree-planting site maintained for 40 years. We found that the 40-year shrub- and tree-planting sites exhibited higher soil nutrient contents. Green and senesced leaf nitrogen (N) concentration, NRE, and biomass at plant community level did not differ significantly among the three sites. However, at plant functional group level, the NRE of graminoids was higher than that of forbs, and the senesced leaf N concentration of graminoids was lower than that of legumes and forbs. With increasing soil nutrient contents, the biomass of graminoids increased while that of forbs decreased, and the NRE of graminoids decreased whereas that of legumes and forbs remained stable. Our results indicate that graminoids replaced forbs as the dominant species as restoration progressed. In addition, the decrease in graminoid NRE with increasing soil nutrients suggests a shift in their nutrient strategies that relies more on soil uptake. The higher biomass of graminoids and lower N concentration in their litter in the 40-year sites may lead to a

slowdown in subsequent soil restoration. These findings imply that appropriate management to control graminoid dominance could benefit long-term soil nutrient improvement and the growth of other species. Our study offers valuable insights for the future management of restored grasslands in semiarid areas from the perspective of plant internal nutrient cycling.

P065 Elevated CO_2 Alters Competitive Dynamics between Endemic *Aster koraiensis* and Alien *Coreopsis lanceolata*: Physiological Responses and Future Distribution Projections

＊Ji Yeong Hwang (Seoul National University, ESK), Eun Ju Lee (Seoul National University), Youngsung Joo (Seoul National University)

The average global temperature has risen by 1.5°C compared to pre-industrial times, largely due to increased greenhouse gas emissions, such as carbon dioxide. Increased atmospheric CO_2 often induces changes in plant growth rates, survival strategies, and interspecific interactions. In this experiment, we focused on how elevated CO_2 affects competition between *Aster koraiensis*, a Korean endemic species, and *Coreopsis lanceolata*, an alien species. Both are perennial Asteraceae occupying similar humid-area niches. Schoener's D indicated a current distribution overlap of 0.799, which is projected to increase to 0.855 by 2050 under the RCP 4.5 scenario. However, no studies have examined competition or habitat overlap between these two species. To test their responsiveness to climate change, we grew them under solo, intra-, and inter-specific competition at current (460 ppm) and elevated (560 ppm) CO_2 in open-top chambers. We used rhizomes of *A. koraiensis* and seedlings of *C. lanceolata* to simulate the invasion of *C. lanceolata* into *A. koraiensis* habitat. Although there were no significant differences in leaf number or length, *C. lanceolata* showed a significantly higher relative growth rate in plant height under inter-specific competition at current CO_2; this tendency disappeared under elevated CO_2. *A. koraiensis* showed more efficient photosynthesis, with a higher carbon assimilation rate and lower transpiration rate than *C. lanceolata*, but both plants showed decreases in both photosynthetic parameters under elevated CO_2. When competing with *A. koraiensis*, *C. lanceolata* exhibited a shade-avoidance strategy. Both species showed metabolic changes in response to elevated CO_2. In addition, we can verify their defense responses via phytohormones when the generalist herbivore *Spodoptera litura* attacks. Incorporating these data into distribution models will enable more realistic projections that include physiological and interaction-based plant responses to climate change.

P066 Comparison of moth communities in semi-natural grasslands in central Honshu and northern Kyushu and their relationship with the site environment

＊Hisashi Tajima (Shinshu Uni., ESJ), Kumiko Okubo (Shinshu Uni.)

Moths are expected to be bioindicator species because of their high species diversity, but few studies have been conducted on environmental assessment because of the difficulty of identification. In recent years, declines and extinctions of grassland moth species have been reported in many areas, but few studies have clarified the composition and structure of moth communities in grassland ecosystems. The purpose of this study was to clarify the moth community in the grassland ecosystem and to discuss the environmental assessment of the relationship between the moth community and the environmental conditions of the site. Surveys of communities and environmental factors were conducted in two areas, Kirigamine in central Honshu and Kujyu in northern Kyushu. In the qualitative analysis, the species that appeared were compared, and the grassland moths were classified into western and eastern Japanese types. As a quantitative analysis, TWINSPAN analysis was conducted using abundance at 11 sites in Kirigamine. The proportion of host plants, diversity index, and similarity in each community were compared. The results showed that the proportion of host plants in each community was relatively common among sites with similar vegetation, indicating the characteristics of each environment. The results of the multiple diversity indices differed according to the different diversity components that each index assessed. The similarity (PS) of each community had a significant negative relationship with distance between sites and a significant positive relationship with vegetation. When comparing community types with and without mowing and other management practices, there was a significant difference in the degree of similarity between them. These results suggest that the composition and structure of moth communities correspond to differences in vegetation environment caused by elevation, distance, and management. This work was supported by JSPS KAKENHI Grant Numbers JP 19K06107, JP 22K05706.

P067 Urbanization and habitat diversity promote endozoochorous seed dispersal by raccoon dogs (*Nyctereutes procyonoides*) within forest fragments in Tokyo

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Urbanization transforms natural habitats affecting biodiversity and essential ecological functions such as animal-mediated seed dispersal. Novel urban habitats introduce environmental heterogeneity, altering animals' ability to disperse seeds effectively. This study examined whether urbanization indicators such as built-up areas, population density and artificial light along with spatial heterogeneity influence endozoochorous seed dispersal by raccoon dogs (*Nyctereutes procyonoides*), an urban-adapted omnivore, in the urban forest fragments of the Tokyo metropolitan area. We surveyed raccoon dog latrines across 19 urban green spaces and identified 67 plant species. Despite the context of urbanization, raccoon dogs primarily dispersed native plant species, contributing to mutualistic seed dispersal services. The most frequently dispersed species were *Morus australis* and *Aphananthe aspera*. However, the mismatch between plant species in feces and the local vegetation suggested a broader foraging range beyond the study sites. Our results demonstrated that the urbanization rate, measured by built-up area, significantly increased plant species richness found in feces. The additive effect of built-up area along with habitat diversity enhanced endozoochory by raccoon dogs at larger scales. This underscores the role of seed dispersers in maintaining the plant diversity in urban forest fragments which can be supplemented by the spatial heterogeneity at large scales. Our findings highlight the need to

integrate urbanization indicators and spatial heterogeneity into the maintenance of endozoochorous seed dispersal processes. This study reinforces the importance of urban-adapted raccoon dogs in maintaining biodiversity and ecological processes despite the challenges posed by urbanization.

P068 Influence of flower predation by Yakushima macaques on the reproduction of *Camellia japonica*

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Primates are thought to significantly impact other organisms through foraging because they are foraging generalists, can break through many barriers with their well-developed brains and dexterous hands, have large biomass, and can utilize all forest areas from the ground to the tree top. Much research has been conducted on the positive effects of primates on plants, such as seed dispersal and pollination. On the other hand, there have been few studies on the negative impact of primates on plants, especially on the effects of primates on flowers. In the cedar forests of Yakushima, Yakushima macaques (*Macaca fusucata yakui*) have been observed from January to May destroying large numbers of flowers to feed on the nectar of the *Camellia Japonica*. In this study, I aimed to clarify the impact of flower predation by Japanese macaques on the reproduction of *Camellia japonica*. I investigated the nectar-feeding behavior of Japanese macaques, the proportion of *Camellia japonica* flowers subjected to predation damage, and the fruiting rate of *Camellia japonica* in three study areas with different vegetation on Yakushima. The results showed that Japanese macaques are destroyers, not pollinators, of *Camellia japonica* flowers, that Japanese macaques more frequently damage *Camellia japonica* flowers in cedar forests than those in evergreen forests, and that the fruiting rate of *Camellia japonica* flowers does not differ significantly among the three study areas, regardless of the degree of damage. These results suggest that *Camellia japonica* may have some coping mechanisms to withstand predation pressure by Yakushima macaques.

P069 Does the local extinction of Japanese macaques affect the seed dispersal distance of *Morella rubra*?

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Morella rubra is one of the major components of Japanese evergreen broad-leaved forests, and the seeds are mainly dispersed by Japanese macaques. However, on Tanegashima Island, where Japanese macaques went extinct around 1950, the amount of *M. rubra* seeds dispersed by animals has been reported to have significantly decreased compared to Yakushima Island, where the macaques still inhabit. This study aimed to determine the seed dispersal distances of *M. rubra* on Tanegashima and Yakushima.

DNA was extracted from *M. rubra* leaves collected from study sites on Tanegashima and Yakushima, and genotypes were determined using 19 microsatellite markers. Based on flower observations, individuals were classified into candidate mother trees (152 individuals on Tanegashima and 148 individuals on Yakushima), candidate father trees (143 individuals and 203 individuals), and offspring (116 individuals and 220 individuals). Seed dispersal distances were estimated using the neighborhood model approach. Additionally, correlograms were constructed using kinship coefficients (F_{ij}), and the Sp statistic was calculated as an indicator of the strength of spatial genetic structure.

The mean seed dispersal distance, estimated using an exponential dispersal kernel, was 11.1 m on Tanegashima and 93.2 m on Yakushima, indicating that the impact of forest defaunation was detected as a reduction in seed dispersal distances. Moreover, the offspring population on Tanegashima (Sp = 0.023) exhibited a stronger genetic structure compared to the candidate parent population on Tanegashima (0.003) and the offspring population on Yakushima (0.001), with closely related offspring being concentrated particularly within the 0-50 m range. This pattern suggests that the loss of the primary seed disperser has reduced opportunities for long-distance seed dispersal. Such clustering of related individuals may increase competition and susceptibility to pests and diseases, implying that the extinction of Japanese macaques on Tanegashima could negatively impact the survival of *M. rubra* seedlings.

P070 Shifts in Land Use Consistently Alter Aquatic Size Structures in Japanese Streams

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Understanding how land-use changes influence freshwater ecosystems is critical for biodiversity conservation and ecosystem management. In this study, we investigated how different land-use types (preserved forest, agricultural, and urban areas) affect the size structure and energy dynamics of stream communities across Japan. Using ecological monitoring data from 451 stream sites collected between 2018 and 2022, we applied size spectra analysis to assess biomass distribution across body sizes for fish and macroinvertebrates. Biomass estimates were derived using allometric equations, and size spectra were constructed via maximum likelihood estimation methods. Land-use was assessed using high-resolution satellite data, and a Principal Component Analysis (PCA) was performed to synthesize environmental gradients. Linear mixed models revealed contrasting responses between macroinvertebrates and fish. Macroinvertebrate communities in urban areas showed steeper (more negative) slopes and lower total biomass, suggesting reduced energy transfer efficiency and dominance of small-bodied, disturbance-tolerant taxa. The intercept was higher in agricultural areas, indicating a higher abundance of small organisms, likely benefiting from increased nutrients and sunlight. Urban areas also displayed better model fit, potentially reflecting simplified and more predictable size structures due to reduced diversity. Fish communities, on the other hand, responded differently. While the intercept and slope were also higher in agricultural areas, urban streams exhibited increased total biomass and broader size ranges. This suggests that generalist and mobile fish species may exploit artificial habitat complexity in urbanized settings. Richness pat-

terns also differed: macroinvertebrate diversity declined with disturbance, while fish richness was surprisingly higher in urban areas, likely due to tolerant species with broad ecological niches. Overall, our results demonstrate that land-use intensification alters size-based community structure in distinct ways for different trophic groups. Size spectra proved to be a powerful tool to detect these patterns, revealing how anthropogenic landscapes can simplify, restructure, or even favor certain aquatic assemblages.

P071 How to monitor pollinators: Comparision among conventional and eDNA metabarcoding methods

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Angiosperms and pollinators are experiencing a global decline recently. To promote their conservation, it is essential to monitor plant-pollinator interactions accurately and quickly. Conventionally, direct observation with capturing pollinators (DO), time-lapse camera (TLC) and digital video recording (DVR) have been used for monitoring pollinators of given plant species. Additionally, eDNA derived from flowers has recently been used for examining insects interacting with flowers. However, eDNA analysis presents difficulties in identifying interactions insects have. Pollinators were detected less frequently than parasites, herbivore and small insects because not only eDNA but also their eggs and too small-size individuals were extracted in the existing methods. To select the appropriate method (s) to meet research aims and target flowers in given studies, we need to compare the merits and limitations of these methods, though sufficient studies have not been conducted on this issue.
We aimed to compare three conventional methods and to develop an improved eDNA method for monitoring pollinators. We firstly compared the results of visitation frequency and identification accuracy of pollinators on the same flowers recorded simultaneously by DO, TLC and DVR to clarify merits and limitations of these methods. Second, we introduced a filter with a pore diameter of 100μm, which is approximately the size of insect eggs, during filtration to develop an eDNA method specifically for pollinator detection.
Visitation frequency and identification accuracy significantly differed among methods: DVR recorded more visits than other methods while the proportion of species identified was lowest among the methods. Meanwhile, DO showed the highest identification accuracy. Also, we successfully separated eDNA and individuals by filter. Additionally, we conducted eDNA metabarcoding analysis by using flowers which we recorded interactions with insects by DO, TLC and DVR. As a result, the composition of species detected by eDNA was largely different from those by other methods.

P072 Fish communities monitoring using eDNA metabarcoding considering seasonal and depth variations

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Environmental DNA (eDNA) analysis is a biomonitoring method that is non-invasive, non-destructive and easy to use, and is currently used to detect various biological communities in various environments. However, although biological communities are greatly affected by seasonal and depth changes, current monitoring based on eDNA analysis often only involves short-term sampling of surface water. Several reports have shown that the composition of biological communities detected by eDNA analysis is affected by season and depth, but many of these have only considered either season or depth independently, and there are few reports that have considered the effects of both simultaneously. It is estimated that by considering both seasonal and depth variation in ecosystems when sampling, it is possible to obtain results that more accurately reflect the biodiversity of the area being studied. In this study, we conducted monthly eDNA metabarcoding surveys of fish community at the depth of 0 m and 25 m at two sites off the Ishizuhama coast in Shizuoka Prefecture for one year from April 2024. The results of the beta diversity analysis suggest that the season of sampling influences the composition of fish detected. Particular, it has been shown that the composition of fish changes significantly from July to August. In addition, we found that there found significantly more freshwater fish DNA in the surface water. This suggests that eDNA from rivers is more likely to be present in the near-surface layer when it flows into the ocean. This study is one of the few cases where sampling season and depth have been investigated simultaneously in eDNA analysis, and it suggests a sampling frequency that should be considered for more accurate biodiversity assessment.

P073 Evolution of secondary metabolites, morphological structures and associated gene expression patterns in galls among four closely-related aphid species

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Gall-forming insects induce various types of galls on their host plants by altering gene expression in host plant organs, and recent studies have been conducted for gene expression in galls. However, the evolutionary trajectories of gene expression patterns and the resulting phenotypes have not yet been studied using multiple related species. Host-specific herbivorous insects such as gall insects are likely to be genetically differentiated among populations due to distributional restriction driven by the distribution of their host plants, and such a genetic differentiation can also drive the speciation and the diversification of herbivorous insects. We investigated the speciation and the diversification process of galls induced by four closely related aphid species (Hormaphidini) on a host plant species (*Hamamelis japonica*) by comparing their gene expression patterns and resulting phenotypes, and by examining the phylogenetic congruence between the geographical divergences of aphids and the host plant.
Our gene expression analysis revealed higher expression levels of genes for the biosynthesis of phenolics and morphogenesis in the galls of *Hamamelistes betulinus* and *Ha. kagamii* than the galls of *Ha. miyabei* and *Hormaphis betulae*). The concentration

of phenolics and the complexity of the internal structure of galls were correlated with the expression levels of genes for the biosynthesis of phenolics and morphogenesis respectively. Phylogenetic analysis of aphids and the host plant showed that geographical isolation among host plant populations has interrupted gene flow in aphids and accelerated the speciation process. These results suggest that the expression levels of genes for the biosynthesis of phenolics and morphogenesis have evolutionarily increased in galls accelerated by the speciation process of aphids due to the distribution change of the host plant, leading to the related phenotypic evolution.

P074 Pollination mutualism between *Chrysosplenium* ser. *Macrostemon* and *Nipponorhynchus* sawflies: Ecological and evolutionary perspectives

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Coevolution is a dynamic evolutionary process shaped by reciprocal interactions among multiple organisms. A classic and well-studied example is the relationship between flowering plants and their insect pollinators, the most diverse group of terrestrial organisms on Earth. Among the various mutualistic plant-insect relationships, one of the most highly interdependent and fascinating interactions is known as obligate pollination mutualism. In these relationships, certain insects serve as both seed parasites during their larval stage and effective pollinators as adults, forming a specialized reproductive mutualism with their host plants. Such mutualism not only provides valuable insights into the mechanisms driving floral diversity, but also serves as an important model for studying the intricacies of biological interactions and coevolution.
Recently, we identified a novel mutualism including seed-parasitic pollinators and their host flowers between *Macrostemon* plants (classified in *Chrysosplenium* series *Macrostemon*) and *Nipponorhynchus* sawflies (family *Tenthredinidae*). The larvae of the two *Nipponorhynchus* species, *N. bimaculatus* and *N. mirabilis*, have been documented as specialist seed feeders on *Chrysosplenium macrostemon* var. *shiobarense* and *C. echinus*, two closely related taxa in ser. *Macrostemon*. Intriguingly, the adult sawflies possess a uniquely elongated proboscis—classified as "Type 8" within Hymenoptera—which differs markedly from the known seven types in the order. This specialized proboscis might be an adaptation for accessing nectar hidden within flowers, and has evolved through interactions with *Macrostemon* flowers.
Our field and morphological investigations demonstrated that *Nipponorhynchus* sawflies function as the principal and effective pollinators of *Macrostemon* species. These findings confirm a mutualistic association that confers reproductive benefits to both partners. In this presentation, we introduce recent progress in elucidating the ecological and evolutionary basis of this unique plant-insect mutualism.

P075 How does floral scent control the pollinator diversity of *Asarum* sect. *Heterotropa*?

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Plant-pollinator interactions are one of the main drivers of angiosperm diversity, and of the various cues that flowers use to attract pollinators, floral scent is particularly powerful. *Asarum* sect. *Heterotropa* (Aristolochiaceae) is one of the most diversified plant lineages in Japan, and exhibits huge diversity of floral phenotypes, especially floral scent. This is likely part of a floral mimicry strategy to attract specific fly pollinators, however the pollination systems of most *Heterotropa* species are undescribed. This study aims to identify pollinators and characterise the floral scent content and emission patterns of *Heterotropa* species. We used time-lapse photography and flower aspiration to collect pollinator data, identifying specimens by DNA barcoding. We used solid phase microextraction (SPME) headspace sampling with gas chromatography-mass spectrometry (GC-MS) to analyse scent composition. To examine diel patterns of scent emission, we used GC-MS with time-course sampling as well as real-time proton transfer reaction-mass spectrometry (PTR-MS). We identified dipteran pollinators for eight species and found that the floral scent profiles are highly variable in their composition of oligosulphides, terpenes, alcohols and esters. The time-lapse photography showed that pollinating flies visited the flowers mainly during the daytime, and emission of dominant floral scent volatiles was also highest during the day. Quantitative aerial overlap analysis with all groups of visiting insects showed that the emission of dominant volatiles is synchronised exclusively to visits by pollinating flies, strongly suggesting that floral scent emission is regulated to match pollinator activity. This pattern is present for different volatiles depending on the *Heterotropa* species, implying that specific volatiles are responsible for attracting different pollinators in each species. This is compelling evidence for the role of floral scent in adaptation to specific pollinators, shedding light on the evolutionary mechanisms behind the diversification of this plant lineage.

P076 Factors Determining Partners in *Xiphydria* Woodwasp-Fungus Symbiosis: Fungal Growth is Better on Wasp's Host-Tree Species

＊Ryu Takagi (Graduate School of Bioagricultural Science, Nagoya University, ESJ), Hisashi Kajimura (Graduate School of Bioagricultural Science, Nagoya University)

Some woodboring insect-fungus symbiosis have evolved to utilize trees in early decaying stage, dying fresh resource less predictable for the insects. In the resource utilization, what factors determine their fungal partners remains unclear.

Woodwasps (Siricidae, Xiphydriidae) are wood-feeding insects that rely on fungal symbionts for development. Of these, Xiphydriidae utilizes felled or weakened broadleaf trees. To avoid competition with other woodwasp species and sustain their symbiosis with fungi under such conditions, they can adopt resource partitioning strategies. Indeed, a previous survey has shown that each xiphydriid species belonging to the same genus emerge from different tree species (Takagi and Kajimura 2025), suggesting their host-tree segregation. However, response of their symbiotic fungi in the strategies remains unknown.
Here, we tested whether the fungi are adapted to host-tree preferences of their associated wasps. Fungal strains, *Daldinia* sp. 1 and *Daldinia* sp. 2, isolated from *Xiphydria ogasawarai* and *Xiphydria eborata*, respectively, were inoculated into logs of four host-tree species: maple for *X. ogasawarai*, alder for *X. eborata*, and two non-hosts, cedar and cypress. Fungal growth was assessed by measuring length of wood discoloration, which indicates extent of hyphal expansion. Each fungal strain showed the highest discoloration length on the host-tree species of associated wasps, suggesting the best growth performance. This tree species-specific discoloration expansion was reduced in heat-treated logs, and a bioassay using hot-water extracts inhibited fungal colony growth, indicating that host-tree chemicals influence fungal growth performance.
These findings suggest that *X. ogasawarai* and *X. eborata* are associated with fungal strains suitable for their respective host trees, facilitating interspecific resource partitioning. In turn, the fungi may benefit from their symbiotic wasps that transport them to favorable wood substrates, avoiding colonization competition with other fungal species. This study highlights the interactions with tree as a factor in evolution of insect-fungus symbiosis.

P077 Isotope enrichment trends of aquatic fish parasites in Lake Biwa

＊Kei Kinoshita (Kyoto Univ. CER/Fukushima Univ., ESJ), Yuji Onishi (RIHN), Ketaro Fukushima (Fukushima Univ.), Keisuke Koba (Kyoto Univ. CER)

Predator-prey relationships provide important information for the energy flows within ecosystems, as well as providing new insights into the ecology of individual organisms. Stable isotope analysis is the widely used technique for elucidating predator-prey relationships. This method utilizes the phenomenon of the isotopic enrichment, which is enriched in predators relative to their prey. Previous studies on host-parasite relationships in environments have reported isotope enrichment patterns that differ from those observed in the predator-prey relationships. We hypothesized that the unique isotope enrichment in the host-parasite relationship is caused by the muscle used as an indicator of the host is not the feeding site of the parasite. In this study, we compared isotope enrichment in host muscle and parasite using feeding sites to evaluate isotope enrichment characteristics among parasite taxonomic groups. We collected four species of freshwater fish and freshwater shrimp collected from Lake Biwa in Shiga Prefecture, Japan. Parasites found in each host included trematodes, acanthocephalans, nematodes, copepods and isopods, and the stable isotope analysis was performed on the host-parasite pairs. In trematodes, parasite isotope enrichment in using feeding sites obtained the enrichment value of 1‰ in $\delta^{13}C$ and 3‰ in $\delta^{15}N$ that correspond to the predator indicator. These results indicate that the actual food utilization sites of parasites must be used when calculating isotope enrichment in parasites. In other parasites, analysis using food utilization sites did not provide a sufficient explanation. In other parasites, analyses using the feeding site failed to provide a satisfactory explanation. In copepods, carbon isotope enrichment showed depletion, in acanthocephalans nitrogen isotope enrichment showed depletion, and in isopods both carbon and nitrogen isotope enrichment showed depletion. This isotope enrichment depletion might be explained that some parasites absorb host fluid tissues from their own body surfaces, or that other utilize tissues that is difficult to isotope enrich.

P078 The relationship between fruit preference and fruit traits in seed dispersal by crows

＊Shogo Shimada (Niigata Univeresity, ESJ), Shoji Naoe (Forestry and Forest Products Research Institute Tohoku Research Center), Rei Shibata (Niigata Univeresity)

Corvids are among the few large-bodied frugivorous birds in temperate regions and may play different roles in seed dispersal compared to medium- and small-bodied frugivorous birds. Clarifying their fruit preference is essential for evaluating their seed dispersal function. Although some studies have reported their preferences for certain fruits such as Anacardiaceae species, few have assessed them quantitatively over multiple years.
This study aimed to (1) quantitatively assess whether corvids show fruit preference by evaluating fruit consumption by crows and fruit availability, and (2) evaluate the effects of plant height, fruiting season, and fruit traits on preference. From May 2023 to April 2025, pellets of Corvus macrorhynchos and C. corone were collected on rooftops at Niigata University. Fruit consumption was estimated from seeds in pellets. Fruit availability was assessed via vegetation surveys along 71 transects (50 m × 3 m) within a 2 km radius. The height of each plant species was also recorded. Fruits of the 20 most abundant species were collected and their traits such as size and color measured. Ivlev's selectivity index was used to quantify preference, and its correlations with plant height and fruit traits were tested using Spearman's rank correlation.
Toxicodendron succedaneum and Magnolia kobus were highly preferred, while Cocculus trilobus and Rhaphiolepis indica were avoided. Preference for Celtis sinensis increased in 2024, suggesting behavioral shifts. A positive correlation between plant height and preference was observed, possibly due to perching ease. Fruit traits such as size and water content showed weak correlations, but unmeasured traits like taste or nutrition may influence preference.

P079 Does the microbial loop link to the grazing food chain in Lake Biwa?: Predation by the Calanoid Copepod *Eodiaptomus japonicus* on protists

＊Madoka Inoue (Center for Ecological Research, Kyoto university), Syuhei Ban (University of Shiga Prefecture)

In planktonic food webs, crustacean zooplankton play a key role in transferring organic matter to higher trophic levels through grazing on phytoplankton from grazing food chain and predation on bacterivorous protists from microbial loop. However, it still

remains unclear which crustacean zooplankton species prey on the protists. In Lake Biwa, large cladocerans and copepods dominate the crustacean zooplankton community. The calanoid copepod *Eodiaptomus japonicus* has comprised ～70% of the zooplankton biomass in the North basin for over 40 years. Despite its ecological importance and its role as prey for fish larvae, its diet still remains poorly understood. Previous studies have shown that its biomass does not correlate with phytoplankton abundance, suggesting another food sources for *E. japonicus*. We hypothesized that *E. japonicus* would feed not only on phytoplankton but also on bacterivorous protists by incorporating organic matter from the microbial loop into the grazing food chain. To test this, we conducted 24-hour incubation experiments to measure feeding rates and prey selectivity on protists by *E. japonicus*. In most of the experiments, *E. japonicus* mainly preyed on heterotrophic nanoflagellates (HNF). *E. japonicus* showed the highest feeding volume on ciliates in all seasons. These findings suggest that *E. japonicus* feeds on protists and contributes to the transfer of organic matter from the microbial loop to grazing food chain.

P080 Ecological Resilience and Species Balance in Mutualistic communities

＊Gohki Kasahara (Tohoku University, ESJ), Yutaka Osada (Tohoku University), Michio Kondoh (Tohoku University)

The state of biological communities is thought to be constrained by various factors. In the face of ongoing environmental changes such as global warming and anthropogenic disturbances, community stability has been suggested as one possible factor determining community states. In communities with many mutualistic interactions, such as mutualistic communities, it is known that changes in species interactions due to environmental change can lead to abrupt shifts in community states. The ability of a community to maintain its original state in response to changes in species interactions is referred to as ecological resilience, and has been the focus of extensive research in recent years.
In this study, I investigate whether ecological resilience can determine community states in natural mutualistic systems, through the lens of species richness ratios. Specifically, I first analytically derive the species richness ratio that maximizes ecological resilience using a random community approach. Then, focusing on mutualistic communities listed in the interaction network database Web of Life, I compare the analytically predicted species richness ratios with those observed in real communities.

P081 Spatial distributions of *Burmannia championii* and its *association with* arbuscular mycorrhizal *fungi in Cryptomeria japonica plantations*

＊Yuka Onishi (Graduate school of Bioresources, Mie University), Yudai Kitagami (Graduate school of Bioresources, Mie University), Yosuke Matsuda (Graduate school of Bioresources, Mie University)

Burmannia championii is a perennial mycoheterotrophic plant that grows on dark forest floors being distributed in Southeast and East Asia and central to southern Japan. Since the plant lacks photosynthetic capacity, it depends root-associated arbuscular mycorrhizal (AM) fungi on necessarily nutrients. This study aimed to elucidate the growth condition of *B. championii* under managed forests. Thus, we investigated its occurrence, and the mycorrhization rate and community structure of AM fungi in *Cryptomeria japonica* plantations. In August 2023 and in July and August 2024, we conducted plant sampling at three study sites in Mie prefecture, Japan. We set up two 10 × 10 m plots per site, making a total of six plots across all sites. The occurrence position of *B. championii* in the plots was recorded, and environmental conditions were measured. Distribution patterns of the plant were analyzed by spatial point process analysis (L-function). The effect of environmental conditions on *B. championii* population sizes was modeled by a generalized linear mixed model. The community structure of AM fungi was investigated by molecular methods using fine roots of both *B. championii* and nearby *C. japonica*. As a result, *B. championii* occurred in all plots, with ranging from 4 - 77 individuals per plot. The spatial occurrence pattern was assigned into either random or clustered distributions. The occurrence number of the plant was significantly explained by the slope. Roots of collected *B. championii* plants were colonized by AM fungi, with their mycorrhization rates are currently being measured. AM fungi involved were inferred as genera *Glomus* and *Acaulospora*, and the taxon richness of *Glomus* was predominated. The AM fungal taxa detected in *B. championii* were also common in the fine roots of *C. japonica*. We will discuss the population retention of *B. championii* and its association with AM fungi in *C. japonica* plantations.

