

*Tropical ecology:
Many species,
many challenges*



6th EUROPEAN
CONFERENCE
OF TROPICAL ECOLOGY

CESKE BUDEJOVICE
Czech Republic
19 - 23 June 2023



6th European Conference of Tropical Ecology

6th European Conference of Tropical Ecology

&

34th Annual Meeting of the Society for Tropical Ecology
(Gesellschaft für Tropenökologie, gtö)

Society for Tropical Ecology



Jihočeský kraj



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University of South Bohemia
in České Budějovice
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WELCOME FROM THE ORGANISERS

THE LOCAL ORGANISING COMMITTEE CORDIALLY WELCOMES YOU TO THE
6th EUROPEAN CONFERENCE OF TROPICAL ECOLOGY AND
34th THE ANNUAL MEETING OF THE SOCIETY FOR TROPICAL ECOLOGY

Katerina SAM – Biology Centre of Czech Academy of Sciences

Michaela BOROVSANKA – Biology Centre of Czech Academy of Sciences

Eva KRIEGOVA – Biology Centre of Czech Academy of Sciences

Hana BUTTERILL – Biology Centre of Czech Academy of Sciences

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The Local Organising Committee and the Society for Tropical Ecology would like to thank the following institutions, partners, and sponsors for their support:



EDITORIAL NOTE

Abstracts of the 6th European Conference of Tropical Ecology & 34th Annual Meeting of the Society for Tropical Ecology, Ceske Budejovice, 19-23 June 2023

In the past, abstracts of the European Conferences of Tropical Ecology and Annual Meetings of the Society for Tropical Ecology were printed as booklets handed out only to congress participants. Subsequently, PDF files of the booklets were placed on the webpage of the Society for Tropical Ecology (<https://soctropecol.eu/content/conference-abstracts>). To make abstracts more widely accessible from the very beginning, the Society for Tropical Ecology has decided to publish them in ECOTROPICA. Therefore, this issue of ECOTROPICA includes the abstracts of all oral presentations and posters presented at the 6th European Conference of Tropical Ecology & 34th Annual Meeting of the Society for Tropical Ecology, which took place in Ceske Budejovice (Czech Republic) on 19-23 June 2023. This conference was organized by Dr. Katerina Sam and her team from the Biology Centre of Czech Academy of Sciences and the Faculty of Science of the University of South Bohemia. The congress organizers reviewed all abstracts and accepted them after possible corrections or modifications from the authors. The abstracts are printed here as finally accepted by the organizers.

Eckhard W. Heymann & Marco Tschapka, Editors ECOTROPICA

Tuesday 20th of June

08:45 - 09:15	Opening ceremony (Building C - C2)				
09:15 - 10:15	Rodrigo Camara Leret - Plenary talk 60 min (Building C - C2)				
10:15 - 10:45	Coffee break 30 min (Foyer of C building)				
	Session 1 (part 1) - room C2		Session 5 (part 1) - room C1		Session 7 - room B2
10:45 - 11:00	T1 Farwig Nina	Environmental changes in biodiversity hotspot ecosystems of South Ecuador: ReSponse and feedback effECTs	T20 van Elst Tobias	Patterns and processes of diversification in an entire primate genus: the case of cryptic mouse lemurs	T39 Sreetama Bhadra Genome size and trait flexibility affect evolutionary radiations in a tropical plant family
11:00 - 11:15	T2 Neuschulz Acosta-Rojas	Systematic reduction in seed rain of large-seeded and endozoochorous species in pastures compared to forests of tropical mountains	T21 Lehman Shawn	Dispersal dynamics of four mammal Species in fragmented dry forests of Northwestern Madagascar	T40 Elizabeth Joyce Ancient paleoenvironment shaped biogeographic patterns and processes in the megadiverse Southeast Asian flora
11:15 - 11:30	T3 Homeier Jurgen	The functional structure of a tropical montane forest and the importance of rare tree species	T22 Zhang Liye	Genomic adaptation to saltwater consumption and small population size in Cat Ba langurs	T41 Joao de Deus Vidal Junior Predicted biodiversity loss in the Afromontane flora under different emission scenarios
11:30 - 11:45	T4 Barczyk Maciej	Environmental conditions differently shape leaf, seed and seedling trait composition between and within elevations of tropical montane forests	T23 Tournebize Remi	How can we infer recent fragmentation using genetic data?	T42 Venni Keskiniva Fiddlehead fever: 23 new species discovered in the Neotropical fern genus Danaea
11:45 - 12:00	T5 Andre Velescu	Response of element fluxes and budgets to nutrient additions in a tropical montane forest in South Ecuador	T24 Barratt Chris	Life on the edge: a new informatic toolbox to predict population vulnerability to global change	T43 Maurice Leponce Large old tropical trees as pools of biodiversity: the Life On Trees program
12:00 - 12:15	T6 Tobias Fabian	Vertical distribution of $\delta^{13}C$ values in soils to predict N mineralization rates under forest and pasture along an elevation gradient in South Ecuador	T25 Mendez Laura	Demographic history of Malagasy palms: climate and humans leading to population declines	T44 Marina Franco de Almeida Maximiano Comparing Bird assemblages of rivers with different geological histories
12:15 - 12:30	T7 Giovanni Bianco	The diversity of tree-related microhabitats across climate and land-use gradients on Mount Kilimanjaro (Tanzania)	T26 Ranavat Surabhi	Genomic signatures of inbreeding depression and mutation load in a threatened African timber tree, <i>Pericopsis elata</i> (Fabaceae)	T45 Maël Doré Müllerian mimicry: one ring to bring them all, and in the jungle bind them
12:30 - 12:45	T8 van Kuijk Marijke	Impact of hunting on the functional traits of animal and tree communities	T27 Kamdem Narcisse	Phylogeography of a tree species with high economic potential of the African tropical rainforests: <i>Coula edulis</i> Baill (Coulaceae)	<u>Lightning talks</u> : Chi-Chuan Chen P8 (Unraveling the biodiversity and formation of <i>Adiantum</i> in South America: insights from phylogenetic analysis) (T46)
12:45 - 13:00	T9 Blüthgen Nico	Reassembly of species, interactions and functions in a naturally recovering rainforest	T28 Matvijev Katarina	Seed and pollen dispersal of <i>Staudtia kamerunensis</i> Warb. (Myristicaceae), a timber species of Central African rain forests	FREE SLOT (T47)

13:00 - 13:15	Translocation				
13:15 - 14:30	Lunch 1h 15 min				
	Session 1 (part 2) - room C2		Session 5 (part 2) - room C1		Session 11 (part 1) - room B2
14:30 - 14:45	T10 Mendes Diniz	First insights into the recovery of pollinator communities and their interaction networks within the REASSEMBLY research unit in the Chocó biodiversity hotspot	T29 Hardy Olivier	Discordant phylogeographic patterns between plastid and nuclear genomes in the clade Berlinia (Fabaceae): are African trees evolving as syngameons?	T48 Demirel Maza-esso Bawa Impact of wildfires on biodiversity and spatio-temporal dynamics in Togodo protected area complex in Togo (West Africa)
14:45 - 15:00	T11 Rebello Landim Anna	A trait-based framework to assess plant functional connectivity mediated by animal seed dispersers	T30 Chen Chi-Chuan	On the phylogeny and diversity of Microsoroideae (Polypodiaceae)	T49 Eckhard W. Heymann Hope for a critically endangered, endemic Neotropical primate despite strong habitat fragmentation?
15:00 - 15:15	T12 Ausprey Ian	Dispersal Limitation Predicts the Spatial and Temporal Filtering of Tropical Bird Communities in Isolated Forest Fragments	Lightning talks: Laura Albrecht P6 (Species delimitation of threatened African rosewood species of the genus Pterocarpus ...), Guilain Tsetagoho P7 (Population structure and local parasite assemblages in the conservation flagship species, the Grey-necked Picathartes) (T31-32)		T50 Marin Molina Franklin Geovanny Restoration of Andean tropical forests: Observational and Experimental plots
15:15 - 15:30	T13 Ocampo Ariza Carolina	Regional differences in functional and taxonomic bird diversity patterns in tropical agroforests			T51 Ales Bucek Convergent evolution of termite defence
15:30 - 15:45	T14 Basham Edmund	The Vertical Stratification of Gabonese Amphibians	FREE SLOT (T33)		T52 Hanna Tuomisto Unraveling the realised niches of Amazonian ferns: implications for community assembly and species richness
15:45 - 16:15	Coffee break 30 min (Foyer of C building)				
	Session 1 (part 3) - room C2		Session 11 (part 2) - room C1		Session 11 (part 3) - room B2
16:15 - 16:30	T15 Heveakore Maraia	Arthropods density and herbivory damage along the forest vertical gradient of wet tropical forest in Papua New Guinea	T34 József Geml	Environmental drivers of fungal community composition along elevation gradients in neotropical and paleotropical forests	T53 Noreen Mukhwana Mutoro Modeling cheetah (Acinonyx jubatus) distribution before and aftermajor habitat modification insouth-eastern Kenya
16:30 - 16:45	T16 Finnie Sam	Vertical stratification and defensive traits of caterpillars against parasitoids in a tropical forest in Central Cameroon	T35 Aymeric Oliveira-Xavier	Cocoa agroforests as a tool for biodiversity conservation in human-modified tropical landscapes: the importance of landscape composition and configuration	T54 Chris Bousfield Large-scale impacts of selective logging on canopy tree beta-diversity in the Brazilian Amazon (ONLINE)
16:45 - 17:00	T17 -T19	Lightning talks (combined session 1 and 11): Andrea Nieto P1 (Seed trait diversity and seed rain in tropical dry forests of southern Ecuador), Nadia Sabchuk P2 (Fruit-bat mutualistic interactions in urban neotropic environments), Jozsef Geml P12 (Tree community structure and abiotic factors ...),	T36 Jonas Depecker	Effects of rainforest disturbance and recovery on tree species composition and community traits in the Yangambi area of the Democratic Republic of the Congo	T55 Felicity Newell Contrasting bird-plant and bird-insect phenology structured by dynamic response of arthropods to rainfall extremes.
17:00 - 17:15			T37 Johanna Van Passel	Legacy effects of previous climatic events on the Amazon drought response	T56 Pauline Rosina Jennert Through the taxonomic jungle: towards an integrative taxonomic revision of the mahogany tree genus Toona (ENDL.) M.ROEM.

17:15 - 17:30	T17 -T19	Dominic Andreas Martin P13 (Land-use history in tropical agroforestry), Nadia Sabchuk P14 (Frugivory by Bats in Urban Atlantic Forest remnants), Norbert Kunert P15 (Tree rings indicated a higher drought resistance in mixed species tree plantations than in monospecific plantations), Caka Karlsson P16 (The natal dispersal pattern of Yellow-billed Kites Milvus aegyptius in Nigeria), Mereci Guam JV P17 (Functional properties of Andean upper montane forest trees)	T38 Shao Xiong Chui	How much sticky stuff is there? Estimating resin source availability for stingless bees in Southeast Asian lowland dipterocarp forests	T57 Nadia Sabchuk	Bats of Atlantic Forest in the state of Paraná (from Session 6)
17:30 - 20:30	Poster session with beer stall - until 20:30 (Sponsored by Budweiser Budwar brewery, Foyer of C building)					

Wednesday 21st of June						
09:00 - 10:00	Antonín Macháč - Plenary talk 60 min (Building C - C2)					
10:00 - 10:30	Coffee break 30 min (Foyer of C building)					
	Session 3 (part 1) - room C2		Session 2 (part 1) - room C1		Session 6 - room B2	
10:30 - 10:45	T58 Mike Teucher	BIOCULT- Harnessing synergies between cultural traditions and biodiversity protection in theory and practice	T73 Omer Nevo	Tropical chemical ecology - current questions, future trends	T88 František Vejmelka	Recording diversity of non-volant mammals in the rainforest-covered mountains of New Guinea
10:45 - 11:00	T59 Marianne Wughanga Maghenda	The Effects of Customary Fires for Rainfall Attraction in Taita Hills, Taita Taveta County Kenya.	T74 Xue Xiao	Cry for help : Ficus enhanced their inducible defence with the development of drought	T89 Elise Sivault	Is bat diversity easily determined in the tropics? A field comparison between Papuan rainforests and Peruvian agroforests
11:00 - 11:15	T60 Thomas Schmitt	The last forest fragments of East Africa represent highly important refuge areas for butterfly conservation: the example of Kaya Kambe (southern Kenya)	T75 Katharina Brandt	Floral scents in the Neotropical orchid genus Catasetum: Daily fluctuation in scent emission depends on euglossine pollinating genera	T90 Pierre-Michel Forget	Day and night in a rainforest: there is a rich obscure animal diversity in there

11:15 - 11:30	T61 Halimu Suleiman Shauri	Integrating Cultural Values to Strengthen Conservation Action: The case of sacred Kaya Kambe forest in southern Kenya	T76 Sara Leonhardt	Resin producing plants and stingless bees: an underrated relationship?	T91 Luke Gibson	Human disturbance modulates the species-area relationship among mammals in insular forest fragments
11:30 - 11:45	T62 Marlon Wichmann	Multivariate-statistical analysis of the relationship between the use of ecosystem services and the willingness to protect the Kaya Kambe (Kenya) based on empirical data	T77 Linh M.N. Nguyen	Evolution of fruit scent in Madagascar's figs	T92 Radim Šumbera	How to study ecology and diversity of tropical mammals living belowground?
11:45 - 12:00	T63 David Keck	Multi-method research on the importance of traditional and state actors in forest conservation in Kenya, based on the example of Kaya Kambe	T78 Gerald Franklin Schneider	The branching off of the fruit chemical environment: Using metabolomics to identify patterns of divergence in the secondary metabolites of leaves and fruit within two hyperdiverse pantropical plant genera	T93 Jan Robovský	Evolutionary inspections of large (African) mammals: some advances and limitations
12:00 - 12:15	T64 Habtamu Assaye Deffersha	Conservation and Restoration of the Ethiopian Church Forests; a case study at Tara Gedam Church Forest	T79 Martin Volf	Why are tropical plants chemically diverse: latitudinal trends in various dimensions of chemical diversity	T94 Rosie Drinkwater	Understanding iDNA detections with occupancy models
12:15 - 12:30	T65 Solomon Addisu Legesse	Climate change mitigation strategies: The role of Ethiopian church forests	T80 Lena Husemann	The importance of scent for Hoffmann's two-fingered sloths (<i>Choloepus hoffmanni</i>)	T95 Johannes Nicolaas (Yannick) Wiegers	Evaluating density estimation methods for unmarked wildlife with trail cameras in a Neotropical forest
12:30 - 12:45	Group photo					
12:45 - 13:00	Translocation					
13:00 - 14:15	Lunch 1h 15 min					
14:15 - 15:15	Zuzana Musilová - Plenary talk 60 min (Building C - C2)					
15:15 - 15:45	Coffee break 30 min					
	Session 3 (part 2) - room C2		Session 2 (part 2) - room C1		Session 10 - room B2	
15:45 - 16:00	T66 Tobias Seifert	Biodiversity and Ecosystem Functions Across Afro Tropical Forest islands	T81 Kim Valenta	The Sensory Ecology of Fear: African elephants show aversion to olfactory predator signals	T96 Ernesto Bonadies	Revising the "Insect apocalypse": Are tropical insect pollinators facing genetic erosion?
16:00 - 16:15	T67 Maarifa Ali Mwakumanya	Evaluation of the Land cover Land use (LCLU) Change on the Taita hills forest fragments in Ngerenyi area, Taita Taveta County in Kenya	<u>Lightning talks:</u> Laura Gomez Devia P3 (Effects of Temperature Gradient on Functional Fruit Traits), Evangelia Linda Chronopoulou P4 (Fruits and Microbes, Friends or Foes? The hidden role of microbes in fruit chemical signaling to seed dispersers) (T82)		T97 Gemma Nydia Villagómez	Resource intake of stingless bee colonies in a Neotropical rainforest

16:15 - 16:30	T68 Gladys Nyakeru Kung'u	Effect of human activities on vegetation structure and arthropod availability in the Taita Hills: implication for birds	Session 8 - room C1		T98 Ugo Mendes Diniz	No “perfect fit” between bats and flowers: the ecological drivers of interactions between plants and anthophilous bats in a Neotropical savanna
			T83 Mateus Dantas de Paula	The challenges and importance of dynamic vegetation modeling in the tropics		
16:30 - 16:45	T69 Girma Kelboro Mensuro	Land use transitions in the rural-urban interfaces of Hawassa in Sidama Region of Ethiopia: Implications to agrobiodiversity	T84 Gabriela Zuquim	Effects of soils in drivingbiogeographic and plant use patterns in Amazonia	T99 Robert Tropek	Elevational patterns of specialisation in pollination networks in rainforests of Mount Cameroon
16:45 - 17:00	T70 Dominic Andreas Martin	Drivers and consequences of archetypical shifting cultivation transitions	T85 Rajit Gupta	Modelling the distribution of tropical forests and tree species under changing climate: Implications for conservation in India	T100 Sailee Sakhalkar	Unveiling the Role of Module Persistence in the Spatiotemporal Dynamics of Pollination Networks in Afrotropical Forests
17:00 - 17:15	T71 Michèle von Kocemba	The price of conservation: An effectivity analysis of biodiversity conservation in the protected areas of the Mount Elgon region, Uganda.	T86 Xingyan Cao	Lianas reduce forest-level carbon storage more than previously thought	T101 Štěpán Janeček	Pollination syndrome hypothesis: the role of floral traits in shaping plant-pollinator interactions.
17:15 - 17:30	T72 Barbora Winterová	Sri Lankan Marine Protected Areas demonstrate low levels of protection and establishment efficiency	T87 Ashehad A. Ali	The response of oil palm, rubber and tropical forest plant functional types in the Community Land Model (CLM5) to inter-annual variations in climate	Lightning talks: Claudia Viganò P9 (Exploring plant-animal interactions in the canopy: ...), Patricia Landaverde P10 (Wild bee and not honeybee behaviour on coffee plantation is the responsible of coffee pollination), Dominik Anýž P11 (Do selfing rates rise with elevation as pollinator activity decreases in Afromontane grasslands?), Oriana Bhasin P18 (Is size important? Revealing the pollination process of Arican canopy trees) (T102)	
17:30- 20:00	General Assembly meeting for members AND Continuation of poster session in foyer					

Thursday 22nd of June						
09:00 - 10:00	Trisha Gopalakrishna - Plenary talk 60 min (Building C - C2, speaker online)					
10:00 - 10:45	Coffee break 45 min					
	Session 3 (part 3) - room C2		Session 1 (part 4) - room C1		Session 4 - room B1	
10:45 - 11:00	T103 Maria Fungomeli	Sacred forest fragments exhibit high forest structure, species composition and diversity: A study of the plant diversity and community structure of the Coastal forests of Kenya	T119 Bettina Engelbrecht	Drought response traits in tropical deciduous woody species: opposite relation of turgor loss point to rainfall than in evergreen species	T135 Petr Klimes	Tropical ant diversity and biomass: progress and gaps in knowledge

11:00 - 11:15	T104 Maria Eugenia Degano	Variation in Nature's non-material Contributions to People across habitats: A context-specific perspective at Mount Kilimanjaro	T120 Anita Weissflog	Microbial plant-soil feedbacks affect secondary succession of tropical rainforests	T136 Sabine Nooten	The abundance, biomass, and distribution of ants on Earth
11:15 - 11:30	T105 Demirel Maza-esso Bawa	Ecological analysis of non-timber forest products production areas in Northern of Togo (West Africa)	T121 Lucie Houdková	Topography and temporal variation in recruitment help to maintain species diversity in tropical forest of Papua New Guinea	T137 Jochen Drescher	Land-use change affects biodiversity and functions of Sumatran ant communities across strata
11:30 - 11:45	T106 Alfred Kik	A shift in interest from hunting among the young, educated Papua New Guineans: Implications for conservation	T122 Marion Boisseaux	Linking functional leaf and root traits with endophytic communities in seedlings in a seasonally flooded tropical forest. (talk online)	T138 Philipp Hoenle	Functional and phylogenetic consequences of disturbance on tropical canopy ants
11:45 - 12:00	T107 Melese Merewa Reta	Human - wildlife conflict in forest arm interface of Guraferda and Arsi Negele districts, Ethiopia	T123 Tomonari Matsuo	Drivers of successional changes in functional trait composition in Ghanaian tropical wet forests	T139 Jan Lenc	Diel Foraging Activity of Ants between Primary and Secondary Forests in Papua New Guinea
12:00 - 12:15	T108 Ronja Knippers	Social dimensions of conflict with crop-raiding peccaries in rural Suriname	T124 Piotr Szefer	The effects of pathogenic fungi, herbivores, and predators on pioneer vegetation of tropical forests change with elevation	T140 Michael Staab	Dear neighbor: trees with extrafloral nectaries facilitate defense and growth of adjacent undefended trees
12:15 - 12:30	T109 Anna Rebello Landim	A framework for restoration of ecological processes derived from trophic interactions	T125 Lina Avila Clasen	Moss-associated nitrogen fixation across an altitudinal gradient in cloud forests and páramo ecosystems in Costa Rica	T141 Milan Janda	Phylogeny and ecological history of Philidris ants reveal a broad relationship with myrmecophytes
12:30 - 12:45	T110	FREE SLOT	T126	FREE SLOT	T142 Verónica Barraón Santos	Composting in ant-plant nests? Metabolic potential of bacterial communities for degrading chitin- and cellulose-rich substrates in ant-made patches
12:45 - 13:00	Translocation					
13:00 - 14:00	<div>Lunch 60 min</div>					
	Room C1		Session 11 (part 4) - room C2		Session 9 (part 1) - room B2	
14:00 - 14:15	T111	FREE SLOT	T127 Georg Küstner	Natural pest control in smallholder agroecosystems of sub-Saharan Africa is modulated by functional diversity of natural enemies and landscape composition	T143 Katerina Sam	Forest canopy insects are safer from predators in the tropics than at higher latitudes
14:15 - 14:30	T112	FREE SLOT	T128 Iago Ferreiro Arias	Unveiling the extent and magnitude of overhunting impacts on tropical bird communities	T144 Jan Kollross	Predator exclusion in tropical forests: Impacts on herbivory and arthropod communities along different vertical strata

14:30 - 14:45	T113	FREE SLOT	T129 Tamara Hartke	Impact of land-use change on abundance, biomass, and functional and phylogenetic diversity differs between Sumatran beetle families	T145 Markéta Houska Tahadlová	Trophic cascades in tropical rainforests: Effects of vertebrate predator exclusion on arthropods and plants in Papua New Guinea
14:45 - 15:00	T114	FREE SLOT	T130 Modestine Kompanyi Amisi	Structure and Diversity of the forests of the Lomami, Democratic Republic of the Congo	T146 Amelia Joyce Philip	Top-down control of spiders in Australian forests
15:00 - 15:30	Coffee break 30 min (Foyer of C building)					
	ERC Funding session - room C1		Session 11 (Part 5) - room C2		Session 9 (part 2) - room B2	
15:30 - 15:45	European Research Council - funding opportunities for excellent research (Workshop, Sara Perez Serrano)		T131 Sandoval Calderon Ana Patricia	Camelid herding regulates biotic homogenization in Andean grasslands	T147 Daniel Linke	Anti-predator defences of neotropical Skipper butterflies (Hesperiidae), more complex than previously thought
15:45 - 16:00			T132 Karolina Brandlova	The importance of semi-captive population for Western Derby eland conservation	T148 Martin Libra	Beta diversity in a tropical rainforest is higher for parasitoids than their caterpillar hosts.
16:00 - 16:15			T133 Tereza Vlasata	Population genetic structure and kinship of an endangered fossorial rodent, the giant root-rat (Tachyoryctes macrocephalus)	T149 Warbota Khum	Reforestation types impact the effect invertebrate predators on decomposition rate in tropical forest
16:15 - 16:30			T134 Kerstin Hikel	The role of bushpigs (Potamochoerus larvatus) as seed dispersers in indigenous forests in South Africa	T150 Patrick Jansen	Prey tracking and predator avoidance in tropical forest mammals: a camera-trapping approach
16:30 - 17:00	Closing ceremony (Building C - C2)					
18:00 - 01:00	Conference dinner - Hotel Clarion					



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Plenary talk

Unveiling the hidden web of knowledge

CÁMARA-LERET Rodrigo¹

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Indigenous communities depend to a large extent on their knowledge about plants for food, shelter, and medicine. Unlike the burning of the Library of Alexandria, however, the knowledge that non-literate societies have acquired may vanish in silence. Here, I will introduce a novel framework of “indigenous knowledge networks” to study how knowledge about plant services is structured locally, how it varies regionally, and how it may be eroded in the face of global change. Since indigenous knowledge is transmitted orally, I will also discuss its distribution across the world’s languages and to what degree it is affected by cultural vs. biological extinction. With these examples, I hope to illustrate why studying both biological and cultural diversity matters for biodiversity conservation.

Funding: Swiss National Science Foundation, Starting Grant 211659

Web and/or Twitter account: www.rcamaraleret.com, @R_CamaraLeret

Tuesday, 09:15 – 10:15 Plenary talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Plenary talk

Disentangling the causes of tropical megadiversity

MACHAC Antonin¹¹*Microbiology Institute, Vídeňská 1083, 142 20 Krč - Praha 4***E-mail:** A.Machac@email.cz

Why tropics harbour extraordinary biodiversity has been one of the fundamental enigmas in biology. Three prominent explanations have emerged: (1) tropics have had a long time to accumulate species, (2) tropics serve as a cradle and a museum of diversity, (3) tropics provide high energy for the coexistence of many species. My talk will explore how these three explanations can be reconciled and integrated. Building on diversification analyses, GIS and null models, I will demonstrate how diversification changes over time and as a function of regional energy, using amphibians, reptiles, birds and mammals as the model organismal systems. One promising way to integrate the wide variety of patterns (e.g. geese, penguins, birds) and the mechanisms behind them (time, diversification, energy limits) is to explicitly consider the effects of temporal, phylogenetic and geographic scale. Namely, vertebrate results suggest that time dominates at small scales, diversification rates at intermediate scales, and energy limits at large scales. The patterns and the mechanisms that generate the patterns therefore seem to be scale-dependent. Integrated knowledge of the processes generating the tropical megadiversity might, consequently, advance theory, reconcile many of the previous empirical results, and help safeguard biodiversity for the future.

Funding: NA**Web and/or Twitter account:** <https://machac.weebly.com> @TropEcol (NA in case you do not wish to provide)

Wednesday, 09:00 – 10:00 Plenary talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Plenary talk

See you in the dark: visual ecology of the deep-dwelling fishes**MUSILOVA Zuzana¹, Indermaur Adrian², Cortesi Fabio³**¹*Department of Zoology, Faculty of Science, Charles University, Viničná 7, Prague, Czechia*²*Zoological Institute, University of Basel, Vesalgasse 1, Basel, Switzerland*³*School of Biological Sciences and Queensland Brain Institute, The University of Queensland, Brisbane, QLD 4072, Australia***E-mail:** zuzmus@gmail.com, zuzana.musilova@natur.cuni.cz

In extreme environments like the deep sea or deep freshwater lakes, the inhabitants face significant challenges. In evolution, different species of fishes have adapted to these conditions. The absence of light and a narrower colour spectrum have triggered emergence of numerous adaptations of the visual system in deep-water fishes. Here I will mostly focus on the link between molecular adaptation and the (visual) ecology of different species, specifically tropical crater lake cichlids and deep-sea fishes. Cichlids in the Barombi Mbo crater lake (Cameroon) have undergone ecological speciation resulting in an endemic species flock that has diversified in terms of trophic resources and habitat preferences. Two species have preferentially inhabited the dim and hypoxic deep-water zone. We used genomics and transcriptomics to explore genes responsible for visual sensory system. Deep-dwelling species have optimized colour vision for the light spectrum in the depth. Similarly, deep-sea fishes show numerous adaptations to enhance their vision in darkness, including loss of red photoreceptors, but also boost of the unique and novel rod-based receptors sensitive to the blue-green light. Interestingly, deep-sea fish larvae reside in shallow waters, so any evolved adaptations must reflect the needs of both developmental stages: the shallow-water larva and the deep-water adult.

Funding: NA**Web and/or Twitter account:** www.FishEvo.com, [@zuzmus](https://twitter.com/zuzmus)

Wednesday, 14:15 – 15:15 Plenary talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Plenary talk

The complexities of forest restoration: an Early Career Researcher's perspective**GOPALAKRISHNA Trisha**¹¹*University of Oxford, School of Geography and the Environment, South Parks Road, Oxford OX1 3QY United Kingdom***E-mail:** trisha.gopalakrishna@ouce.ox.ac.uk

There is an unprecedented urgency in mitigating the impacts of climate change and forest restoration strategies are at the forefront. Global and national scale environmental policy fora have championed the cause of forest restoration as an important nature based solution, culminating in the UN Decade of Ecosystem Restoration. Also, it has often been touted as a cost-effective and scalable panacea with the potential to deliver a variety of benefits beyond sequestration of carbon. However, the reality of this strategy is complex. In this talk, I will weave the opportunities and realities of forest restoration as a viable strategy for climate change mitigation and other ecosystem benefits, using a variety of scientific evidence across forest biomes. This will include (i) opportunity of forest restoration as a 'Natural Climate Solution', (ii) the realities of forest restoration in areas that climatically host savannas and forests and (iii) the complexities of forest restoration for Nature's Contributions to People. Throughout my talk I will highlight the role of early career researchers in moving the field of restoration ecology forward.