P082 Resilience of ectomycorrhizal fungal communities in coastal Japanese black pine forests to salt stress

＊Riku Murakami (Tokyo University of Agriculture, ESJ), Takahiko Koizumi (Tokyo University of Agriculture)

The coastal pine forests at northeastern coast of Japan suffered severe damage due to the tsunami triggered by the 2011 Great East Japan Earthquake. The resulting topsoil erosion and increased soil salinity are thought to have affected not only the growth of *Pinus thunbergii* but also the community structure of ectomycorrhizal fungi in the soil. Therefore, this study aimed to clarify the effects of (i) the physical disturbance caused by the tsunami and (ii) the chemical stress of salinity on ectomycorrhizal fungal communities. To achieve this, we compared the inoculum potentials of ectomycorrhizal fungi between two study sites (Sendai, Miyagi Prefecture and Fujisawa, Kanagawa Prefecture) of different years after tsunami, including the presence or absence of salt stress treatment. Twenty soil cores were collected from beneath *P. thunbergii* trees at each site, and axenically germinated *P. thunbergii* seedlings were transplanted to them to induce ectomycorrhizal formation. DNA was extracted from the resulting ectomycorrhizae, and fungal species were identified. We found that some fungal species successfully formed ectomycorrhizae even under salt stress. In Sendai, which recently suffered from tsunami, a small number of phylogenetic groups dominated, indicating the physical impact of the tsunami (i). Additionally, species diversity increased under salt stress treatment at both sites, suggesting the existence of salt-preferring fungal species (ii). These findings suggest that the tsunami served as a large-scale disturbance to the ectomycorrhizal fungi. Furthermore, the presence of salt-tolerant fungal species may have facilitated the establishment of *P. thunbergii* immediately after the tsunami. In addition, to characterize the salt-tolerance potential

of the fungi at coastal areas, we are currently analyzing the community structure of ectomycorrhizal fungi in an inland pine forest at Morioka, Iwate Prefecture.

P083 Developments of species-specific primers for the detection of endangered *Rhizopogon togasawarius*

＊Hirofumi Shimizu (Faculty of Bioresources, Mie University, ESJ), Keita Henry Okada (Graduate School of Sciences and Technology for Innovation, Yamaguchi University), Yudai Kitagami (Graduate school of Bioresources, Mie University), Masao Murata (Forestry Research and Training Center, Akita prefecture), Kazuhide Nara (Graduate School of Frontier Sciences, Tokyo University), Yosuke Matsuda (Graduate school of Bioresources, Mie University)

Pseudotsuga japonica, an endemic and endangered relict tree species, is distributed in small fragmented areas on the Kii Peninsula and southeastern Shikoku Island, Japan. Fine roots of the species have mycorrhizal associations with various soil fungi, which assume to assist the growth and survival via nutrient acquisition from soils. Among them, *Rhizopogon togasawarius* is found only in *P. japonica* forests and thus registered recently as an endangered fungus. Since the fungus is frequently detected in the soil of *P. japonica* forests, the fungal inocula are thought to reside latently as dormant spore banks. The spore bank of this fungus has been conventionally investigated using a bioassay method where seedlings are planted in field-derived soils containing fungal inocula to assess mycorrhization capacity. However, the method does not necessarily reflect the presence of focal fungi, and takes longer periods, e.g. several months. The aim of this study was to develop species-specific primers for *R. togasawarius*. Primer pairs were designed by Primer-BLAST based on the nucleotide sequence of the ITS region of a registered *R. togasawarius* in GenBank. When designed primer pairs were do not have matches to known 1121 *Rhizopogon* sequences deposited in the GenBank, they were selected as candidate primers. Using the candidate primers, PCR amplifications were examined for spore-derived DNAs of *R. togasawarius*, and 13 Japanese *Rhizopogon* species including *R. togasawarius*. As a result, PCR were successfully amplified for a minimum density of 773 spores/ml, and detected only *R. togasawarius*. Currently, we examined PCR amplifications for field collected soils in three different *P. japonica* forests. Based on these results, we discuss the specificity of the primers developed for *R. togasawarius* and their effectiveness as a detection method for the fungus in fields.

P084 Does *Dorcus striatipennis* have different strains of yeast symbionts depending on their habitats?

＊Taiga Hashikawa (The University of Tokyo, ESJ), Gaku Ueki (The University of Tokyo/Shinshu University), Hiroshi Ikeda (The University of Tokyo), Kohei Kubota (The University of Tokyo)

One of the factors that has promoted the diversification of insects is the mutualistic relationships with various microorganisms, and thus understanding such relationships can be the key to clarify the diversification process in insects. However, few studies have demonstrated the effect of microorganisms on the available habitats other than food habits of their host insects.
The adult female of each species belonging to stag beetles (Coleoptera: Lucanidae) possesses a yeast strain specific to each species in the microbe-storage organ (mycangium). Though the individuals of *Dorcus striatipennis* generally have a yeast strain specific to this species, we found that some individuals of this species have the yeast strain specific to *D. rectus* probably due to horizontal transmission between them.
We determined the yeast strain frequencies of *D. striatipennis*, *D. rectus* and the other sympatric *Dorcus* species collected from 65 sites in Japan. As the result, while the yeast strain specific to the *D. striatipennis* dominated in the cool-temperate forest populations, frequencies of the yeast strain that is common with *D. rectus* increased in the populations inhabiting warm-temperate forests. Additionally, any *D. rectus* did not possess the yeast strain specific to *D. striatipennis*. These results indicate the horizontal transmission of yeasts from *D. rectus* to *D. striatipennis* has happened.
We also examined the heat tolerance of each yeast strain by culture experiments. The yeast strain specific to *D. rectus* could grow under higher temperature than that specific to *D. striatipennis*, indicating the higher heat tolerance of the yeast strain specific to *D. rectus*. Therefore, the replacement of the yeast strain from *D. striatipennis* to *D. rectus* is likely to occur in warmer areas. The replacement of the yeast strain specific to *D. striatipennis* may contribute to the expansion of the habitat and distribution of its host species.

P085 Divergent soil P status and tree nutritional strategies in carbonate rock ecosystems in Japan

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Background: Karst soils have been characterized by high pH and low P availability. However, recent studies propose that P availability of karst soils vary with progression of soil weathering and the decline of soil pH. Further research on soil P status and plant nutritional strategies is required to understand the diverse P status of carbonate rock ecosystems.
Methods: We examined soil chemical properties and leaf traits (Ca, Mg, P and Mn concentrations; P resorption proficiency and efficiency) in forests on carbonate and silicate rocks in two regions differing in the degree of soil weathering in the Honshu Island of Japan. Foliar Mn concentration was used as an indicator of root organic acid exudation. We explored how abundant soil P influence plant nutritional strategies and how specialist of karst forests (calcicole species) and generalists differ in the response to soil P.
Results: Karst soils exhibited wide ranges of pH (4.07-6.58) and total P concentrations (300 - 30,000 mg kg^{-1}). Karst soils with relatively higher pH showed greater total P concentration than nearby forests on silicate rock, while karst soils with lower pH showed the similar total P concentration as nearby forests on silicate rock. Phosphorus resorption and foliar Mn concentrations decreased with increasing soil P concentrations, irrespectively of bedrock types. Calcicole species exhibited a disproportionately lower resorption efficiency than generalists.
Conclusions: Our research demonstrated high variability in P availability of karst soil. Our findings advance understanding of

plant nutritional strategies in highly fertile environment and highlight the importance of considering unique species composition of the ecosystem.

P086 Taxonomic study of the genus *Tulasnella* (Fungi, Basidiomycota) in Japan focusing on its teleomorph

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The genus *Tulasnella*, characterized by resupinate and thin basidiomata on a decomposed wood or other substrates, belongs to the order Cantharellales, phylum Basidiomycota. Several species of *Tulasnella* are known to form mycorrhiza with orchids. Accurate identification of this group of fungi and elucidation of their life cycles are essential for understanding their ecological importance and association with orchids. Although the morphology of basidiomata (teleomorphic fruitbodies) is an important taxonomic character, it is difficult to find basidiomata of *Tulasnella* from the field due to their inconspicuous appearance. Induction of basidiomata formation in culture is also difficult. Therefore, *Tulasnella* species isolated from orchid mycorrhizae have been classified mostly based on DNA sequences. However, by striving for collecting basidiomata, we obtained 12 specimens having characteristics of *Tulasnella* from the fields in Japan. We conducted a comprehensive taxonomic study based on basidiomata morphology, culture properties, and molecular phylogenetic analyses. As a result of phylogenetic analyses of ITS region, the 12 specimens are separated into three clades: Clade 1 (*T. eichleriana*), Clade 2 (an undescribed species), and Clade 3 (*Tulasnella* cf. *albida*). This study will be the first record of *T. eichleriana* from Japan. Although the Clade 3 fungus morphologically resembles *T. albida*, DNA sequence homology of ITS showed a 6% difference from European *T. albida* specimen. The DNA sequences of the three clades of fungi did not correspond with those of any orchid mycorrhizal *Tulasnella* species, but it is not certain that these species don't have the potential to be orchid mycorrhizal symbionts. Further taxonomic and ecological studies of *Tulasnella* focusing on collection and characterization of basidiomata will contribute for the progress of taxonomy and a better understanding of their way of life including the relationship with orchids.

P087 Poplar Root-Microbe Interactions Drive Soil Nutrient Cycling and Micro-Food Web Stability in Degraded Mollisols

＊Jia Yang (Northeast Forestry University, ESC), Hui Yan Gu (Northeast Forestry University)

Degraded Mollisols pose significant ecological challenges, necessitating plant-microbe-mediated soil restoration strategies. This study investigates how *Populus* spp. (*P. xiaohei*) modulates microbial communities and micro-food web dynamics across root-associated compartments in degraded Mollisols. Analyses of microbial diversity, metabolic profiles, and multi-trophic interactions revealed that soil degradation reduced microbial diversity in bulk and rhizosphere soils but enhanced endosphere microbial community stability. Bacterial communities exhibited higher environmental sensitivity and lower functional redundancy than fungi, highlighting their role as early indicators of soil stress. Poplar roots stimulated rhizosphere microbial activity, promoting organic/fatty acid accumulation to bolster nutrient cycling. Concurrently, *P. xiaohei* increased the diversity of four soil biomes (bacteria, fungi, protists, nematodes) and stabilized soil micro-food webs across degradation gradients. As degradation intensified, Poplar shifted survival strategies from resource acquisition to conservation, paralleled by microbial functional shifts from nutrient competition to high-growth-potential dominance. Poplar drove convergent metabolic processes (e.g., carbon/nitrogen cycling) via trophic-level coordination, mobilizing protists and nematodes to accumulate functionally similar metabolites despite varying degradation levels. These interactions underscore a hierarchical "microbiome-metabolome-microfood web" axis underpinning soil rehabilitation. Specifically, root endosphere microbial stability buffered against external degradation stress, while rhizosphere microbial-metabolic activation compensated for nutrient depletion. The study further demonstrates that fungal communities, with higher functional redundancy, maintained metabolic flexibility under degradation, whereas bacteria acted as rapid responders to soil physicochemical shifts. These findings elucidate Poplar's dual role as a rhizosphere engineer and micro-food web modulator in degraded Mollisols by linking root niche-specific microbial dynamics to multi-trophic network resilience. The results provide a framework for targeted phytoremediation strategies leveraging plant-microbe-metabolic synergies to restore soil health in degraded ecosystems.

P088 Dynamics and grazing responses of plant nitrogen use strategies are driven by plant nitrogen demand and resource availability

＊Lin Wu (School of Ecology and Environment, Inner Mongolia University, ESC), Frank Yonghong Li (School of Ecology and Environment, Inner Mongolia University)

Perennial plants meet nitrogen (N) demand for aboveground growth through two key strategies: root N remobilization (internal cycling) and soil N uptake. However, whether there exists temporal heterogeneity in the trade-offs between these two plant N use strategies and their responses to grazing remains unknown. We conducted an in-situ experiment using ^{15}N isotope labeling techniques to quantify the contributions of two plant N use strategies in two plant growth stages in a semi-arid grassland. Our results demonstrated that plant aboveground growth used more soil N uptake (65%) during the regreening stage, but more root N remobilization (58%) during the rapid-growth stage. Grazing significantly enhanced the reliance of plant N use on N remobilization, these effects were more pronounced under autumn than summer grazing. Plant N demand for growth and soil N availability, rather than plant root N storage. Our study highlights the importance of internal N cycling in buffering the impacts of environmental resource fluctuations on plant growth.

P089 Context-Aware Marine Plankton Classification with Multimodal Large Language Model and Retrieval-Augmented Generation Reasoning

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Marine plankton are vital to ocean ecosystems and serve as indicators of biodiversity and environmental change. Scalable monitoring of plankton communities is essential for understanding ecological dynamics and the effects of climate change. However, traditional identification through manual microscopy is time-consuming, expertise-dependent, and not scalable.
Convolutional Neural Networks (CNNs) have been used to automate plankton image classification, but they require large labeled datasets. They also struggle to generalize across variations in sampling and imaging conditions, such as lighting, zoom level, or filter pore size, as well as environmental metadata that human experts often consider in classification.
To address these limitations, we propose a framework that combines Multimodal Large Language Models (LLMs) with Retrieval-Augmented Generation (RAG). LLMs enable reasoning over both visual and textual inputs, allowing context-aware classification that integrates domain-specific knowledge, including metadata and imaging conditions. While pre-trained LLMs reduce the need for large labeled datasets, RAG further enhances the process by incorporating domain-specific knowledge through the retrieval of similar examples from a curated plankton database.
Our system processes video microscopy data from PlanktoScope by detecting individual plankton, pairing each instance with metadata-informed prompts, and retrieving comparable samples for inference. The LLM then outputs structured taxonomic predictions in JSON format, including genus and family.
Designed with a modular architecture, the system supports scalable deployment and can integrate with real-time biodiversity monitoring platforms. Preliminary results demonstrate promising accuracy. Beyond marine applications, the framework is generalizable to domains such as microbiome analysis and automated species annotation. By reducing manual workload and enhancing interpretability, our approach advances biological classification and contributes to more responsive environmental monitoring.

P090 Effects of deer-induced understory degradation on soil mesofauna community via changes in soil properties in beech forests: comparison between Kyushu and San-in

＊Erika Kawakami (Kyushu University, ESJ), Takuo Hishi (Fukuoka University), Ayumi Katayama (Kyushu University)

An increasing number of large ungulates such as Sika deer has induced overgrazing of the understory vegetation (*Sasa* spp.) all over Japan. Since understory vegetation prevent soil from erosion and provide leaf and root litter to belowground, declining understory vegetation may induce degrade soil fauna communities, which play important roles in soil ecosystem function. Climatic condition such as precipitation and snow-coverage may influence the effect of understory degradation on soil fauna community. Thus, we aimed to clarify the effects of the understory degradation by Sika deer on soil mesofauna communities in six beech forests in the Kyushu (little snowfall and heavy rainfall) and San-in (heavy snowfall) regions. Soil mesofauna were sampled using cylindrical soil cores in fall of 2024 at nine plots where *Sasa* remained and at nine plots where *Sasa* had completely disappeared (No *Sasa*). The samples were extracted with a Tullgren funnel, and individuals were counted. Soil surface temperature, water content, hardness, carbon and nitrogen concentration, A0 layer weight, bulk density and fine root biomass were obtained at each plot. In Kyushu, the abundance of soil mesofauna were significantly lower at the No *Sasa* plots than the *Sasa* plots whereas there was no significant difference in San-in. The number of taxa was lower at the No *Sasa* plots in both forests, but the differences of the presence or absence of *Sasa* were larger in Kyushu than San-in. The abundance and number of taxa of soil mesofauna significantly decreased with increase in soil bulk density in both areas. It was reported that soil bulk density was generally higher where soil erosion occurs. Therefore, these results suggested that soil runoff associated with understory degradation may have degrade soil mesofauna communities by altering soil physical structure, and the effects of understory degradation on soil mesofauna communities were different among regions.

P091 Crushed ALC as a Functional Substrate Material for Green Roofs: A Pilot Study with AMF Inoculation

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Recently, there has been growing interest in the use of recycled materials for green roof substrates. Autoclaved lightweight concrete (ALC), a widely used construction material in Japan, shows potential for recycling as a substrate component for extensive green roofs (EGRs). Additionally, arbuscular mycorrhizal fungi (AMF) symbiosis has been considered beneficial for plant performance under the harsh environmental conditions typical of green roofs. We conducted a seven-month pilot study to evaluate the effects of crushed ALC substrates and AMF inoculation on plant growth and runoff characteristics. Twenty-four EGR modules—plastic containers measuring 60 cm × 40 cm × 10 cm, each with drainage holes at the bottom corners and filled with a 10 cm-depth substrate layer—were installed on the rooftop of Matsudo Campus, Chiba University, central Japan located in humid subtropical climate. Three substrate types were tested: two ALC-based mixtures with different compost amendment rates and one perlite-based control. The modules were planted with *Phedimus aizoon* var. *floribundus*, a native Japanese species closely related to *Sedum*. We monitored plant coverage and both the quantity and quality of runoff (ammonia, nitrate, and phosphorus) across multiple precipitation events. Control modules without vegetation and empty containers were also included for comparison. Results indicated significant interaction effects between substrate type and AMF inoculation on plant coverage. In particular, AMF appeared to enhance plant growth in substrates characterized by lower moisture retention and nutrient con-

tent. Runoff analyses showed that ammonia and nitrate leaching declined after several initial runoffs with high concentrations. A similar trend was observed for phosphorus, although ALC-based substrates consistently released less phosphorus than the perlite-based substrate throughout the study. This suggests that ALC particles may chemically bind and retain phosphorus. Our findings suggest that combining ALC-based substrates with AMF inoculation may offer a viable approach for sustainable green roof systems.

P092 Slope aspects affect stability of soil respiration to drying-rewetting disturbance in a cool-temperature forest

＊Fangzheng Fu (Okayama University, ESJ), Takuo Hishi (Fukuoka University), Fujio Hyodo (Okayama University)

Understanding stability of soil microbial function to disturbance is important under climate change, given that soil biota primarily drive the decomposition process. Previous studies have shown that stability of soil respiration to drying-rewetting disturbance was related to microbial community structure (MCS). Topography, such as slope aspects, can have a profound impact on soil properties (e.g. soil pH, soil C/N) and MCS due to differences in solar radiation between slope aspects. However, how slope aspects affect the stability of soil respiration remains unclear. Here, we examined the effects of slope aspects on the stability of soil respiration to drying-rewetting disturbance, and its relationships with MCS on soils from north- and south-facing slopes in northern Japan. We estimated stability (resistance and resilience) based on the basal respiration (BR) and substrate-induced respiration by adding glucose (SIR) before and after rewetting soil from a drying condition. In addition, we assessed soil microbial biomass and MCS using phospholipid fatty acids analysis (PLFAs) which reflect active microbial community. The results showed lower soil pH and higher soil C/N and Fungi/Bacteria ratio on south-facing slopes compared to north-facing slope. Besides, we found resistance of BR and resilience of SIR were both higher on south- over north-facing slopes. Moreover, the resistance and resilience were significantly associated with bacteria biomass and indicators of physiological and nutritional states of soil microbes (e.g., the gram-positive to gram-negative bacteria ratio). Our results provide a basic insight into how topography would affect the responses of soil microbial function to drying-rewetting disturbance, which would occur more frequently in near future.

P093 An effective transfer learning method for automatic fine root extraction using ARATA and fine-root dynamics in a 100-year-old Chamaecyparis obtusa forest.

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Tree fine roots play key roles in forest soil carbon cycle through organic matter inputs. The scanner method, which captures root images in soil profile using flatbed scanners, enables non-destructive, fixed-point observation of fine root dynamics. Advances in automatic scanning technologies have provided us a number of image data, making automated analysis increasingly important. This study aims to evaluate the effect of adding image data at target site to the training set on extraction accuracy in fine root analysis using ARATA, a deep learning-based automatic root extraction tool. It also examines whether applying image processing techniques—commonly used to enhance visibility in manual extraction—to training images improves the extraction accuracy.

To apply fine roots at Kota Chamaecyparis obtusa stand, the Kota model was developed by additionally training the ARATA model using root images and manually annotated ground-truth images. Three types of training images with different image processing techniques were used and the combination created models. The Dice score was used to assess the accuracy of each model. Models with high accuracy and practical utility were selected, and monthly fine root projected area and length were calculated over one year. To assess the relationship between manual and automatic extraction results, correlation coefficients were calculated.

The Dice score in ARATA model without transfer learning was approximately 0.6. In contrast, the Kota models scored about 0.7, indicating that incorporating images at the stand improved significantly extraction accuracy. However, differences in Dice score among the Kota models were minimal. This suggests that there are limitations to improving extraction performance through image processing. A one-year analysis of fine root dynamics showed that the monthly root projected area and length by automatic extraction were strongly correlated with those by manual extraction, indicating that the Kota model is appropriate to extract fine roots at the stand.

P094 Formation of large oocytes and planulae in *Aurelia coerulea* (Cnidaria, Scyphozoa) as an adaptive strategy to low water temperatures

＊Satauki Takauchi (Graduate School of Marine Biosciences, Kitasato University, ESJ), Hiroshi Miyake (Graduate School of Marine Biosciences, Kitasato University)

In the general life cycle of *Aurelia coerulea*, a planula settles on a substrate and metamorphoses into a polyp. However, in some regions of Japan, medusae with large oocytes and planulae have been observed during periods of low water temperature. These planulae develop directly into ephyrae after settlement, without passing through the polyp stage. Even in the same area, medusae produce normal-sized oocytes and planulae during periods of high water temperature. Additionally, seasonal changes in planula size have also been reported in Geoje Bay, South Korea. We investigated whether water temperatures affect oocyte and planula size and examined the adaptative strategy of the "direct development type".

Ephyrae of both development types, those from large planulae and those from polyps, were reared at 13℃ or 23℃ (room temperature) until the medusae reached maturity. Oocyte and planula sizes were measured, and the developmental types of planulae were observed. The results showed that the direct development type medusae produced large oocytes and planulae at low

temperature and normal-sized oocytes and planulae at high temperature. In contrast, the normal type medusae produced normal-sized oocytes and planulae at both temperatures. This suggests that the formation of large oocytes is a unique trait of the direct development type, maintained by reproduction in restricted areas during the low temperature season. The low temperature season is an environment with limited food resources. The planktonic stages can swim and actively search for prey, making them well-adapted to limited food resources. Thus, large planulae can adapt to these conditions by developing into ephyrae. The formation of large oocytes and the direct development of planulae into ephyrae represent an adaptive strategy specialized for surviving in low temperature environments.

P095 Anti-predator defenses of adult weevils: how do they escape predation by frogs?

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Prey animals employ various strategies to defend against predators. These strategies are broadly categorized into primary defenses, which act before the predator attacks, and secondary defenses, which function after physical contact with the predator. In secondary defenses, how prey animals prevent swallowing by the predator is particularly important. Although previous studies have reported that some insect species can escape even after being captured, very few studies have revealed how they can escape. In this study, we observed how adults of a weevil *Sternuchopsis trifida* (Coleoptera: Curculionidae) defend themselves against their potential predator, the Japanese tree frog *Dryophytes japonicus* (Anura: Hylidae), in the laboratory. All frogs opened their mouths to attack the adult weevils. Most frogs captured weevils, but they frequently failed to swallow them. Some weevils used their legs to cling to the frogs' tongues, which prevented them from swallowing. To test whether this clinging behavior prevents frog predation, we provided frogs with weevils whose legs had been surgically amputated. These legless weevils could not cling to the frog's tongue; however, most of them were still not swallowed by frogs. These results suggest that clinging behavior using their legs can prevent frog predation, but *S. trifida* may possess a more effective defense.

P096 The coevolution of mating behavior between male and female driven by sexual conflict in leaf beetles (Chrysomelidae)

＊Hiromu Nakaegawa (The University of Tokyo, ESJ), Hiroshi Ikeda (The University of Tokyo)

Sexual conflict, which is caused by the difference in reproductive strategies between males and females, drives the rapid evolution of reproductive traits by generating sexual antagonistic coevolution between sexes, leading to the acceleration of speciation. The knowledge of the macroevolutionary patterns of reproductive traits resulting from sexual conflict remains scarce, and specifically, few studies have focused on the evolution of male and female mating behaviors. In this study, we focused on leaf beetle species (Chrysomelidae), of which male's attack and female's defense behaviors during mating are highly diverse, to investigate whether male and female mating behaviors have coevolved. We examined the mating behavior in a laboratory environment using 22 species of Chrysomelidae, and tested whether four male traits and five female traits are evolutionarily correlated by interspecific comparative analysis. We found that female kicking can interrupt mating by pulling the male down from their backs, and is the most common resistance behavior by female in the Chrysomelidae. However, female kicking had no evolutionary relationship with any of male behaviors. We also found that in species where the male vibrates more to stimulate the female's copulatory organ during copulatory genital insertion, the female attempts to sway the male more by shaking her body. Ancestral reconstruction showed that both male abdominal vibration and female body shaking had evolved rapidly in subfamily Cassidinae. However, none of the matings was interrupted by female body shaking, suggesting that female body shaking may be less effective as the resistance against male or may have a role other than resistance. These results suggest that specific mating behaviors in males and females have coevolved in some groups of the Chrysomelidae. We will examine the function of each male and female behavior to test the coevolutionary process of mating behavior in further study.

P097 What do spines function for diving beetles?—Focused on walking, swimming and flight—

＊Kengo Hide (The University of Tokyo, ESJ), Ryota Morii (The University of Tokyo), Shona Yasuda (The University of Tokyo), Hiroshi Ikeda (The University of Tokyo)

Since predation pressure works as a strong selection pressure, various traits against predators have evolved in many animals. Above all, spine-like trait is one of the representative defensive traits against predators. On the other hand, spines are also known to have other functions than defense in a few species such as water scavenger beetles whose spines increase their swimming speed. Therefore, spines might have diverse functions than previously thought. However, few studies have examined these functions.

Though diving beetles (Dytiscidae) have remarkable spines in their hind legs, their functions have not been clarified. Their spines are directed to inside, and our preliminary experiment showed that they have no defensive function against their predators. Since their spines touched the ground when walking and taking off in our observations, spines may support walking and flight. In addition, the flat spines in some species may be useful for swimming. Here, we focused on following three functions: walking, swimming and flight to find out the function of spines in Dytiscidae. We collected eight species of Dytiscidae from field and compared the function between the individuals with spines (control) and those with spines removed (treatment). By removing spines, the speed of walking decreased in *Graphoderus adamsii*, and the success rate of flight decreased in *Rhantus erraticus*, *Acilius japonicus* and *Cybister brevis*. However, the swimming abilities were not different between control and treatment groups. Our results suggest that spines improve the behavior on the ground by supporting walking and flight in Dytiscidae. Furthermore, obtained results also suggest that the function of spines can be different among species.

P098 Monogamous Tanganyikan cichlid with biparental offspring use vocal signals to maintain social bonds: novel evidence of fish vocal communications?

＊Ryoichi Inoue (Osaka Metropolitan University, ESJ), Ryo Hidaka (Osaka Metropolitan University), Kento Kawasaka (Niigata University), Shun Satoh (Kyoto University)

Highly social animals use sound to maintain their social bonds. Recent studies have revealed that even aquatic fish use sounds in their interactions. However, their function in communication remains unexplored. In this study, we addressed the acoustic signals produced between monogamous pairs of Lake Tanganyika cichlid *Boulangerochromis microlepis* during brood care and examined their functional roles through detailed field behavioral observations and vocal recordings using hydrophones. Two call types were identified. First, the 'knock' sound, which had a dominant frequency of approximately 200 Hz with 2-20 consecutive pulses. This sound was emitted more frequently when both parents were present around their offspring than when one parent was alone, indicating that it may play a role similar to contact calls in mammals and birds, thereby helping to maintain proximity and affiliation between mates. Second, the 'burst' sound, which had a dominant frequency of approximately 400 Hz with multiple pulses. This sound was often associated with a rapid rushing behavior toward predators of eggs and fry. Based on the motivation-structural rules hypothesis, the higher frequency of the burst sound may reflect a more aggressive and aroused state. In addition, instances were observed in which a nonvocalizing individual responded to their partner's burst by rushing to their side. This shows that burst sounds may also function as alarm signals to warn mates of danger. These findings indicate that cichlid vocalizations reflect the internal state of the signaler, such as excitement or aggression, and may serve to coordinate behaviors between pairs. Understanding context-dependent vocal communication in fish provides novel insights into how social interactions involving multimodal signals, including sounds, are mediated underwater.