Funding: Oxford India Centre for Sustainable Development, Somerville College, University of Oxford**Web and/or Twitter account:** @trishuphigh

Thursday, 09:00 – 10:00 Plenary talk

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023****Session 1: Traits, interactions and functioning across environmental gradients**

Chairs: Nina FARWIG, Eike Lena NEUSCHULZ, Jörg BENDIX

Climate and land-use change modify the structure and composition of ecosystems across the globe. The dramatic loss of biodiversity calls for a mechanistic understanding of the relationships among environmental change, communities, biotic interactions, ecological processes and functions. Functional traits are considered as key to describe these relationships. Tropical ecosystems with pronounced gradients of environmental conditions, e.g., along elevational or successional gradients, can be used as natural experiment to study the links between environmental changes, biodiversity and ecosystem functions. This session aims at compiling the latest knowledge on patterns of biodiversity and ecosystem functions and processes across such environmental gradients. A special focus will be on the use of traits to predict biotic interactions and ecosystem functionality across environmental gradients.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Environmental changes in biodiversity hotspot ecosystems of South Ecuador: response and feedback effects**FARWIG Nina¹, BENDIX Jörg²**¹*University of Marburg, Department of Biology – Conservation Ecology, Karl-von-Frisch-Str. 8, 35043 Marburg, Germany*²*University of Marburg, Department of Geography – LCRS, Deutschhausstr. 12, 35032 Marburg, Germany***E-mail:** farwig@staff.uni-marburg.de

Tropical mountain forests are threatened by climate and land-use changes. Their diversity and complexity make projections how they respond to environmental changes challenging. As a solution, we combined a trait-based Response-Effect-Framework with an improved Land Surface Model (LSM) to project the response of ecosystem functions to environmental changes. We implemented a plot system and sampled abiotic drivers, biotic trait and process data. Our analyses point to a complex interplay between abiotic drivers and traits for biotic processes and ecosystem functions. Further, we developed a locally adapted, biodiversity informed LSM by coupling three models that cover the relevant compartments of the forests. The biodiversity-LSM informed by local functional trait and soil data improved the simulation of biomass production substantially. Next steps will be to include biotic interactions into the LSM. We conclude that local data and most likely also biotic interactions are key elements to project the response of environmental change on complex ecosystems.

Funding: DFG, FA926/16-1**Web and/or Twitter account:** www.uni-marburg.de/en/fb17/disciplines/conservation/farwig-group, @ConsEcol

T1 – Tuesday 10:45 – 11:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 1: Traits, interactions and functioning across environmental gradients

Systematic reduction in seed rain of large-seeded and endozoochorous species in pastures compared to forests of tropical mountains

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Seed rain is crucial for natural plant recruitment in undisturbed and degraded forest ecosystems. Here, we investigate to what extent seed rain between forests and pastures varies along an elevational gradient in the tropical Andes of southern Ecuador. Over three months, we recorded seed rain in 324 seed traps located inside 18 1-ha forest and pasture plots at 1000, 2000 and 3000 m a.s.l. We collected over 123,000 seeds of 255 species/morphospecies along the elevational gradient. By comparing biomass, species richness and two key functional traits (seed mass and seed dispersal mode) in the seed rain of both habitats, we demonstrate that large seeds and endozoochorous species were poorly represented in the seed rain of pastures compared to that of forest habitats across elevations. Interestingly, our findings suggest that seed rain in pastures came from alternative seed sources rather than from the nearest forest habitats. Our study highlights that measuring key seed traits is important when recording seed rain to quantify the restoration potential of degraded habitats and to optimize restoration efforts in tropical mountains.

Funding: DFG (German Research Foundation), RESPECT project (FOR2730)

Web and/or Twitter account: <https://www.senckenberg.de/en/institutes/sbik-f/functional-ecology-and-global-change/team-functional-ecology-and-global-change/>

T2 – Tuesday 11:00 – 11:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

The functional structure of a tropical montane forest and the importance of rare tree species

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Tropical forests are composed of many tree species differing in their functional properties. In the presented project, we explore the functional composition of an Ecuadorian tropical montane forest at about 2000m asl. Within three permanent 1-ha plots in a tropical montane forests in S Ecuador we recorded all trees (dbh \geq 10cm) with their species and determined functional leaf and wood properties of ~200 tree species. Tree diameters and heights were determined to calculate aboveground biomass for each tree.

Our main question were how a tree species' contribution to stand biomass and productivity and to functional diversity is related to its abundance and if rare species are functionally distinct from the more abundant tree species.

Funding: DFG research unit RESPECT, Ho3296-6

Twitter account: @HomeierJ

T3 – Tuesday 11:15 – 11:30 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Environmental conditions differently shape leaf, seed and seedling trait composition between and within elevations of tropical montane forests

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Plant traits can be used to examine how the functional composition of plant communities varies in response to environmental conditions. However, we still lack understanding of how different traits corresponding to different plant life stages respond to environmental conditions across and within elevations in tropical mountains. To study this, we investigated how the trait composition of leaves, seeds and seedlings vary across elevations and within elevations in relation to soil and light conditions in southern Ecuador. We surveyed traits of individual trees, seeds and seedlings and measured two environmental factors: soil C/N ratio and canopy openness. To address our two study objectives, we calculated community-weighted mean trait values to analyse trait variation across and within elevations. We found that specific leaf area and seed mass decreased with increasing elevation. Within elevations, mean trait values of leaves, seeds and seedlings responded differently to the environmental gradients. Specific leaf area decreased with increasing soil C/N ratio. Seed mass was associated neither with soil nor with light conditions. Initial seedling height decreased with increasing canopy openness. Our findings show that broad-scale and local-scale processes differently shape trait composition indicating that different plant life stages respond independently to environmental variation in tropical montane forests.

Funding: DFG (German Research Foundation), RESPECT project (FOR2730)

Web and/or Twitter account: <https://www.senckenberg.de/en/institutes/sbik-f/functional-ecology-and-global-change/team-functional-ecology-and-global-change/>, @MaciejKBarczyk

T4 – Tuesday 11:30 – 11:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Response of element fluxes and budgets to nutrient additions in a tropical montane forest in South Ecuador**VELESCU Andre¹, VALAREZO Carlos², WILCKE Wolfgang¹**¹Karlsruhe Institute of Technology, Institute of Geography and Geoecology, Reinhard-Baumeister-Platz 1, 76131 Karlsruhe, Germany²National University of Loja, Research Directorate, Av. Pio Jaramillo y Reinaldo Espinosa, La Argelia, Loja, Ecuador**E-mail:** andre.velescu@kit.edu

In the tropical montane rainforest of the SE Andes, we observed increasing atmospheric N deposition during the past 20 years, because of forest fires in the Amazon Basin. Although P deposition remained constantly low, P availability increased because P inputs were retained in the ecosystem. Occasional Ca inputs originated from long-range transport of Sahara dust. To explore the response of element cycling to low-level nutrient additions, a nutrient manipulation experiment (NUMEX) was established at 2000 m a.s.l. We have continuously added low levels of N, P, N+P, and Ca in a fourfold replicated, randomized block design to simulate atmospheric deposition. To calculate element fluxes, all plots were equipped with litterfall and throughfall collectors, lysimeters, suction cups, tensiometers and soil water content sensors. We observed a rapid response of the ecosystem to fertilization, increased nutrient fluxes with throughfall, indication of N and P co-limitation in the organic layer and a nearly complete retention of the applied nutrients in the ecosystem. We detected a dynamic adjustment of the K cycle to the increased N and P supply, suggesting that increasing N and P deposition may lead to an additional K limitation in the future. Our results emphasize that fertilizer addition to forests affects all nutrients including those that have not been fertilized.

Funding: DFG WI 1601/8-1, WI 1601/8-2**Web and/or Twitter account:** NA

T5 – Tuesday 11:45 – 12:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Vertical distribution of $\delta^{13}\text{C}$ values in soils to predict N mineralization rates under forest and pasture along an elevation gradient in South Ecuador

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Understanding the response of net N mineralization and nitrification to climate and land-use change is important to predict the effect of environmental change on the biodiversity of the tropical montane forest in Ecuador.

To determine the roles of land use and climate for N mineralization in the mineral topsoil, we conducted 31-days field incubations with PVC cylinders in forest and pasture soils along a land-use and elevation gradient from 1000–3000 m a.s.l. We used a threefold replicated, full factorial design with 2 land use types and 3 elevations.

N mineralization was significantly higher under pasture than under forest, except at 3000 m a.s.l., where we detected the highest ammonification rates. Nitrification was, in contrast, significantly higher under forest than under pasture, with highest nitrification rates at 2000 m a.s.l.

We additionally explored the slope of the regression line of $\delta^{13}\text{C}$ values on soil organic C concentrations in 10-cm soil layers as a proxy for N mineralization rates. Following the concept of Garten et al. (Can. J. For. Sci, 2006), we could demonstrate that the shift to higher $\delta^{13}\text{C}$ values with increasing depth of the soil profile is related to N turnover and can thus serve as predictor of N mineralization rates.

Funding: DFG, WI 1601/26-1, WI 1601/26-2

Web and/or Twitter account: NA

T6 – Tuesday 12:00 – 12:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

The diversity of tree-related microhabitats across climate and land-use gradients on Mount Kilimanjaro (Tanzania)

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Previous studies have shown that microhabitat diversity promotes biodiversity. Understanding how microhabitat diversity is linked to environmental drivers and to human activity is therefore essential for biodiversity conservation and management. In this study, we investigate how climatic conditions, vegetation structure and human impact affect the diversity of tree-related microhabitats (TreMs) along land-use and elevational gradients on Mount Kilimanjaro, Tanzania.

We adapted a standardised typology of TreMs established for temperate ecosystems to record TreMs in tropical ecosystems. We used rope-based methods to access the tree canopy and performed vertical transects on > 100 individual trees to assess the abundance and diversity of TreMs at 44 1-ha plots across 11 ecosystem types on the slopes of Mount Kilimanjaro. Based on these data, we computed the effective diversity of tree-related microhabitats for each tree and related this measure of vertical microhabitat diversity to climatic conditions, vegetation structure and human impact measured on each study plot.

We found that the effective diversity of microhabitats was strongly positively associated with both rainfall and temperature. In addition, a higher structural complexity of the vegetation and a lower human impact increased vertical microhabitat diversity at the plot level. Our study demonstrates that the assessment of tree-related microhabitats yields important information on microhabitat diversity in tropical ecosystems and is shaped both by climatic conditions and human impact. Importantly, high human impact on ecosystems can reduce microhabitat diversity and lead to a subsequent decline in biodiversity.

Funding: DFG, FOR5064

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T7 – Tuesday 12:15 – 12:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Impact of hunting on the functional traits of animal and tree communities

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Hunting impacts tropical vertebrate populations, causing declines of species that function as seed dispersers and predators, or that browse seedlings and saplings. This can have cascading effects on the tree recruit community and thus on forest functioning. We explored how hunting changed the functional composition of vertebrate assemblages in French Guiana. We compared eight functional traits between 11 hunted and 12 control sites. In a subset of these sites tree functional composition was studied along a gradient of defaunation, by comparing leaf and fruit traits and wood density between tree recruits (up to 5 cm diameter at breast height) and adults. We found that in hunted sites, animals were smaller, had a lower ability to distinguish colors, and the community contained less frugivores. For tree functional composition we found that in hunted sites there are more trees with low leaf toughness, large specific leaf area, and low wood density. We can conclude that the functional composition of the animal community changes due to hunting and that as a cascading effect, the functional traits of the tree community also changes. Even though these changes sometimes seem minor, together they may alter forest dynamics for generations.

Funding: NA

Web and/or Twitter account: NA

T8 – Tuesday 12:30 – 12:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Reassembly of species, interactions and functions in a naturally recovering rainforest

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Some tropical forest ecosystems in degraded agricultural landscapes need to be actively restored, while others recover naturally at a remarkable speed, particularly when surrounded by intact forests. We study a case of natural forest recovery in the Ecuadorian Chocó, within and around a nature reserve protected and maintained by the conservation organization Fundación Jocotoco. A total of 62 study plots defines a well-resolved chronosequence ranging from actively used pastures and cacao plantations, secondary forests (recovering for 1 – 38 years) to undisturbed old-growth forests.

We investigate mechanisms underlying the re-assembly of species communities, their interaction networks, traits and ecosystem processes. Our first results reveal a rapid and relatively complete recovery of animal communities and their functioning, for which a few examples will be highlighted. Our Research Unit 'Reassembly' covers various functional groups including pollinators, seed-dispersers, decomposers and predator-prey interactions. For instance, dung beetle communities play a key role for dung burial and secondary dispersal of tree seeds – and a high rate of functional recovery in regenerating forests.

The study plots along the chronosequence and the Chocó Lab provide an open platform for collaborations and further investigations by international scientists.

Funding: Deutsche Forschungsgemeinschaft (DFG), Research Unit REASSEMBLY (FOR 5207)

Web and Twitter account: www.reassembly.de, @ReassemblyNet

T9 – Tuesday 12:45 – 13:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

First insights into the recovery of pollinator communities and their interaction networks within the REASSEMBLY research unit in the Chocó biodiversity hotspot

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As anthropogenic disturbance reduces biological complexity across the globe, little is known about the rules that underlie the disassembly and subsequent reassembly of biotic interaction networks. Within the chronosequence of the newly-born REASSEMBLY research unit in the biodiversity hotspot of the Ecuadorian Chocó, our subproject aims at understanding the trajectories that pollinator communities and their interactions networks undertake as forests recover using a trait-based framework. Additionally, we extend our sampling to the canopy, a rarely-explored segment of tropical forests. Here we present the project, its overarching hypotheses, and our first results. We are now in the second year of data collection and have sampled over 10000 diurnal and nocturnal pollinating insects. Preliminary abundance data shows that certain groups, such as small social bees and solitary nocturnal bees are highly dependent on forests, particularly the canopy environment, and engage in pollen collection more often in late-regeneration forests. Pollen-carrying moths, especially small species, are the most abundant in late-regeneration forests, giving place to larger species with higher dispersal ability in disturbed or young forests. The next phase of the project will deliver key results on network reassembly across the chronosequence, as well as the re-establishment of pollination service and pollinator provisioning.

Funding: Deutsche Forschungsgemeinschaft, FOR 5207

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T10 – Tuesday 14:30 – 14:45 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

A trait-based framework to assess plant functional connectivity mediated by animal seed dispersers

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The functional connectivity of plants in heterogeneous landscapes crucially relies on seed dispersal. At the community level, functional connectivity can be defined as the diversity of seeds that can reach a recipient patch coming from a source patch. Many plant species, especially in tropical forests, depend on seed dispersal by animals to move between patches. Despite its importance, there is a lack of studies to examine the role of plant-animal interactions on functional connectivity. Here, we present a new framework to quantify functional connectivity for entire networks of plants and their seed dispersers. We suggest that plant functional connectivity depends on an interplay of factors defined by plant and animal communities, their interactions and the relationship between habitat patches. We use our framework to simulate seed dispersal between patches and test the following hypotheses: 1) high specialization in plant-bird interactions reduces functional connectivity; 2) functional connectivity decays non-linearly with increasing distance, and 3) a high functional diversity of plants in the recipient patch promotes functional connectivity at community level. We propose that our framework can be widely applied to assess plant functional connectivity in heterogeneous landscapes and be expanded to other interactions involving the movement of plant propagules by animals.

Funding: DFG-funded Research Unit REASSEMBLY (FOR 5207)

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T11 – Tuesday 14:45 – 15:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Dispersal limitation predicts the spatial and temporal filtering of tropical bird communities in isolated forest fragments**AUSPREY Ian J.^{1,2}, NEWELL Felicity L.^{1,2}, ROBINSON Scott K.²**¹*University of Bern, Division of Conservation Biology, Institute of Ecology & Evolution, Switzerland*²*University of Florida, Florida Museum of Natural History, Gainesville, Florida, USA***E-mail:** ian.ausprey@unibe.ch

The link between dispersal traits and community assembly remains a frontier in understanding how vertebrate communities persist in fragmented landscapes. Using experimental release trials and intensive field surveys of bird communities in fragmented forests of the Peruvian and Colombian Andes, we demonstrate that morphological traits related to movement (1) predict experimental flight performance and (2) exhibit dispersal-mediated environmental filtering at the community scale. First, species that successfully flew across an experimentally hostile landscape had longer pointed wings, carried less mass per wing area (lower wing loading), and had smaller eyes. Second, communities in the Colombian landscape where fragments had been isolated for > 60 years were filtered for species with long and narrow wings and small eyes, especially within the most spatially isolated fragments. Conversely, communities in the more recently fragmented Peruvian landscape (15-30 years) tended to have shorter and more rounded wings compared to those in forests, suggesting that dispersal-limited species accumulate in the initial years following patch isolation due to "restricted dispersal" and represent an extinction debt yet to be paid. Our results demonstrate how the spatial and temporal components of patch isolation produce a gradient in dispersal-mediated environmental filtering and extinction debt for communities inhabiting fragments.

Funding: National Geographic Society, American Ornithological Society, Wilson Ornithological Society, Ordway Foundation (University of Florida)

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T12 – Tuesday 15:00 – 15:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Regional differences in functional and taxonomic bird diversity patterns in tropical agroforests

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Bird diversity and ecosystem services in tropical agroforests are shaped particularly by forest type and amount in the surrounding landscape. However, most research on the topic has focused on rainforests, whereas other tropical forests remain understudied. We used point counts to compare functional- and beta-diversity patterns of bird communities in 23 cacao agroforests along a gradient of distance to 12 forest sites in two Peruvian landscapes with contrasting forest types: dry tropical forests and subtropical rainforests. We found higher dissimilarity and species turnover among bird communities in the subtropical forest, whereas nestedness explained differences among communities in the dry forest. Forest distance threatened insect consumption in the subtropical rainforest, whereas frugivory was most vulnerable in the dry forest. Ground foraging dominated in the dry forest, replaced by canopy foraging in the subtropical rainforest landscape. Based on these differences, we suggest locally-adapted management strategies to enhance wildlife-friendly practices in tropical agroforestry. Conserving and restoring forests remains a priority in both landscapes. However, in the rainforest, high shade trees may be most valuable for conserving insectivorous birds and their biocontrol services, whereas diversifying low-strata vegetation and fruiting trees may enhance bird diversity and ecosystem service provision in the dry forest.

Funding: German Federal Ministry for Economic Cooperation and Development (BMZ) through GIZ contract number 81219430. Center of Biodiversity and Sustainable Land Use supported Tara Hanf-Dressler.

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T13 – Tuesday 15:15 – 15:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

The vertical stratification of Gabonese amphibians

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Tropical forests are vertically complex, and offer unique niche opportunities in the form of resource, climate, and habitat-gradients from the forest floor to the canopy. Rainforest amphibians organize within this vertical space and the highest levels of vertical stratification occur in structurally complex and climatically stable tropical rainforests. Amphibians have diversified into numerous habitat and climatic niches through the development of morphological, behavioural, physiological, and reproductive traits. However, a lack of data regarding the vertical height accessed by amphibians has prevented nuanced analyses of traits and height. We performed 74 ground-to-canopy surveys for amphibians at Baposso Village, Ngounie Province, Gabon, and describe the vertical stratification patterns of the assemblage in terms of richness, abundance, and species specific vertical space use. We analyse the relationships between amphibian traits with vertical height using linear mixed effects models, finding strong support for the relationship between the ratio of frog length:toe disc width with vertical height, i.e. frogs with bigger toes in relation to their length were found higher above the ground. We also see differences in the vertical heights of species according to their reproductive modes, highlighting the importance of reproductive mode diversity and evolution in influencing the vertical stratification of amphibian assemblages.

Funding: GoFundMe (<https://www.gofundme.com/f/eds-expedition-to-gabon>)

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T14 – Tuesday 15:30 – 15:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Arthropods density and herbivory damage along the forest vertical gradient of wet tropical forest in Papua New Guinea

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Herbivorous arthropods play important roles in forest ecosystems. Their communities, and the damages they cause on foliage are heterogenous and vary in intensity along vertical forest strata. However, plausible cause(s) of diversity, abundance and herbivory by herbivorous arthropods in different forest strata, especially in the tropical regions are limited. We investigated the effect of herbivorous arthropods on seven dominant plant species in a 1-ha forest plot in Papua New Guinea over 2 seasons (during wet and in dry season), at three time points, using a canopy crane. The tree species selected were trees with several individuals occurring at different layers - from 1-30m heights, 5m height increments, i.e., 7 height categories). Total of 131 branches located on 66 individuals were surveyed. From them, we collected 3445 arthropods in total. Overall, herbivorous arthropods consumed on average 6.4% of leaf biomass but the herbivory differed between plant species and strata. The overall densities of the arthropods were significantly affected by tree species, strata, and season. The density of arthropods was significantly higher in the beginning of wet season and in the lowest and upper most layers of the forest. Our results suggest that plant species, strata and season plays important role in shaping arthropod communities and levels of herbivory in the tropical forest in Papua New Guinea.

Funding: ERC Starting grant BABE 805189

Web and/or Twitter account: <https://multitrophicinteractions.blog/>

T15 – Tuesday 16:15 – 16:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Vertical stratification and defensive traits of caterpillars against parasitoids in a tropical forest in Central Cameroon

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Studies on insect communities along entire vertical forest gradients generally compare between the understory and canopy. However, dividing the forest into multiple, distinct strata may provide a more accurate and nuanced perspective on how insect communities change across the height of the forest. In this study, caterpillar communities and parasitism rates were investigated across a vertical gradient in a 0.1 ha tropical forest plot in Nditam, Cameroon. The forest was divided into eight equally sized strata of five meters. Caterpillars were categorized based on their defence traits: aposematic, cryptic, and shelter-building. Caterpillar density followed the opposite pattern to diversity and species richness, with the highest density in the understory. Compositional turnover and dissimilarity were highest between the lowest and highest strata, and specialization was highest in the midstory. Parasitism rates were significantly higher in both aposematic and shelter-building caterpillars than they were in cryptic. Overall, parasitism rates fluctuated across strata with two distinct peaks and were lowest in the uppermost part of the canopy. This novel approach reveals nuanced patterns and differences in caterpillar-parasitoid communities that would likely have been obscured using traditional methods.

Funding: European Research Council (ERC), "Ecological determinants of tropical-temperate trends in insect diversity" Horizon 2020 grant.

Web and/or Twitter account: <https://multitrophicinteractions.blog>

T16 – Tuesday 16:30 – 16:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Seed trait diversity and seed rain in tropical dry forests of southern Ecuador**NIETO Andrea¹, KERWER Lea¹, NEUSCHULZ Eike Lena¹, SCHLEUNING Matthias¹**¹*Senckenberg Biodiversity and Climate Research Centre (SBiK-F), Senckenberganlage 25, Frankfurt, 60325, Germany***E-mail:** andrea.nieto@senckenberg.de

Seed dispersal is a crucial ecological process shaping the diversity and composition of plant communities, especially in the tropics. We investigate seed trait diversity and dispersal syndromes in the tropical dry forests of southern Ecuador to test how differences in climatic conditions and land use shape the diversity and composition of fruit and seed traits. Over a period of eight months, we harvested fruits and measured fruit and seed size and mass, and the dispersal syndrome of plant species. In addition, we collected fruits and seeds from 214 seed traps. We recorded a large diversity of fruit and seed traits. Fruit size and mass ranged from 9 to 313 mm and from 0.003 to 248 g, respectively. According to our preliminary data, gravity-dispersal was the dominant dispersal syndrome in the plant community (45%, 14 species) followed by wind-dispersal (29%, nine species) and animal-dispersal (26%, eight species). So far, we identified 81 seed morphotypes from the seed traps. Our data will provide important information on the trait diversity of plant communities in the poorly studied, but highly diverse tropical dry forest ecosystem and will have important implications for predicting the future dynamics of these plant communities under changing environmental conditions.

Funding: DFG FOR 2730 RESPECT**Web and/or Twitter account:** NA

T17 – T19 – Tuesday 16:45 – 17:30 Poster 1 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Fruit-bat mutualistic interactions in urban neotropic environments

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Seed dispersal is a major process in plant reproduction, playing a central role in forest restoration including anthropized habitats, such as urban areas. The most important seed dispersers in the cities are bats and birds, however little is known about how increasingly urban expansion affects the interactions between plants and their dispersers. Although urbanization leads to habitat fragmentation and species loss, green areas in the cities can harbour considerable biodiversity, contributing to the forest succession process. We conducted a literature review to compile fruit-bat networks along the Neotropics from 1970 to the present. For each network, we determined the level of urbanization by estimating the urban area in a 5 km radius around the geographic coordinates of the network location. Network metrics are being taken for each network, and the relationship between urbanization and network structure will be estimated through regression models. We hypothesize that specialization will increase with the gradient of urbanization, considering the decreasing species richness and diversity and the prevalence of generalist species.

Funding: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

Web and/or Twitter account: NA

T17 – T19 – Tuesday 16:45 – 17:30 Poster 2 + Lightning talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Tree community structure and abiotic factors correlate with fungal community composition in primary and regenerating secondary tropical forests

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Successional dynamics of plants and animals during tropical forest regeneration have been thoroughly studied, while fungal compositional dynamics during tropical forest succession remain unknown, despite the crucial roles of fungi in ecological processes. We combined tree data and soil fungal DNA metabarcoding data to compare richness and community composition along secondary forest succession in Costa Rica and assessed the potential roles of abiotic factors influencing them. We found a strong coupling of tree and soil fungal community structure in wet tropical primary and regenerating secondary forests. Forest age, edaphic variables, and regional differences in climatic conditions all had significant effects on tree and fungal richness and community composition in all functional groups. Furthermore, we observed larger site-to-site compositional differences and greater influence of edaphic and climatic factors in secondary than in primary forests. The results suggest greater environmental heterogeneity and greater stochasticity in community assembly in the early stages of secondary forest succession and a certain convergence on a set of taxa with a competitive advantage in the more persisting environmental conditions in old-growth forests. Our work provides unprecedented insights into the successional dynamics of fungal communities during secondary tropical forest succession.

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**

Funding: Naturalis Research Initiative grant; Lendület program of the Hungarian Academy of Sciences and the Eötvös Loránd Research Network: 96049; Hungarian National Research, Development and Innovation Office: 2019-1.2.1-EGYETEMI-ÖKO-2019-00009 sz. *Kutatáshasznosítás, innováció az Eszterházy Károly Egyetemen*

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European Conference of Tropical Ecology 2023

T17 – T19 – Tuesday 16:45 – 17:30 Poster 12 + Lightning talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Land-use history in tropical agroforestry

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Agroforestry systems have the potential to combine agricultural production with high levels of ecosystem service provisioning and biodiversity, thereby representing an opportunity for sustainable land use. However, agroforests may differ in land-use history, meaning some result from direct forest conversions while others are established on historically forested but currently open land. Drawing on a review, a meta-analysis, and an empirical field study, this poster shows why tropical ecologists should care about this important difference. First, I introduce a conceptual framework with explicit hypotheses for biodiversity and ecosystem services: forest-derived agroforest may overall be more biodiverse and may provide more services, but ultimately degrade tropical forests, while open-land-derived agroforests may realize promised benefits compared to open land. Second, I show how this difference plays out for birds in cocoa agroforests and how not considering land-use history can lead to misleading findings in a meta-analysis. Lastly, I show findings from vanilla agroforests in Madagascar, demonstrating how multi-taxa biodiversity differs between agroforests of contrasting land-use history and along a yield gradient. I conclude that land-use history should be incorporated into science and policy to avoid incentivizing forest degradation and to harness the potential of agroforestry for ecosystem services and biodiversity conservation.

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T17 – T19 – Tuesday 16:45 – 17:30 Poster 13 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Frugivory by bats in urban Atlantic forest remnants

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Bats (Mammalia: Chiroptera) provide important ecosystem services, such as seed dispersal, that contribute to forest regeneration, including disturbed habitats. One major driver of disturbance, and consequently habitat loss, is urbanization. Ultimately, urban sprawl leads to changes in community composition, which may result in local loss of species. Nevertheless, green areas located in cities are known to harbor considerable number of species, which evidences the importance of urban forest fragments to biodiversity maintenance. Here, we investigate the dietary composition of fruit-bats in tropical medium- and small-sized cities located in South Brazil, namely Goioerê and Maringá, PR. Field work was conducted from 2010 to 2013. We captured bats using mist-nets and obtained fecal samples to seed identification. We registered 191 individuals in Goioerê and 490 in Maringá, from three subfamilies, seven genera and ten species, with *Artibeus lituratus* being the most abundant species for both cities. The sampled species are known for their persistence in disturbed habitats and presented a broad variety of seeds in their feces, pointing to a high potential of seed dispersal across urban areas. Our study sheds light on the importance of urban forest fragments for the persistence of bat communities, that, in turn, contribute with the forest regeneration through seed dispersal.

Funding: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

Web and/or Twitter account: NA

T17 – T19 – Tuesday 16:45 – 17:30 Poster 14 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 1: Traits, interactions and functioning across environmental gradients
Tree rings indicated a higher drought resistance in mixed species tree plantations than in monospecific plantations
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Tropical tree plantations play a crucial role in the provision of valuable tropical timber and the restoration of ecosystem processes in devastated tropical landscapes. Most tropical tree plantations consist of a single species which brings certain advantages in the management and harvesting practices at the end of a rotation period. Research over the last decades has provided some evidence that admixing species has positive effects on biogeochemical cycles in those plantations. Further, mixed species plantations are characterized by a higher yield. In this study, we tested if mixture effects influence growth and carbon allocation patterns during extended periods of water shortage. Therefore, we performed a tree ring analysis, including tree discs from different tree organs (coarse roots, stems, and branches) harvested from an experimental tree plantation in Central Panama. Monocultures did not show any significant growth reduction in any organ in response to a prolonged dry period, whereas in tree species mixtures stem growth was significantly reduced, but coarse root and branch growth was unaffected. We conclude that due to niche separation, mixtures deplete soil water resources more completely and faster than monocultures and might be more susceptible to climate-change-induced increasing soil water shortage.

Funding: NA

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T17 – T19 – Tuesday 16:45 – 17:30 Poster 15 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

The natal dispersal pattern of yellow-billed kites *Milvus aegyptius* in Nigeria

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The Yellow-billed Kite (YBK) is an abundant raptor species in sub-Saharan Africa. However, little is known about its movement and dispersal pattern. In this study, we investigate the natal dispersal pattern of the species in West Africa. Three nestlings from two different nests were tagged with GPS/GSM telemetry devices in central Nigeria and observed for >300 days. During the nestling and pre-dispersal stages, the juveniles stayed close to the nest. Two siblings dispersed within a three-day period (16/6 and 18/6) and the last juvenile dispersed the 17/6. All birds migrated northeast to northern Nigeria and southern Niger where they spent their non-breeding period in the Sahel zone. The birds initiated the return migration in the end of October. Two individuals dispersed 53 and 111 km, respectively, from their natal nest to new areas. The last individual flew west to Benin (730 km from its natal nest) where it occupied an area from early November, but unfortunately the logger stopped sending data from mid-December. The individual trajectories from tagging to last point were 3875, 5055 and 5049 km (4660 ± 392 SE), respectively. These migration trajectories are shorter compared to a male YBK from South Africa which migrated to Uganda.