P099 Dominant breeders punish idle helpers depending on group size and spatial proximity in a cooperatively breeding cichlid fish: First evidence in non-human animals

＊Ryo Hidaka (Osaka Metropolitan University, ESJ), Ryoichi Inoue (Osaka Metropolitan University), Chisaki Hosoda (Osaka Metropolitan University), Yuto Kitamukai (Osaka Metropolitan University), Satoshi Awata (Osaka Metropolitan University)

In cooperative animals, including humans, punishment is a key mechanism for maintaining stable cooperation. Both theoretical and empirical studies have extensively examined the effectiveness of punishment and the circumstances in which it occurs in humans. However, in non-human animals, empirical evidence for punishment is limited to a few vertebrate species, and no studies have comprehensively assessed the conditions under which punishment effectively promotes cooperation. In this study, we conducted a field experiment using the Tanganyikan cooperatively breeding cichlid fish *Neolamprologus savoryi*, in which subordinates (helpers) care for the offspring of dominant breeders. By experimentally preventing subordinates from helping, we examined the effects of five factors, namely group size, helping efforts of other group members, spatial proximity, body size differences, and genetic relatedness between breeders and helpers, on the punishment of subordinates by dominant breeders. The results showed that the dominant breeders in close proximity to the focal helpers increased their aggression toward the helpers that were prevented from helping, and that the attacked helpers subsequently exhibited increased helping behavior (territory defense) depending on the level of breeder aggression. The results also showed that breeder aggression toward helpers decreased with increasing group size, although other factors did not affect the behavior of breeders and helpers. These findings provide the first field evidence that punishment promotes helping behavior in animals, and suggest that punishment is effective in smaller groups where breeders can more easily monitor the behavior of helpers. Thus, this study fills an important empirical gap by comprehensively identifying the key conditions that trigger punishment in non-human animals.

P100 Comprehensive evaluation and optimization strategy of ecological resilience on the Qinghai-Tibet Plateau

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The Qinghai-Tibet Plateau (QTP), functioning as a global climate regulator, plays an indispensable role in maintaining global and regional climate stability, conserving biodiversity, securing water resource supply, and promoting sustainable human development. Given the critical importance of ecological resilience on the QTP, this study constructed an evaluation model based on resistance, adaptability, and recovery, employing the entropy weight method to assess the ecological resilience of six provinces on the plateau from 2010 to 2022. The spatiotemporal evolution patterns of ecological resilience were further analyzed. Using the Dagum coefficient and spatial Durbin model, this study investigated the spatial correlation of ecological resilience and its influencing factors. The results showed that (1) The ecological resilience of the QTP exhibited an increasing trend over time, with a spatial transition from higher resilience in the northern regions to lower resilience in the southern regions. (2) Intra-regional differences in ecological resilience remained relatively stable, whereas inter-regional contributions and hypervariable density contributions displayed significant fluctuations during the study period. The former ranged between 13.463% and 55.293%, while the latter varied from 26.929% to 36.044%. (3) While natural factors predominantly govern long-term ecological changes, anthropogenic disturbances have substantially accelerated degradation. Population density, economic development, and resource exploitation exerted negative impacts on the QTP, whereas government green investment demonstrated positive effects and spatial spillover effects. This study proposes three targeted policy recommendations to enhance the ecological resilience of the QTP. First, establishing an ecological monitoring and early-warning system while designating core protection zones for glaciers and permafrost to improve climate adaptation. Second, promoting rotational grazing, artificial grassland cultivation, and eco-

friendly animal husbandry development to achieve sustainable pastoralism. Third, advocating for an international "Asian Water Tower" agreement to facilitate transboundary cooperation in water resource allocation and grassland degradation mitigation.

P101 Ejaculation volume is not influenced by female reproductive potential or mating status, but is adjusted according to sperm stock in the Japanese pygmy squid

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Males are expected to adjust ejaculation volume because they have energy constraints to produce sperm. Theoretically, males increase the ejaculation volume when mating with females of high reproductive potential and when facing increased sperm competition, such as mating with non-virgin females. Additionally, to ensure sperm stock for future mating opportunities, males may allocate sperm in each copulation according to their remaining sperm stock and expected mating opportunities. In this study, we investigated ejaculation patterns in the Japanese pygmy squid (*Idiosepius paradoxus*), focusing on 1) female quality, including reproductive potential (spawn egg number and egg size) and mating status (virgin or copulated), and 2) male sperm stock. We found that female body size was not correlated with spawn egg number, but with egg size. This result suggests that female body size can be an indicator of at least egg size involved in female reproductive potential. In addition, female sperm storage status is visually detectable in this species. However, we found no evidence that males adjusted their ejaculate volume based on either female reproductive potential or mating status. These results suggest that theoretically optimal ejaculation strategies may not be advantageous for males in *I. paradoxus*. Ejaculation volume was positively correlated with the male's sperm stock, with approximately 13% of the stock transferred per mating. This constantly small proportion of ejaculation may be adaptive given this species' high mating frequency, driven by dense populations and frequent forced copulations by males. Interestingly, in the early reproductive season, smaller males transfer the same amount of ejaculate as larger males by allocating a higher proportion of their sperm reserves, despite possessing less sperm overall. However, this trend was absent later in the season. In this poster, we discuss the possible evolutionary drivers of these unique ejaculation patterns in this species.

P102 Machine learning of individual identification and age-class classification of wild Japanese macaque vocalizations using mel spectrograms

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In bioacoustics research, machine learning approaches — particularly deep learning — have increasingly facilitated the classification of animal vocalizations using automatically extracted acoustic features from large datasets. However, their applicability to small-scale datasets remains underexplored, particularly for primate vocalizations recorded under field conditions. In this study, we evaluated the utility of mel spectrograms — a widely used spectral acoustic features — in classifying a relatively small dataset of wild Japanese macaque (*Macaca fuscata yakui*) calls. Using 651 coo calls from six individually identified adult females recorded on Yakushima Island between October to December 2023, we tested the classification performance of two machine learning (RM: random forest and SVM: support vector machine) on two tasks: 1) individual identification and 2) binary age-class classification (<10 yrs vs. >20 yrs). All vocalizations were obtained via focal animal sampling using a directional microphone, and mel spectrograms were generated and standardized prior to analysis. For the individual identification, both classifiers achieved mean balanced accuracies above 80 % (RF: 0.81; SVM: 0.82), despite individual variation in discriminability. In age-class classification, performance was notably high (RF: 0.91; SVM: 0.93), with higher accuracy in younger individuals. These findings demonstrate that even without specifying traditional acoustic features such as pitch or formant frequencies, mel spectrograms are sufficient to capture biologically meaningful variation in vocal signals. In particular, high performance in age classification may reflect spectral features indicative of senescence-related vocal change, e.g., increased harshness. Importantly, our approach offers a feasible and replicable methodology for analyzing acoustic individuality and age structure in wild populations when sample sizes are limited, which may be especially valuable for conservation-related monitoring and non-invasive demographic assessments.

P103 Optimizing camera trap sampling designs in rocky montane environments: Comparing fixed vs rotating placement

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Camera traps are increasingly used to explore broader ecological aspects. However, optimizing sampling design and understanding the factors that influence the precision of detection rates (i.e., the number of detections per unit of effort) in montane rocky areas remain key methodological challenges. Little attention has been given to the effects of keeping cameras fixed at the same locations throughout the survey period versus periodically relocating them to new positions to maximize spatial coverage, especially when a limited number of camera devices are available. We explored the differences in the precision of detection rates between relocated (i.e., moving them to new locations during the sampling period) and fixed camera designs when cameras remained in the same location during the study in a montane rocky environment. We used simulations and field data to test differences in detection rate precision for both designs. We simulated two different population distributions (random and aggregated) and three abundance scenarios. The simulations were validated with a field experiment focusing on species with different behavioral traits, including carnivores, lagomorphs, and birds. The results showed that rotating designs generally improved precision over fixed designs. For random distributions, the rotating (30 single points) design had the lowest CV of 0.114, while the fixed (10 single points) design had the highest mean of 1.056 but a lower CV of 0.176. For aggregated distributions, both the rotating (30 single points) and fixed (10 single points) designs had the highest mean of 1.417, with rotating (30 single points) show-

ing the lowest CV of 0.116. Overall, rotating cameras and increasing the number of sampling points improved detection precision, particularly for aggregated populations both in simulations and field conditions. Our study provides guidelines for wildlife managers and researchers to enhance the precision of camera trap detection rates and optimize resource allocation.

P104 Mapping Suitable Nest-sites for the Tiger Shrike *Lanius tigrinus* Based on Food Availability and Reproductive Success

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It is well recognized that the environmental characteristics of avian nest-sites are highly diverse, reflecting variation in species-specific ecological niches. For rare-species conservation, assessing habitat persistence and vulnerability is essential. We generated a nest-site suitability map for the Tiger Shrike (*Lanius tigrinus*), a critically endangered passerine species in Japan, by integrating food availability and reproductive success.
We developed a hierarchical, serial statistical model to capture sequential nest-site decisions. First, we recorded video at active nests to document prey taxon, size and reproductive outcome, while point counts identified foraging locations. Using environmental covariates, we modelled energy gained per unit time (foraging efficiency) and mapped its expected value. Following central-place foraging theory, we modelled individual site-occupancy frequency as a function of foraging efficiency and Euclidean distance from the nest. Treating expected occupancy probabilities as a spatial kernel, we convolved them with the foraging-efficiency map to produce a food-availability map reflecting biomass deliverable to nestlings per unit time. Finally, we predicted nest-site suitability by modelling the probability of reproductive success as a function of food-availability and additional environmental covariates, and constrained the model using nest-occurrence data (assuming fewer nests occur at sites with lower reproductive success) to enhance spatial transferability, yielding the final nest-site suitability map. All covariates were derived from Sentinel-2 imagery vegetation maps (generated from NDVI and NDMI) with reference to UAV aerial imagery.
As a result, foraging efficiency peaked in forest stands bordering open areas with high leaf-litter cover, and in multilayered pine forests with a tall broadleaf understory. Reproductive success was highest at forest edges containing numerous feeding sites within a 200 m radius. Predicting habitat suitability with ecological robustness is expected to achieve high predictive accuracy across space and time marked by uncertainty, underscoring its utility for formulating long-term conservation plans for rare-species' habitats.

P105 The effects of spectrally distinct artificial night light on insect development and reproductive traits in urban and rural populations

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In recent years, rapid urbanization has introduced a variety of environmental stressors for organisms. While air and water pollution have long been recognized, artificial light at night (ALAN) has emerged as a significant ecological concern. Urban environments are increasingly illuminated by streetlights, vehicle headlights, and other light sources, resulting in the disruption of natural dark cycles. Such nocturnal illumination has been reported to affect diverse taxa, including insects. The widespread adoption of LED lighting has further altered the spectral composition of nighttime light, leading to increased exposure to blue-rich light. Organisms are known to exhibit wavelength-specific physiological responses, and thus the spectral quality of ALAN has attracted growing attention. Moreover, there is evidence that organisms can undergo rapid evolutionary adaptations to urban environments. We aimed to investigate how different wavelengths of artificial nightlight affect male reproductive capabilities and development by using *Drosophila suzukii* collected from both urban and rural environments. The larvae were reared under various nighttime light conditions (either white, red, green, or blue single-wavelength light), as well as a control condition without nightlight. Sperm head size, time to emergence and wing length of males were examined under each light condition. Exposure to blue light led to a reduction in sperm head size and an increase in emergence time, compared to the control condition. In contrast, exposure to red light led to an increase in wing length compared to the control. These findings suggest that nightlight, especially blue and red light, can have critical effects on *D. suzukii* development and reproduction. The understanding of the wavelength-dependent effects described above is essential for predicting the effects of urbanization on organisms.

P106 Do specialist and generalist ticks respond differently to host odor?

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The host specificity of ticks varies from being specific to certain animal species to feeding on a wide range of animals, such as mammals and birds. So how do ticks recognize and select their preferred hosts from the surrounding environment? Ticks perceive animal-derived odors through the Haller's organ located on their forelegs, allowing them to detect host-emitted volatile compounds. However, the role of olfactory cues in host selection behavior is not fully understood. In this study, we examined behavioral responses to the odor of sika deer (*Cervus nippon*), a representative host species, in four tick species (*Haemaphysalis flava, H. longicornis, H. kitaokai, and H. megaspinosa*) that differ in their degree of host specificity. Odor samples were obtained by attaching cotton cloths to captive sika deer for a defined period. In a Y-tube olfactometer test, ticks were presented with air streams carrying volatiles from either the deer-scented cloth or a control (untreated cloth). Their behavioral responses (initial arm choice, number of selections, and residence time) were recorded. The results showed that tick species that preferentially in-

fest sika deer (*H. kitaokai* and *H. megaspinosa*) tended to show stronger behavioral responses to the odor of sika deer compared to generalist species, *H. flava*. These findings suggest that olfactory cues play a key role in tick host recognition and selection.

P107 Molecular mechanisms underlying diversification of thermal tolerance during embryonic and larval development in sticklebacks

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Environmental changes such as global warming, extreme weather events, and atmospheric and oceanic pollution pose serious threats to many organisms. In aquatic ecosystems, ectothermic animals are particularly vulnerable, as their body temperatures are largely determined by ambient water temperatures. This makes high latitude freshwater environments especially susceptible to the impacts of climate change. The three spined stickleback (*Gasterosteus aculeatus*), a cold-water fish distributed from freshwater to marine environments, is likely to be among the species most affected by rising temperatures. Although numerous studies have examined how elevated temperatures influence fish physiology—such as growth, oxidative stress responses, and immunity—the molecular genetic mechanisms underlying interspecific variation in thermal tolerance remain poorly understood. Previous research has shown that the closely related species *G. nipponicus*, which diverged from *G. aculeatus* approximately 680,000 years ago, exhibits greater heat tolerance at both juvenile (2 months post-hatch) and adult stages. However, it remains unclear whether such differences in thermal tolerance are also observed during the early developmental stages, such as embryogenesis and early larval development, and what molecular mechanisms underlie them. To address this, we compared embryonic development and larval survival between the two species under high temperature conditions. We found that *G. nipponicus* embryos and larvae also exhibit greater heat tolerance than those of *G. aculeatus*. Moreover, high temperatures induced morphological abnormalities, particularly affecting in the head and vertebrae. RNA-seq across multiple developmental stages and temperature treatments revealed differentially expressed genes in response to heat stress. We will discuss the potential roles of these genes in contributing to the differences in thermal tolerance between the two species.

P108 Resolving the Phylogeographic Inconsistencies among *Onychodactylus* Species in Northeast Asia

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Onychodactylus, commonly known as a clawed salamander, is a genus in the Hynobiidae family that is endemic to Northeast Asia. Previously, this genus was consisted of only two species, but recent phylogenetic studies have revealed significant genetic divergences among them, leading to the addition of ten new species to the genus. Based on previous studies using mitochondrial DNA (mtDNA), their phylogenetic relationships do not align with their geographic distributions. In this study, we tried to resolve this inconsistency by conducting phylogenetic analyses, including Approximate Basian Computation (ABC) approach. We used three mtDNA genes (Cytb, COI, and 16S rRNA) and one nuclear DNA (nDNA) gene (RAG-1) of ten *Onychodactylus* species and constructed phylogenetic trees using mtDNA, nDNA and combined dataset. Additionally, we tested various past divergence scenarios of Korean and Japanese species using ABC approach. Herein, we present the mito-nuclear discordance observed among *Onychodactylus* species and discuss the potential factors contributing to this discordance. Furthermore, we discuss the past divergence history of *Onychodactylus* species by integrating the ABC analysis with the paleogeographic history of Northeast Asia.

P109 Evolutionary developmental factors of the exaggerated genital morphology in the *Ohomoputerus* ground beetles

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The genital morphology of animals with internal fertilization shows rapid diversification and contributes to reproductive isolation. In *Ohomopterus* ground beetles, morphologies of the male copulatory piece (CP) and the female vaginal appendix (VA) correspond to each other species-specifically. Sexual selection including sperm competition and sexual conflicts may be involved in the correlated evolution of *Ohomopterus* genitalia, and the mismatch in genital morphology in interspecific mating contribute to mechanical reproductive isolation. In contast to these evolutionary factors, developmental factors underlying this morphological diversity remain poorly understood.

In *Ohomopterus*, *C. maiyasanus* includes multiple geographical lineages with varied genital sizes (specifically, CP and VA). *C. uenoi*, which originated as a lineage of *C. maiyasanus*, possesses a remarkably large genitalia. Using X-ray micro-CT imaging, we compared the morphogenesis of the CP among three lineages of *C. maiyasanus* (including *C. uenoi*) with different genital sizes. We found that exaggeration of the CP involves increased growth rates, prolonged maintenance of internal tissues of the CP possibly related to genital growth, and post-emergence morphological change.

To explore these processes at the cellular level, we histologically analyzed genital development in one of these populations. Epidermal cell division began at the initial formation of the CP between the 2nd and 4th days after pupation. The epidermal cells had grown and started secreting folded cuticle between the 4th and 6th days. Folded cuticle covering epidermal cells were then unfolded with continued cell growth and deformation, leading to the elongation of the CP after 6 days of pupation. Pigmentation of the tip of the CP began by the 10th day. The internal tissue decreased along with the grows of the CP, probably reflecting di-

gestion of fat bodies.
These findings provide novel insights into the developmental processes of remarkably divergent genital morphologies that relate to sexual selection and speciation.

P110 A study on the migratory status of Warbler complex in the Republic of Korea using genetic analysis

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The genus *Phylloscopus* includes 81species globally and 22species are recorded in the Republic of Korea. Species within the *Phylloscopus* can be distinguished based on unique vocalizations and wing formula. However, species identification is often unclear between closely related *Phylloscopus* species due to morphological similarity. Generally, the Arctic Warbler (*Phylloscopus borealis*), the Kamchatka Leaf Warbler (*P. examinandus*) and the Japanese Leaf Warbler (*P. xanthodryas*) are difficult to discriminate. The Pale-legged Leaf Warbler (*P. tenellipes*) and Sakhalin Leaf Warbler (*P. borealoides*) also look very similar. In Korea, the migratory status of these closely related species has been poorly understood. To clarify the migratory status of these five species, we analyzed genetic species identification using cytochrome*b* gene. Samples were collected at two stopover sites, Socheongdo (northwest) and Marado (southwest), during the spring and autumn. As a result, *P. borealis* (N=177, 91%), *P. tenellipes* (N=321, 98%) had the highest capture rates at Sochongdo. In contrast, *P. examinandus* (N=62, 84%), *P. borealoides* (N=30, 91%) were predominated at Marado. *P. xanthodryas* (N=5, 7%) was observed only at Marado. The results indicate that each migratory route differs based on their breeding range and these differences have been also reflected in the choise of stopover sites. It was inferred that *P. borealis*, which breeds from northern Europe to Alaska, and *P. tenellipes*, which breeds from the Amur to eastern Manchuria, mainly migrate along the western coast of Korea. Whereas, *P. examinandus*, breeding in Kamchatka, Sakhalin, Hokkaido, as well as *P. borealoides*, breeding in Sakhalin, Honshu, Shikoku, Kyushu, migrate along the southern coast of Korean Peninsula. The main migratory route of *P. xanthodryas* breeding in Honshu, Shikoku, Kyushu was expected to be further east than other species. This is the first reports on the migratory patterns of Warbler complex in the Republic of Korea.
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P111 Genetic analysis of the Eastern Buzzard *Buteo japonicus* wintering in the Republic of Korea

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Buteo japonicus burmanicus, a subspecies of the Eastern Buzzard (*Buteo japonicus*), breeds from the Russian Far East and northern Mongolia to the Amur region and northeastern China. It is a common winter visitor to the Republic of Korea and also winters in southern China and southern Japan. Whereas, the Japanese subspecies *B. j. japonicus* breeds in Sakhalin, Hokkaido and Honshu, and winters from Honshu to Kyushu. No influx of *B. j. japonicus* into the East Asian continent has been reported to date. In the Republic of Korea, no phylogenetic studies on the genus *Buteo* have yet been conducted. This study aimed to clarify the subspecies status of *B. japonicus* in Korea by analyzing biological samples from 71 individuals collected within the country between 2007 and 2023. For subspecies identification, phylogenetic analyses were conducted using the mtDNA ND6, tRNA-Glu and ψCR regions (821 bp). As a result, 70 individuals were identified as *B. j. burmanicus*, while one individual rescued in Busan on 12 February 2022 was identified as a female *B. j. japonicus*. This is the first record of *B. j. japonicus* in the Republic of Korea. The genetic distance between *B. j. burmanicus* and *B. j. japonicus* was 0.015, indicating a level of divergence comparable to that observed among other *Buteo* species such as *B. buteo buteo*, *B. b. vulpinus*, and *B. refectus* (0.010-0.017). The intraspecific genetic diversity of *B. j. burmanicus* in the Republic of Korea was estimated to be 0.0013. These findings provide foundational data for future ecological and phylogenetic studies on *B. japonicus*.
This study was supported by the National Institute of Biological Resources (NIBR) under grants [NIBR 202321101, NIBR 202523101]

P112 Quantifying Migratory Connectivity and Spatial Clustering of the Rook *Corvus frugilegus* Using Tracking Data

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Understanding the spatial migration structures of migratory birds is critical for both population conservation and the study of population dynamics. However, quantitative analyses of individual-level migratory connectivity and strategies remain limited

for migratory species in East Asia. In this study, we conducted a comprehensive analysis of migratory connectivity and the spatial clustering structure of movement trajectories using tracking data from 37 Rooks *Corvus frugilegus* that breed and winter in East Asia.
Migratory connectivity was assessed based on distance matrices between breeding and wintering sites. The Migratory Connectivity Index was 0.049, and the Mantel correlation coefficient was r = 0.105 (p = 0.0686), indicating low spatial connectivity and low site fidelity at the population level. Visualization of the migratory connectivity network model revealed relatively strong links along the Mongolia-China (0.28), China-Korea (0.25), and Russia-Korea (0.21) routes, with South Korea emerging as a central wintering hub aggregating individuals from diverse breeding origins.
To investigate variability in individual migration strategies, we separated spring and autumn migration routes and performed K-means clustering based on four metrics: migration distance, direction, and changes in latitude and longitude. The analysis identified three distinct migration clusters: medium-distance linear, long-distance diagonal, and short-distance linear trajectories. Notably, the spatial distribution of breeding and wintering sites within each cluster showed no clear geographic consistency, suggesting that individuals sharing wintering sites may adopt divergent migratory strategies.
Our findings offer a quantitative characterization of the spatial migratory structure of Rook populations in East Asia and yield valuable insights into their population dynamics. This research provides a scientific basis for evidence-based conservation strategies targeting migratory bird population in the region.
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P113 The study for different feed on the growth performance of larval *Andrias davidianus*

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Quantitative feeding method was used to study different baits on the difference of larval *Andrias davidianus* growth performance.The experiment samples were selected from the same parents and close incubation time which enter the stage of feeding and in mixed nutrition stage.The larvas (12 samples) were divided for four groups, each group 3 tails were marked as B-0, B-1, B-2 and B- 3. B- 0 group was the matched group which were fed the natural baits; B- 1 group were fed artificial diets mixture with probiotics; B-2 group were fed quality ratio of 1:1 of natural baits and artificial diets; B-3 group were fed quality ratio of 1:1 of artificial diets and silver carp.
This result provided a foundation for the artificial diets additive formula, and the mixture of artificial diets and probiotics with natural baits showed no obvious advantage.The experiments should be conducted to adjust the artificial diets additive formula in order to achieve the best effect.

P114 Temperature modulates the ontogenetic effects of microplastics on amphibian life history.

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This study investigates how temperature influences the effects of microplastics (MPs) on the Japanese tree frog (Dryophytes japonicus), with a focus on life history traits and MP dispersal across habitats. Results indicate that MPs can translocate between aquatic and terrestrial ecosystems during metamorphosis, though temperature had limited influence on this transfer. In contrast, elevated temperatures significantly reduced MP-induced mortality and hindlimb deformities, thereby mitigating some developmental toxicity. MP exposure was associated with hindlimb deformities likely mediated by oxidative stress, as well as alterations in gut morphology and fecal microbiome composition—effects that were more pronounced at higher temperatures. Notably, these adverse effects persisted into the terrestrial stage, implying potential long-term risks to amphibian populations. This study underscores the pivotal role of temperature in modulating pollutant effects in ectothermic organisms and provides new insights into the multifaceted ecological challenges posed by MPs.
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P115 Effects of Group Size and Habitat Disturbance on Intestinal Parasite Load in Free-ranging Proboscis Monkeys

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Group-living primates face both the benefits and costs of sociality, one of which is an increased risk of parasite transmission. While numerous studies have examined ecological and social determinants of parasitic infection, the relative effects of group type (i.e., social structure), group size, and anthropogenic habitat disturbance remain insufficiently understood—particularly in Southeast Asian primates. In this study, we examined the abundance of intestinal parasites in proboscis monkeys (*Nasalis larvatus*) inhabiting a riverine forest along the Menanggul River in Sabah, Malaysian Borneo. A total of 160 fecal samples were collected year-round from individuals belongings to one-male-multifemale and all-male groups, situated in habitats exhibiting varying degrees of human disturbance. Using fecal egg counts and Bayesian modeling, we assessed the influence of group type, group size, and sampling location on parasite abundance. We identified three nematode taxa—*Trichuris* sp., *Strongyloides fuel-*

leborni, and *Oesophagostomum aculeatum*—with an overall infection prevalence of 80.62%. Group type did not significantly affect parasite abundance. However, group size was positively associated with *Trichuris* sp. and negatively associated with both *S. fuelleborni* and *O. aculeatum*. Moreover, parasite abundance for *Trishuris* sp. was higher in more disturbed downstream areas, while *O. aculeatum* abundance increased in less disturbed upstream habitats. These findings indicate that parasite infections in *N. larvatus* are shaped by a combination of social and environmental variables, underscoring the importance of taxon-specific approaches in conservation strategies under intensifying anthropogenic pressures.

P116 Roadkill of Terrestrial Vertebrates in the Northern part of Okinawajima Island: Ecological Insights from a Year-Round Survey

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Wildlife mortality from vehicle collisions (roadkill) is a growing global conservation concern. On the northern part of Okinawajima Island, located in the central Ryukyu Archipelago of Japan, endemic species are particularly vulnerable, yet the impacts of roadkill on terrestrial vertebrates—especially amphibians and reptiles—remain poorly understood.
Year-round nocturnal surveys were conducted in Yambaru National Park to assess the ecological effects of roadkill and focus on frequency, species composition, and spatio-temporal patterns. Between February 2024 and January 2025, 95 surveys (～three hours each, starting two hours after sunset) were carried out along a 31.8 km stretch of road (Okinawa Prefectural Routes 2 and 70), covering 6,042 km in total.
First, we recorded 908 roadkill individuals, of which 83.3% (756 individuals) were amphibians. The detection rate is 0.150 individuals/km. Also, we found clear seasonal variation of roadkill incidence, with peaking in winter and declining in summer.
Second, we revealed a statistically significant negative correlation between temperature and the total number of terrestrial vertebrates' roadkill. Two frog species, *Odorrana narina* (253 individuals, 27.9%) and *Zhangixalus viridis* (223 individuals, 24.6%), were markedly more abundant than the others, but the two species exhibited completely different seasonal patterns: *O. narina* was recorded year-round except during winter, whereas *Z. viridis* was observed only during autumn and winter. Our results suggest that the number of roadkill of *O. narina* increased with temperature and humidity, whereas *Z. viridis* showed a negative association with temperature.
This study provides the first comprehensive assessment of roadkill among terrestrial vertebrates in the northern part of Okinawajima Island. Our findings suggest the necessity of conservation action, particularly for amphibians in our study area. We should assess the impact of roadkill on wild populations in a further study.

P117 Comparison of Population Density and Dynamics of Eurasian Otters (*Lutra lutra*) between Urban and Rural Areas Using a non-invasive Spatially Explicit Capture-Recapture Model

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Urban and rural river ecosystems differ in various environmental factors such as habitat structure, water quality, and anthropogenic disturbances. These differences can affect the habitat use and movement of semi-aquatic wildlife, potentially leading to variations in population density. Although the impacts of urbanization on Eurasian otter (Lutra lutra) populations have been widely studied, there are few cases that quantitatively compare population density or demographic parameters between urban and rural areas.
In this study, we surveyed 36 sites in the urban area of Daegu Metropolitan City once per season from August 2022 to April 2023, totaling four surveys. In March 2024, we conducted two surveys at 85 sites in the rural area of Yeongyang County, collecting otter feces from both regions. Otter feces collected from both regions were genetically analyzed to identify individuals. Using this information, we applied Spatially Explicit Capture-Recapture (SECR) modeling to estimate population density and parameters such as survival and immigration rates across regions.
As a result, the rural area showed higher population density (Daegu: 0.02individual/ha, Yeongyang: 0.04individual/ha) and survival rate (Daegu: 0.82, Yeongyang: 1.00) compared to the urban area. In contrast, the immigration rate was slightly higher in the urban area (Daegu: 38%, Yeongyang: 36%). These findings suggest that otter populations in urban areas have lower survival and rely more heavily on immigration to maintain population levels.
Future research will incorporate additional covariates, such as distances to roads and forests, into the model to further examine the influence of landscape features on population dynamics.