Funding: AP Leventis Ornithological Research Institute, Linnaeus University and Lund University

Web and/or Twitter account: NA

T17 – T19 – Tuesday 16:45 – 17:30 Poster 16 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Functional properties of Andean upper montane forest trees

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The Tropical Andes of South Ecuador are considered as a hotspot of biodiversity due to its high species richness and increasing habitat loss. The main objective of this research is knowing how functional traits of trees can change along of altitudinal gradient. We are studying the functional composition of the upper montane forest tree community at Cajanuma (all tree species, Podocarpus PN, 3000 m) within 3 permanent plots of 1 ha. We focus on leaf and wood functional traits. We used 6 functional traits (wood: bark thickness, wood moisture, and wood specific gravity, leaf: thickness, toughness, and dry matter content)

Our hypothesis is that common and rare tree species differ in their functional properties, and preliminary results show that within the studied community a wide range of tree strategies is present. We found that some tree species have very specific trait combinations, and further traits will give us more information about specific tree strategies. This knowledge will contribute to our ecological understanding of how plant community structure affects ecosystem functioning and will contribute to a better-informed conservation of the endangered tropical forest of South Ecuador with wealth of rare tree species.

Funding: DFG (Deutsche Forschungsgemeinschaft) and DAAD (Deutscher Akademischer Austauschdienst).**Web and/or Twitter account:** NA

T17 – T19 – Tuesday 16:45 – 17:30 Poster 17 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Drought response traits in tropical deciduous woody species: opposite relation of turgor loss point to rainfall than in evergreen species

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To improve projections how global-change will affect vegetation, and which species will win or lose, we urgently need to improve our understanding of the mechanisms underlying plant responses to drought and identify traits that allow to predict them. The problem is especially acute in the Caatinga, an extensive seasonally dry tropical forest biome in northeastern Brazil, which is threatened by desertification through decreasing rainfall and through anthropogenic disturbance. Turgor-loss point (TLP), the water potential at which leaves lose turgor, has been identified as a key trait of drought resistance in evergreen woody species. In this study we addressed, if TLP is also related to drought resistance in drought deciduous tropical dry forest species. We quantified TLP for 21 deciduous woody species, and examined if the community weighted mean (CWM) increases across a strong rainfall gradient. Opposite to our expectation from evergreen species, the CWM of TLP decreased with rainfall. These results indicate that avoiding dehydration is an important mechanism for deciduous woody plants in this system. More importantly, our results highlight the need to assess the relation of functional traits to drought resistance in different plant life forms and systems, before using traits to predict plant drought responses.

Funding: NA

Web and/or Twitter account: NA

T119 – Thursday 10:45 – 11:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Microbial plant-soil feedbacks affect secondary succession of tropical rainforests

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In two greenhouse experiments in Panama, we assessed the effects of soil successional age (0-,15-,25-,115- yrs) and light on PSF effects on germination and performance of seven tree species that vary in their association from early- to late-successional forests. Subsequently, we inoculated seedlings with conditioned soils and quantified PSF variation with tree species' phylogenetic distance. PSF varied strongly among species. Late-successional species were least susceptible. Overall, species experienced more positive PSF in their associated soil ages. Light strongly, yet inconsistently, modulated PSF. Negative, heterospecific PSF decreased with phylogenetic distance. We provide evidence that PSF can affect rainforest recovery. Their importance may be higher early in succession when the abundance of more susceptible species is highest. The unexpected specificity of mutualists may promote establishment of species at associated successional stages. PSF that favor unrelated successors may in contrast accelerate diversification.

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T120 – Thursday 11:00 – 11:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Topography and temporal variation in recruitment help to maintain species diversity in tropical forest of Papua New Guinea

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Strong effects of abiotic environment on tree species composition were observed in many tropical forests. Within that, less attention was paid to the patterns in seedling composition. In a tropical lowland forest of Papua New Guinea, we investigated the effect of biotic (the number, size, and species composition of neighboring adult trees) and abiotic environment (mainly topography) on the composition of over 3000 tree seedlings in 800 permanent quadrates for five consecutive years. Further, to see if the outcomes of effects caused by topography vary with ontogeny, we tested the composition of adult trees against the same abiotic variables. Biotic environment had only negligible effect on seedling composition, however, the abiotic environment (mainly the ridge-valley position and slope steepness) affected the composition of both seedlings and (even more) adult trees. Thus, we expect that habitat filtering through topography is one of the mechanisms shaping the forest composition since the start of seedling recruitment. Although mostly invariable, for some species, the preferences on topographic gradient differed between seedlings and adults. Species composition of seedlings changed significantly through the consecutive years, indicating that inter-annual changes in reproduction can contribute to the mechanisms maintaining diversity, in concordance with the regeneration niche theory.

Funding: GAČR, 23-06745S

Web and/or Twitter account: NA

T121 – Thursday 11:15 – 11:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 1: Traits, interactions and functioning across environmental gradients
Linking functional leaf and root traits with endophytic communities in seedlings in a seasonally flooded tropical forest.

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An important unanswered question in the understanding of plant strategies is the extent to which leaf and root microbial communities contribute to tropical tree species functioning. Leaves and roots of tropical tree species harbor taxonomically diverse bacterial and fungi assemblages which enhance plant growth and performance by increasing nutrient and water supply and resistance to stress. Water excess or shortage, found in seasonally flooded (SF) forests in the Amazon basin, has been overlooked as being an important plant stressor in these particular habitats. Few studies have linked the ecophysiological functioning with the microbial composition of SF tropical tree seedlings. Our objective is to answer how functional traits are linked to the diversity and composition of leaf and root associated microbial communities in SF tree seedlings. We investigated 13 leaf and root functional traits, in 70 individuals belonging to seven tropical 1-year old SF tree seedlings. Seedlings were sampled exclusively in the seasonally flooded forests of French Guiana. The investigation of the diversity and composition of leaf and root associated microbial communities was conducted using ITS2 and 16S high-throughput sequencing. This study will confer robust knowledge of SF tropical forests through the lens of their microbial composition and functional traits syndrome.

Funding: Labex Ceba (ANR-10-LABX-25-01), DRYER project.

Web and/or Twitter account: Academic (marionboisseaux.netlify.app)

T122 – Thursday 11:30 – 11:45 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Drivers of successional changes in functional trait composition in Ghanaian tropical wet forests

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Introduction: During tropical forest succession functional trait composition rapidly changes from acquisitive to conservative trait reflecting life form turnover from herbaceous to woody species. Such successional changes are strongly influenced by surrounding landscape matrix and soil- and microclimatic conditions. However, there is paucity of studies in tropical landscapes to test this assertion. **Methods:** Research was carried out in 19 wet secondary forest plots (0-3 years after abandonment) in Ghana. Community-level functional traits were represented by community-weighted means based on 12 functional traits measured on 185 species of eight different life forms. **Results:** Successional changes in functional trait composition were strongly influenced by percentage of surrounding old-growth forest cover and soil moisture and pH. With increase in percentage of surrounding old-growth forest cover, conservative trait values (e.g., higher leaf dry matter content) related to shade- and drought tolerance increased. In contrast, with increase in soil moisture and pH, acquisitive trait values (e.g., higher leaf nitrogen concentration) related to rapid growth increased. **Conclusion:** Successional changes in functional trait composition from acquisitive to conservative are therefore faster when the patch is on infertile soil and more surrounded by old-growth forests, indicating the importance of species pool and abiotic filtering on functional trait composition.

Funding: The European Research Council Advanced Grant PANTROP 834775

Web and/or Twitter account: NA

T123 – Thursday 11:45 – 12:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

The effects of pathogenic fungi, herbivores, and predators on pioneer vegetation of tropical forests change with elevation.

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Pathogenic fungi, herbivores, and their predators play an important role in shaping tropical forest communities. On an altitudinal gradient, local climatic and ecological conditions can influence the strength of biotic interactions. We present the results of a manipulative experiment replicated at three elevations to examine the effects of focal predators (birds, bats, and ants), herbivorous insects, and pathogenic fungi on pioneer plants during tropical forest regeneration.

Trophic cascades caused by focal predators are stronger at higher elevations. Fungi affect species richness and increase woody plant density at the highest elevations. Insect and predator effects are correlated, suggesting strong bottom-up control. Insects and pathogenic fungi shape community composition in the pioneer stages of regeneration. Specific leaf area (SLA) significantly influenced the success of plant species only when predators were excluded. In the case of fungicides and additional herbivory, water content of leaves was the significant predictor of plant biomass change. All these results suggest a strong bottom-up control of pioneer vegetation of tropical forests during succession, but the mechanism changes with altitude.

Funding: NA

Web and/or Twitter account: NA

T124 – Thursday 12:00 – 12:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 1: Traits, interactions and functioning across environmental gradients

Moss-associated nitrogen fixation across an altitudinal gradient in cloud forests and Páramo ecosystems in Costa Rica

CLASEN Lina A.¹, ALVARENGA Danillo O.¹, VINCENT Andrea G.², WANG Yinliu^{1,3}, ANDERSEN Rune F.¹, ROUSK Kathrin¹

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Moss-associated nitrogen (N) fixation can be a major source of new-N in natural ecosystems. Yet, the associations between mosses and N₂-fixing cyanobacteria in tropical regions are still largely unexplored. Climatic factors have been linked to N fixation rates in northern ecosystems; for instance, changes in moisture and temperature lead to changes in N fixation rates. To investigate how climatic factors influence these associations in the tropics, we measured moss-associated N fixation rates and microclimate (soil-air moisture and temperature) along an altitudinal gradient (2200 – 3750 m.a.s.l.) in Chirripó National Park, Costa Rica, comprising cloud forests with high relative humidity, and páramo sites dominated by grasses and shrubs, often experiencing freezing temperatures. Our results show higher N fixation rates in cloud forest sites where lower variation in moisture and temperatures were found compared to the páramo. To further investigate the large differences in N fixation we sequenced the 16S rRNA gene, finding differences in microbial communities composition associated with the mosses. Our findings suggest a strong link between N fixation rates and species-specific responses to climate factors, and that those will ultimately be affected by climate change, possibly leading to shifts in communities and ecosystem N input via the moss-cyanobacteria pathway.

Funding: European Research Council (ERC), grant agreement No. 947719 (SYMBONIX) to KR

Twitter account: @clasen_lina

T125 – Thursday 12:15 – 12:30 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology - current questions, future trends

Chairs: Omer NEVO, Kim VALENTA, Katharina BRANDT

Species interactions can operate via multiple channels, of which the most ancient and common of them by far is chemical. Chemical cues and signals guide pollinators to flowers, seed dispersers to fruit, symbiotic bacteria to roots, and predator to prey. Many of these signals are conflicting and intertwined: the sweet scent of a fruit attracts a seed disperser, but also antagonistic insects. As such, it is safe to say that all species operate in a complex chemical environment, and that this chemical environment shapes much of the adaptive landscape of all organisms. Much of this complexity remains unresolved, particularly in tropical systems, where species richness and the interaction networks they form are especially complex, and where sampling of chemical samples is particularly challenging. Recent years have seen technical and computational developments which have transformed the field of chemical ecology and brought it to the -omics age with the development of metabolomics. This session will cover these latest developments and explore how chemical interactions underlie ecological processes in tropical systems. It will cover a wide range of topics and applications: from herbivory to pollination and seed dispersal, and from animal communication to conservation, in an attempt to identify common themes and major drivers of variance in tropical chemical ecology and facilitate future collaboration and synthesis.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Tropical chemical ecology - current questions, future trends

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Species interactions operate via multiple channels, of which the most ancient is chemical. Chemical cues and signals guide pollinators to flowers, seed dispersers to fruit, symbiotic bacteria to roots, and predator to prey. Many of these signals are conflicting and intertwined: the sweet scent of a fruit attracts a seed disperser, but also antagonistic insects. Thus, it is safe to say that all species operate in a complex chemical environment which shapes much of the adaptive landscape of all organisms. Much of this complexity remains unresolved, particularly in tropical systems, where species richness and the interaction networks they form are especially complex, and where sampling of chemical samples is particularly challenging. Recent years have seen technical and computational developments which transformed the field of chemical ecology and brought it to the -omics age. This session will cover these latest developments and explore how chemical interactions underlie ecological processes in tropical systems. It will cover a wide range of topics and applications: from herbivory to pollination and seed dispersal, and from animal communication to conservation, in an attempt to identify common themes and major drivers of variance in tropical chemical ecology and facilitate future collaboration and synthesis.

Funding: NA

Web and/or Twitter account: www.evolutionary-ecology.de, @ONevo_EvolEcol

T73 – Wednesday 10:30 – 10:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Cry for help: *Ficus* enhanced their inducible defence with the development of drought**XIAO Xue^{1,2}, SAM Katerina^{1,2}, MOOS Martin², NOVOTNY Vojtech^{1,2}**¹Faculty of Science, University of South Bohemia, Branisovska 31, 37005, Czech Republic²Biology Centre of the Czech Academy of Sciences, Branisovska 31, 37005, Czech Republic**E-mail:** eiraxiao@gmail.com

The tropics are particularly vulnerable to drought, which can have a significant impact on the diverse tropical insect species that feed on plants. Understanding the affect of drought on *Ficus* – insect interaction is crucial to understanding tropical plant-insect interaction in the context of climate change.

We set up an experiment in the tropical rainforest of Papua New Guinea, where we established a drought gradient: control (100% rainfall), mild drought (50-60% rainfall), and severe drought (20-30% rainfall) by constructing shelters for 10 replicates per treatment across five plant species. After 15 and 26 months of drought stress, we collected predatory flies from five individuals of each treatment by placing a yellow sticky trap on each plant for 72 hours. We also triggered leaf defense by spraying certain 25mM Methyl Jasmonate solution on each individual and collected the resulting leaf volatiles using silicone tubes.

We found both drought intensity and duration had significant impacts on the number of predatory flies, and the total emission of volatile compounds of each plant. Additionally, drought intensity and duration were the primary predictors of the volatile similarity among plants of each species. Overall, our findings indicate that tropical plants enhance indirect defense when resources are limited.

Funding: Czech Science Foundation, Grant No. 19-28126X**Web and/or Twitter account:** <https://multitrophicinteractions.blog/>

T74 – Wednesday 10:45 – 11:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Floral scents in the Neotropical orchid genus *Catasetum*: daily fluctuation in scent emission depends on euglossine pollinating genera

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In perfume-rewarding orchids, it is assumed that chemistry of floral scents has evolved under pre-existing olfactory and behavioural biases of male orchid bees belonging to different genera. Similarly, fluctuation of floral scent emission over the day might have evolved according to the activity pattern of pollinators. We hypothesise that, not only the chemistry but also the fluctuation of floral scent emission differs among *Catasetum* species showing a peak of scent emission around noon in *Euglossa*-pollinated and a peak early in the morning in *Eulaema*-pollinated species. To explore this question, we compared the chemistry of floral scents and their diel fluctuation in *Catasetum* species pollinated either by *Euglossa* or *Eulaema* bees using dynamic headspace methods and GC-MS. The chemical analyses reinforce previous findings that floral scent chemistry of *Catasetum* species groups according to pollinating euglossine genera. Moreover, our study offers the first experimental evidence for a distinct fluctuation of scent emission between *Euglossa*- and *Eulaema*-pollinated species. Altogether, our results indicate that floral scent traits within the genus *Catasetum* and other perfume-rewarding plants undergo pollinator-mediated selection, which also affects the total emission of scent over the day in such a way that more scent is emitted when pollinators are more active.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

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<https://www.researchgate.net/profile/Katharina-Brandt-3>

T75 – Wednesday 11:00 – 11:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Resin producing plants and stingless bees: an underrated relationship?**LEONHARDT Sara Diana ¹**

¹Technical University of Munich (TUM), Department of Life Science Systems, Hans-Carl-v.-Carlowitz-Platz 2, Freising, 85354, Germany

While it is widely known that bees collect pollen and nectar from flowers, it is still largely unknown that many bees, both solitary and social, also collect substantial amounts of plant resins from various plant species. This is particularly true for the tropical group of stingless bees. They utilize this chemically and physiologically complex plant exudate to build and protect their nests, to support their immune system and to increase their chemical and functional repertoire.

Our group aims at elucidating the role of resin collection for stingless bees. We also investigate the influence of landscape-related availability and diversity of resin-providing plants on their collection behavior and colony performance. Our findings revealed a broad spectrum of resin sources generally targeted by stingless bees in different tropical regions. However, the spectrum of resin collected was strongly affected by the surrounding landscape and plant community. Resin diversity collected by colonies decreased in intensively used agricultural areas, with likely negative effects on its functional properties. Resin may thus play a strongly underestimated role in the wellbeing of tropical stingless bees.

Funding: NA**Web and/or Twitter account:** <http://pii.wzw.tum.de/home.html>, @BeePlantChem

T76 – Wednesday 11:15 – 11:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Evolution of fruit scent in Madagascar's figs

NGUYEN Linh M. N. ^{1,2,3}, **RAZAFIMANDIMBY Diary** ⁴, **SONTOWSKI Rebekka** ^{1,2}, **Ebersbach Jana** ⁵, **WEINHOLD Alexander** ^{1,2}, **ONSTEIN Renske** ^{1,6}, **SCHLUTER Philipp** ⁷, **VAN DAM Nicole** ^{1,2,3}, **NEVO Omer** ^{1,2}

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Fruit scent has evolved as a signal for frugivores, in ripeness and potentially in fruit quality. However, it is still unclear how and what parts of fruit scent have evolved as signals for frugivores and what information they contain. Aliphatic esters are found to be concentrated in species that communicate with seed dispersers via chemical cues and only in ripe fruits. Some evidence and theoretical basis have indicated a positive correlation with sugar content. This means that there might be a link between chemical signals and where chemical coevolution is expected for fruit dispersed in lemurs. Our research aims to identify whether aliphatic esters are indeed an honest signal for fruit quality and test whether it is an adaptation acquired by plants. We test this hypothesis on a model system of up to 20 fig species (*Ficus* spp; MORACEAE) growing in Madagascar. With collections of fruit and leaf, we intend to (1) establish an ecological network, (2) reconstruct phylogeny, (3) identify the link between chemical signal and reward by using thermo desorption gas chromatography-mass spectrometry (TD-GCMS) and high-performance liquid chromatography (HPLC), and (4) to sequence alcohol acyltransferase (AAT) to check if the selection regimes corresponding to the dispersal mode.

Funding: DFG- NE 2156/3-1

Web and/or Twitter account: @LinhNchemeco

T77 – Wednesday 11:30 – 11:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

The branching off of the fruit chemical environment: using metabolomics to identify patterns of divergence in the secondary metabolites of leaves and fruit within two hyperdiverse pantropical plant genera

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Animal-mediated seed dispersal represents a distinctive adaptive landscape for plant secondary metabolites, encompassing a variable combination of antagonistic and mutualistic interactions. Fruit and seeds involved in such interactions can contain a diverse array of secondary metabolites, but distinguishing the compounds associated with fruit-centric interactions remains a challenge. Focusing on the species-rich pantropical genera *Piper* and *Psychotria*, we use a metabolomic approach to characterize the chemical diversity, tissue specificity, and phylogenetic relationships of fruit secondary metabolites in contrast to leaf secondary metabolites. We analyse leaf, pericarp, and seed tissue of 12 *Piper* species and 21 *Psychotria* species, using untargeted UPLC-MS² metabolomic profiling and structural similarity-based molecular networking to quantify chemical diversity and classify compounds for phylogenetic comparisons. Chemical similarity was compared with phylogenetic similarity through hierarchical clustering, phylogenetic signal (K) tests, and mantel tests for each tissue type. In both genera, fruit-specific compound richness exceeded that of leaf tissue, though overall compound richness of fruit vs. leaves was highly variable. In both genera, interspecific chemical similarity of one or more fruit tissue was uncorrelated with phylogeny (Mantel tests $P > 0.05$). Thus, our study provides evidence for evolutionary divergence in fruit- and leaf metabolomes, while demonstrating the efficacy of metabolomics for such purposes.

Funding: U.S. National Science Foundation # IOS-1953934, DEB-1210884, and DEB-1856776

Web and/or Twitter account: <https://seedscape.github.io/BeckmanLab/>,
<https://www.speciesinteractions.com/>

T78 – Wednesday 11:45 – 12:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Why are tropical plants chemically diverse: latitudinal trends in various dimensions of chemical diversity

VOLF Martin^{1,2}, **LEONG Jing Vir**^{1,2}, **AUBONA Gibson**^{1,2}, **SEGAR Simon T.**³, **NOVOTNY Vojtech**^{1,2}, **SEDIO Brian E.**^{4,5}

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Intense herbivory is generally supposed to increase the potency of defensive metabolites in tropical plants. However, previous studies that focused on trends in total contents of broad chemical classes have found either little variation with latitude or greater plant investment in defence at higher latitudes. We thus still do not understand patterns in plant chemistry across large spatial scales. To bridge the contrasting results of previous studies, we propose that we need to study various dimensions of chemical diversity that underline the overall latitudinal trends in plant chemistry. We can draw some information on the complex latitudinal trends in plant chemical diversity by generalizing conclusions from elevational gradients. We show that different trends contribute to distinct aspects of chemical diversity in speciose genera of plants occupying different realised habitats. While abiotic stress at high elevations filters plants towards similar chemistry and possibly supports chemical convergence, lowland conditions promote divergence between closely related species. We propose that these elevational patterns of herbivory, host specialization, quantitative investment in chemical defence, and chemical β -diversity may be analogous to latitudinal clines in plant chemistry due to similar underlying gradients in the relative importance of abiotic stress and biotic interactions.

Funding: Grant Agency of the Czech Republic, grant 19-28126X

Web: <https://www.volfiab.com/>

T79 – Wednesday 12:00 – 12:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

The importance of scent for Hoffmann's two-fingered sloths (*Choloepus hoffmanni*)

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Sloths are highly specialised mammals living in the tropics throughout Central and South America. The unique structure of sloth hair along with humid conditions facilitate the growth of algae, microorganisms, and arthropods. The biodiversity of epibionts associated with sloths remains poorly characterised and most aspects of sloth behaviour are still unknown. The two-fingered sloth, *Choloepus hoffmanni*, displays great spatial orientation despite having poor vision. It exhibits strong sniffing behaviour as it moves and encounters other sloths, suggesting that it relies on its sense of smell instead of visual cues. We tested the importance of olfactory cues for social recognition in two-fingered sloths and investigated whether sloth fur algae/microbes might contribute to the smell of sloths. We will report on preliminary results for 3 sets of experiments aimed at understanding: (1) whether two-fingered sloths can distinguish scents obtained from sloths of the same or different species (the three-fingered sloth *Bradypus variegatus*); (2) how scents collected from the face or from anal secretions of sloths differ within and between sloths of different sexes; and (3) whether sloths present a difference in body odours when dry vs. wet, possibly due to activation and release of volatiles from algae and other microbes.

Funding: Deutsches Zentrum für Integrative Biodiversitätsforschung (iDiv; DFG-FZT 118, 202548816) & NSF-CAREER #DEB-1846376 (EFYH)

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T80 – Wednesday 12:15 – 12:30 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

The sensory ecology of fear: African elephants show aversion to olfactory predator signals**VALENTA Kim¹, SCHMITT Melissa², AYASSE Manfred³, NEVO Omer⁴**¹*University of Florida, Anthropology 355 Newell Dr, Gainesville, FL 32611, USA*²*University of California at Santa Barbara, Ecology, Evolution and Marine Biology, 2009 Marine Sciences Building, Santa Barbara CA 93206, USA Street name and number, Town, Postal code, Country*³*Universität Ulm, Institute of Evolutionary Ecology and Conservation Genomics, Albert-Einstein-Allee 11 D-89081 Ulm, Germany*⁴*German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, 04103 Leipzig, Germany***E-mail:** kimvalenta@ufl.edu

Human–elephant conflict is a persistent problem across elephant home ranges, that results in economic damage to commercial and subsistence farmers, and physical harm and death to humans and elephants. Various methods to mitigate human–elephant conflict have been employed, but to date these have been hampered by financial and logistical considerations. Based on the fact that African elephants are preyed by lions and possess a remarkable sense of smell, we hypothesize that elephants are strongly averse to olfactory signals of lion presence, and that this can be utilized to create invisible barriers which elephants will not cross. We conducted a series of tests that show that lion dung is an effective deterrent of elephants. We conducted chemical analyses of lion dung and identified the main compounds. We then used synthetic mixtures containing these compounds, and show that they successfully elicit the deterrence effect, even in miniscule concentrations. These results indicate that elephants can be deterred using simple and low-concentration mixtures based on available commercial products, that can be developed into products that offer a safe, sustainable, and cost-effective method to mitigate human– elephant conflict.

Funding: NA**Web and/or Twitter account:** www.kimvalenta.com

T81 – Wednesday 15:45 – 16:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 2: Tropical chemical ecology – current questions, future trends

Effects of temperature gradient on functional fruit traits

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Fruit traits mediate animal-plant interactions and have to a large degree evolved to match the sensory capacities, morphology and behavior of their respective dispersers. At the same time, fruit traits are affected by local environmental factors; specifically, temperature has been identified as a major factor with a strong effect on fruit development. Little is known about the effect of rising temperatures on fruit traits of wild species and the implications this could have on frugivore dispersal networks. We addressed this using the elevation-for-temperature approach in a montane tropical system and examined whether a temperature gradient is associated with variation in fruit traits relevant for animal foraging in five species. The gradient selected compromised a temperature variance corresponding to IPCC projections for temperature rise in this century. The results showed there was no significant effect of temperature on the traits evaluated, although some species showed different effects, particularly in chemical profiles. This suggests that temperature rise within this range alone is not likely to drive substantial changes in the dispersal networks. While no systemic effects were found, the results also indicate that the effect of temperature on fruit traits differs across species and may lead to mismatches in specific animal-plant interactions.

Funding: Dr Arthur Pfungst-Stiftung

Web and/or Twitter account: NA

T82 – Wednesday 16:00 – 16:15 Poster P3 + Lightning talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 2: Tropical chemical ecology – current questions, future trends
Fruits and microbes, friends or foes? The hidden role of microbes in fruit chemical signaling to seed dispersers

CHRONOPOULOU Evangelia^{1,2,3}, **PRADA SALCEDO Luis Daniel**^{1,4}, **HERRMANN Martina**^{1,2}, **KÜSEL Kirsten**^{1,2}, **NEVO Omer**^{1,2}

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Seed dispersal is crucial for plants and a major strategy for this is wrapping the seeds in nutritious flesh, attracting animals, and turning them into vectors for movement. Fruit scent plays a significant role in providing information on ripeness, and facilitating fruit selection. Chemical signalling is based on “generic” plant volatile organic compounds with a significant exception: aliphatic esters! They are prominent primarily in ripe fruits and only in species that rely on scent for dispersal. Previous studies assumed that the fruit itself was responsible for all chemical communication, but is this true? Esters are synthesized from alcohols and acids, which can be products of microbial fermentation, and are strongly linked to sugar levels, the reward animals seek. Thus, microbes may play an unexplored role in turning a bipartite interaction into a tripartite one. However, increased microbial activity can hasten fruit decomposition. We will test a “trade-off” hypothesis: plants relying on scent-driven animal seed dispersers tolerate higher microbial activity to enhance their scent while suffering faster decay. We will apply chemical and molecular tools to assess if fruit scent is driven by microbes and behavioural tests to evaluate the enhanced attractiveness to dispersers on two different groups of fig species: lemur-dispersed, as lemurs are olfaction-oriented, and bird-dispersed, as birds tend to be vision-oriented. Derived results could unveil a previously unseen key partner, providing a better understanding of the co-evolution between plants, microbes, and animals.

Funding: Friedrich Schiller University of Jena, LIFE “Connect” fund 2022

Web and/or Twitter account: www.evolutionary-ecology.de , @LindaMcDuck, @ONevo_EvolEcol

T82 – Wednesday 16:00 – 16:15 Poster P4 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Chair: Christine B. SCHMITT

Most of the world's biodiversity hotspots are located in the tropics. They are defined as areas with exceptional high species diversity and endemism where only a small proportion of natural habitat still remains. While some of those habitats are under formal protection, others have long been conserved by local societies that attach cultural and spiritual value to particular species, forests or other natural phenomena. As there is growing recognition that nature conservation needs to go beyond conventional protected areas, it is crucial to better understand how societies have maintained species and ecosystems as part of their local traditions. Moreover, traditions and lifestyles are changing in many parts of the tropics, which also has repercussions on traditional conservation approaches. Therefore, this symposium aims to showcase examples of the role culture and tradition can play in biodiversity conservation. The session has a focus on research conducted in East Africa within the project "BioCult: Culture and Conservation – Harnessing synergies between cultural traditions and biodiversity protection", including the Ethiopian church forests and the sacred Mijikenda Kaya Forests of Kenya. In addition, we welcome contributions from other parts of the world. We believe that this topic is of interest to a wider audience as the recent meeting of the Convention of Biological Diversity (CBD) in Montreal (COP 15) has shown that indigenous peoples and local communities play a crucial role in the global effort to stop biodiversity loss.

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

BIOCULT - Harnessing synergies between cultural traditions and biodiversity protection in theory and practice

TEUCHER Mike¹, HABEL Jan Christian², SCHMITT Christine³, RIECKMANN Marco⁴, MAGHENDA Marianne⁵, SHAURI Halimu Suleiman⁶, DEFFERSHA Habtamu Assaye⁷, LEGESSE Solomon⁷

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The current biodiversity crisis is particularly pronounced in the tropics, where demographic pressure is high and many ecosystems are fragile. The provision of habitats for biota and ecosystem services for livelihood quality are essential functions and thus the preservation of biodiversity beyond nature reserves, across anthropogenic landscapes is of high relevance. In this talk we will present our transdisciplinary network activity, which is focusing on the combination of natural sciences and social sciences. The selected study regions form exclaves of remaining forest ecosystems with a high cultural relevance. These ecosystems are of high cultural relevance and still harbor a high level of biodiversity and ecosystem functions – also to the surrounding landscapes and living people. Our findings show that the active participation of the local community plays a key role, especially the youth are an important target group to ensure the persistence of these sacred places for the cultural traditions in a modern world and raising awareness among them. Thus, we structured this research and teaching activities into three phases: 1. Data collection and analyses; 2. Identification of stakeholders; 3. Implementation of active conservation and resource management in the field.

Funding: funded by the DAAD with funds from the Federal Ministry for Economic Cooperation and Development (BMZ)

Web and/or Twitter account: www.biocult.net

T58 – Wednesday 10:30 – 10:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

The effects of customary fires for rainfall attraction in Taita Hills, Taita Taveta County Kenya.