P118 Evaluating nymphal behavior of *Riptortus pedestris* (Hemiptera: Alydidae) to balance symbiont acquisition and predation avoidance using an individual-based model

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Riptortus pedestris (Hemiptera: Alydidae) forms a mutualistic symbiosis mainly with microbes belonging to the genus *Caballeronia*, which confer various benefits including accelerated growth of nymphs and enhanced dispersal capacity by adults. Nevertheless, *R. pedestris* acquires these symbiotic microbes from soil during nymphal stages each generation, which may not guarantee the acquisition of the symbionts. In addition, symbiont acquisition of the nymphs has been suggested to depend largely on random encounter with soil harboring symbiotic microbes. However, field surveys have reported symbiont acquisition rate up to > 90% by field populations of *R. pedestris* adults. To achieve such high symbiont acquisition rate, the nymphs may increase their likelihood of symbiont acquisition, either temporally by having an extended window of acquisition during development, or spatially by having increased dispersal tendency or inhabiting symbiont-rich environments. Meanwhile, the effort to increase the likelihood of symbiont acuiqisiton, greater dispersal tendency in particular, may come at a cost of elevated exposure to predation. Then how do the *R. pedestris* nymphs maximize acquisition rate while minimizing predation risk? In our study, we used an individual-based model to evaluate behavioral strategies by *R. pedestris* to optimize symbiont acquisition and predator avoidance. For this, we developed an individual - based model of nymphal movement and symbiont encounter, varying (1) the temporal window for acquisition, (2) baseline dispersal tendency, (3) symbiont richness, and (4) predator density. In particular, we investigated if switching dispersal tendency from high to low upon symbiont acquisition - rather than maintaining consistent dispersal tendency - could increase symbiont acquisition while reducing predation risk. Our study on symbiont acquisition of *R. pedestris* provides insights into the complex relationship between host insect and its environmentally acquired symbiotic microbes.

P119 Morphological Feminization of Hermit Crab Hosts Induced by Rhizocephalan Parasites

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Rhizocephalans (Thecostraca: Cirripedia) are parasitic barnacles that infect a diverse range of decapod crustaceans, including hermit crabs, crabs, and shrimps. These parasites cause profound physiological and morphological alterations in their hosts, including parasitic castration and morphological/behavioral feminization. In this study, we investigated the feminizing effects of two rhizocephalan genera, *Peltogasterella gracilis* and *Peltogaster* sp., on male hermit crab hosts from two geographically distinct populations: *Pagurus lanuginosus* from Asari, Hokkaido (Sea of Japan coast), and *Pag. filholi* from Chikura, Chiba (Pacific coast). Morphological feminization was assessed based on two criteria: the presence or absence of secondary pleopods and the relative length of the right enlarged cheliped. Both *Pel. gracilis* and *Peltogaster* sp. induced feminization in their respective hosts; however, the extent of morphological change varied depending on the parasite and host species. Notably, *Pag. lanuginosus* males parasitized by *Pel. gracilis* exhibited a significantly higher frequency of secondary pleopods and a substantial reduction in cheliped length compared to uninfected males. In contrast, these feminizing traits were less pronounced or absent in *Pag. filholi* males parasitized by *Peltogaster* sp. Furthermore, differences in the degree of feminization induced by the same rhizocephalan genus across host species suggest species-specific responses to parasitic manipulation. These findings highlight the importance of considering both parasite and host identity when evaluating the impact of parasitism. This study provides new insights into host-parasite interactions and the evolutionary consequences of parasitic feminization in marine invertebrates.

P120 Impacts of Grazing Intensity on Soil Carbon and Nitrogen Storage in Grasslands of Gannan

＊Meiling Zhang (Gansu Agricultural University), Qiaonan Wang (Gansu Agricultural University), Yarui Zhan (Gansu Agricultural University)

Ninety percent of the carbon and nitrogen in grassland is stored in the soil, and grazing is the main production and utilization manner. This study focused on the mechanism of the impact of grazing intensity on soil carbon and nitrogen storage in the alpine meadows of Gannan Prefecture. By integrating field experiment data and climate data, the DAYCENT model was used to simulate the dynamic changes of soil organic carbon and total nitrogen storage under different grazing intensities over the past 50 years. Principal component analysis and co-kriging interpolation were combined to analyze their spatial differentiation characteristics. The results show that: (1) On the temporal scale, although the soil organic carbon storage in Gannan grassland fluctuated slightly during the study period, it generally showed a downward trend under the influence of grazing. With the increase of grazing years, the reduction rate of total soil organic carbon storage under moderate grazing would be faster than light grazing, and eventually lower than that of no grazing. Soil nitrogen storage show a significant upward trend under light grazing, contrary to soil carbon. Moderate grazing had a limited impact on the stable carbon pool. (2) On the spatial scale, the surface soil carbon and nitrogen storage in Gannan showed a trend of being higher in the southwest and lower in the northeast. Under heavy grazing, the reduction of surface organic carbon storage was the largest, while under light grazing, the total soil nitrogen storage in each layer showed a cumulative effect.

P121 Discrete time population dynamics model for exploitative competition between native and alien predators

＊Akshat Goyal (Tohoku University)

Today numerous species are experiencing habitat shifts potentially driven by climate change. Invasion of an alien predator species into a native prey-predator system could lead to substantial ecological consequences. The limiting dynamics of the predator

and prey populations are shown to depend substantially on what ages of prey are eaten by predators [1]. Cases have been observed where more than one predator species predates on the same prey species but at different life stages. In such cases, new features of biological importance could emerge that are not present in simpler models. In this research we present a discrete-time population dynamics model to analyze exploitative competition between native and alien predators sharing a common prey. The study investigates the conditions under which an alien predator can successfully invade a native predator-prey system, the persistence of both predators, and the consequences of their interactions.
The model is constructed using a Nicholson-Bailey framework for predator-prey interactions and extends to a three-species system incorporating density-dependent prey growth via the Beverton-Holt model. Two scenarios are explored: (1) Model J, where the native predator P targets juvenile prey, and (2) Model A, where the native predator Q preys on adults. The introduction of an alien predator creates indirect competition between the two predators, leading to varied ecological outcomes.

P122 Climate warming-driven expansion and retreat of novel ecosystems-alpine scree in the Third Pole over the past 45 years

＊Guanshi Zhang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences), Lingxiao Ying (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences), Yu Zhao (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

Alpine scree, a unique high-altitude ecosystem located below the snowline and above the treeline or grassline, is frequently found in high mountain or plateau regions globally. Despite its barren appearance, alpine scree supports rich biodiversity, including cold-tolerant, wind-resistant, and radiation-resistant species such as *Rheum nobile*, *Meconopsis*, *Androsace tapete* and *Arenaria kansuensis*. It also provides crucial habitats for endangered species like *Panthera uncia* and *Pseudois nayaur*. However, data on the spatial boundary and extent of alpine scree are limited, and systematic analysis of their spatial pattern and long-term evolution is lacking. In the context of global warming, the driving mechanisms behind the expansion and retreat of alpine scree—acting as "sentinel" of high-altitude ecosystem—remain unclear. This gap hampers efforts to enhance biodiversity conservation and improve early-warning systems for high-altitude ecological security. Using the Tibetan Plateau as a case study, we defined the spatial boundary of alpine scree based on its surface formation process and examined their distribution and long-term evolution. The results show that in 2020 year, alpine scree on the Tibetan Plateau covered 73,735.34 km^2, 1.5 times the area of glacier. Alpine scree is mostly distributed at elevations between 4,000 and 6,000 meters, with slope of approximately 30-40 degrees. Characterized by low temperature and sparse rainfall, the regions are located in the humid zone. From 1975 to 2020 year, the area of alpine scree initially increased before declining, with an overall decrease of 560.68 km^2. Climate warming was the primary driver of these changes, leading to an increase of scree from 1975 to 1995 year and a decrease of scree from 1995 to 2020 year. This study enhances understanding of the spatial distribution and dynamics of this unique ecosystem-alpine scree, offering new insights into climate change impacts on alpine ecosystem.

P123 Plant functional groups modulate the effects of landscape diversity on natural predators

＊Zhi Wen (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Hua Zheng (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

In agricultural landscapes, pests and natural predators are collectively influenced by crop structures, landscape composition, and landscape configuration. While the independent effects of these factors on pests and their natural enemies have been investigated, their interactive effects remain unclear. This study set up 15 heterogeneous landscapes centered on mango orchards, interpreted surrounding habitats (forest, rubber, areca, and longan), and characterized the landscape composition (habitat cover and landscape diversity) and configuration (patch density). Orchards with and without understory plants were selected using paired designs within each landscape. We measured abundances of pests (thrips) and predators (lacewings) in the orchards and their surrounding habitats. The independent and interactive effects of landscape composition, configuration, and understory plants on pests and predators were analyzed, and the effects of the functional groups (linear-leaved, and nonlinear-leaved plants) of understory plants on species abundance were explored. Landscape diversity, forest cover, and understory plants showed insignificant effects on thrips but significantly affected lacewing abundance. Specifically, lacewing abundance in orchards was significantly higher in landscapes with forest cover than in those without forest cover. Orchards with understory plants showed significantly higher lacewing abundance than orchards lacking such vegetation. Landscape diversity was negatively correlated with lacewing abundance; however, this effect was only observed in forested landscapes. More importantly, understory plants mitigated the adverse effects of landscape diversity with forest cover on lacewing abundance, mainly because understory nonlinear-leaved plants, rather than linear-leaved plants, promoted natural predator abundance. This study provides evidence that the effects of landscape diversity are co-dependent on forest cover, plant functional groups, and species. We first recommend preserving suitable forest cover and retaining understory nonlinear-leaved plants to collectively address the negative impacts of landscape diversity on pests and natural predators in agricultural landscapes.

P124 Characterization and potential use of citizen science-derived biodiversity data from ten Nature Sanctuaries.

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Citizen science is the key to achieving a Nature Positive society through ecosystem data. While much data exists from natural recreational areas, understanding biases in observation locations and subjects is crucial for effective data use and citizen engagement. Particularly, when aggregating and utilizing data from sources such as social media for small-scale forest recreation areas, the characteristics and inherent challenges of such data are not yet fully understood.

Therefore, this study clarified the characteristics of biodiversity information derived from citizen science at ten Nature Sanctuaries located in suburban Japan by analyzing photo post data collected from the social media "Biome," which reports wildlife watching records. A total of 4,435 geotagged photographs were analyzed, with detailed examinations of their spatiotemporal distribution, recorded species, and data biases (spatial, taxonomic, and contributor biases, as well as data quality issues). Field surveys and interviews with site managers were conducted to investigate the factors contributing to these data characteristics.
The results indicated that social media-derived data tend to be concentrated in easily accessible locations within sanctuaries, such as trails near visitor centers, and that recorded species are often biased towards visually appealing and commonly recognized organisms. While these characteristics may limit the utility of the data, they also suggest that such data can provide valuable insights into how people interact with nature and what elements they perceive as cultural ecosystem services. Understanding the identified data characteristics and inherent biases (including misidentification and inclusion of records from indoor exhibits) is a prerequisite for the sound utilization of this type of information. This research demonstrates that citizen science data derived from social media, if appropriately screened and interpreted, hold the potential to foster broader public engagement with nature and supplement biodiversity monitoring efforts. This is anticipated to be a novel citizen-led approach towards achieving a Nature Positive society.

P125 The spatial pattern of butterfly diversity and its impact factors in Beijing urban green spaces

＊Zhimin Su (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

The environmental changes brought about by urbanization were recognized as one of the main drivers for the decline in biodiversity. Butterflies, as an important component of biodiversity, had ecological functions and service values such as helping pollinate and supporting food chains, making them significant indicators of urban environmental changes. In this study, a combination of line-intercept and point sampling methods was used to investigate the butterfly diversity in 47 urban green spaces within the fifth ring road of Beijing from April to September 2023. The results showed that: 1) A total of 4,469 butterflies were surveyed, belonging to 5 families, 16 genera, and 17 species, with the *Pieris rapae*, *Pontia edusa*, and *Polygonia c-aureum* being the three largest dominant species. 2) Butterfly species diversity decreases with increasing urbanization, and the butterfly species richness, abundance, and diversity indices were highest in the outer of the city (between the fourth and fifth ring roads). 3) The similarity of butterfly communities in different urban zones was relatively high, and the ANOSIM test results showed small differences among urban zones (R=-0.012, P>0.05). 4) Butterfly species diversity was extremely significantly positively correlated with the total species number of plants (P<0.001) and the species number of nectar plants (P<0.001), and significantly positively correlated with urban green space area (P<0.05). The study indicated that butterfly diversity tends to be homogenized in different urban zones, and urban green space area and plant diversity were important factors limiting butterfly species diversity. It was suggested that a certain proportion of urban green spaces should be preserved in urban area to expand butterfly living space. Moreover, increasing plant diversity and scientifically arranging different plant flowering sequences were recommended to provide more food sources for butterflies, so as to maintain or even increase butterfly species diversity.

P126 Construction and optimization of urban ecological network based on bird friendly perspective: a case study of Hefei

＊Dexian Zhao (Anhui Agricultural University, ESC), Yuxin Ding (Anhui Agricultural University), Qian Ma (Anhui Agricultural University)

With the development of urbanization, the fragmentation of urban green spaces is severe, threatening the habitat and development of birds in urban area. Therefore, how to optimize the ecological network of urban green spaces, improve the connectivity and quality of urban bird habitats, has become a key issue in urban biodiversity conservation. This study selected ecological source areas based on field survey bird data, assigned resistance values using environmental factors that affect bird diversity, and constructed urban ecological networks using circuit theory models. The results showed that (i) a total of 22040 birds belonging to 15 orders, 38 families, and 99 species were surveyed. There were differences in the results of ecological source identification based on bird data and MSPA method, with a higher number of ecological source based on bird data. (ii) The land use type and vegetation cover were key factors in constructing the ecological resistance surface. According to the linear fitting results, the ranking of environmental factors on urban bird richness was grassland (0.219), forest land (0.189), impermeable land (0.184), other land use (0.169), water body (0.133), and vegetation cover (0.106). iii) The ecological network constructed based on bird richness identified a total of 23 ecological corridors, 7 pinch points, and 9 barriers. Based on the findings, it is proposed to enhance the connectivity of the overall urban ecological network and construct a bird friendly urban ecological network by improving and optimizing the classification of ecological source areas, constructing ecological corridors, and controlling ecological nodes.

P127 Traditional management practices sustaining plant species diversity in thatch-producing grasslands in central Japan

＊Hideyuki Ida (Shinshu University, ESJ)

Thatch-producing grasslands, known as *kayaba* in Japan, are semi-natural ecosystems managed to harvest thatching materials for traditional roofs, essential for preserving Japan's cultural heritage. Although fire and mowing management sustains biodiversity, the effects of thatch production on biodiversity in *kayaba* remain unclear. I examined the relationship between management and plant diversity in these now rare traditional grasslands, assessing their cultural and ecological value.
The study was conducted in *kayaba* sites (dominated by *Miscanthus tinctorius* as thatch) in Otari, Nagano Prefecture and Gokayama, Toyama Prefecture. In Otari, fire-managed fields are burned annually in May, with thatch harvested in October. Plots included three in 'Maki-no-iri-kayaba' and one in 'Shoku-no-kayaba'. In Gokayama, hand-mowed fields consisted of four

sites, each with one plot: traditional (managed since the Edo period), restored (resumed in 2012), established (created in 2011), and abandoned (left unmanaged for 20 years). Managed sites, except the abandoned one, undergo summer weeding (*nakagari*) and post-harvest cleanup (*souji*).
A species-area curve was constructed for each plot to assess species composition, with the maximum plot size (256—1024 m^2) varying by site according to its shape.
Fire-managed plots exhibited uniform vegetation, favoring ground-level perennials (Raunkiaer's criterion: H) and underground perennials (G) that are less affected by fire, with 26 species (Maki-no-iri, mean) and 27 (Shoku) recorded at 128 m^2. In contrast, hand-mowed plots exhibited diverse growth forms, including H and G, as well as small shrubs (N) and low-growing plants (Ch), showing more species: 65 (traditional), 68 (restored), and 59 (established) at 128 m^2. The abandoned plot had 38 species, indicating a decline in herbaceous species with succession.
These results suggest that fire management leads to vegetation homogeneity, favoring species less affected by repeated burning, while hand mowing, unintentionally, preserves dormant buds and habitat heterogeneity, supporting diverse various growth forms.

P128 Estimation of conservation importance of tidal flats under different environmental contexts using endangered fish species

＊Ryuya Sakamoto (University of Miyazaki, ESJ), Mika Mukai (Tanabe Kankyo Kougaku Co., Ltd), Atsunobu Murase (University of Miyazaki)

Environmental contexts should be considered in studies on determining conservation priorities for a certain ecosystem because variation of these contexts may affect formation of ecological communities. Among coastal ecosystems, tidal flats are one of the most vulnerable ecosystems. It is therefore necessary to evaluate the contribution of each tidal flat for biodiversity in each region for implementing efficient conservation measures. However, there have been few studies to date that have examined the conservation priorities of each tidal flat considering variation of environmental contexts. In order to estimate conservation importance of tidal flats with different environmental contexts, the present study conducted a quantitative quadrat survey of fish in nine tidal flats among five different contexts at a temperate coast of Japan (northern Miyazaki Prefecture). Those contexts differ in each as follows: marine or estuary; lagoon or regular estuary; large or small estuary; inside of estuary or in front of river mouth. This study presents a list of species occurred in each tidal flat, and a comparison of diversity and density of endangered fish species across tidal flats to make proposals for formulating guidelines for the future conservation of tidal flats.

P129 The Current Status and Trends of Natural Capital Accounting in China

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To promote biodiversity conservation and achieve sustainable development goals, China is exploring natural capital accounting and integrating it into mainstream decision-making. This article provides a brief overview of natural capital and its related concepts, as well as the practice of natural capital accounting in China. We aim to clarify the relevant concepts of natural capital, examine the latest developments in natural capital accounting in China, and explore local practices for mainstreaming natural capital into decision-making. The cases of natural capital accounting and value realization hold significant potential and offer valuable insights for environmental management that can guide natural capital accounting and mainstreaming in other countries and regions. We also highlight key issues that need to be addressed, such as data accessibility, data systematization, and applicability of results. Effective natural capital accounting and mainstreaming must fully consider these factors to address future critical environmental management challenges.

P130 Impact of Global Warming on Lake Biwa Fish: Identifying Climate-Sensitive Species

＊Qianqian Wu (Kobe University, ESJ), Jinxin Zhou (Tokyo University), Yuan Yao (Hokkaido University), Toshiyuki Ishikawa (Shiga University), Daisuke Kitazawa (Tokyo University), Toshifumi Minamoto (Kobe University)

Recent global warming has disrupted water mixing in Lake Biwa, Japan, causing hypoxia in deep-water layers and threatening benthic organisms. Previous studies focused on species like *Palaemon paucidens* and *Gymnogobius isaza*, examining warming effects and spatiotemporal variations, but data on other aquatic organisms remain limited. This study used quantitative environmental DNA (eDNA) metabarcoding to assess fish distribution and identify species sensitive to climate change. Water sampling and quality assessments were conducted in summer and winter during two periods: 2016-2017 (full water circulation) and 2019 (partial water circulation). DNA was extracted from samples collected at 31 sites in 2016-2017, 31 sites in summer 2019, and 28 sites in winter 2019, with fish DNA quantified via eDNA metabarcoding. A total of 35 fish species were detected, including seven endemic to Lake Biwa. Diversity index showed that no significant differences between seasons, but NMDS revealed clear variations in community structure depending on circulation types and seasons. A random forest model identified three species—*Plecoglossus altivelis*, *Hemibarbus* spp., and *Gymnogobius isaza*—as highly sensitive to year-based changes, suggesting they respond to environmental shifts. Structural equation modeling (SEM) was used to evaluate the effects of temperature and depth on these sensitive species. Surprisingly, SEM found no significant direct effects, indicating that other environmental or ecological factors may influence eDNA variation. Overall, the study suggests that climate-driven changes in water circulation may alter fish community structures in Lake Biwa. However, further long-term monitoring is needed to clarify the drivers of species distribution changes.

P131 Impact of rainfall on water quality and plankton in the river and lake supplied by reclaimed water

＊Yufen Ren (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC)

This study explores the ecological impacts of rainfall on reclaimed water bodies in Beijing, focusing on Qinghe River and Longxingshuixi in the Olympic Forest Park. A one-year dynamic monitoring of water quality and plankton was conducted, and statistical and modeling tools were applied to analyze the response of the water environment to rainfall. Both waters meet the standards for landscape environmental water use, but the Longxingshuixi shows significantly better water quality, with higher DO and lower TN levels, and supports a more diverse and stable plankton community structure. After rainfall, the water quality of Qinghe River was mainly affected by urban non-point source pollution and crossing overflow pollution, the dominant phytoplankton populations in Qinghe River after rainfall alternated from Bacillariophyta to Cyanophyta. In Longxingshuixi, rainfall mainly led to non-point source pollution, with relatively stable phytoplankton structure. After rainfall, the stability of plankton community structure in the upstream of Longxingsuixi decreased, and the stability of plankton community structure in the midstream of Longxingshuixi increased. Redundancy analysis showed that TN was a common water quality factor affecting the plankton community structure in Qinghe River and Longxingshuixi. The MIKE11-based hydrodynamic-water quality coupled model was successfully built for Qinghe River. After calibration of the riverbed roughness, longitudinal diffusion coefficient of pollutants and integrated attenuation coefficient, the model had a good simulation result. Simulation results showed that increased rainfall leads to elevated pollutant concentrations, but increasing reclaimed water inflow to 2 m^3/s after heavy rain significantly reduces peak pollutant levels and accelerates recovery. The research results provide theoretical basis and technical support for the management of reclaimed water and water quality regulation under urban rainfall scenarios.

P132 eDNA from Rainfall Runoff Can Provide More Biodiversity Information Than We Anticipate.

＊Keonhee Kim (Konkuk University Human and Ecocare center, ESK), Junghwan Park (PJ Factory Co.)

Traditional monitoring of wild mammals relies on detecting ecological traces, requiring significant time, cost, and expertise. To overcome these limitations, we applied environmental DNA (eDNA) from stormwater runoff to detect mammalian species in Bukhansan National Park. Stormwater runoff can transport DNA from watershed soils, concentrating terrestrial mammal DNA at a single point, enhancing detection efficiency.

In August 2023, we collected runoff samples at two sites in the Bukhansan watershed: upstream (within the park) and downstream (residential area) of Gupabal Stream, following Typhoon Khanun. Mammalian mitochondrial 12S rDNA was amplified from the runoff eDNA and analyzed using Illumina MiSeq metabarcoding, identifying 12 species. Most detected species matched those reported in the "Bukhansan National Park Natural Resource Survey," confirming the reliability of eDNA detection.

At the upstream site, eDNA analysis detected 10 mammalian species, while conventional methods (camera traps, trace detection, and fecal analysis) confirmed only two. This result demonstrates the higher sensitivity of eDNA analysis, capable of detecting species that traditional methods may miss. However, DNA from non-native species, such as cattle and sheep, was also detected, a common issue with eDNA, where false positives can occur due to contamination or distant DNA sources.

Our findings suggest that eDNA analysis using stormwater runoff is a highly sensitive and efficient method for mammal monitoring, capable of detecting a broader range of species compared to conventional methods. However, to ensure data reliability, we recommend that eDNA surveys be used complementarily with traditional monitoring methods, providing a more comprehensive understanding of mammalian biodiversity in natural areas.

P133 Trends in Cephalopod Consumption and Ocean Conditions at the Time of Stranding in Risso's Dolphins (*Grampus griseus*) along the Japanese Coast.

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The stomach contents of 14 Risso's dolphins (*Grampus griseus*) stranded along the Japanese coast between 2003 and 2018—six from the Pacific coast, six from the Sea of Japan coast, and two from the East China Sea coast—were analyzed. As in previous reports from Europe, their diet consisted primarily of cephalopods. Based on lower beak morphology, 689 cephalopods were identified, representing 42 species in 13 families across four orders; three species could not be identified to the species level. Overall, squid from the order Oegopsida were the most frequently consumed, comprising 81.3% of all prey. Prey quantity varied widely: the most prey-rich stomach contained 287 cephalopods from 14 species, while the least had an empty stomach. Cephalopod composition differed by stranding location. In dolphins from the Pacific and Sea of Japan coasts of Honshu, Oegopsida dominated (83.6%-100%). In contrast, Octopoda accounted for about half the prey in one dolphin from the Pacific coast of Kyushu, while one from the East China Sea coast had a diet dominated by Sepiida (77.6%). Most cephalopods in Sea of Japan specimens originated from subtropical-transition and subarctic zones, inhabiting upper to mesopelagic layers. Those from the Pacific coast of Honshu were mainly from the subtropical-transition zone, spanning upper to bathypelagic layers. In Kyushu, dolphins from both coasts primarily consumed species from the subtropical-transition zone. The Pacific-side individual consumed warmer-water species from upper to mesopelagic layers. Of the two East China Sea dolphins, one had an empty stomach, while the other mainly preyed on neritic species from the subtropical-transition zone. Based on cephalopod habitat data and ocean current conditions on the stranding dates, we inferred pre-stranding foraging behavior in each region.

P134 Validation of acoustic imaging sonar for monitoring submerged aquatic vegetation in small agricultural reservoirs

＊Seong Min Lee (Kunsan National University, ESK), Ji Yoon Kim (Kunsan National University)

Acoustic systems are increasingly recognized as effective tools for mapping and monitoring submerged aquatic vegetation (SAV), particularly for biomass estimation. Under monsoon-driven hydrological environments, the dynamic nature of agricultural reservoirs, especially their rapid changes in water level and turbidity, poses challenges to the applicability of sonar-based SAV monitoring techniques that were largely validated in lentic systems with greater water level stability. This study aimed to: 1) validate the accuracy of recreational acoustic sonar in determining SAV presence/absence, and 2) assess the correlation between sonar-derived SAV height and field-measured SAV length. Field surveys were conducted in three agricultural reservoirs (July & September 2024) in Republic of Korea. Sonar data were collected along 50-meter transects within SAV-rich areas (1.5-3m depth), concurrently the occurrence and shoot length of SAV were recorded using rake sampling. Processed sonar data was compared to field measurements using three buffer zones (i.e., 1.5 m, 3 m, 6 m) around sampling points. SAV detection accuracy was assessed using the Cohen's kappa coefficient. Linear regression evaluated the relationship between sonar-derived SAV height and field-measured SAV length. Validation results indicated a 92.2 ±18.0% accuracy in detecting SAV across the three reservoirs. A positive correlation was identified between field-measured SAV length and sonar-derived SAV height. This relationship was most pronounced (R^2 = 0.24, p <0.001) between the minimum SAV length and the mean sonar derived height within a 1.5m buffer, indicating moderate predictive power. This correlation weakened with increasing buffer size, showing no consistent trends at the 6m buffer. These results demonstrate that recreational imaging sonar can be a reliable method for estimating SAV distribution and its growth characteristics and has potential for improving its accuracy and scalability of SAV monitoring in freshwater habitats.

P135 Environmental DNA Analysis to Assess Species and Genetic Diversity of Dominant Trees in Riverine Forests

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Environmental DNA (eDNA) analysis is a non-destructive method for detecting and analyzing DNA fragments from organisms in environmental samples, such as sea and river water. In forest ecosystems, river water is thought to contain genetic information from organisms living throughout the upstream catchment area. Therefore, it is expected to provide biodiversity information on various species in the ecosystem. This study aims to non-destructively assess the species and genetic diversity of the dominant trees within the forest river catchment using eDNA analysis.

First, artificial water samples were created by placing water and a part of one leaf into tubes, to test whether plant-derived DNA from tissues falling into water can be reliably detected. Second, artificial water samples were created by placing water and leaves from multiple individuals into bottles. This was to test whether genetic diversity can be measured from plant-derived DNA in water. Third, eDNA samples were collected from a river in a cool-temperate broadleaf forest. This was to test whether species and genetic diversity can be measured from naturally occurring plant DNA in river water. Genome-wide amplification was conducted using the inter-simple sequence repeat (ISSR) primers in a multiplexed ISSR genotyping by sequencing (MIG-seq) approach. In addition, a target-capture method was applied to enrich amplified DNA fragments specific to target tree species. Plant-derived sequences were identified from the high-throughput DNA sequencing data, and genetic diversity analyses were conducted using sequences from the target species.

Our results demonstrate the successful detection of plant DNA from artificial water samples. Furthermore, genetic diversity analysis was conducted for natural river water samples. These findings highlight the potential of eDNA-based approaches as effective tools for biodiversity assessment in forest ecosystems.

P136 Assessment of Urban OECM Candidate Sites Using a Biotope Map: A Case Study of Suwon City

＊Sae Mi Lee (Seoul National University, Graduate School of Environmental Studies, ESK)

The designation of protected areas is an effective strategy for **biodiversity conservation**, but its application faces limitations in urban environments due to spatial and policy constraints. Suwon City, covering 121 km^2, contains a variety of urban ecological spaces that are not legally protected but hold high conservation value.

This study aims to analyze the applicability of OECM (Other Effective area-based Conservation Measures) criteria in an urban context by applying them to ecologically valuable sites in Suwon City. By identifying and categorizing candidate sites using biotope map data and evaluating their spatial characteristics, the study seeks to assess how OECM principles can be interpreted and implemented within dense urban environments.

To this end, Grade 1 and 2 ecological zones from the Suwon City Biotope Map were initially selected as candidate areas. A total of 29 sites were then evaluated based on four key K-OECM criteria: (1) whether the area is a protected area, (2) geographic boundaries, (3) governance and management, and (4) biodiversity value. As a result, 21 sites were identified as highly compatible with the OECM concept and were categorized into three waterfront areas, six forest areas, eight parks, and four arboretums. Examples include *Seoho Park* (waterfront), *Seoul National University's Chilbo Mountain Research Forest* (forest), *Gwanggyo Central Park* (park), and *Ilwol Arboretum* (arboretum).