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There exists limited research on customary or cultural fire practices and consequences on biodiversity losses have not been adequately documented. This paper examines historic and contemporary utilization of fire for rainfall attraction among the Taita community in Kenya. It also explores the potential effects of cultural adherence on the suppression of endemic biodiversity species in the Taita Hills forest fragments. Interviews and focus group discussions were conducted to understand both historical and current practices in forest patches of Susu, Mwanjenye, Vuria, Ngangao, Wesu, Wongonyi and Nyache. The elders, youth and women were interviewed, and data collected on history of land use, reasons for burning and perceptions of fires. The major reason noted was to keep the tradition to appease the ancestors for rains. Secondly, access to firewood in restricted areas. This custom is not sustainable in the current climate-change circumstances and a policy should be agreed upon by the community to stop it. The community emphasized the need to do away with this retrogressive custom that has destroyed the landscapes and needs restoration. Restoration of the Taita Hills forest fragments remains a big challenge and evaluation of the seven recently burned sites is in the process to put mitigation measures.

Funding: DAAD-Quality Network Biodiversity Kenya (2016-2019)

Web and/or Twitter account: NA

T59 – Wednesday 10:45 – 11:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

The last forest fragments of East Africa represent highly important refuge areas for butterfly conservation: the example of Kaya Kambe (southern Kenya)

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Forests of East Africa are hotspots of diversity and endemism. However, most of them have been destroyed so that only small remnants do exist today. To what extent the original species inventories can persist there is questionable. Therefore, we analysed the community structures of butterflies, a taxonomic group reacting highly sensitive to environmental changes, in the coastal forest patch Kaya Kambe (southern Kenya), but also in the adjoining agricultural landscape. Line-transects were established in the dense forest, along forest edges, as well as in neighbouring pastures and orchards. The butterfly communities of the forest differed sharply from the anthropogenic landscape and had a less pronounced difference between seasons than anthropogenic habitats. Although abundance and species richness were lowest inside the natural forest, vulnerable forest specialists were exclusively detected here and were absent from all anthropogenic habitats. The butterfly communities found in the agricultural landscape were comparatively species rich but dominated by some generalist species. Thus, no surrogate habitats exist for specialist forest butterflies. Similar results were obtained in other studies on butterfly communities in the coastal and mountain forests of East Africa. This underlines the high relevance of long-term preservation of these forest remnants to safeguard biodiversity.

Funding: German Academic Exchange Service, project BIOCULT

Web and/or Twitter account: NA

T60 – Wednesday 11:00 – 11:15 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation**Integrating cultural values to strengthen conservation action: The case of sacred Kaya Kambe forest in southern Kenya****SHAURI Halimu Suleiman¹, OBEKA, B. W.¹, HABEL J.², MIKE T.³**¹*Pwani University, Social Sciences, Mombasa-Malindi Highway, Kilifi, 80108, Kenya*²*Paris Lodron University Salzburg, Dept. Environment and Biodiversity, Hellbrunner Str. 34, Salzburg, 5020, Austria*³*Martin Luther University Halle-Wittenberg, Institute of Geosciences and Geography, Department of Geoecology, Von-Seckendorff-Platz 4, 06120 Halle (Saale), Germany***E-mail:** hshaurig@gmail.com

The tropics has a large proportion of the global biodiversity. Increasing anthropogenic pressure leads to large-scale habitat destruction such as deforestation, and the subsequent vanishing of biodiversity. The impact of climate change and strained eco-system services is clear testimony. While the exploitation of government forests raises majorly climate related concerns, the depletion of cultural forests adds loss of community shrines, culture and heritage spaces for cultural practices. The sacred Kaya Kambe, like many Kayas in southern Kenya, has suffered serious degradation. This study addresses the questions of what is the influence of cultural values of the Kambe people on the conservation of the Kaya forest and what gaps exist in the transmission of cultural values across generations on conservation of the Kaya. A cross-sectional survey design applying a questionnaire and a key interview guide was applied to collect data on a simple random sample of 384 participants. Findings show that the Kambe people appreciate the role of cultural values on conservation of the Kaya forest. On the contrary, a glaring gap was also found with regard to the involvement of youth in conservation, especially in managerial and leadership roles. This gap is evidence of the intergenerational conflict pitying community values and use of the Kaya resources to support livelihoods.

Funding: NA**Web and/or Twitter account:** NA

T61 – Wednesday 11:15 – 11:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation**Multivariate-statistical analysis of the relationship between the use of ecosystem services and the willingness to protect the Kaya Kambe (Kenya) based on empirical data****WICHMANN Marlon¹, SCHRÖDER Winfried¹, REITH Alexandra¹, RIECKMANN Marco¹**¹*University of Vechta, P.O.B. 1553, 49377 Vechta, Germany***E-mail:** Marlon.Wichmann@mail.uni-vechta.de

Cultural ecosystem services of Kaya forests for the Mijikenda society in Kenya contributed to the conservation of this tropical landscape despite a growing population. A questionnaire was used to collect data on the human-environment relationship in the vicinity of Kaya Kambe in 2022. The data analysis aimed at identifying factors and their interactions for the willingness of the local population to protect the Kayas, defined as a dependent variable in two statistical models. In the first model, those variables were considered that were also used in the hypothesis-testing based on individual contingency tables, which is not presented here. This hypothesis-testing approach was supplemented by a hypothesis-explorative second model which additionally regarded variables not considered in the hypothesis testing. These two statistical analyses were carried out using Chi Square Automatic Interaction Detection. The first model confirmed the following interacting constraints on conservation willingness: importance of Kaya trees, personal benefits from protecting Kayas, importance of Kaya animals and usefulness of Kayas as a source of minerals. The second model discovered additional influences, as for instance the cultural value of Kayas. The study enabled recommendations for the protection of the Kayas such as the participation of local people in sustainable forest management.

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Web and/or Twitter account: www.biocult.net

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T62 – Wednesday 11:30 – 11:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Multi-method research on the importance of traditional and state actors in forest conservation in Kenya, based on the example of Kaya Kambe

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The centuries-old religious and cultural relationship of the Mijikenda society with the ecologically highly significant Kaya Forests in the coastal region of Kenya is probably unique in the world. However, the Kaya Forests are threatened by factors such as increasing droughts and rising settlement pressures. In order to generate more knowledge about these developments, a multi-method research was conducted using Kaya Kambe as an example to investigate the importance of traditional culture and its actors on the one hand and government institutions on the other hand for Kaya Forest conservation. For this purpose, a series of qualitative expert interviews were carried out with representatives of the traditional authorities of the Mijikenda as well as relevant state institutions to be able to capture their roles and perspectives on the conservation issue. Subsequently, the interviews were analyzed using Qualitative Content Analysis. In addition, the forest area was mapped involving traditional knowledge systems to gain a better understanding of the current condition of the Kaya Kambe Forest. The research was conducted through Kenyan-German collaboration and advances understanding of how traditional and state actors work together to protect Kaya Forests and, furthermore, what factors hinder this cooperation.

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Web and/or Twitter account: www.biocult.net

T63 – Wednesday 11:45 – 12:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Conservation and restoration of the Ethiopian Church Forests; a case study at Tara Gedam Church Forest

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The northern highlands of Ethiopia are largely degraded. However, in the midst of the vast degraded lands, there are many well preserved church forest patches of the Ethiopian Orthodox Church. There are about 35,000 church forests patches throughout the country. These forest patches are relics of the dryafromontane forest which has high biodiversity and endemism. Recently, a study was undertaken on the biodiversity of the Tara Gedam Church Forest through the BIOCULT project. This forest covers about 175 ha and inhabits about 200 monks, nuns and deacons. The study focuses on the conservation status of the church forest by comparing the core areas with the forest edge and its spillover effect to croplands. The population structure, regeneration condition and level of disturbances of the vegetation will be analyzed. Preliminary results have shown that there are over 150 woody plant species (shrubs and trees). Felling trees for fuel wood and grazing of the regeneration by cattle threaten sustainability of the forest ecosystem. Ensuring the regeneration of the forest is most important. Therefore, interventions that limit the grazing of cattle to restricted areas, as well as plantation developments at the buffer areas that provide fuel wood are vital.

Funding: German Academic Exchange Service - Deutscher Akademischer Austauschdienst, BIOCULT

Web and/or Twitter account: <https://biocult.net/>

T64 – Wednesday 12:00 – 12:15 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Climate change mitigation strategies: The role of Ethiopian church forests

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Ethiopia is one of the most vulnerable countries to climate change. This is not only because the country is prone to droughts and floods, but also because the majority of Ethiopians (80-85%) depend on rain-fed agriculture and pastoralism for their livelihoods. Vulnerability is exacerbated due to the country's high level of poverty and its dependence on key sectors most likely effected by climate change. Sensitive systems such as agriculture, health, and water have been affected, and the effects of climate change will continue to magnify without the right adaptation and mitigation measures. Forests are known to play an important role in regulating the global climate, by serving as a natural sink of CO₂ to mitigate climate change. Churches and monasteries have a long history of planting, protecting and conserving trees. Church forests are playing a significant role in combating climate change and informal enhancing biodiversity conservation. Estimated carbon stocks of church forests by quantifying the aboveground biomass and belowground carbon of trees are playing a significant role in storing carbon from the atmosphere. Church forests and indigenous way of forest protection has playing an enormous roles in carbon sequestration. Hence, it needs urge calls for an immediate attention for conservation, protections and documentation of indigenous knowledge and cultural and religious practices all over the country.

Funding: Bahir Dar University, BIOCULT Project

Web and/or Twitter account: www.bdu.edu.et

T65 – Wednesday 12:15 – 12:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Biodiversity and ecosystem functions across Afro-tropical forest islands**HABEL Jan Christian¹, SEIFERT Tobias¹, TEUCHER Mike²**¹*Evolutionary Zoology, Department of Environment and Biodiversity, University of Salzburg, A-5020, Salzburg, Austria*²*Department of Geoecology, Institute for Geosciences and Geography, Martin Luther University Halle-Wittenberg, D-06120 Halle/Saale, Germany***E- mail:** tobias.seifert@plus.ac.at

Ecosystem functions are important for the resilience of ecosystems and for human livelihood quality. Intact habitats and heterogeneous environments are known to provide a large variety of ecosystem functions, which are of high relevance for food-crop production. In our studies we analysed proxies of biodiversity and ecosystem functions, namely pollination activity, predation rates, and arthropod diversity in tree canopies. We set study plots along forest-agroecosystem-gradients, covering cloud forest, forest edge and agricultural fields, as well as plantations of exotic trees in Taita Hills (Kenya) cloud forests and beyond. The expression of ecosystem functions differed among habitat types, with comparatively high predation rates in the forest, high pollinator activity in the open agricultural areas, and highest arthropod diversity along the forest edge. Eucalyptus plantations showed reduced ecosystem functions and lowest arthropod diversity. Local factors such as vegetation cover and flower supply positively influence pollinator activity. Our study show that natural ecosystems may positively contribute ecosystem functions such as predation, while the homogenization of biota through planting of invasive exotic tree species significantly reduce biodiversity and ecosystem functions.

Funding: NA**Web and/or Twitter account:** NA

T66 – Wednesday 15:45 – 16:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Evaluation of the Land cover Land use (LCLU) Change on the Taita hills forest fragments in Ngerenyi area, Taita Taveta County in Kenya

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The Taita hills forest is undergoing rapid transformation into different land uses and land cover changes attributed mainly to anthropogenic activities. The study evaluated the land cover land use changes and tenure systems on Taita hills forest fragments between 1999 and 2017 to elucidate the diminishing tropical forests in the County. A supervised classification analysis was applied to detect land cover land use changes using multispectral satellite imagery from Landsat 4-5 1987 and 2008, Landsat 7 1999, and Landsat 8 2017. Four land cover classes; artificial surface, agricultural land, dense vegetation and light vegetation were identified and changes over the period quantified. There was both an increase and decrease in land cover changes of the different classes, with land cover changing to artificial surfaces and light vegetation by up to 290.6% and 50.6% respectively. Agricultural land and dense vegetation reduced by 20.7% and 33.7% respectively due to encroachment and establishment of settlements. There was notable increase in the annual forest cover of about 9.7% and 1.7% per annum due to the exotic trees and agro-forestry practices. Land ownership was mainly the revolving land tenure system. Gazetting of all forest fragments can enhance forest protection and management.

Keywords: *Change detection, supervised classification, Land Cover; Land Cover change*

Funding: DAAD-Quality Network Biodiversity Kenya (2016-2019)

Web and/or Twitter account: NA

T67 – Wednesday 16:00 – 16:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Effect of human activities on vegetation structure and arthropod availability in the Taita Hills: implication for birds

KUNG'U Gladys Nyakeru^{1,4}, COUSSEAU Laurence^{2,4}, GITHIRU Mwangi^{3,4}, HABEL Jan Christian¹, KINYANJUI Mwangi⁵, MATHEKA Kennedy⁶, SCHMITT Christine B.⁷, SEIFERT Tobias¹, TEUCHER Mike⁸, LENS Luc², APFELBECK Beate^{1,6}

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Land use change poses the main threat to forested ecosystem and forest specialists. In addition, it has recently become evident that the ongoing degradation of the remaining primary forests will magnify species loss, especially for highly specialized fauna with little mobility. Identifying drivers of forest degradation is fundamental for guiding forest management and conserving threatened forest species. The present study had three objectives: (i) identifying factors that best explain variation in vegetation structure in the cloud forest fragments of the Taita Hills, (ii) examining the influence of degraded vegetation structure on arthropod abundance and diversity and (iii) discussing the implications of vegetation structure degradation and altered arthropod availability on insectivorous birds and recommending conservation solutions. We sampled various vegetation structure elements and arthropods across eight forest fragments, covering a wide range of fragment sizes and human disturbance level. We found that human activities at the landscape and plot level were important predictors of variation in vegetation structure in the Taita Hills forest fragments. Our results also show a relationship between multi-layered vegetation stands and canopy cover on arthropod abundance. Thus, exploitation of forest resources in a manner that distorts the vegetation layering may affect arthropod availability for insectivorous birds.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

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Web and/or Twitter account: NA

T68 – Wednesday 16:15 – 16:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation**Land use transitions in the rural-urban interfaces of Hawassa in Sidama Region of Ethiopia: implications to agrobiodiversity****KELBORO Girma¹, LEGESSE Abiyot²**¹*University of Bonn, Center for Development Research (ZEF), Genscherallee 3, Bonn, 53113, Germany*²*Dilla University, Geography and Environmental Studies, P.O.Box 419, Dilla, Ethiopia***E-mail:** gmensuro@uni-bonn.de

Smallholder farmers in Sidama are characterized by indigenous agroforestry, which constitutes culturally managed agrobiodiversity-rich landscapes. This culture is now at risk partly due to urbanization. We conducted research on rural-urban interfaces of Hawassa to understand the changes taking place and the implications to agrobiodiversity. Mixed methods approach was followed for data collection in which Focus Group Discussion, in-depth interviews, case stories and participatory transect walks were combined with analysis land use/cover changes using remotely sensed imageries. Our findings show that significant proportion of agroforestry land use, wetland and agricultural land in rural areas around Hawassa were converted to urban settlements, social facilities and infrastructure. Urbanization-induced land market boom has challenged the cultural land value of Sidama. With urbanization, land is being commodified and entering market. These lands are changing into urban settlements by clearing the vegetation cover. Between the years 1986 and 2016, for example, built-up areas expanded by about 65%. More than 90% of our interviewees agreed that natural vegetation cover is being lost due to urbanization and increasing population. Urbanization should consider ways to integrate traditional agroforestry and land management practices into their planning to reduce biodiversity loss.