The findings offer strategic insights into how OECM frameworks can support urban **ecosystem management** and contribute to achieving global biodiversity targets.

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P137 Taxonomy and Evolutionary Study of Spider-Pathogenic Fungi

＊Mingjun Chen (Anhui Agricultrual University, ESC)

Spider-pathogenic fungi are key natural regulators of spider populations, playing vital ecological roles in terrestrial ecosystems. Despite their importance, their taxonomic diversity and evolutionary origins remain underexplored. In this study, 77 specimens were collected from subtropical forests across China and identified as 26 species within 15 genera from Cordycipitaceae, Clavicipitaceae, and Ophiocordycipitaceae using morphological and multi-locus phylogenetic analyses. We proposed a new genus (*Araneicillium*), described four new species (*Arachnidicola guizhouensis*, *Gamszarella araneicola*, *Liangia guizhouensis*, and *Purpureocillium araneicola*), and made seven new combinations, including one newly recorded species for China. Mitochondrial genomes of five representative species were sequenced, showing significant size variation and complex intron dynamics. Phylogenomic analysis based on 14 mitochondrial protein-coding genes and six nuclear loci revealed well-supported clades and clarified the systematic placements of several enigmatic genera, such as *Chlorocillium* and *Husseyia*. By integrating global records and literature, we summarize 181 known spider-pathogenic fungal species across 35 genera worldwide, revealing distinct biogeographic and taxonomic patterns. Molecular clock analyses estimated that spider-pathogenic fungi originated in the Late Cretaceous, approximately 77.4 million years ago, with their divergence occurring later than that of entomopathogenic fungi. Their diversification appears driven by ecological specialization and adaptation to spider hosts, with some lineages (e.g., *Gibellula*, *Hevansia*) transitioning toward obligate parasitism. These evolutionary processes may reflect adaptations to resource-limited environments and niche differentiation from other entomopathogenic or saprotrophic fungi. This study offers new insights into the evolutionary ecology of spider-pathogenic fungi and lays a foundation for future research on their biodiversity, ecological function, and potential applications.

P138 Prioritizing Conservation Areas for the Endangered Long-tailed Goral (*Naemorhedus caudatus*) in South Korea

＊Soyeon Park (Ewha Womans University, ESK), Sangdon Lee (Ewha Womans University)

Industrialization has significantly altered the environment, leading to habitat loss and fragmentation. These changes increase the risk of species extinction and degrade the functionality of ecosystems. The long-tailed goral (*Naemorhedus caudatus*), a representative endangered species on the Korean Peninsula, has experienced severe population decline due to anthropogenic threats. This study aims to (1) predict the potential habitat of the long-tailed goral using the Maximum Entropy (MaxEnt) model, (2) quantitatively assess cumulative risk by anthropogenic threats using the InVEST Habitat Risk Assessment (HRA) model, and (3) identify priority areas for conservation through integrated analysis using Zonation software. Environmental data for the MaxEnt model were categorized into topography, distance, land cover, and vegetation. The threats considered in the HRA model included roads, mountain trails, deforested areas, quarries, and wind power plants. The MaxEnt model outputs indicated the probability of species occurrence with the average AUC value of 0.925, and suitable habitats for the long-tailed goral accounted for about 10.4% of the total area. The HRA model results indicated that cumulative risk scores ranged from 0 to 11.141, where roads were the most significant threat among all factors. The Zonation results revealed that areas classified as the highest priority for conservation comprised approximately 20.4%, while those with the lowest priority accounted for 19.6%. This study integrates habitat prediction, risk assessment, and conservation prioritization to enhance the effectiveness of conservation strategies for the long-tailed goral. The findings provide essential data for species prediction and underscore the need for ongoing research to support sustainable habitat conservation efforts.

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P139 Monitoring distribution and height of coastal plant communities in the Janghang Songlim wetland using UAV-based LiDAR data

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Remote sensing technologies provide efficient tools for analyzing the spatial distribution and structural attributes of wetland vegetation, with advantages in spatial coverage and repeatability over field-based methods. This study aims to quantify the distribution and relative height structure of coastal plant communities in the Janghang Songlim wetland, located within the Seocheon tidal flat, using UAV-based LiDAR data. Ground points were extracted from the LiDAR point cloud, and elevation was normalized to estimate vegetation height. A Local Maximum Filter (LMF) algorithm was applied to detect individual plant apex points, which were then spatially integrated with vegetation maps to assess the distribution and height characteristics of each community. The analysis revealed that the dominant herbaceous communities, including *Zoysia sinica*, *Bolboschoenus planiculmis*, *Carex scabrifolia*, and *Phragmites australis*, were distributed across elevation gradients transitioning from intertidal flats to sand dune areas. Community-level vegetation height estimates showed that *P. australis* had the highest growth, while *B. planiculmis* and *C. scabrifolia* exhibited lower plant heights. However, in some mixed or boundary patches, the estimated height values did not accurately reflect the vegetation structure, thereby limiting interpretation. Estimation errors can arise from factors such as insufficient point density, suboptimal filter parameters, and the inclusion of non-vegetative returns. Furthermore, the exclusion of outliers during data processing may inadvertently eliminate valid vegetation points, which could reduce the accuracy of height estimation. This study utilized LiDAR-based three-dimensional structural information to numerically identify differences in the vertical distribution of coastal vegetation, and the integrated analysis of habitat elevation and plant height

structure suggests that LiDAR data can be a valid monitoring tool for vegetation management.

P140 Phylogeographic structure of *Podocarpus macrophyllus* in Japan revealed by genome-wide SNPs

＊Wenhan Zhai (Tohoku University, ESJ), Kaho Kumagai (Tohoku University), Daiki Takahashi (Kyusyu University), Yoshihisa Suyama (Tohoku University)

Podocarpus macrophyllus is an evergreen gymnosperm belonging to the family Podocarpaceae, distributed mainly in East Asia, including southern Honshu, Shikoku, Kyushu, the Ryukyu Islands in the Japanese Archipelago, as well as southern China. This species has high cultural and economic value and is commonly planted as garden trees, hedges, and windbreaks, especially in Japan, where it has a long plantation history. Therefore, due to anthropogenic activities such as planting and resulting gene flow, the genetic composition of natural individuals may have been altered.

In this study, we conducted genome-wide single nucleotide polymorphism (SNP) analysis to investigate whether *P. macrophyllus* retains a phylogeographic structure in the Japanese Archipelago. We sampled 246 individuals from 33 populations, including 229 samples from Japan and 17 from other related regions. SNPs were obtained using the multiplexed ISSR genotyping by sequencing (MIG-seq) method. The phylogeographic structure was analyzed based on SNP variation among populations.

Preliminary analyses revealed genetic differentiation between populations in the Ryukyu Islands and those in more northern regions, including Kyushu, Shikoku, and Honshu islands. Despite possible genetic disturbance due to planting, our current results suggest the presence of a preserved phylogeographic structure in the natural distribution area. Our subsequent experiments will continue, and further results regarding genetic diversity and population structure will be presented at the conference.

P141 Dispersal and Management of *Coreopsis lanceolata* : Controlling Its Sexual and Asexual Reproduction

＊Eunhee Cho (Dankook University, ESK), Yeongeun Yoon (Dankook University), Minhyo Seo (Dankook University), Deokjoo Son (Dankook University)

Invasive plant species pose significant ecological and economic threats; however, the specific mechanisms by which they impact native ecosystems are not fully understood. *Coreopsis lanceolata*, native to North America, is an invasive species that spreads through both sexual reproduction via seeds and asexual reproduction through rhizomes. This study aimed to identify the primary dispersal methods of *C. lanceolata* and evaluate effective management strategies by examining changes in relative coverage after different removal treatments. Four experimental groups were established: CON (no removal), CUT5 (aboveground parts cut in May, limiting only seed production), PUL5 (roots removed in May, restricting both seed and rhizome reproduction), and PUL10 (roots removed in October, allowing only seed-based reproduction). Relative coverage data were collected in 2024 and 2025 and analyzed to compare the relative coverage change across treatments. Results showed no significant difference among CON, CUT5, and PUL5, but PUL10 exhibited a notable 42% decrease in relative coverage from 2024 to 2025. In contrast, CUT5 exhibited a 114% increase in relative coverage. These findings suggest that vegetative spread through rhizomes is the main reproductive pathway for *C. lanceolata*. Even when roots are removed, recovery can occur over time, likely due to the germination of buried seeds from the seed bank. Consequently, effective management of *C. lanceolata* requires continuous monitoring and control measures that address both its sexual and asexual reproductive capacities. This study highlights the importance of integrated approaches for invasive species management, considering the species' ability to recover after root removal and the persistent seed bank.

P142 Aesthetic ecosystem services of old-growth grassland: Diverse preferences for wildflowers among people

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Old-growth grasslands, which have persisted for hundreds to thousands of years, are considered one of the highest conservation priority ecosystems. However, semi-natural grasslands are rapidly being lost due to management abandonment. In the remaining grasslands, the primary purposes of grassland maintenance are shifting in response to modernization, focusing more on tourism and scenic vistas. The aesthetic value of grasslands plays a key role in their future conservation, and diversity of people's preferences should shape such aesthetic value is. This study examined whether wild flowers in old-growth grasslands hold higher aesthetic value and what factors contribute to the variation in people's preferences for diverse flowers.

We assessed the dependency on old-growth grassland by 160 plant species based on vegetation data from 68 old-growth grasslands (over 300 years old) and 49 newer grasslands (less than 70 years old) in the Sugadaira Highland of the central Japan. An online questionnaire using flower photographs of those plant species was administered to 10,000 Japanese to determine their relative aesthetic preferences for each species.

The results revealed that people preferred flowers with higher old-growth grassland dependency, and this tendency was more pronounced among individuals with richer nature experience. Two possible explanations exist for this pattern. First, blue flowers, which exhibit general popularity in previous studies, are more in old-growth grasslands. Second, downward-facing flowers, which are particularly favored by those with richer nature experience, tended to be more in old-growth grasslands. Furthermore, participants with rich nature experiences showed a broader range of preferences, indicating that the diversity of old-growth grasslands is important for them. Overall, we suggest that the personal experience and background determine people's preferences for flowers, and that old-growth grasslands probably have higher tourism resource values. Tourism in old-growth grasslands would possibly increase their tourism resource values synergistically, by increase of people's nature experience.

P143 Quantifying the effects of land use on wetland biodiversity with consideration of the groundwater cycle

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Wetlands recharged by groundwater provide stable water temperatures throughout the year, making them important habitats for rare and endemic species. Additionally, rivers with large amounts of spring water inflow tend to maintain lower temperatures even during summer, functioning as refugia for aquatic organisms under climate change. Thus, maintaining groundwater cycle is crucial for the conservation of wetland biodiversity under changing climate. However, urbanization-induced land use changes can influence conditions such as groundwater temperature and supply. In this study, we focused on eight-barbel loach (*Lefua echigonia*) as an indicator of the groundwater cycle and tested the hypothesis that land use within a catchment affects its distribution using a generalized linear model (GLM). Additionally, we mapped locations where promoting rainwater infiltration would be most effective at the wetland level using a GLM and at the grid level using maximum entropy modeling (MaxEnt) with only landscape variables. Specifically, we developed statistical models for two scenarios: "rainwater infiltration under current land use" and "increased rainwater infiltration" and calculated the difference in habitat suitability between the two models. The statistical models also included explanatory variables related to temperature or wetland conditions as confounding factors. Distribution data of *L. echigonia* were collected through field and environmental DNA surveys in 102 first-order valleys of the Lake Inba watershed, Japan. The GLM results indicated that permeable surfaces in the catchment and period of rice paddy abandonment positively influenced the fish's presence, while summer temperature had a negative effect. The habitat suitability mapping for the target watershed quantitatively evaluated increase of habitat suitability in response to infiltration increase (in both GLM and MaxEnt). Our results highlight that land use within a catchment is a key factor in the conservation of wetland species, and these analytical methods can contribute to land use planning as the scientific basis for Nature-based Solutions.

P144 Withdrawn

P145 Withdrawn

P146 Novel attempt to assess marine mammal dynamics over the past 100 years using sedimentary DNA: An example in finless porpoise

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Over the past several centuries, human activity has posed a significant threat to global biodiversity. Marine mammal populations are suspected to have declined over the last hundred years, with the adverse effects of chemical pollutants considered to be one of the major causes. However, field surveys of marine mammal are technically challenging, resulting in limited *in situ* data and unresolved questions regarding the historical impacts of chemical exposure. In this study, we aimed to elucidate the long-term population dynamics of the finless porpoise (*Neophocaena asiaeorientalis*), a sedentary coastal species. To reconstruct population trends, we analyzed environmental DNA (eDNA) preserved in sediment cores collected from the Beppu Bay, Seto Inland Sea, Japan. eDNA concentrations in sediment layers were determined using quantitative PCR. Temporal trends showed a marked increase from the 1940s to the 1950s, followed by a rapid decline in the early 1960s and a subsequent recovery around 2000. These trends were largely consistent with sporadic reports, supporting the potential of sedimentary DNA (sedDNA) as a tool for reconstruction of the long-term marine mammal population dynamics. Correlation analysis revealed a significant negative relationship between sedDNA concentrations and the concentrations of polychlorinated biphenyls (PCBs) and cadmium in the sediment. Positive correlations were observed with temperature, prey abundance, and microplastic concentrations. In accordance with historical PCB production patterns, tissue PCB concentrations in finless porpoises from the Seto Inland Sea during the 1960s-1970s appeared higher than those in the 2000s. These findings imply that the finless porpoise population in this region experienced a significant decline around the 1960s, possibly due to environmental deterioration, including elevated chemical exposure. This study highlights the potential of sedDNA-based approaches to enhance our understanding of long-term anthropogenic disturbances on marine animal populations.

P147 Snapshot Japan: a nationwide camera trap monitoring project in Japan

＊Kana Terayama (National Institute for Environmental Studies, ESJ), Keita Fukasawa (National Institute for Environmental Studies), Yoshihiro Nakashima (Nihon University), Takahiro Morosawa (Tokyo University of Agriculture and Technology)

Camera traps, widely used for monitoring wildlife populations, provide essential knowledge for wildlife management, conservation, and biodiversity trends. Since 2019, Snapshot Global has been dedicated to global, standardized, and long-term monitoring of ground-dwelling mammals through collaborative projects involving research groups, scientists, and citizen scientists. This collaborative network promotes the collection and use of large-scale open data while strengthening and expanding partnerships among national and international research groups. Snapshot Global is present in several countries, including the United States (since 2019), Europe (since 2021), Japan (since 2023), and Brazil (since 2025). Here, we present a large camera trap monitoring project in Japan as a collaborative project of Snapshot Global called Snapshot Japan. Following Snapshot Global protocols, Snapshot

Japan conducted the monitoring survey. During the sampling period (September and October), at least 8 camera traps were deployed at 8 locations across the monitoring site for 60 days. Camera traps were placed 50 cm above the ground and parallel to the slope. The protocols require that the camera traps be capable of taking 3-5 images per trigger with infrared flash. Once fieldwork is complete, the participants should upload photos and metadata (e.g., start and end date of deployment, longitude and latitude of camera location, and camera status) to Wildlife Insights, the web platform for managing and annotating the camera-trap photos. For Snapshot Japan 2024, principal investigators from universities, museums, NPOs, institutes, citizen groups, and a company participated. The camera trap arrays were located on Hokkaido, Honshu, Shikoku, Kyushu, Okinawa, and several small islands in Japan. We call for collaboration with researchers in East Asian countries to develop a regional-scale camera trap network.

P148 The novel identification method of the hybrid using environmental DNA

＊Masayuki K. Sakata (Hokkaido University, ESJ), Nanako Yano (Kobe University), Akio Imamura (Hokkaido University of Education), Hiroki Yamanaka (Ryukoku University), Toshifumi Minamoto (Kobe University)

The decline in biodiversity is an enormous problem, partly due to the invasion of alien species and hybridization with them. It is important to quickly identify where alien species are invading. Also, if the hybridization is possible, it can be more quickly ascertained and prioritized for eradication steps. As a cost-effective method for estimating the distribution of alien species, environmental DNA (eDNA) analysis has been used over a wide area and with high sensitivity. However, usual eDNA analysis cannot be used to identify hybridization. Therefore, the aim of this study was to identify hybridization by eDNA analysis. We (1) verified whether PCR could be performed on a cell-by-cell basis using digital PCR (dPCR) and tissue-derived samples, (2) verified whether environmental cell (eCell) could be recovered from environmental water sample, and (3) identified hybridization by eCell through tank experiments. The results showed that cell-by-cell PCR is possible using digital PCR in experiments with tissue-derived samples and environmental water samples. Finally, dPCR analysis of samples from tanks where only hybrid individuals were kept and samples from tanks where two parental species were kept at the same time, successfully distinguish from hybrid individuals from sympatric inhabitants of the parental species. Thus, we demonstrated that hybridization can be identified by incorporating cell-by-cell PCR to eDNA analysis.

P149 Enhancing Carbon Sequestration Efficiency by Coupling *Halophila beccarii* with Carbon-Based Materials

＊Henan Li (Guangxi Academy of Marine Sciences, Guangxi Mangrove Research Center, ESC), Guanglong Qiu (Guangxi Academy of Marine Sciences, Guangxi Mangrove Research Center)

Halophila beccarii, a fast-growing seagrass species in intertidal zones, plays an essential role in blue carbon storage. However, its carbon sequestration efficiency is often limited by poor sediment stability and suboptimal environmental conditions. This study couples carbon fiber materials with *Halophila beccarii* to enhance its functional traits and systematically investigates the underlying mechanisms by which this integration improves carbon sequestration efficiency.

A series of controlled experiments were conducted to evaluate the effects of coupling carbon fibers with *Halophila beccarii* on carbon sequestration efficiency and related ecological parameters. The results demonstrated that carbon fibers significantly improved plant growth indicators, including shoot density, biomass allocation, and photosynthetic performance (measured by chlorophyll fluorescence parameters using a PAM fluorometer). In parallel, sediment properties such as redox potential and organic matter content were improved, creating a more favorable microhabitat for carbon retention.

Coupled systems showed significantly higher dissolved inorganic carbon (DIC) fixation rates and increased stabilization of dissolved and particulate organic carbon (DOC and POC). The synergistic improvement in plant traits and sediment conditions contributed to enhanced carbon burial efficiency and ecological stability.

This study highlights the potential of integrating biocompatible carbon materials with seagrass restoration to boost blue carbon sequestration. The findings provide technical support for scalable, nature-based solutions in coastal carbon sink enhancement and climate change mitigation.

P150 Assessing Habitat Prediction for Clithon retropictus in South Korea and Japan Using the MaxEnt Model

＊Jiyoung Choi (Research Institute of Agriculture and Sciences, Seoul National University, ESK)

The Convention on Biological Diversity approved the Post-2020 Global Biodiversity Framework as part of the Aichi Targets, recommending quantitative goals to conserve biodiversity and ecosystem services by 2030. Among the strategic objectives, 'Maintaining and Enhancing BES' is designated as Target 2 of the National Biodiversity Strategy and Action Plan. Beyond small-scale studies, globally distributed species require international analyses to improve global understanding of conservation status, ecosystem functionality, and data availability.

This study aims to predict the habitat of *Clithon retropictus* to support conservation efforts for this endangered species. It has been reported to inhabit South Korea and Japan, but coastal development has increasingly degraded marine environments. Consequently, its population is declining, and it is currently designated as a Level 2 endangered species in Korea. In this study, habitat distribution was evaluated using the MaxEnt model. The model predicts probability distributions based on environmental variables and is widely applied in international ecological research.

The analysis showed that the AUC, which determines the model's accuracy and reliability, was 0.98. The accuracy of the model is assessed using the AUC value, where scores between 0.8 and 1.0 indicate strong performance. In Korea, the southern coast, particularly the Gyeongsangnam-do coastline, showed a high predicted suitability close to 1.0. The Jeollanam-do coastline demonstrated a predicted occurrence rate ranging from 0.5 to 0.7. In Japan, high suitability (near 1.0) was observed in Kyushu and Honshu, as well as in Tottori and Niigata City. The coastal areas of the southern islands, excluding Hokkaido, had prediction

rates ranging from 0.5 to 0.7.
This study suggests that the research can serve as a basis for decision-making in selecting effective alternative habitats and protected areas for the target species. Future research aims to present a more advanced approach by integrating species distribution predictions from the MaxEnt model with ecosystem service evaluations.

P151 Integrating decision-making preferences into ecosystem service conservation area identification: A case study of water-related ecosystem services in the Dawen River watershed, China

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The degradation of ecosystems and their services is threatening human wellbeing, making ecosystem service (ES) conservation an urgent necessity. In ES conservation planning, conservation area identification is crucial for the success of conservation initiatives. However, different decision-making preferences have not been fully considered and integrated in ES conservation area identification. This study takes the Dawen River watershed as the study area and considers three water-related ESs to be conserved. We aim to integrate the decision-making preferences of cost-effectiveness, ES sustainable supply, and ES social benefit into identifying ES conservation areas by using conservation cost, ecosystem health, and ES social importance as spatial constraints, respectively. We identified ES conservation area alternatives under the scenarios set according to different decision-making preferences. Specifically, ES conservation targets, i.e., the expected proportion of each ES in conservation areas, are designed to be met where there is low conservation cost (cost-oriented scenario), high ecosystem health (ES sustainable supply scenario), or high ES social importance (ES social benefit scenario). A balanced scenario considering all three decision-making preferences together is further established. The results show that under each scenario, the identified conservation areas can concurrently meet the conservation targets and decision-making preferences. The consideration of different decision-making preferences can greatly influence the spatial distributions of ES conservation areas. Moreover, a severe trade-off between conservation cost and ES social importance is observed under the ES social benefit scenario, and the balanced scenario can achieve a synergy of decision-making preferences. Our study provides a method to integrate the decision-making preference into ES conservation area identification, which can improve the rationality and practicality of ES conservation planning.

P152 Evaluating the Effectiveness of Management Plans for Protected Areas: A Case Study of Lake Tofutsu Ramsar Site, Hokkaido, Japan

＊Suguru Hirahara (Tokyo University of Agriculture and Technology)

In recent years, international interest in protected areas has been increasing, as seen in the adoption of the Kunming-Montreal Global Biodiversity Framework at the Convention on Biological Diversity COP15 in December 2022. The objective is to expand protected areas. To improve the quality of protected area management, developing a management plan that shares goals and specific methods for ecosystem conservation and resource use among stakeholders is essential. However, as many practitioners and researchers know from experience, many management plans are formalities that do not function effectively. Therefore, in this study, we examined how management plans could be used effectively in protected area management using the following two approaches. First, an evaluation index for management plans was created. The Ramsar Convention, which aims to conserve wetlands internationally, requires contracting parties to formulate and implement management plans for designated sites. The Secretariat has issued a 96-page, 229-item guideline to promote this (Ramsar Convention Secretariat 2010). However, its extensiveness makes it difficult for policymakers and practitioners to use it. In this study, the guidelines were simplified and a new index that summarizes them into 21 important items was created. Second, the index was applied to case studies to test its effectiveness in the practice of protected area management. The Lake Tofutsu Ramsar site located in Abashiri City and Koshimizu Town, Hokkaido, Japan, was selected for our investigation. These municipalities formulated a management plan for Lake Tofutsu in 2011 and are currently working on its conservation and wise use. As a result of the analysis using the above two approaches, the study findings revealed problems specific to this case and areas for improvement in the content of the guidelines.

P153 Long-term organic mulching enhances the stability of soil organic carbon in Phyllostachys praecox

＊Zhuangzhuang Qian (Anhui Agricultural University, ESC), Yichen Zhang (Anhui Agricultural University)

Organic mulching is widely applied in agricultural and forest ecosystems to improve crop yields and maintain soil quality. However, its long-term impact on soil organic carbon (SOC) stability and the underlying mechanisms remain unclear. An in situ experiment was initiated in 2018 in the subtropical region of China, with the non-mulched treatment serving as the control group (0 years of mulching), to investigate the effects of mulching on the organic carbon components (particulate organic carbon, POC, and mineral-associated organic carbon, MAOC) in Phyllostachys praecox bamboo forests across different mulching durations of 1, 3, and 5 years. Our results indicated that five-year mulching decreased soil POC concentration by 13.36%, while increasing MAOC and SOC by 130.3% and 64.53%, respectively, compared to no mulching. The POC/MAOC ratio dropped, indicating improved SOC stability. Additionally, soil pH decreased with mulching duration, while bacterial and fungal diversity, available phosphorus content, and β-xylosidase activity significantly increased. Structural equation modeling indicated that POC was

mainly regulated by available phosphorus and fungal communities. While MAOC was affected by soil pH, which also mediated its response by influencing enzyme activity and bacterial diversity. In bamboo forest ecosystems, long-term organic mulching enhances SOC sequestration and stability, providing insights into SOC management for sustainable forestry. Such information indicates continuous mulching can be used to improve SOC sequestration in subtropical bamboo ecosystems.

P154 Withdrawn

P155 Individual and interactive effects of N and P additions on leaf P fractions in evergreen forests of China

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Atmospheric deposition and/or fertilization of nitrogen (N) and phosphorus (P) to ecosystems alter N (P) availability and the nature of nutrient limitation for plant growth. Changing the allocation of leaf P fractions is potentially an adaptive strategy for plants to cope with soil N (P) availability and nutrient relative limitation. However, the impact of the interactions between imbalanced anthropogenic N and P inputs on the allocation pattern of leaf P fractions in forest plants is unclear. We conducted an analysis of data about the concentrations and allocation proportions of leaf P fractions, specifically associated with individual and combined additions of N and P in evergreen forests, the dominant vegetation type in southern China which are usually considered P-limited. This analysis quantitatively evaluated the effects of N and P additions alone and interactively on leaf P allocation and use strategies. Nitrogen addition (exacerbating P limitation) reduced the concentrations of leaf total P and of different leaf P fractions. Nitrogen addition reduced the allocation proportion to leaf metabolic P but increased the proportion to other fractions, while P addition showed opposite trends. The simultaneous additions of N and P showed an antagonistic (mutual suppression) effect on the concentrations of leaf P fractions, but an additive (summary) effect on the allocation proportions of leaf P fractions. These results highlight the importance of strategies of leaf P fraction allocation in forest plants under changes in environmental nutrient availability. Importantly, our study identified critical interactions associated with combined N and P inputs that affect leaf P fractions, thus aiding in predicting plant acclimation strategies in the context of intensifying and imbalanced anthropogenic nutrient inputs, and also providing scientific reference for nutrient management of evergreen forest ecosystems.

P156 Boosting biodiversity monitoring using smartphone-driven, rapidly accumulating community-sourced data

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Comprehensive biodiversity data is crucial for ecosystem protection. The 'Biome' mobile app, launched in Japan, efficiently gathers species observations from the public using species identification algorithms and gamification elements. The app has amassed >9M observations since 2019. Nonetheless, community-sourced data may exhibit spatial and taxonomic biases. Species distribution models (SDMs) estimate species distribution while accommodating such bias. Here, we investigated the quality of Biome data and its impact on SDM performance. Species identification accuracy exceeds 95% for birds, reptiles, mammals, and amphibians, but seed plants, mollusks, and fishes scored below 90%. Our SDMs for 132 terrestrial plants and animals across Japan revealed that incorporating Biome data into traditional survey data improved accuracy. For endangered species, traditional survey data required >2,000 records for accurate models (Boyce index ≥ 0.9), while blending the two data sources reduced this to around 300. The uniform coverage of urban-natural gradients by Biome data, compared to traditional data biased towards natural areas, may explain this improvement. Combining multiple data sources better estimates species distributions, aiding in protected area designation and ecosystem service assessment. Establishing a platform for accumulating community-sourced distribution data will contribute to conserving and monitoring natural ecosystems.

P157 Assess the Threatened Risks of Provincially Significant Wetlands by IUCN Red List of Ecosystems—A Case Study of Jiangsu, China

＊Ying Kong (Seoul National University, ESK), Youngkeun Song (Seoul National University)

The growing contradiction between wetlands' vital ecosystem functions and their severe degradation has spurring conservation efforts. While the effectiveness of local wetland conservation policies in lowering their threatened risks remains insufficiently evaluated. We applied IUCN Red List of Ecosystems (RLE) framework to assess the ecological threatened risks of five provincially significant wetlands in Jiangsu Province, China, based on its four criteria (A, B, C, and D). We also conducted expert interviews as a qualitative evaluation to compare the assessment results with field conditions. The results show that: under Criterion A (decline in distribution), three of the five wetlands were classified as facing varying levels of threat (Critical Endangered, Endangered, or Vulnerable); Under Criterion B (restricted geographic distribution), all five wetlands were categorized with different degrees of threat (Critical Endangered, Endangered, or Vulnerable); Under Criterion C (environmental degradation), one wetland was recognized as Vulnerable; Under Criterion D (disruption of biotic processes or interactions), two wetlands were assessed as Critical Endangered and Endangered, respectively. Local experts overall agreed with the assessment results for Criteria A and C, indicating that RLE framework provides effective support for assessing the threatened risks in local wetlands; whereas the results for Criteria B and D show inconsistency with expert opinions, serving as a basis for exploring the applicability of the RLE framework to local wetlands and potential improvements. These findings help assessing the effectiveness of wetland conservation and optimizing management strategies, as well as provide references for enhancing the RLE frame-

work's applicability to wetlands in region.

P158 Preferences and Perceptions of Ecosystem Services and Disservices in Urban Green Spaces of Ulaanbaatar, Mongolia

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Urban green spaces (UGSs) play a vital role in cities' ecological and social fabric by providing a wide array of ecosystem services (ESs) that support environmental health and enhance residents' well-being. However, UGSs may also generate ecosystem disservices (EDSs) that negatively impact the perceived quality of life (QOL). To address a significant research gap in related research in Ulaanbaatar, Mongolia, this study explores social preferences and perceptions of both ESs and EDSs by comparing planned UGSs (National Garden Park) with nature-based UGSs (Bogd Khan Mountain's Public Space, BGS). The primary objective of this study is to understand the dual role of UGSs in providing ESs and EDSs in Ulaanbaatar. A quantitative face-to-face questionnaire survey was conducted with 594 visitors across both sites. The survey consisted of three parts: (1) visitor motivations and area preferences; (2) perception ratings of ESs and EDSs; and (3) self-reported impacts on QOL, all measured using a five-point Likert scale ranging from "strongly disagree" to "strongly agree". All statistical analyses and visualizations were performed using R version 4.4.0. Key findings include: 1) Fresh air and recreation emerged as primary motivations, reflecting strong and distinct social preferences that shape the demand for accessible and convenient green environments. 2) Respondents widely recognized regulating, cultural, and supporting services in both UGS types—particularly in nature-based area—while disservices were comparatively less acknowledged. 3) These perceptions were closely linked to self-reported QOL, though some conflicting views also emerged. These results offer critical insights for developing context-sensitive management strategies for UGSs, enhancing urban well-being. This research provides a holistic perspective that informs future urban planning and environmental management, contributing to the understanding of urban ecology in Ulaanbaatar, the global dialogue on sustainable cities, and the integration of green and blue infrastructure.

P159 Imbalance in lakes variability but not embodying in driving factors on the Qinghai-Tibetan Plateau calls on heterogeneous lake management

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Comprehensive regional remote analysis tends to greatly neglect heterogeneous characteristics, as reflected by the inconsistent results of a questionnaire on the perception of lake variations held by local general residents from different counties on the Qinghai-Tibetan Plateau (QTP). We integrate multisourced lake datasets, high-resolution glacier runoff information, and available altimetry datasets to establish multiple mathematical models to meta-simulate lake volume changes, obtain complete and current lake variation datasets, and quantify the imbalance of variations and factors driving the water mass budget. Shrinkage is predicted to occur in 22.77% of the QTP lakes, which is masked by the regionally expanding lakes, with an overall annual lake expansion rate of 0.37 ± 0.02 km^2. Lake expansion in the endorheic basins forms a hotspot cluster. Even though glacier runoff is currently considered as a weak factor of lake variation, heterogeneous results call for remaining attention in glacier-induced lake basins. Imbalance embodying in lake variability but not in drivers, whatever precipitation, actual evapotranspiration, snow equivalent, and glacier runoff, which calls for special lake management ways in different watersheds.

P160 Mapping Soil Carbon Stocks in Forests with Complex Terrain Combining Efficiency-Oriented Multipoint Surveys and Machine Learning

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Soils in terrestrial ecosystems hold a large amount of carbon and play an important role in global carbon dynamics. While the estimation of forest soil carbon stocks has been attempted at national and global scales, improving the accuracy of such estimates at local forest scales remains a challenge due to the spatial heterogeneity of vegetation and soil systems.
In this study, we used the Chiba Experiment Forest (2,169 ha), characterized by complex topography, as a research site to investigate an efficient soil sampling method that accounts for topographic features and accessibility, and to estimate soil carbon stock using this approach.
Specifically, 50 survey sites were selected through clustering while limiting the distance from forest roads to ensure full coverage of the area and enhance efficiency. A global navigation satellite system (GNSS) device was used to accurately determine po-

sitions even under dense canopy, and a boring stick was employed to efficiently collect deep soil samples. Soil carbon stock for the entire area was then estimated using a random forest model.
The total soil carbon stock in the Chiba Experiment Forest was estimated at approximately 110,000 tons within the 0-30 cm depth layer (5.03 kg/m^2), and about 190,000 tons from 30-90 cm. Machine learning analysis revealed that slope was a key factor, with higher soil carbon on gentle slopes and lower values on steep slopes. NDVI was also important, indicating higher soil carbon stocks under conifers compared to broad-leaved trees.

P161 Restoration of Aquatic Biodiversity Using Ecosystem-Enhancing Wavelength-Specific LED Light Irradiation

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In marine and freshwater environments, the vertical distribution of light intensity and the spectral composition of incident sunlight-both governed by the optical absorption properties of water play a critical role in determining the vertical community structure of photosynthetic organisms such as algae and phototrophic bacteria. In recent years, anthropogenic impacts, including eutrophication and prolonged turbidity, have significantly reduced the penetration of sunlight into aquatic systems on a global scale. This has led to a contraction of the productive photic zone and an expansion of the decompositional zone. Notably, the disappearance of submerged macrophytes and benthic algal communities key primary producers and essential components of aquatic habitats has resulted in the formation of hypoxic water masses, abnormal blooms of specific algal species, and subsequent degradation in both the quality and quantity of ecosystem services.
This report presents a case study focusing on the vertical spectral characteristics of underwater light environments and explores the potential of using various light emitting diodes (LEDs) capable of emitting specific wavelengths, including ultraviolet light, to enhance the activity of indigenous aquatic photosynthetic organisms. The results demonstrate that selecting appropriate LED wavelengths can promote desirable ecological effects, such as the removal of harmful substances, suppression of cyanobacterial blooms, and preferential regeneration of valuable or beneficial native species under conditions that inhibit the growth of invasive or harmful taxa.

P162 Variation in Microbial Communities Across Reforested and Afforested Mangroves in Arid United Arab Emirates Driven by Forest Age, Physicochemical Properties, and Tidal Gradient

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Soil microorganisms play a key role in mangrove ecosystem function, yet their dynamics in arid-zone restoration sites remain poorly understood. This study investigates how microbial diversity and soil properties vary across afforested and reforested grey mangrove (*Avicennia marina*) sites of different ages in the United Arab Emirates (UAE), to inform adaptive management under rising sea levels and climate stress. Three sites were studied: Ras Al Khor Wildlife Sanctuary, Dubai (>30 years, afforested), Jebel Ali Wildlife Sanctuary, Dubai (<10 years, afforested), and Khor Al Beidah, Umm Al Quwain (>14 years, reforested). Soil samples were collected across tidal zones (seaward to landward) and seasons (fall and winter) from vegetated and non-vegetated areas.
Preliminary results show that younger sites, like Jebel Ali, have coarser soil texture, lower organic content, and greater seasonal pH fluctuation. Microbial alpha diversity was higher but less stable at early-stage sites, particularly in exposed, non-vegetated zones. In contrast, older sites exhibited more stable pH, increased salinity, and greater beta diversity, reflected in more distinct microbial community patterns across tidal zones along the land-sea gradient. These findings suggest that ecological filtering and niche differentiation intensify with forest age. Overall, the results support the hypothesis that forest age and associated changes in soil physicochemistry are key drivers of microbial community composition.
Our findings suggest that mangrove afforestation and reforestation enhance environmental stability and microbial specialization over time, improving ecosystem resilience. We present a directional focus on how microbial communities vary along the vertical (tidal) gradient, and how their ecological roles may shift with forest age and soil conditions. Future analyses will explore microbial functional traits related to carbon and nitrogen cycling, and habitat preferences inferred from 16S rRNA gene data. These insights will support a deeper understanding of microbial contribution to biogeochemical stability across mangrove restoration stages.

P163 The Impact of the Rapid Increase in National Nature Parks on Local Vegetation

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The number of National Nature Parks in China has grown rapidly in recent years. However, their unclear management systems pose a risk of ineffective governance, potentially exacerbating the degradation of fragile ecosystems. This study aimed to clarify the impact of National Nature Park establishment on the local vegetation environment in Inner Mongolia. We conducted field observations and interviews with park managers (focusing on protection strategies and tourism development) across 50 parks, comprising 10 forest, 14 desert, and 26 wetland ecosystems. The parks were categorized into four types: (I) Active Protection and Tourism; (II) Active Protection, No Tourism; (III) Tourism without Adequate Protection; and (IV) No Effective Protection or

Tourism (nominal parks). To assess vegetation changes pre- and post-establishment, we analyzed MODIS-derived Normalized Difference Vegetation Index (NDVI) and its coefficient of variation. Preliminary findings indicated some trends: (1) Wetland parks were mainly classified as type (II), and their NDVI showed an increasing trend. (2) Forest parks were concentrated in types (I) and (II). Desert parks were more dispersed, notably with half classified as type (IV) —effectively "paper parks" lacking substantive management—and also prevalent in types (II) and (III). Both forest and desert parks showed a decreasing NDVI trend post-establishment. Future research will rigorously examine these trends, incorporating deeper analysis of management systems and socio-economic impacts on local communities to consider more effective park management strategies.

P164 Assessing the alien species invasions and their ecological and socio-economic drivers in Japan

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Biological invasion has caused serious negative impacts on local biodiversity as well as human society. Biodiversity of Japan has also been altered due to alien species invasions as islands suffer severer impacts of alien species on biodiversity than continents. While negative impacts of alien species invasions on local biodiversity are numerously reported from various countries, how socio-economic activities drive biological invasions and subsequently result in the biodiversity loss remains unknown particularly at local scales (e.g. municipal levels). Multi-taxonomic studies at local scales are also needed to comprehensive understanding of biological invasions. Here, we assessed the multi-taxon alien species invasions and their ecological and socio-economic drivers in Japan. First, we obtained municipality-level occurrence data of alien species from Ministry of the Environment, Japan. Second, we collected data of factors that potentially influence alien species invasions from the following five categories: ecological traits of alien species, geographical features of each municipality, climate conditions, intensity of socio-economic activities (e.g., GDP, transportation networks and population), and habitat quality. Then, model-based assessments on linkages between the factors and alien species invasions were performed. This study with a multi-taxonomic approach at municipal level can provide practical suggestions for how to tackle the issues related to alien species.

P165 Comparing native and non-native species with interstage flow and reproductive-value flow matrices

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Population statistics such as population growth rate, reproductive value, and elasticity are widely used to characterize species' demographic patterns. We propose two novel metrics: the inter-stage flow matrix and the reproductive-value flow matrix. These matrices represent the movement of individuals and the transfer of reproductive value between life stages, respectively, with each matrix summing to the population growth rate. Reproductive value quantifies an individual's expected contribution to population growth, based on its likelihood of growing, remaining in the same stage, or reproducing. The reproductive-value flow matrix specifically captures the transfer of reproductive value between stages.

Using plant demographic data from the COMPADRE database, we analyzed patterns of both inter-stage and reproductive-value flows across four life-history groups: semelparous herbs, iteroparous herbs, shrubs, and trees. We categorized the flow elements into three types—stasis, fecundity, and growth—for comparative analysis.

To examine differences between native and introduced species, we performed Dirichlet regression with species origin (native vs. introduced) as a categorical predictor and the three flow types as response variables. Functional group, population growth rate, and matrix dimension were included as covariates. Our results showed significant differences between native and non-native species in the distribution of both inter-stage and reproductive-value flows. In particular, introduced species tended to show greater flow through fecundity and growth components.

In this presentation, we will discuss how these flow-based metrics provide novel insights into the demographic strategies of non-native species and explore their broader applications in the population ecology of biological invasions.

P166 Expansion of the distribution range of glyphosate-resistant *Amaranthus palmeri* in Japanese ports

＊Ayako Shimono (Toho University/Institute for Plant Protection, NARO, ESJ), Naoki Chida (Toho University), Motoaki Asai (Institute for Plant Protection, NARO)

The dispersal of Introduced species is tightly coupled to human activities such as trade and transport. Trade is known to spread troublesome weeds from countries exporting, to those importing grain. Glyphosate-resistant (GR) *Amaranthus palmeri* is one of the most problematic weeds in the US, which is the largest grain exporter to Japan. We detected that GR *A. palmeri* has become established in a Japanese port in 2014. Since then, we have monitored the establishment and expansion of GR *A. palmeri* at Japanese ports over past decade.

The primary glyphosate resistance mechanism is a copy-number amplification of the 399-kb region containing the herbicide target site gene 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS). Quantitative PCR was used to measure the EPSPS genomic copy number.

We detected GR *A. palmeri* at four ports. At two of these ports (Ishinomaki and Sendai), GR *A. palmeri* had not been detected before 2018. At Hakata and Kashima Ports, where GR individuals were already present in 2014, they continued to persist. At Kashima Port, the proportion of GR individuals, which had remained at 20% or lower between 2014 and 2018, increased dramatically to 99% after 2020. These results clearly indicate that GR *A. palmeri* is currently expanding its distribution range in Japan.

P167 "Namul," Traditional Wild Eadible Plants: Bridging Ecological Knowledge between Parents and Children

＊Eunjeong Ju (Seoul Naitional University of Education, ESK)

This study explores the design and implementation of a parent-child participatory "Namul" gathering program aimed at integrating Traditional Ecological Knowledge (TEK) into elementary science education. Food is an essential link connecting ecosystems and humans, and traditional gathering activities provide opportunities to understand both ecological cycles and human dietary practices. In the past, wild plant "Namul" gathering served as a crucial channel for transmitting TEK across generations in East Asian agrarian societies. However, industrialization and urbanization have rapidly diminished this cultural practice, resulting in the discontinuation of plant knowledge transmission. Notably, participating parents also served as elementary school teachers, playing dual roles in the program. The program was designed to include plant identification, sustainable harvesting practices, and traditional cooking experiences, with parent-teachers facilitating learning and sharing ecological understanding with students.

Data collection included classroom recordings, field activity videos, and Focus Group Interviews (FGI) with participants, aiming to explore parent-child interactions and changes in ecological awareness during the learning process. Preliminary analysis revealed that the co-learning process between parents and children deepened their understanding of local biodiversity and enhanced awareness of sustainable harvesting methods. Furthermore, participants expressed a strong sense of connection to their local environment and a heightened appreciation for the importance of traditional ecological knowledge. Additionally, the involvement of parent-teachers highlighted the potential applicability of such programs in school settings.

This study suggests that integrating TEK into educational contexts can promote the transmission of intergenerational knowledge and foster ecological awareness. Moreover, the program demonstrates that such educational initiatives can effectively contribute not only to ecological literacy but also to the preservation of cultural heritage within local communities.

P168 Sika deer feeding damage and the effect of deer-proof fences in the wetlands of the Kujyu district, Aso Kujyu National Park

＊Kumiko Okubo (Faculty of Agriculture, Shinshu Uni., ESJ)

In recent years, the increase in the number of sika deer (hereafter referred to as "deer") has become a problem in the south of Honshu, resulting in the alteration and destruction of vegetation. The Kujyu District of Aso-Kujyu National Park has an outstanding grassland landscape, with valuable semi-natural grasslands and wetland grasslands remaining, but there are concerns about the negative impact of the increased number of deer on the vegetation and ecosystem as a whole. The purpose of this study was to verify the effectiveness of a deer fence installed to protect a valuable grassland community from deer feeding damage in a wetland area with particularly high natural in the Kujyu district. Vegetation surveys, blooming condition surveys, feeding trace surveys, and site environment surveys were conducted inside and outside the fence.

Plant species with the most deer tracks outside the fences were Miscanthus sinensis and Phragmites australis, Moliniopsis japonica, Arundinella hirta, Scirpus asiaticus, Carex maximowiczii, and others. These plant species were the dominant species in the community with perennial grasses of the Poaceae and Cyperaceae families. In this wetland, the feeding rate of the rare species Hemerocallis citrina var. vespertine was more than 80%. H. emerocallis citrina var. vespertine was highly preferred by deer, with few flowering individuals and low dominance in the community.

The endangered species Geranium soboliferum var. kiusianum, Aster maackii, Saussurea maximowiczii, and Lilium concolor were feeding on deer and had few flowering individuals and low dominance outside the fence. On the other hand, inside the fence, which was set up before the plants emerged, the dominant species Moliniopsis japonica and Arundinella hirta recovered in terms of plant height and dominance, and flowering individuals of many endangered species were observed. This work was supported by JSPS KAKENHI Grant Numbers JP19K06107, JP 22K05706.

P169 Effect of Ligularia sagitta Expansion on Alpine Meadow Vegetation and Soil in the Qinghai-Tibet Plateau

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The Gannan alpine meadow, locates on the northeastern edge of the Qinghai-Tibet Plateau, as a critical ecological barrier for the Yellow River Basin and a key pastoral region in China, faces severe degradation due to climate change and overgrazing. Toxic *Ligularia sagitta,* due to its high reproductive rate, environmental adaptability and livestock-deterring properties, which increasingly dominates degraded ecosystems, leading to the formation of secondary plant communities. This study examined its ecological effects across coverage gradients (CK: 0%; C1: ≤25%; C2: 26-50%; C3: >50%). The results provide a theoretical basis and practical guidance for vegetation restoration and sustainable management of alpine meadows. The key conclusions are as follows:

1. With the *Ligularia sagitta* coverage increasing, Gramineae biomass significantly reduced by 74.52%, 77.91% and 123.48% while the forb biomass of C3 significantly increased 161.79% than CK, respectively.
2. In the 0-15 cm layer, the total nitrogen and nitrate nitrogen of C3 significantly decreased by 15.3% and 27% while the nitrate nitrogen, available nitrogen, and potassium declined by 24.1%, 16.3%, and 32.2% compared to CK, respectively. Moreover, organic matter of C1 was significantly higher than C3 about 32.6%.
3. Microbial biomass nitrogen was 50.4% (C1) and 121.6% (C2) higher than CK in the 0-15 cm layer. In the 15-30 cm layer, C3 increased alkaline phosphatase activity (27.0%) but reduced urease activity (33.8%).
4. Soil total phosphorus showed a positive correlation with *L. sagitta* biomass

(P<0.01) but a negative correlation with Gramineae, suggesting phosphorus preferentially favors forbs expansion. Available phosphorus and potassium negatively affected diversity indices.
5. Redundancy analysis (RDA) identified that total nitrogen, available nitrogen, and available phosphorus as the primary factors shaping community structure. Soil microbial activity had a weaker influence on species distribution compared to nutrient availability. *L.sagitta* expansion alters plant communities and soil functionality, highlighting the need for targeted restoration strategies in degraded meadows.

P170 Urbanization and spatial aggregation impair multifunctionality in urban vacant lots

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Urban shrinkage driven by population decline, rather than expansion, is a growing concern in many developed countries. This demographic shift is leading to an increased prevalence of novel green spaces, such as vacant lots. Consequently, there is heightened interest in leveraging vacant lots for urban biodiversity conservation and enhance ecosystem functions. However, how environmental change alters the mechanisms governing biodiversity-ecosystem multifunctionality relationships in vacant lots remain largely unknown.
This study investigated 69 vacant lots in Yokohama, Japan, a city with a projected population decline. We quantified six environmental factors, three taxa (plants, bacteria, fungi), and five ecosystem functions. Using structural equation modelling, we analyzed the direct and indirect influences on each ecosystem function and average multifunctionality.
Our results indicated that all ecosystem functions were directly and/or indirectly influenced by the diversity and composition of plants and microbes (fungi and/or bacteria). Environmental factors strongly shape ecosystem functions. Soil moisture directly enhanced ecosystem functions and average multifunctionality, while spatial clustering indirectly impaired them, mediated by increased plant richness and altered fungal community composition. Moreover, the urbanization rate not only indirectly affected all ecosystem functions but also had a direct negative impact on average multifunctionality.
Our study demonstrates that multifunctionality in urban vacant lots is complexly shaped by environmental factors, mediated through changes in the diversity and composition of multiple taxa. Specifically, multifunctionality declined with urbanization rate and spatial aggregation of vacant lots. This suggests that dispersed vacant lots configurations in less urbanized areas could foster higher multifunctionality, although such dispersal may negatively impact plant diversity. Therefore, future urban planning in shrinking cities should navigate a careful balance between promoting plant diversity and enhancing ecosystem multifunctionality. This necessitates ongoing assessment of prioritization strategy concerning the spatial configuration of vacant lots.

P171 Identifying the distribution of giant panda staple food bamboo by integrating multi-source remote sensing data and deep learning techniques

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The giant panda *(Ailuropoda melanoleuca)* is an endangered species endemic to China, depends on bamboo as both a primary food source and habitat. Therefore accurately identifying the distribution of staple food bamboo is vital for the species' long-term survival. Yet, most existing studies rely on single-source data and often fail to capture the complex interplay between forest structure and seasonal vegetation changes, limiting mapping accuracy. To address these challenges, this study develops a novel model that integrates multi-source remote sensing data with deep learning techniques. Using the Wolong area of the Giant Panda National Park as a case study, we extract temporal features from vegetation indices through a self-attention mechanism and LSTM, while incorporating forest vertical structure data derived from spaceborne LiDAR. An ensemble learning algorithm then classified the presence of staple food bamboo and generated spatial distribution maps. The results reveal that the proposed model achieves high classification accuracy, with a 85.7% consistency with field survey data. The staple food bamboo is predominantly distributed in the central and eastern regions of Wolong, particularly at altitudes between 2000 m and 3000 m. By effectively integrating structural and temporal information, the model significantly improves mapping performance over traditional approaches. This method offers a scalable and accurate tool for bamboo distribution monitoring, supporting more informed conservation planning and habitat management for giant pandas.

P172 Classification of Aquatic Vegetation Cover Using Sentinel-2 Satellite Imagery

＊Jonghun Kim (Kunsan National University, Deapartment of Biological Science, ESK), Ji Yoon Kim (Kunsan National University, Deapartment of Biological Science)

Distribution pattern of aquatic vegetation continuously changes due to various factors such as temperature, water level fluctuation, wind direction, eutrophication and human activities. Therefore, a systematic and effective method for national-wide monitoring and analysis is required to support adaptive site management. This study aims to classify aquatic vegetation cover in 1,541 reservoirs across Jeonbuk State, Republic of Korea, using satellite images to compare the effectiveness of different machine learning algorithms for the classification. Training data was collected in the field and by visually interpreting high-resolution satellite imagery or aerial photos to identify areas covered by aquatic plants in 2020. The aquatic vegetation cover classes include floating leaved-submerged, emergent-lotus, emergent-others, and open water. Sentinel-1 synthetic aperture radar and Sentinel-2 multispectral imagery were used to train and evaluate classification models. Random Forest (RF) and Support Vector Machine (SVM) algorithms were used for classification. The model performance was evaluated using a confusion

matrix, overall accuracy, user's accuracy, and producer's accuracy. As a result, the RF algorithm showed higher classification accuracy compared to the SVM algorithm. The overall accuracy of the RF model was 85.4%, whereas that of the SVM model was 80.5%. Additionally, the VV band of Sentinel-1, which reflects surface structural characteristics and moisture conditions, and Band 11 of Sentinel-2, which provides information on vegetation moisture content, were identified as key variables. This study is expected to serve as essential data for monitoring aquatic vegetation cover using remote sensing and machine learning, and it will contribute to effective conservation and management strategies for freshwater ecosystems.

P173 Phylogeographic analysis of *Phellodendron amurense* in Japan based on simple sequence repeat markers and chloroplast DNA sequences

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Phellodendron amurense is a deciduous broadleaf tree that is widely distributed in East Asia, and in Japan it ranges from Hokkaido Island to Kyushu Island. This species is of significant economic value; its bark is used as a traditional medicine and its wood is utilized for furniture. In this study, to contribute to the future development of genetic guidelines for seedling transfer, we analyzed simple sequence repeat (SSR) and chloroplast genetic variation in *P. amurense* to elucidate its genetic population structure. STRUCTURE analysis based on nuclear SSR markers indicated the optimal number of clusters (K) to be two. Individuals belonging to Cluster 1 were predominant in the northeastern region of the Japanese Archipelago, including Hokkaido Island, Tohoku, and northeastern Chubu, whereas those in Cluster 2 were dominant in the southwestern region, including northwestern Kanto, southern Chubu and Kinki, and the islands of Shikoku and Kyushu. In areas between these regions (northwestern Chubu and Chugoku), a mix of individuals from both clusters was found, with some exhibiting intermediate cluster proportions. Based on chloroplast DNA sequences, we identified 13 haplotypes. The most common (A) was detected in all populations, with four populations along the Sea of Japan coast consisting solely of haplotype A. Rare haplotypes, unique to specific populations, were frequently observed in the southwestern region of the Japanese Archipelago. Geographical structural analysis of haplotypes using SAMOVA did not detect a significant population structure. These results indicate substantial genetic differentiation among *P. amurense* populations between northeastern and southwestern Japan. This species may have differentiated into two lineages after migrating to the southwestern region of the Japanese Archipelago via the Korean Peninsula.

P174 Discrimination of *Bidens pilosa* var. *pilosa* provenances within a single city

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Bidens pilosa L. var. *pilosa* (hairy beggarticks), an annual herbaceous plant in the Asteraceae family, is a globally distributed invasive weed. Due to its efficient dispersal, its barbed fruit readily adheres to clothing and animal fur and is frequently encountered in forensic investigations. The ability to identify plant fragments found on a suspect and trace their origin to a crime scene makes them potentially valuable evidence for linking individuals to specific locations.

Discrimination of sample origins can be achieved using molecular genotyping markers, such as single-nucleotide polymorphisms (SNPs). Multiplexed ISSR genotyping by sequencing (MIG-seq) offers a powerful next-generation sequencing approach, amplifying inter-simple sequence repeats (ISSRs) to efficiently analyze numerous anonymous genome-wide *loci* without needing prior genetic information. In this research, we utilized MIG-seq to discriminate *B. pilosa* populations.

Four sampling sites within a single Japanese city were selected for this study. To avoid sampling clonal individuals, distances between sampling points ranged from 0.1 to 3.41 km. At each site, eight to ten individuals were collected. MIG-seq analyses were performed in duplicate for each sample. Following SNP site extraction, a pairwise comparison of samples was conducted, and discrimination was determined by the number of base differences observed across both replicate analyses.

Genotypic comparisons showed that 32% of combinations from identical sampling locations were indistinguishable, while only 1.5% of combinations from disparate locations lacked differences. Samples from adjacent sites showed increased genetic similarity. Consequently, these results demonstrate that MIG-seq enables effective discrimination of contiguous *B. pilosa* L. populations.

P175 Microhabitat analysis on the Genus *Racomitrium* from East Asia

＊Eunhwa Yoo (Semyung University, ESK), Kyounghoon Kim (Semyung University), Jeeeun Koo (Semyung University), Shin-Ho Kang (Semyung University)

In Korea, the genus *Racomitrium* as resource plants for landscaping and packing materials, have recently been getting attention as resources plants with excellent carbon reduction capabilities and response capabilities to the climate crisis. As this interest in *Racomitrium* mosses as a resource plant increases for indoor landscaping in Korea, there is also an increasing demand to provide information on the environmental elements for acculturation as well as morphological characteristics of native *Racomitrium* mosses. Therefore, this study attempted to understand morphological and ecological characteristics of Genus *Racomi-*

trium in Korea that can be used as a resource plant, and to identify domestic distribution and habitat characteristics.

P176 Phylogeography of Four Conifer Species With Different Elevational Distributions Reveal Partial Quaternary Origins of Extant Lineages

＊Yuka Iwai (University of Tsukuba, ESJ), Kentaro Uchiyama (Forestry and Forest Products Research Institute), James R.P Worth (Forestry and Forest Products Research Institute), Takaki Aihara (University of Tsukuba), Yoshihiko Tsumura (University of Tsukuba)

The Sohayaki elements represent a distinctive floristic kingdom of Japan, centered on the Kii Peninsula, Shikoku and Kyushu. This region harbors endemic species as well as taxa differentiated from conspecifics in Honshu. Although clarifying their evolutionary origins is crucial for genetic resource conservation, historical analyses of plant distribution shifts in this area have been lacking. To address this gap, we investigated the range-wide genetic structure and demographic history of four coniferous species (*Abies veitchii*, A. homolepis, Tsuga diversifolia and T. sieboldii) that occur across the elevational gradients present in the Sohayaki region. Genome-wide SNPs were obtained through MIG-seq and genetic structuring was assessed by species. Approximate Bayesian computation was then used to compare demographic models and infer divergence times. Among the four species, A. veitchii and T. diversifolia exhibited significant genetic differentiation in the Sohayaki region. Furthermore, isolation-by-distance patterns and principal coordinate analysis revealed that, in A. veitchii, genetic distances among populations within the Sohayaki region were greater than those among populations in Honshu, suggesting pronounced intraregional genetic differentiation. Demographic inference further indicated that these lineages diverged during the late Pleistocene, approximately 100,000 to several hundred thousand years ago. Together, these findings suggest that part of the Sohayaki elements may have originated during the Quaternary probably driven by the abrupt climatic fluctuations of this period. In addition, the complex topography of the Sohayaki region, particularly in Shikoku, characterized by isolated high mountain ranges and sea strait-separated landscapes, likely contributed to promoting genetic differentiation.

P177 Genetic differentiation in the timing of budburst along altitude and its causal factors in *Fagus crenata* populations

＊Kiyoshi Ishida (Hirosaki University, ESJ), Yuki Kondo (Hirosaki University), Mizuho Orui (Tohoku regional Forest Office), Saki Sugimoto (Tohoku regional Forest Office)

In order to elucidate altitudinal cline of the budburst timing and its causal factors in beech, we conducted observations in the habitat and common garden experiments (low, medium, and high gardens with altitudes from 30 to 900m; four provenances with altitudes from 450 to 900m) in Mt. Hakkoda, northern Japan. In the habitat, the budburst day was delayed by 4.5 days as the altitude increased by 100 m. In the common gardens, the budburst day of the seedling was delayed with an increase of the garden altitude as well as the provenance altitude, indicating phenotypic plasticity and genetic differentiation of the bud burst day along altitude. The cumulative temperature for the budburst was also correlated positively with the provenance altitude, but negatively with the garden altitude, suggesting effects of long day length at high altitude. An analysis of the risk of late frost damage showed that even in high-altitude areas where snow thaws in late spring, the seedlings can suffer from the late frost damage. In the high garden, the range of the budburst timing overlapped with the range of annual fluctuations in the timing of the last late frost, but seedlings originating from high-altitude provenance exhibited the budburst timing late enough to avoid the last late frost. These findings suggest that the late budburst timing of high-altitude populations is consequence of local adaptation to spring climatic conditions of the habitat, and that natural selection by late frost is involved in evolution and maintenance of the late budburst timing. In the medium and high gardens in 2021 that were not affected by late frost damage, the seedlings with earlier budburst timing exhibited larger height growth, suggesting that natural selection due to competition may also be involved in evolution and maintenance of the optimal budburst timing at mid- and high-altitude areas with relatively short growing season.

P178 Ecological Traits and Plant Growth-Promoting Activities of Endophytic fungi Isolated from *Cymbidium macrorhizon*

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A leafless, partially mycoheterotrophic terrestrial orchid *Cymbidium macrorhizon* is legally protected as Endangered Species in Korea. However, there is insufficient information on its habitat characteristics, associated microbial interactions, and growth conditions, which are crucial for developing effective conservation strategies and understanding its ecological adaptation. We investigated the vegetation, canopy coverage, soil respiration rates, and soil physicochemical parameters in *C. macrorhizon* habitats. Additionally, we analyzed the fungal community composition in the rhizosphere soil surrounding the natural habitat and rhizome of a legally transplanted *C. macrorhizon* plant for laboratory study. *C. macrorhizon* forms large populations, especially in *P. thunbergii* stands, which are characterized by well-developed organic layers and well-drained soils with approximately 40% soil moisture content. It is proposed that *C. macrorhizon* may increase its population size through vegetative propagation via rhizomes facilitated by microbial activity in environments that limit population growth through seed reproduction, such as shaded stands with high organic matter content. The majority of the isolated endophytic fungi belonged to Ascomycota. We identified *Trichoderma sp.* as one of the isolated strains and conducted an analysis of plant growth-promoting hormones produced by the endophytic fungi to evaluate its potential impact on the *C. macrorhon* growth and development.

P179 Hidden Forces: Non-Adaptive Urban Evolution in White Clover Phenotypic Clines

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Urbanization significantly alters ecosystems by imposing novel selective pressures, such as elevated temperatures, pollution, and changing interspecific interactions, which drives evolutionary changes in urban organisms. In addition, habitat fragmentation associated with urbanization reduces gene flow and amplifies genetic drift, potentially constraining adaptive evolution. The interaction among these evolutionary processes along the urban-rural gradient gives rise to geographic patterns in phenotypes, providing insights into both adaptive and non-adaptive evolution.
A well-studied example of a phenotypic cline in urban evolution is the hydrogen cyanide (HCN) polymorphism of white clover (Trifolium repens), which is a defensive trait against herbivory. Urban habitats typically less suffer from herbivorous pressure, which is associated with decreased HCN frequency. However, global-scale analyses have revealed deviations from the expected urban-rural pattern, suggesting that a range of factors, including local environmental variability and stochasticity, should influence shaping the patterns.
Here, we developed a metapopulation model based on the Wright-Fisher framework to capture the stochastic processes driving urban evolution. The model incorporated geographic gradients in both selection and migration rate among subpopulations. We explain how adaptive clines emerged under restricted gene flow. Especially, when gene flow was severely restricted in urban area, phenotypic cline was reversed adaptive clines. The resulting cline well fitted with an empirical observation, including cases that deviate from the expected urban-rural gradient, and potentially explained the mechanisms in terms of stochastic processes.

P180 Comparison of root growth costs among rice species in natural habitats with different soil oxygen conditions

＊Motoka Nakamura (Tamagawa University, ESJ), Motoka Nakamura (Tamagawa University)

To evaluate the ecophysiological adaptations of aquatic plants to anoxic soils, we focused on root respiration efficiency, a key physiological trait in oxygen-limited environments. ATP generated through aerobic respiration is allocated to root growth, nutrient uptake, and maintenance. In our previous study, we suggested that macrophytes may reduce ATP allocation for root growth to maintain energy balance under conditions of limited oxygen availability.
In this study, we assessed the respiratory cost of root growth in wild and cultivated rice species across habitats ranging from shallow to deep water, with varying soil oxygen levels. To understand the impact of different oxygen concentrations, we performed hydroponic experiments under both high- and low-oxygen conditions. Our results revealed that species from deeper water habitats exhibited lower respiratory costs for root growth and showed higher alcohol dehydrogenase (ADH) activity in their roots, a key enzyme associated with anaerobic metabolism. Furthermore, rice species, both wild and cultivated, displayed lower root growth costs compared to terrestrial plants, suggesting a specialized adaptation to low-oxygen environments. This is especially true for species from deeper water habitats, which had both lower respiratory costs and higher ADH activity. These findings indicate that rice enhances its tolerance to anoxic soils by reducing the costs of aerobic respiration for root growth, thus efficiently utilizing oxygen through reduced aerobic respiration and utilizing anaerobic pathways when necessary. This strategy allows rice to thrive in environments with fluctuating or low oxygen availability, offering insight into its ecological success in wetlands and flooded areas.

P181 Black locust developed different water use strategies to acclimatize to semiarid and sub-humid sites in the Loess Plateau, China

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The mesic-origin species black locust (*Robinia pseudoacacia*) is widely planted throughout semiarid and sub-humid regions of the Loess Plateau of China for reforestation of vegetation-degraded land. Determining the changes in water use patterns of this species in different climatic areas is important for revealing the acclimation mechanism and developing suitable forest management practices, particularly in the context of global climate change. In this sutdy, sap flow and canopy conductance of black locust plantation trees in semiarid (Yan'an) and sub-humid (Yongshou) sites were quantified using Granier-type thermal dissipation probes and concurrent environmental observations from 2012 to 2017. Several physiological parameters were measured throughout the growing season. The results showed that sap flow was correlated with phenological factors across seasons within a year. However, interannual changes in sap flow were affected mainly by the reference evapotranspiration (ET_0) at the Yongshou site, and jointly by precipitation (P), soil water content, and P/ET_0 at the Yan'an site. Sap flow response to meteorological factors showed less discrepancy between periods of pre- and post-rainfall event at the Yan'an site. Moreover, canopy conductance fluctuated less with a wider range of vapor pressure deficit (VPD) and the slope of canopy resistance as a function of VPD was lower, indicating relatively lower sensitivity of stomatal conductance to environmental factors in Yan'an site. Physiological parameters, except for predawn leaf water potential, were significantly different between the two sites. The results suggested that black locust tended to reduce transpiration, modify leaf morphology, and improve water use efficiency to enhance its adaptability to the dryer site. The species changes stomatal regulation characteristics and general growth rate to acclimatize

to distinct water habitats.

P182 Divergent responses of root traits of nitrogen-fixing and non-nitrogen fixing seedlings to phosphorus addition in southern China

＊Qifeng Mo (South China Agricultural University, ESC)

Phosphorus (P) limitation is common for plant growth and seedling regeneration in highly weathered soil of southern China. The response of plant growth to various P supply are well conducted. However, the response of different root orders of different functional tree seedlings to various soil P availability is still unclear. A field-based manipulative experiment was carried out to investigate the response of different orders of roots of *Ormosia pinnata* (N-fixing), *Michelia macclurei* (non-N-fixing), and *Schima superba* (non-N-fixing) seedlings to P addition in southern China. The results showed that (1) P addition mainly changed the morphological traits of the 3rd order root of tree seedlings. N-fixing seedling tended to invest more resource in acquisition traits such as specific root length (SRL) rather than non-N-fixing species. (2) The contents of N and P in 3rd roots of non-N-fixing tree seedlings was greatly affected by external P addition, but only the P content in 1st order root was affected. P addition only increased the 3rd order root N:P ratio of N-fixing species. (3) P addition increased soluble sugar content while reduced starch contents in 2nd and 3rd order roots and greatly changed the distribution pattern of non-structural carbohydrates (NSC) of N-fixing seedling.
Therefore, N-fixing seedling is relatively more adaptable to the environment of exogenous P addition and have stronger ability to use soil P. The physiological shapes of different functional seedlings such as root N and P contents and NSC contents to various P availability was divergent, which was tightly related to the root hierarchy of seedlings in southern China.

P183 Nitrogen addition alleviates water loss of Moso bamboo (*Phyllostachys edulis*) under drought by affecting light-induced stomatal responses

＊Xi-pin Wu (Northwest University/International Centre for Bamboo and Rattan, ESC), Xiaomin Gao (International Centre for Bamboo and Rattan/Chinese Academy of Forestry), Ruichang Zhang (Northwest University), Junwei Luan (International Centre for Bamboo and Rattan), Yi Wang (International Centre for Bamboo and Rattan), Shirong Liu (Chinese Academy of Forestry)

The combined climate-change-evoked drought and nitrogen (N) deposition have severely affected plant carbon and water relations governed by stomata. However, the interplay between steady-state and dynamic stomatal behavior responses to light remains unclear regarding its impact on plant water and carbon relations. The objective here was to investigate whether light-induced stomatal dynamics could mitigate the adverse effects of steady-state gas exchange on water conservation or photosynthesis under drought and N addition conditions. We conducted a manipulative experiment to investigate the impacts of throughfall reduction, N addition, and their combination on light-induced stomatal and photosynthetic dynamics in a Moso bamboo (*Phyllostachys edulis*) forest. We determined the influence of stomal response rate on water loss and photosynthesis, and further assessed whether it mitigated the effects of steady-state gas exchange (g_s). We found that Moso bamboo decreased g_s under throughfall reduction, while accelerated stomatal opening and biochemical activation when irradiance increased, which reduced the lag in photosynthesis during the induction period. In contrast, under the combined throughfall reduction and N addition condition, Moso bamboo increased g_s but showed faster stomatal closure, which decreased the percentage of transpiration following a decrease in light intensity. Our findings indicate that stomatal dynamic behavior may depend on the effects of steady-state gas exchange on water conservation and carbon uptake under different soil water and N conditions. These discoveries contribute to our understanding of the coupling mechanisms of plant water use and carbon uptake in the context of global changes.

P184 Floral trait variation in *Oxalis corniculata* along an urbanization gradient: Shifts in herkogamy without genetic divergence

＊Yusuke Hoshino (Botanical Gardens, Tohoku University, ESJ), Sachiko Horie (Botanical Gardens, Tohoku University), Shoki Murakami (Makino Herbarium, Tokyo Metropolitan University), Ikumi Dohzono (Department of Environmental Sciences, Tokyo Gakugei University), Masayuki Maki (Botanical Gardens, Tohoku University)

Urbanization can act as a strong ecological filter that shapes plant phenotypes; however, its effects on the plant reproductive traits and genetic structure remain poorly understood. *Oxalis corniculata* is a perennial herb that exhibits variation in herkogamy: homostyled plants with little herkogamy are capable of autonomous selfing, whereas long-styled plants with pronounced herkogamy tend to avoid autonomous selfing. In this study, we investigated the spatial variation in herkogamy and the genetic structure of *O. corniculata* in populations distributed along an urbanization gradient across Tokyo, Japan. We measured herkogamy in 30 populations and performed MIG-seq analysis on a subset of 16 populations. To quantify urbanization, we calculated the area of built-up land within radii of 250 m, 500 m, and 1000 m around each population.
Across the survey plots, the proportion of built-up land ranged from 0% to 97%. Herkogamy was significantly reduced in populations surrounded by a greater proportion of built-up land, suggesting that selfing homostyled plants dominate urban environments. Principal coordinate analysis (PCoA) based on Mash distances revealed no genetic differentiation corresponding to floral morphs, and no correlation was found between pairwise morphological and genetic distances among individuals.
These results indicate that selfing homostyled plants may have reproductive and dispersal advantages in urban environments characterized by disturbed habitats and low pollinator availability. The lack of a corresponding genetic structure suggests that this variation in herkogamy may have arisen relatively recently, potentially shaped by the urban environments acting as ecological filters. Further investigations, such as broad-scale studies of genetic structure and analyses of genomic regions associated with herkogamy, could provide deeper insights into the processes driving variations in floral traits along urbanization gradients.

P185 Differentiated impacts of light intensity and soil properties on rhizobial and rhizosphere bacterial communities associated with *Sophora davidii* during forest succession

＊Ying Cao (Northwest University, ESC), Ming Yue (Northwest University)

Forest succession involves dynamic changes in soil nutrient conditions and light availability, both of which significantly influence plant-microbe interactions in terrestrial ecosystems. However, the mechanisms by which plants modulate microbial associations in belowground niches under these environmental gradients during forest succession remain unclear. This study investigated *Sophora davidii*, a leguminous pioneer species important for forest succession and ecological restoration on the Loess Plateau of China, to examine how forest edge (early-successional, high light) and understory (late-successional, low light) habitats shape the assembly of rhizosphere bacterial communities and nodule-associated rhizobia. Using 16S rRNA gene sequencing and multilocus phylogenetic analyses, we found that rhizosphere bacterial communities were more sensitive to light intensity, showing significant shifts in community composition and functionality between the two habitats. Rhizosphere communities in the understory exhibited lower alpha diversity and stability, along with increased involvement in nitrogen cycling, greater network robustness, and functional differentiation, indicating ecological adaptation to forest succession. In contrast, rhizobial communities were primarily shaped by soil properties, including pH, organic carbon, and nutrient availability, with light intensity having a minor effect. This divergence highlights a niche-specific shift in the relative importance of light intensity and soil properties in structuring plant-microbe interactions. Additionally, although rhizobia nodulated with *S. davidii* from both habitats were identified as *Mesorhizobium* species, those from the forest edge exhibited stronger growth-promoting abilities, suggesting ecological optimization under early successional conditions. Our results show that rhizosphere and nodule environments are distinct microbial niches, with legumes adapting to environmental gradients during forest succession by balancing microbial diversity and specific functions (e.g., nitrogen cycling) in response to environmental changes. This study provides new insights into plant-microbe ecological niche differentiation and the dynamics of root-associated microbial communities during forest succession, with key implications for ecological restoration and forest management.

P186 Carbon Emission Reduction and Benefit Analysis of Comprehensive Utilization of Crop Straw in Karst Areas: A Case Study of Guizhou Province

＊Haifeng Nie (College of Ecological Engineering, Guizhou University of Engineering Science)

Residue and burning of straw have exacerbated the deterioration of the fragile karst ecosystem. To alleviate environmental pressure, fully tap the potential of straw resources, and maximize carbon reduction, this paper quantitatively analyzed the available straw resources in Guizhou Province based on crop yield data, using the grass-to-grain ratio and the straw collection coefficient. Furthermore, scenario analysis was conducted to explore the optimal utilization pathways for straw resources to achieve maximum greenhouse gas reductions. The results indicate that the available straw resources in Guizhou Province in 2023 amount to 8.63 million tons, with the majority distributed in Zunyi and Anshun regions. If straw is utilized in the most resource-efficient manner, specifically through biogasification, the economic benefit of straw biogas resource utilization in Guizhou Province in 2023 would reach 5.61 billion yuan, while directly reducing approximately 674,350 tons of carbon dioxide emissions. This highlights the substantial potential for greenhouse gas mitigation. It is recommended to accelerate the utilization rate of straw resources, prioritize the development of straw biogasification technology, promote the advancement of straw energy utilization, and encourage diversified applications of straw as feed and fertilizer. These measures will contribute to targeted reductions in greenhouse gas emissions and provide critical support for achieving the "dual carbon" goals.

P187 Effect of Early Waterlogging on Aquatic Oligochaete Density and Weed Abundance in the Setouchi District

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In Shimane and Tottori prefectures, where winter soils are wetter, early waterlogging has been observed to increase aquatic oligochaete density, which in turn reduces weed density. However, in the Setouchi district, where winters are dry, conditions are unsuitable for the overwintering of aquatic oligochaetes. Therefore, this study investigated the effects of early waterlogging on aquatic oligochaetes in paddy fields in Fukuyama City, located in the Setouchi district. We also examined the relationship between aquatic oligochaete parameters (density and soil deposition rate) and weed abundance through two experiments: a field plot and an enclosure experiment.

This study was conducted at the West Japan Agricultural Research Center (NARO). The main plots were subjected to two water management treatments: early waterlogging (3 months before transplanting), and immediate pre-flooding (3 days before transplanting). Sub-plots were managed either with or without mechanical weeding using a high-efficiency weeder applied 8 days after transplanting. Sub-sub-plots included two seedling sizes: medium and small. An enclosure experiment was also conducted under early waterlogging conditions to assess the impact of varying aquatic oligochaete densities (0, 400, 800, and 1600 individuals per 500 cm^2) on soil deposition rates and weed abundance.

Early waterlogging significantly increased aquatic oligochaetes density ($P<0.001$). In both experiments, soil deposition rates increased with higher aquatic oligochaete densities or input numbers ($P<0.05$). In the field plot experiment, increased oligochaete density was significantly associated with reduced dry weight of three major weed species: *Schoenoplectiella juncoides*, *Monochoria vaginalis*, *and Echinochloa* spp. ($P<0.05$). Similarly, in both experiments, higher soil deposition rates corresponded with decreased weed biomass ($P<0.05$).

This study demonstrates that early waterlogging can effectively suppress weed abundance by enhancing aquatic oligochaete density.

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P188 Nectar Sugar Enhancement in Response to Bee Buzzing in *Rhododendron* x *pulchrum*: Sound-sensing Organs and Sensitivity Range

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Recent studies suggest that some plants can perceive and respond to airborne sounds, but current understandings of this phenomenon remain limited. Previously, such sound-specific responses to pollinator visitation had only been documented in *Oenothera drummondii* (Veits et al., 2019), where petals were implicated as the primary sound-sensing organs. To investigate the generality of this phenomenon, we examined responses to airborne sounds, particularly those produced by bee buzzing, in *Rhododendron* x *pulchrum*.

We exposed the flowers to playback sound of a flying bee, synthetic sound signals at similar (200 Hz) and higher frequency (5000 Hz) and compared nectar sugar concentration among these sound-treated and non-treated flowers. We observed approximately 10% increase in nectar sugar concentration in response to playback sound of bee buzzing sound and synthetic sound signal at bee-like frequency (200 Hz), while no such response was observed under higher-frequency stimuli or silent condition. This suggests that *R.* x *pulchrum* can selectively perceive and respond to pollinator sounds similar to the case in *O. drummondii*. Furthermore, the responses occurred at the sound pressure range of 50-65 dB, indicating sound sensitivity within this range, though the exact thresholds remain to be determined.

To determine which floral organs sense the sound, we experimentally removed petals, stamens and/or pistils from flowers and exposed them to the 200Hz sound. We then compared differences in nectar sugar concentration between these experimental and sound-treated intact flowers. As a result, we found that both petals and stamens were necessary to make such sound responses, suggesting these floral organs were involved in acoustic sensing.

These findings provide new insights into floral sensory mechanisms and suggest that acoustic responsiveness to pollinators may be more widespread among flowering plants.

P189 Possible Pollinator Attraction by Long-chain Hydrocarbonsin Floral Volatiles of *Asimitellaria* Species.

＊Naoko Okui (Department of Biological Sciences, Graduated School of Science, The University of Tokyo, ESJ), Yudai Okuyama (National Museum of Nature and Science Tsukuba Botanical Garden)

Most angiosperms have evolved their flowers to control pollinators for efficient pollination. Among various flower traits, scent is often strongly associated with specific pollination system. It is known that some flower produces signals that pollinator readily use, such as pheromones or oviposition cues.

Asimitellaria is a genus with remarkable species diversity in Japan. It is known that they are pollinated by fungus gnats, but the mechanism by which these insects discover and visit the flowers remains unclear.

It has been said that the floral scent has an important role of that and it is supported by Katsuhara et al. (2017), but definitive evidence is still lacking.

First, we revist this problem whether the floral scent of *Asimitellaria* plays a crucial role in attracting its pollinators. We conducted a field experiment using custom-made traps that allowed scent to be released. The trap successfully attracted the pollinators, indicating that floral scent alone is a sufficient cue for locating the flowers.

Then we analyzed the floral scent of *A. pauciflora*. Previous research identified linalool and β - caryophyllene as the main floral volatiles of this species. However, these compounds are commonly emitted by various flowers and are likely unrelated to the specific attraction of fungus gnats. In this study, we identified several previously unreported long-chain hydrocarbons which is similar to the compounds reported in sexual mimicry system. Therefore, the hydrocarbons found in *A. pauciflora* may play a similarly important role in attracting fungus gnats.

Further investigation of these hydrocarbons is needed

P190 Community in the gall: torophic and non-trophic interactions with gall midges

＊Honoka Nagashima (Kobe University, ESJ), Ayman Khamis Elsayed (Saga University), Makoto Tokuda (Saga University), Kaoru Tsuji (Kobe University)

Organisms interact in trophic and non-trophic ways, including habitat formation, and both types are entangled in the ecosystem. Galls are induced structures on plants by gall-makers, and provide high-quality food and a stable environment for them. In addition, galls sometimes provide habitats for other organisms such as fungi and arthropods. However, their complex trophic and non-trophic interactions within galls remain poorly understood. This study aims to elucidate these interactions using galls induced by gall midges (Diptera: Cecidomyiidae).

Within galls on flower buds of *Eurya japonica*, we always found hyphae surrounding the midge larvae, and sometimes mites, thrips, and other arthropods. To identify the gall midges, we first observed the morphology of larvae and adult females, and then made a molecular phylogenetic tree. These surveys suggest that this species belongs to the genus *Schizomyia*, which is probably a new species. Next, we performed Sanger sequencing of fungi in crushed larvae. In almost all samples, we detected only a single fungus: *Botryosphaeria dothidea*, a known pathogen of trees. Because *B. dothidea* is known as a symbiotic fungus in other gall midge species, our results suggest that it has also symbiotic relationships with *Schizomyia* sp. in the galls on *E. ja-*

ponica plants.
In the near future, we will examine whether the presence or absence of *B. dothidea* affects gall formation, larval development of the gall midge, and other coexisting species in the galls.

P191 Do spider webs help plants?—Herbivore-mediated indirect effect of spider webs on plants—

＊Sho Mishima (Faculty of Agriculture and Life Science, Hirosaki University, ESJ), Mito Ikemoto (Faculty of Agriculture and Life Science, Hirosaki University/The National Institute for Environmental Studies), Kanta Yokogawa (Faculty of Agriculture and Life Science, Hirosaki University), Koya Hashimoto (Faculty of Agriculture and Life Science, Hirosaki University/The National Institute for Environmental Studies)

Predators structure terrestrial communities by reducing prey density and altering prey behavior, which can result in positive effects on the associated plants. Spiders are known as the most common predators and are frequently used in studies examining the effects of predation on terrestrial communities. Spiders are also known for using webs to capture prey. Although spider webs may influence herbivores directly and affect plants indirectly by serving as a visual cue or physical barrier, their effects on herbivores and plants have not been thoroughly investigated. Here, we examined the effects of spider webs on herbivores and the plants they feed by conducting common garden and laboratory experiments. In the laboratory experiment, herbivores were offered both control and web-treated leaf discs. No significant difference was observed in the consumed amount between the two treatments. In the common garden experiment, we applied the following four treatments: 1. Plant only; 2. Plant and herbivores; 3. Plant, herbivores, and a spider web; 4. Plant, herbivores, a spider web, and a spider. Plant biomass decreased only in treatment2 due to herbivore feeding, suggesting that both spider webs and spiders suppressed the reduction in plant biomass. Leaf damage was significantly higher in treatment2 and 3. However, the increase in treatment3 was smaller than in treatment2. Herbivore mortality was lowest in treatment2, likely due to the insufficient amount of plant resources. In treatment3, despite the sufficient amount of resources, herbivore mortality was higher than in treatment2, suggesting that spider webs have unknown top-down effects on herbivores. These findings suggest that not only spiders but also their webs may have indirect positive effects on plants. Future studies should consider the role of spider webs themselves independently from the spiders.

P192 Tracking climate impacts on Kuroshio marine fish communities using environmental DNA

＊Jiwei Yang (WPI-AIMEC, Tohoku University, ESJ), Michio Kondoh (WPI-AIMEC, Tohoku University)

Ocean warming is driving rapid ecosystem transformations. However, the extent to which marine fish communities can adapt through distributional shifts remains poorly understood. Based on a multi-year environmental DNA survey across Japanese coastal waters, we demonstrate that regional differences in species' thermal positioning play a pivotal role in shaping community responses to warming. High-latitude Oyashio communities, limited by colder thermal environments, are approaching thermal thresholds, reducing their resilience to ongoing warming. In contrast, low-latitude Kuroshio communities, already near their thermal limits, exhibit frequent species turnover and shifts toward cooler regions, partially mitigating thermal stress but at the cost of heightened community instability. These contrasting dynamics underscore the importance of accounting for both physiological limits and spatial reorganization of species in anticipating biodiversity changes under future climate scenarios.

P193 Community structures of ammonia-oxidizing archaea associated with fine roots of old growth *Cryptomeria japonica* in a pristine forest

＊Yosuke Matsuda (Mie University, ESJ), Raku Oue (Mie University), Yudai Kitagami (Mie University)

The first stage of nitrification involves ammonia-oxidizing genes, with being carried out by bacteria (ammonia-oxidizing bacteria, AOB) and archaea (ammonia-oxidizing archaea, AOA). The aim of this study was to clarify AOA communities associated with fine roots of old-growth *Cryptomeria japonica* trees. For this purpose, we studied AOA community structures of *C. japonica* roots in natural and artificial forests. We selected 10 trees on a slope in a natural forest of more than 1000-year-old trees and in a 50-year-old artificial forest in Yakushima, Japan. Fine root systems physically connected with focal trees were collected at three points around each tree. We measured environmental data at the sampling points, extracted DNAs from the collected fine roots, and performed amplicon sequencing of a partial region of amoA genes, which encodes ammonia monooxygenase subunit A. A total of 212 amplicon sequence variants (ASVs) was detected, and 22 ASVs were shared between the forests. The detected ASVs were phylogenetically assigned into either Nitrososphaerales or Candidatus Nitrosotaleales, and the lineage in a Nitrososphaerales γ clade was predominated accounted for 92.5% (196/212 ASVs). The community structure of AOAs based on the dissimilarity multidimensional scaling differed significantly between the forests, and C/N ratio and MEM1 were significant ordinating factors. AOA community structures in the natural forest were clustered more closely each other than those in the artificial forest. AOA compositions in both the forests showed significant turnovers with no significant nested patterns in the natural forest. These results suggest that taxonomically similar AOAs can be involved in the nitrification process of fine roots, but the AOA community may change in a convergent manner with tree ages.

P195 Climate change escalates the prevalence of antibiotic resistance genes in Salmonella globally

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Climate change may accelerate the dissemination of antimicrobial resistance. Salmonella is a leading causative agent of infectious diseases worldwide. However, the impact of climatic factors on the transmission of antibiotic resistance genes (ARGs) within Salmonella remains poorly characterized. Here, by analyzing data from over 480,000 publicly available Salmonella

genomes from 1940 to 2023 across 139 countries, we show that the ARGs abundance in Salmonella has increased by 72.3% in the past eight decades. Multiple regression models reveal that ARGs variability follows a quadratic nonlinear response to temperature and precipitation. Impact of climate change drove a 2.7% rise in Salmonella ARGs abundance globally in recent ten years, with increases observed in 79% of countries. Due to warming by 2100, the emergence of ARGs would be further intensified, however, meeting low-emissions scenarios targets alongside antibiotic stewardship could reduce Salmonella ARGs by 25% compared to high-emissions scenarios. Our results highlight the imperative of climate-informed strategies to combat antimicrobial resistance.

P196 Deer carcasses enhance the decomposition by soil microbial communities in evergreen forests

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Recent global warming is mainly driven by increased CO_2 emissions from fossil fuel combustion. However, human activities can also influence carbon dynamics indirectly through alterations in ecosystem structure and function. In the temperate and boreal forests of the Northern Hemisphere, ungulate populations, particularly deer, have expanded under anthropogenic influence, potentially modifying forest processes, including soil carbon cycling. Despite this, the effect of deer on soil microbial community decomposition remains poorly understood.
This study investigated how deer carcasses influence the multifunctionality and functional composition of soil microbial community decomposition across 31 carbon substrates. Two field experiments were conducted in the Wakayama Experimental Forest, Hokkaido University, Japan: (1) a deer carcass experiment in natural and plantation forests during the summers of 2021 and 2022, and (2) an insect exclusion experiment in 2022, using polyethylene nets to prevent carrion beetles (*Silphidae.spp*) from accessing carcasses. The heads of deer were used as the carcasses, and soil samples were collected post-decomposition using PVC cores. Microbial functional activity was assessed using Biolog EcoPlates.
Deer carcasses treatment increased microbial multifunctionality, especially in plantation forests in 2021 and natural forests in 2022. Functional composition also shifted: variance decreased in plantation forest (2021), and compositional changes were observed in both forest types (2022). Insect exclusion treatment further increased multifunctionality but did not alter functional composition, suggesting that antimicrobial compounds secreted by carrion beetles may suppress microbial activity.
These results indicate that elevated deer mortality—an indirect outcome of human-driven changes in wildlife populations—can enhance soil microbial decomposition and potentially accelerate CO_2 emissions from forest soils. Understanding such biotic pathways is essential for accurately predicting ecosystem carbon fluxes under ongoing global change.

P197 Microbial community responses to non-additive effects in mixed-species litter decomposition

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In response to growing interest in enhancing forest ecosystem services, the conversion of monoculture plantations into mixed-species forests is increasingly encouraged. Mixed forests are expected to improve biodiversity, nutrient cycling, and soil stability. However, their effects on belowground ecological processes remain insufficiently understood. Among these, litter decomposition plays a central role in regulating nutrient turnover and availability, and is largely mediated by microbial communities shaped by litter composition.
In a previous study, we simulated mixed forest conditions by conducting decomposition experiments using leaves and fine roots from multiple tree species. We observed non-additive effects in the mixed-species leaf litter decomposition processes: nutrient elements such as calcium and nitrogen were retained more than in single-species treatments. That is, nutrient leaching due to rainfall was suppressed in mixed litter combinations. We hypothesized that the chemical diversity of mixed litter fosters a more active and diverse microbial community, which in turn immobilizes nutrients into microbial biomass and thus reduces leaching losses.
To test this hypothesis, the present study examines how tree species composition affects the structure and function of microbial communities involved in litter decomposition. A total of 42 litter residue samples were analyzed from a 106-week laboratory decomposition experiment using leaves and fine roots from three tree species —Quercus dentata, Zelkova serrata and Pinus thunbergii—arranged in monocultures, two-species mixtures, and a three-species mixture, each with three replicates. Microbial DNA was extracted and analyzed via PCR and next-generation sequencing. This study provides new insights the microbial mechanisms underlying non-additive effects during litter decomposition and highlights the potential of mixed-species forests to enhance nutrient retention through microbial mediation.

P198 Interspecific comparison of substrate mineralization in incubation experiments using artificial soil

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Soil microbes play a critical role in carbon (C) cycling. The r/K selection theory provides a framework for understanding how microbial communities affect C dynamics, yet the specific effects of interactions between r- and K-strategists on C mineraliza-

tion remain underexplored. Artificial soil, designed to simulate natural soil property, offers a controlled system to study individual microbial dynamics and their contributions to C cycling. While previous studies have cultured single species or simple microbial communities in artificial soil, they have not assessed how interspecific interactions influence C mineralization. This study investigates how r- and K-strategist bacteria, specifically *Bacillus subtilis* and *Streptomyces cinnamoneus*, affect glucose mineralization in an artificial soil system.
Two bacterial strains, *Bacillus subtilis* (NBRC101584) and *Streptomyces cinnamoneus* (NBRC13823), were used. Artificial soil was prepared following on Ellis (2004) with minor modifications. The artificial soils consisted of quartz sand as the sand fraction, and kaolinite and Japanese acid clay as the clay fraction. Calcium carbonate and humic acid were added to provide buffering capacity. The strains were inoculated individually or in combination into artificial soil with glucose as the carbon substrate and incubated at 30°C for 14 days. Glucose mineralization was measured using the alkali trap method during the incubation period.
Over the 14-day incubation, *B. subtilis* had rapid and high respiration rates, while *S. cinnamoneus* had slower and delayed respiration rates, consistent with their respective r/K selection strategies. In co-culture treatments, cumulative glucose mineralization was similar to that of *B. subtilis* monoculture and positively correlated with its relative abundance. These results highlight the effectiveness of artificial soil systems in demonstrating microbial interactions and provide a controlled approach for investigating the mechanisms underlying soil C cycling.

P199 Effects of long-term removal of understory vegetation on litter decomposition : the role of soil fauna in *Quercus crispula* and *Larix kaempferi* forests

＊Tsutomu Enoki (Kyushu University, ESJ), Takuo Hishi (Fukuoka University)

Understory vegetation plays a variable role in forest ecosystems. The decline or elimination of understory vegetation due to excessive foraging by sika deer has often been observed throughout Japan. We conducted an experiment to clarify the effects of long-term understory vegetation removal on litter decomposition and the role of soil fauna in *Quercus crispula* forest and *Larix kaempferi* plantation in eastern Hokkaido, northern Japan. The understory in both forests was dominated by *Sasa nipponica*. We maintained the no-understory condition for ten years. The decomposition rate and the role of soil fauna were evaluated using litterbags with different mesh sizes (S = 49μm, M = 1mm, L = 4mm). The decomposition rate in the *Larix* plantation was slower than in *Quercus* forest, partly due to the lower soil moisture content in the *Larix* plantation. Understory vegetation removal reduced the decomposition rate in both forests, with a similar degree of reduction observed between the *Quercus* forests and *Larix* plantation. Litterbags with larger mesh sizes showed faster decomposition rates, indicating the contribution of soil macro- and mesofauna to the decomposition process. Among these, soil macrofauna contributed more to decomposition than mesofauna. In the *Larix* plantation, the reduction in decomposition rate due to understory vegetation removal was more pronounced in the litterbag with small mesh size. In contrast, in *Quercus* forests, the decomposition rate in the litter bag with small mesh size was not significantly affected by understory removal. However, the decomposition rate decreased in the litterbags with larger mesh sizes following understory vegetation removal. These results suggest that changes in factors other than soil macro- and mesofauna, such as soil moisture content, played larger role in the *Larix* plantation. Meanwhile, the decrease in decomposition rate in *Quercus* forest maybe more closely associated with changes in the community structure of macro- and mesofauna.

P200 Effects of litter inputs on N2O emissions from a tropical rainforest in southwest China

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To investigate how litter affected nitrous oxide (N_2O) emissions from soil, we set up a paired study with a control (L) treatment and a litter-removed (NL) treatment in a tropical rainforest in southwest China, and for two years continuously monitored the effects of these treatments on soil N_2O flux, fresh litter input, litter decomposed carbon (LCI) and nitrogen (LNI), soil nitrate (NO_3^--N), ammoniacal nitrogen (NH_4^+-N), dissolved organic carbon (DOC), and dissolved nitrogen (DN). Soil N_2O flux was 0.48 and 0.32 kg N_2O-N ha^{-1} yr^{-1} for the L and NL treatments, respectively. Removing the litter caused the annual soil N_2O flux to decrease by 33%. Flux values from litter layer was higher in the rainy season (2.10 ± 0.28 μg N_2O-N m^{-2} h^{-1}). The N_2O fluxes were significantly correlated with the soil NO_3^--N contents, indicating that the N_2O emissions derived mainly from denitrification. Soil temperature, water-filled pore space (WFPS), and rainfall were the main influences on N_2O emissions, and soil N_2O fluxes from the L and NL treatments were higher in the rainy season than in the dry season. The contribution from litter meant that N_2O fluxes from the L treatment were more sensitive to soil temperature, WFPS, and rainfall than those from the NL treatment, and that the mechanisms that controlled N_2O emissions varied between treatments. Multiple linear regression analysis showed that emissions from L were dominated by LCI, while emissions from NL were dominated by the soil NO_3^--N content and soil temperature. Cross-correlation analysis revealed that the effects of LCI and LNI on the soil N_2O fluxes were greatest at two months after the litter decomposition. Litter affected the variability in the amounts of N_2O emitted, and also the mechanisms that controlled the emissions.

P201 A resin-based approach for $\delta^{15}N$ and $\delta^{18}O$ analysis of nitrite in low-nitrite freshwater systems

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Nitrite is a key intermediate in the redox transformations of the nitrogen cycle and provides important insights into nitrogen cycling processes. However, due to its typically low concentrations in natural waters, stable isotope analysis of nitrite has been lim-

ited. In this study, we developed and evaluated a method combining anion exchange resin enrichment with the azide reduction technique to enable $\delta^{15}N$ and $\delta^{18}O$ analysis of nitrite at nanomolar levels. We systematically assessed the effects of key procedural parameters, including resin quantity, eluent volume, pre-filtration, and potential nitrate interference, in terms of both nitrite recovery and isotopic integrity. High recovery rates were achieved even with small amounts of resin, although the use of at least 0.4 g was necessary to ensure reliable results. Eluent volume had a strong influence, and a minimum of 4 mL of 1 M NaCl was required to achieve acceptable recovery and isotopic precision. High concentrations of coexisting nitrate did not significantly affect the measurement of nitrite. Spike tests using natural water samples confirmed the applicability of the resin-based enrichment method under environmentally relevant conditions. In addition, we investigated the vertical distribution of nitrite in Lake Biwa as a case study. For the azide reduction step, both NaCl and azide buffer concentrations affected the accuracy of oxygen isotope values, with NaCl concentration having a particularly pronounced effect. A minimum NaCl concentration of 0.3 mol L^{-1} was required to minimize isotope exchange and ensure accurate $\delta^{18}O$ values. This optimized approach provides a reliable tool for nitrite isotope analysis in low-nutrient aquatic environments and contributes to a better understanding of nitrogen cycling dynamics.

P202 Maximized microbial protein production with hydrogen oxidizing bacteria for simultaneous CO2 fixation and Nr recovery

＊Wen Wang (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, ESC), Yongguan Zhu (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences)

Producing microbial protein (MP) is considered as a promising method for Nr resource recovery and to alleviate the demand for the global protein supply. The conversion of carbon dioxide (CO2) and organic carbon into MP by hydrogen oxidizing bacteria (HOB) is considered as a potent solution. In this study, MP production under mixotrophic condition was 2.4 g/L, higher than the sum of that in autotrophic and heterotrophic mode (1.9 g/L), showing the mutualistic relationship of two pathways. According to functional enzyme analysis, the abundance of glutamate dehydrogenase and glutamine synthetase in the heterotrophic and mixotrophic modes was obviously enhanced (80% - 800% increment), indicating that adding soluble organics could enhance both the direct ("NH4+ → L-Glutamate") and the indirect pathway ("NH4+ → L-Glutamine → L-Glutamate") of NH4+ assimilation in the mixed HOB consortium. For further enhancing MP production, different C/N ratio was evaluated based on mixotrophic mode, achieving amino acid production of 3.3 ± 0.1 g/L and high protein content (58.1%) in C/N-9 reactor. Corynebacterium was dominant (91.4%). In nitrogen assimilation pathway, the higher abundance of glutamine synthetase than glutamate dehydrogenase suggested that NH4+-N was mainly converted via the indirect pathway. With the increase of C/N ratio, 24-48% increment was obtained on glutamine synthetase, along with the decrement of glutamate dehydrogenase. Thus, high C/N ratio could boost the indirect pathway, while performing the negative effect on the direct pathway.

P203 Role of Contour-Felled Logs as a Post-Thinning Treatment on Organic Matter Decomposition in a Cypress Plantation.

＊Kalolaine Kata (Kyushu University), Takuo Hishi (Fukuoka University), Ayumi Katayama (Kyushu University)

Organic matter decomposition is a fundamental process for material cycling in forest ecosystems, particularly in erosion-prone slope environments where soil degradation can hinder long-term conservation. This study examines how contour-felled log (CFL) erosion control treatments influence decomposition dynamics in a Japanese cypress (Chamaecyparis obtusa) plantation following thinning. We investigated how biotic and abiotic factors interact with topography and forest management by comparing three treatments: Control, Contour-felled logs (CFL), and Random-felled logs (RFL) across five slope positions ranging from lower to higher elevations.

Cellulose filter paper was used as a standardized proxy for organic matter decomposition, with mass loss serving as the decomposition indicator. Soil microbial activity was assessed using Substrate-Induced Respiration (SIR) and Basal Respiration (BR), alongside key abiotic soil properties including pH, temperature, soil organic matter (SOM), and moisture content. Laboratory incubations were also conducted to isolate biological responses and evaluate microbial activity under controlled environmental conditions.

The CFL treatment significantly enhanced cellulose decomposition and microbial activity compared to Control and RFL. Among the measured variables, SIR showed the strongest positive correlation with decomposition rate under CFL, highlighting microbial activity as a key driver of decomposition. Importantly, soil organic matter (SOM) emerged as the most significant soil property related to SOM, indicating that improved soil conditions under CFL facilitate microbial processes essential for material cycling. Additionally, SIR demonstrated greater resilience to dry-wetting cycles in CFL plots, suggesting enhanced microbial stability under variable moisture conditions.

These findings demonstrate that contour-felled log treatments not only mitigate soil erosion but also promote resilient microbial activity and organic matter decomposition. Integrating erosion control into post-thinning forest practices supports sustainable forest function and highlights the ecological value of combining conservation strategies with effective ecosystem management.

P204 Carbon sequestration potential and effects on nitrogen dynamics of biochar applied to forest soils

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Biochar, a porous material produced by pyrolyzing biomass under limited oxygen, has attracted attention for its ability to sequester atmospheric carbon in soils. Although its use in agricultural systems has been widely studied, limited research has examined its decomposition and effects on nitrogen dynamics in forest ecosystems—major carbon sinks, particularly in Japan.

This study investigated the decomposition characteristics of biochar, along with its effects on nitrogen dynamics, in three representative forest types: deciduous broadleaf (*Quercus serrata*), evergreen conifer (*Pinus densiflora*), and planted conifer (*Cryptomeria japonica*).
Experimental sites were established in 2023 at Honjo-Waseda Campus of Waseda University (Quercus and Pinus forests) and Tamagawa University (Cryptomeria forest). Three organic treatments were applied to the forest floor: (1) wood chips from coarse woody debris, (2) biochar made from those wood chips, and (3) commercial woody biochar. Decomposition rates were assessed based on mass loss by litterbag experiments. The amount of carbon mineralized was estimated from CO_2 emissions measured in litterbag samples, with adjustments for temperature and moisture dependencies derived from laboratory experiments. Carbon leaching, as another pathway of carbon loss, was quantified as the net flux of dissolved organic carbon (DOC), calculated from the difference in DOC concentrations between throughfall and water percolating from samples. This concentration-difference approach was also used to estimate fluxes of inorganic nitrogen compounds (NH_4^+, NO_3^-, NO_2^-).
After approximately two years, both types of biochar exhibited a residual rate close to 90%, indicating their effectiveness in carbon sequestration compared to wood chips. The primary decomposition pathway was mineralization, with leaching having minimal impact. Additionally, biochar was confirmed to adsorb ammonium ion, which may subsequently alter the nitrogen dynamics in the underlying soil and influence soil microbial communities and plant root activity.

P205 Soil sulfur accumulation under the influence of domestic and transboundary air pollution

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Although sulfur emissions from fossil fuel combustion and other sources have declined, sulfur compounds deposited in the past accumulate in soils, forming a legacy of air pollution. When sulfur input exceeds the sulfur storage capacity of the soil, it can lead to the leaching of toxic aluminum ions, causing harmful environmental effect. However, how these legacy sulfur compounds will be mobilized under climate change remains poorly understood. Therefore, it is urgent to clarify the actual state of sulfur accumulation in soils.
In Japan, domestic sulfur emissions peaked in the 1970s. Since the 2000s, however, increased sulfur input from transboundary air pollution has been observed, particularly along the Sea of Japan coast. This study compares soils from two catchment areas: the Kajikawa catchment in Niigata Prefecture, which has been significantly affected by recent transboundary pollution, and the Lake Ijira catchment in Gifu Prefecture, which was mainly influenced by domestic emissions during Japan's high-pollution era. According to the Ministry of Environment, which assessed the cumulative sulfur load over 25 years nationwide on a seven-tier scale, both regions fall into the highest category. By comparing these two regions, it may be possible to understand the effects of time and environmental factors on the accumulation and mobilization of sulfur compounds in soil.
The aim of this study is to analyze the chemical forms of sulfur compounds from the Kajikawa catchment and compare them with those from the Lake Ijira catchment. Sulfur in soils accumulates primarily as organic compounds and inorganic sulfate ions, with their mobility largely determined by their chemical speciation. Clarifying the chemical speciation of sulfur in soils and identifying the factors contributing to regional differences—such as soil properties and the relative influence of wet and dry deposition—will help improve predictions of future sulfur release from soils under changing environmental conditions.

P206 Phosphorus fertility regulates microbial carbon use efficiency and SOM decomposition in non-allophanic Andosols.

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Soil carbon (C) plays a central role in the global C cycle with the potential to mitigate the elevated atmospheric carbon dioxide (CO_2) concentration by sequestering C into soil organic matter (SOM). Phosphorus (P) availability influences SOM decomposition and microbial processes, including microbial C use efficiency (CUE), determined as the ratio of C allocated to microbial biomass growth to C respired as CO_2. Non-allophanic Andosols are characterized by high organic C contents and strong P retention, but the effects of soil P fertility on C dynamics in these soils remain poorly understood. A 20-day incubation experiment, using ^{13}C-enriched glucose, investigated how soil P fertility level (Truog-P: 157 mg kg^{-1} or 12 mg kg^{-1}), driven by long-term fertilization practices, influenced microbial C dynamics in non-allophanic Andosols. Soil samples (100 g dry soil) were treated with water (control), ^{13}C-glucose (450 mg C kg^{-1}), or glucose with $(NH_4)_2SO_4$ (61 mg N kg^{-1}), and incubated at 25°C with 55% moisture content (w/w). Microbial respiration and biomass C were assessed using NaOH traps and chloroform fumigation-extraction, respectively, and ^{13}C analysis was performed using an EA-IRMS. Microbial biomass P was measured using an anion exchange membrane method with malachite green colorimetry. Results showed SOM priming was P-dependent, with low P soils exhibiting positive priming effects (PEs) due to microbial P-mining, while high P soils with glucose and N additions showed negative PEs. Higher CUE was observed in high P soils after 20 days, reflecting enhanced microbial assimilation. In low P soils, P limitation drove SOM decomposition, reducing CUE. This suggests SOM decomposition associated with microbial P maintenance regulates CUE, and that contrasting P fertilities differently affect substrate-induced microbial assimilation and SOM decomposition

in non-allophanic Andosols.

P207 Medaka begin courtship and spawning behavior from midnight: behavioral observations in natural and semi-natural environments

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Understanding the ecology of organisms in the wild, especially reproductive ecology, which is crucial in their life history, is important from both academic and conservation perspectives. When ecological knowledge in the wild is insufficient, there is a risk of misinterpreting biological phenomena observed in laboratory settings. Medaka (*Oryzias latipes*) has been studied for over a century across various fields including developmental biology, genetics, physiology, and ecology, and is a representative model organism among fish species. However, due to the ease of indoor keeping, breeding, and experimentation, studies on their ecology in outdoor environments, including semi-natural conditions, remain limited. In fact, spawning behavior of medaka has traditionally been thought to occur within one hour before and after sunrise, but empirical research through direct observation under dark conditions in the wild, let alone in the laboratory, has not been conducted. In this study, we investigated the spawning initiation time of medaka and the temporal changes in associated courtship behavior by conducting field observations in natural environments and continuous 24-hour observations of individuals kept under natural light and water temperature conditions. The results revealed that spawning behavior occurs from midnight to early morning, with a peak between 2:00-4:00 AM. Male courtship behaviors toward females, such as "following" and "quick circle," increased from midnight and peaked between 2:00-5:00 AM. This study provides new insights into the reproductive ecology of medaka that have been overlooked until now. Furthermore, we are currently conducting laboratory experiments to compare with these field results. In this presentation, we will also discuss these experimental findings. This study demonstrates the importance of ecological studies of model organisms in their natural habitats for more comprehensively understanding biological phenomena observed in laboratory settings.

P208 Dietary Soybean Isoflavones improves ewe reproductive performance, immunity, and antioxidant defense capabilities by modulating rumen microbiome across different reproductive stages

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Soy isoflavones (SI), phytoestrogenic compounds derived from plants, demonstrate estrogenic bioactivity, antioxidant potential, and lipid metabolism-modulating properties. While existing research has focused on humans, sows, and female murine models, their reproductive regulatory mechanisms in ewes remain underexplored. This study systematically investigated the effects of dietary SI supplementation in Hu sheep ewes across key reproductive stages (sexual maturity, estrus, gestation, lactation). Twenty healthy Hu sheep ewes (1.5 months old) with similar body weight (BW; mean: 17.82 ± 0.98 kg) were randomly divided into a control group (Con) and an SI group. The Con group received a basal diet, while the SI group was supplemented with 30 mg/kg BW of SI in the basal diet. Feed the experimental ewes until sexual maturity (7 months of age), perform estrus synchronization and artificial insemination, and continue feeding SI to the successfully pregnant ewes until the end of the lactation period. Results revealed that SI significantly enhanced serum reproductive hormone levels (E2, FSH, LH, P4) during sexual maturation, gestation, and lactation, with concurrent increases in LH and P4 during estrus ($p < 0.05$). Antioxidant capacity improved through elevated CAT (sexual maturity/lactation), GSH-Px (estrus/lactation), SOD, and T-AOC (gestation), alongside reduced MDA (gestation) ($p < 0.05$). Immune function was augmented via upregulated IgA/IgG throughout the reproductive cycle and IgM during sexual maturation/gestation ($p < 0.05$). Rumen microbiota analysis showed increased acetate production during lactation and reduced abundance of *unclassified_Lachnospiraceae* (estrus) and *Prevotella* (lactation) ($p < 0.05$). Correlation analyses identified significant associations between microbial taxa (*unclassified_Lachnospiraceae* positively with SOD/P4; *Prevotella* positively with T-AOC/MDA) and metabolic parameters ($p < 0.05$). These findings demonstrate that SI optimizes reproductive performance through coordinated modulation of endocrine signaling, antioxidant defenses, immune activity, and rumen microbial ecology, providing mechanistic insights into phytoestrogen-mediated reproductive regulation in ovine species.

P209 Elucidating the reproductive ecology of the genus *Onychodactylus* using environmental DNA

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Due to their mysterious life histories, the reproductive season of two clawed salamander species (*Onychodactylus koreanus* and *O. sillanus*) is unknown. Recently, cryptic species have been the subject of environmental DNA (eDNA) investigations, which offer a noninvasive and cost-effective method for verifying their ecology. Through an analysis of eDNA concentration changes

and population dynamics in their habitat over the course of a year, this study aims to identify the reproductive season for the *O. koreanus* and *O. silanus*. We developed a species-specific qPCR primer and probe that targets the *CO1* region of the mitochondria. In addition to demonstrating adequate sensitivity for environmental sample amplification, the developed primer and probe's specificity was validated by both in-silico and tissue DNA assays. According to our monitoring results, new larvae recruitment of *O. koreanus* and *O. sillanus* in June and October. In the *O. koreanus*, eDNA peaks were confirmed twice a year, in May and December, but in July and December in the *O. silanus*. Although the times of eDNA peaks in the two species were different, the pattern of two peaks was similar. Based on the fact that larvae were recruited twice a year, that eDNA peaks appeared twice, and that eggs were spawned in December during the survey period, it was confirmed that the *O. koreanus* and the *O. silanus* breed twice a year. In the future, we plan to develop an nDNA marker to more clearly identify the reproductive season and confirm the changes in nDNA-eDNA concentration throughout the year. This study is important in that it was the first to verify the reproductive ecology of the genus *Onychodactylus*.
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P210 How Kentish plovers respond to chick vocalizations: A decision-making analysis using Bayesian Network and Random Forest models

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Parent-offspring acoustic communication is an invaluable mechanism in numerous bird species, enabling the full request of parental care. Compared to passerines, the mechanisms of most shorebirds remain poorly understood despite their widespread use for contact between parents and chicks in open areas. The Kentish plover (*Anarhyncus alexandrinus*), widely distributed across Eurasia and North Africa, is a well-known species for parental care behaviors. These behaviors play an essential role in the survival of chicks, which employ vocal signals to request necessities from their parents. Here, we studied the vocalizations of Kentish plovers to elucidate how parents respond to their chick vocalizations. We recorded 957 responding affiliative calls of four reported contact call-types (types A, B, B-long, and C) from nine nests (eight females and six males) from March to July in 2014 and 2020. We constructed the decision-making models of parent responding calls using a Bayesian network (BN) model and conducted a random forest (RF) model to determine the most influenced vocal properties. As a result, the BN model exhibited higher accuracy in identifying types B-long and C compared to types A and B. Additionally, the BN model revealed specific distinctions between types B-long and C. The RF model indicated that chick vocal properties were more closely associated with the vocal properties of type B-long than with those of type C. Our findings offer substantial insights into the vocal communication mechanisms in the parent-offspring interactions of shorebirds, particularly concerning the roles of affiliative vocal types of parents.

P211 Parasites on parasites on parasites: First Report of Phoresy of Two Cuckoo-Specific Ectoparasites

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It has been fundamentally announced that phoresy through louse flies (Hippobocidae) is used by host-generalist ectoparasites because louse flies are also host generalist. So, host-specialist ectoparasites have been known that they are difficult to use louse flies as phoresy vector, because there is no guarantee that louse flies will move to a suitable host. Feather mite and bird louse are well-announced as host-specialist ectoparasites, so they should disperse to suitable specific host individuals to successful breeding dispersal. For the reason, these ectoparasites are generally dispersed vertically from parent to offspring, and horizontally among individuals within dense flock. However, dispersal way of parasitic cuckoo-specific parasites is ambiguous because they do not raise offspring and also live solely without even pairbond. In this study, but, we found that cuckoo-specific feather mite (*Scutalges* sp.) and bird louse (*Cuculicola* sp.) used louse flies as phoresy vector by sampling louse flies on bodies of several parasitic cuckoos. Of course, we cannot conclude that phoresy is major dispersal way to cuckoo-specific parasites because only a very small number of the louse flies collected contained specific parasites, and dominant species of feather mite (*Coraciacarus cuculi*) and bird louse (*Cuculoecus* sp.) were not observed on samples. Nevertheless, this new discovery is meaningful to reveal dispersal way of parasitic cuckoo-specific ectoparasites which has not been announced yet.

P212 Using olfactometers to test dung beetle diel activity and olfactory response

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Olfactometers are widely used tools to assess insect responses to volatile organic compounds. One of the insects tested with this apparatus is the dung beetle, which relies on these compounds to locate and utilize dung. Because competition for these ephemeral resources is high, and due to other physiological factors related to thermoregulation, different species of dung beetles have varying time frames in which they are active during the day. The diel activity of dung beetles was mainly determined through field experiments. However, field experiments are labor- and resource-intensive, and susceptible to adverse weather conditions such as rain. Therefore, this study proposes a method that allows olfactometers to measure diel activity and olfactory response

of dung beetles simultaneously. To do this, a four-trap olfactometer was designed to test the diel activity of dung beetles and the preference between carnivore, herbivore, and omnivore dung. The diel activity was examined by checking the traps every three hours from 07:30 to 19:30. Six species were used across six experiments with different combinations of dung. The results for the diel activity indicated that dung beetles were active at specific times of the day, while the dung preference was less clear. This suggests that measuring diel activity for dung beetles using olfactometers in laboratory conditions is feasible, although improvements to olfactometer design are needed to yield more accurate results for olfactory response. Conducting two experiments at the same time in laboratory environments could save time and resources, while ultimately enhancing our understanding of dung beetle morphology, evolutionary history, and life cycle.

P213 Effects of temperature on the symbiont acquisition by the host insect, *Riptortus pedestris* (Hemiptera: Alydidae), from soil environments

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Riptortus pedestris acquires symbiotic bacteria from the soil during the nymphal stage. In this study, we investigated the effects of temperature on symbiont acquisition by *R. pedestris* with varying bacterial abundance and food availability. First, symbiont acquisition rates of nymphs were evaluated when they were exposed on the soil arena (ca. 3 cm^2) fully covered with symbionts at five abundance levels (10^4, 10^5, 10^6, 10^7, and 10^8 cells/g) across six temperatures (10, 15, 20, 25, 30, and 35℃). Over 96 hours, >96% of nymphs successfully acquired symbionts from soil when treated with ≥10^6 cells/g at ≥25℃. Second, symbiont acquisition rates were evaluated along with walking patterns of nymphs in the arena (ca. 64 cm^2) with a single symbiont patch (10^7 cells/g) covering 12% of the surface area under the six temperatures. All nymphs successfully acquired symbionts between 25 and 35℃, with the highest movement frequency and distance observed at 30℃. However, below 25℃, both the symbiont acquisition rates and walking movement showed gradual decrease with temperature decrease, resulting in 3% acquisition rate at 10℃. Third, in a larger experimental arena (ca. 8,100 cm^2) where multiple symbiont patches (10^7 cells/g per patch) were randomly established covering 1%, 2%, 3%, and 4% of the surface area, symbiont acquisition rates of nymphs were evaluated at 25℃ and 30℃. The acquisition rates decreased as the symbiont coverage decreased, while yielding higher rates at 30℃. Finally, the descending behavior by nymphs from plant to soil, which is a prerequisite step for nymphs to acquire the symbionts, was evaluated across the six temperatures varying with food availability. When the nymphs were placed on an artificial plant structure without food, all nymphs descended across the tested temperatures except for 10℃; however, when food was provided on the structure, <40% of the nymphs descended to the floor.