Funding: German Research Foundation (DFG)**Web and/or Twitter account:** www.zef.de

T69 – Wednesday 16:30 – 16:45 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Drivers and consequences of archetypical shifting cultivation transitions

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Shifting cultivation represents an important social-ecological system in many tropical landscapes, but transitions away from shifting cultivation to other land uses are increasingly common. So far, our knowledge on the drivers and consequences of such shifting cultivation transitions is incomplete, focusing on certain transitions, drivers, consequences, or regions. Here, we use an archetype approach, validated through systematically identified literature, to describe eight archetypes encompassing the transition from shifting cultivation to 1) perennial plantation crops, 2) permanent agroforestry, 3) passively regrowing forest, 4) permanent non-perennial crops, 5) pasture, 6) wood plantation, 6) non-cultivated non-forested land, and 8) actively restored forest (ordered in decreasing prevalence). We then elucidate factors favouring and disfavouring each archetype and discuss consequences of these transitions for biodiversity and ecosystem services. Our archetype analysis shows that shifting cultivation transitions are diverse in themselves, in their drivers, and their consequences; in line with commonly observed system dynamics in social-ecological systems. This is calling for a critical and contextualized appraisal of the continuation of shifting cultivation, as well as the transition away from it, when designing land system policies.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

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T70 – Wednesday 16:45 – 17:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation**The price of conservation: an effectivity analysis of biodiversity conservation in the protected areas of the Mount Elgon region, Uganda.****VON KOCEMBA Michèle¹**¹*University of Hamburg, Department of Geography, Bundesstraße 55, 20146 Hamburg, Germany***E-mail:** mvkocemba@gmail.com

As the global protected area network expands further in the wake of global biodiversity loss and climate change, conservation interests continue to clash with socioeconomic needs of local inhabitants residing in the world's biodiversity hotspots. While the number of studies on the effectiveness of protected areas grows steadily, fewer publications address their impact on the well-being of local populations in multidimensional approaches. This case study, located in the Mount Elgon region, Uganda, aims to answer (1) how forest cover has developed since the establishment of the Mount Elgon national park (1993) and the Mount Elgon UNESCO biosphere reserve (2005), and (2) how management affects community well-being based on a combined remote sensing and interview analysis methodology. The results reveal that Mount Elgon national park is managed in a fortress conservation approach, whereas the UNESCO biosphere reserve is currently not fully implemented: While the highly restrictive, militarised conservation approach has been partially effective in reducing deforestation, it has fostered an intense conflict rooted in historical injustices: Currently, communities pay for conservation through the severe decrease of their well-being. Increased and equal participation, fair benefit sharing mechanisms, mediation between stakeholders and communities, as well as proper implementation of the UNESCO biosphere reserve concept are among the necessary recommendations to increase community well-being and to improve conservation outcomes in the region.

Funding: Deutsche Bundesstiftung Umwelt AZ 35183**Web and/or Twitter account:** NA

T71 – Wednesday 17:00 – 17:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Sri Lankan Marine Protected Areas demonstrate low levels of protection and establishment efficiency

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Are Sri Lankan Marine Protected Areas (MPAs) simply “paper parks”? As little hard biological survey data is available to assess the efficacy of these reserves, we have attempted to address this question using an approach which considers the harmful activities impacting sites, as well as their planning and management. Our findings, based on thorough review and personal knowledge, suggest that Sri Lankan MPA implementation makes successful MPAs unlikely. Harmful fishing, anchoring, and non-extractive activities within the areas, and spill over of pollutants from external sources, all occur with their magnitude varying between different MPA types. Lack of administrative transparency, communication, awareness, insufficient funding and staffing also seriously jeopardize MPA efficacy. Levels of collaboration and partnership with surrounding human communities are mostly undocumented, with social objectives and maintenance of human well-being not being considered in management plans. Because only areas reaching a certain standard of good practice can protect biodiversity and accrue its benefits, we are concerned that Sri Lankan MPAs will not necessarily achieve these goals. Ensuring their success will ultimately require better legislative and ministerial support, involvement of local human communities and promotion of sustainable financing and alternative livelihoods for those dependent on the MPA resources.

Funding: NA

Web and/or Twitter account: NA

T72 – Wednesday 17:15 – 17:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Sacred forest fragments exhibit high forest structure, species composition and diversity: a study of the plant diversity and community structure of the coastal forests of Kenya

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The coastal forests of Kenya are biodiversity hotspots composed of sacred forests and forest reserves. They face threats of increased population and biodiversity loss. There is lack of studies covering a wide range of these fragments for a biogeography conservation approach. Here, we investigate patterns and drivers of forest structure and species diversity across remnants and within protection status of forest reserves and sacred forests. We sampled woody vegetation in 25 fragments composed of 18 sacred forests and seven forest reserves using 158 plots. We measured the diameter at breast height DBH > 5cm and height, and shrubs recorded in two subplots of each plot. We recorded 600 taxa belonging to 343 genera and 80 families. We found forest structure, composition and species diversity to be significantly different across forest sites and between sacred forests and forest reserves. Species accumulation curve and multiplicative beta partitioning showed significantly higher beta diversity across fragments than within plots and subplots (alpha diversity). Our results present for the first time a quantitative information on the coastal forests of Kenya exhibiting the critical role of the sacred forests in biodiversity conservation. Conservation strategies across biogeographical and ecological scales should include sacred forests in the protected areas network.

Funding: NA

Web and/or Twitter account: NA

T103 – Thursday 10:45 – 11:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Variation in nature's non-material contributions to people across habitats: a context-specific perspective at Mount Kilimanjaro

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Nature's non-material Contributions to People (non-material NCP) are intangible outcomes that stem from interactions between people and perceived entities of nature (EN), like feelings of inspiration or spirituality. Generalizing perspectives have been used to link broad categories of NCP to coarse proxies for EN, limiting our understanding of the role of EN in underpinning non-material NCP. We applied a context-specific perspective to assess variation in non-material NCP and perceived EN across multiple habitats at Mount Kilimanjaro, using tourists' posts on Twitter. We further investigated to what extent perceived EN underpinned non-material NCP. We found that both non-material NCP and EN varied across habitats, yet there was an inverse relationship between biodiversity-rich habitats and both number and type of non-material NCP. Recreation was strongly associated with mid-elevation habitats with perception of Plants as the most significant biotic entity. Overall, abiotic rather than biotic EN, and broad interpretations of nature rather than specific EN significantly influenced the number of non-material NCP. This study showed that variation in non-material NCP across habitats is contingent on people's awareness of EN and its derived benefits. Inclusion of our findings in decision-making will improve sustainable planning and management and promote locally-relevant NCP and EN.

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T104 – Thursday 11:00 – 11:15 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Ecological analysis of non-timber forest products production areas in Northern Togo (West Africa)**BAWA Demirel Maza-esso^{1,2}, FOLEGA Fousséni¹, AKPAGANA Koffi¹**¹University of Lomé, Department of Botany, Boulevard Gnassingbé Eyadema.01, Lomé, 1515, Togo²University of Belgrade, Faculty of Biology, Studentski trg 1, Belgrade, 11000, Serbia**E-mail:** demirelbawa@gmail.com

In Togo, non-timber forest products (NTFPs) play an important socio-ecological role for local populations but remain poorly known and exploited. This study aims to characterize and assess the management of NTFPs in the region of savannah in Togo. The methodological approach adopted is based on ethnobotanical surveys by focus groups of at least 3 to 4 people and individual interviews, complemented by direct observations in the field. Results reveal the knowledge of 46 species of NTFPs of plant origin divided into 43 genera and 24 families with Fabaceae (26,09%), and Combretaceae (6,52%) dominating. Microphanerophytes and Guinean-Congolese/Sudanian-Zambesian dominate respectively the life forms and phytogeographical types. The species listed are mostly used for food (53%) and medicinal purposes (26%). Almost all NTFPs are collected in agroforestry parks and surrounding protected areas. *Vitellaria paradoxa*, *Parkia biglobosa*, *Tamarindus indica* and honey are the most collected. Bushfires, logging, and the removal of organs such as bark, leaves, fruits, and latex are threats to the integrity of agrosystems. This paper highlights the diversity of NTFPs species and their threats. Mechanisms for the sustainable management of NTFPs through programs involving all stakeholders should be promoted for an optimal valorization of goods and services from forest ecosystems.

Funding: NA**Web and/or Twitter account:** NA

T105 – Thursday 11:15 – 11:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

A shift in interest from hunting among the young, educated Papua New Guineans: implications for conservation.

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Hunting, as a component of traditional indigenous livelihoods, can serve many functions in indigenous rainforest communities, but it can also be a major stress on wildlife. Quantitative data on changes in hunting skills in indigenous communities driven by education, employment, and other lifestyle changes are lacking. We surveyed 7818 young Papua New Guineans, representing 15% of the most educated individuals in their age cohort, to assess their hunting skills and ethnobiological knowledge. The students' self-assessment of their hunting skills showed that only 20% had good hunting skills, indicating an already low hunting skills among the young, educated population in Papua New Guinea. Although the results do not indicate abandonment in subsistence hunting, they do suggest that while hunting is increasing in remote rural areas and becoming a conservation concern, the educated portion of the young population appears to be turning away from hunting and pursuing other activities that provide food, income, prestige, and entertainment traditionally provided by hunting.

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Web and/or Twitter account: NA

T106 – Thursday 11:30 – 11:45 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Human - wildlife conflict in forest arm interface of Guraferda and Arsi Negele districts, Ethiopia

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The study was conducted in Gurafeda, Bench Magi zone, in the South region, and Arsi Negelle in the West Arsi zone of Oromia Region, Ethiopia, from December 2001 to January 2017. The aim of the study was to investigate human-wildlife conflict at the forest farm interface between Gurafarda and Arsi Negele. A questionnaire survey, focus group discussions, key informant interviews, direct observation, and review of literature were employed to collect data. A total of 247 households (86 in Guraferda and 161 in Arsi Negelle) participated in the household survey. Data were analyzed using the statistical package for social science (SPSS), especially the chi-square test, one-way ANOVA, and Microsoft Excel. Seventy-two percent (92%) in Guraferda and one hundred fifty-four percent (96%) in Arsi Negelle of respondents viewed the conflict between humans and wildlife as longstanding since the establishment of the farmland. According to the respondents, crop damage and livestock depredation were the major causes of human-wildlife conflict. Increased subsistence agricultural land was the main factor in escalating the conflict between humans and wildlife. Thirty-eight (38% of respondents) revealed that warthogs (*Phacochoerus africanus*) and 52 (32% of respondents) were the potential crop riders involved in crop damage in Guraferda and Arsi Negelle, respectively. Eighteen (18%) of respondents revealed that frequently damaged crops were rice in Guraferda and thirteen corn (5%) in Arsi Negelle. On the other hand, spotted hyenas (*Crocuta crocuta*) and common jackals (*Canes aureus*) were causing the highest livestock depredation. There had been killings of wildlife and human beings by large carnivores. There was significance difference in extent of crop damage ($\chi^2 = 25.845$, $df = 3$, $P = 0.001$). The shortage of food for wildlife might have increased trend and extent of crop damage during the last five years in both study sites. Guarding and fencing were commonly used as increased management options in both study sites. The study revealed that there was human-wildlife conflict that extended farms into the natural habitat (forest) where wildlife could have survived by finding food, causing damage to crops and depredation on livestock. Therefore, harmonizing wildlife conservation with human needs would reduce the conflict.

Key/phrases: Attitude, Human wildlife conflict, Forest farm interface, Wildlife

Funding: NA

Web and/or Twitter account: NA

T107 – Thursday 11:45 – 12:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

Social dimensions of conflict with crop-raiding peccaries in rural Suriname**KNIPPERS Ronja Hermiene Maria¹, VAN KUIJK Marijke¹, NOORLANDER Julia², DORRESTEIJN Ine³**¹*Utrecht University, Department of Biology, Padualaan 8, Utrecht, 3584 CH, The Netherlands*²*Wageningen University & Research, Department of Forest and Nature Conservation Policy, Droevendaalsesteeg 3, Wageningen, 6700 AA, The Netherlands*³*Utrecht University, Copernicus Institute of Sustainable Development, Princetonlaan 8a, Utrecht, 3584 CB, The Netherlands***E-mail:** r.h.m.knippers@uu.nl

The social dimensions of human-wildlife interactions are poorly understood because research rarely ventures beyond the tangible costs and benefits of living with wild animals. This is especially true for the understudied interactions between people and assemblages of small- to medium-bodied crop-raiders in South-America. We conducted semi-structured interviews with inhabitants of Nieuw-Aurora in Suriname, who depend on slash-and-burn agriculture, hunting and fishing. Subsistence farmers, hunters and village elders were questioned about their interactions with crop-raiders and associated tangible and intangible costs and benefits. We also investigated interactions between interviewees and locally active institutions regarding crop-raiding.

Inhabitants of Nieuw-Aurora experienced a recent increase in crop-raiding, especially by white-lipped peccaries (WLP). Crop-raiding by WLP was perceived as extremely problematic due to potential complete crop loss leading to food insecurity. Interviewees linked the rise in crop-raiding to an increase in (illegal) logging in the area. Moreover, they noted a lack of support by government and NGOs. These developments have led to negative perceptions of WLP and intensive hunting of the species, which is categorized as "Vulnerable" on the IUCN Red List. Conflict mitigation measures are necessary to simultaneously achieve food security and conservation of WLP in rural Suriname.

Funding: NA**Web and/or Twitter account:** NA

T108 – Thursday 12:00 – 12:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 3: Biodiversity and people: the role of culture and tradition in biodiversity conservation

A framework for restoration of ecological processes derived from trophic interactions

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Species reintroductions are proposed as a management strategy to restore ecosystem functioning. Restoration occurs through the re-establishment of trophic interactions and their derived ecological processes, such as pollination and seed dispersal. However, there are no methods to select the best species to achieve this goal. Here, we present a multitrophic, trait-based framework to estimate the consequences of species reintroductions to ecological processes resulting from trophic interactions. We built on the concept of process-related niche and used consumed resources to estimate the functional niche of the consumer community. Our model evaluates the ecological role of a consumer species based on its interaction novelty and resource availability. It incorporates a parameter that distinguishes unique interactions when measuring a species' potential effect, facilitating analysis of how originality affects restoration species selection. To illustrate the findings obtained from the framework, we compared the potential effects of two reintroduced frugivores (agoutis and howler monkeys) on seed dispersal. Agoutis and howlers have a similar potential effect when the originality of interactions is not taken into account. Nonetheless, howlers interact with fruits' trait values that are more common in the resource community, while agoutis add more unique interactions and interact with a broader trait variety of fruits.

Funding: CNPq, FAPERJ and FAPESP.

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T109 – Thursday 12:15 – 12:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Chairs: KLIMES Petr, HOENLE Philipp Otto

Ants are among the most abundant groups of tropical invertebrates and make important contributions to many ecosystem functions. They are suitable models to study the effects of environmental changes on the invertebrate abundance and diversity, at the level of both individual species and communities. In addition, studies are increasingly looking at the mutual interactions between different ant species (species behaviour and coexistence), and between ants and their feeding and nesting resources (bottom-up and bottom-down effects). Finally, manipulative experiments such as ant suppression have repeatedly shown the key role of ants, with some species benefiting other organisms and others, e.g. invasive species, causing harm. We propose to welcome speakers at this symposium who will use ants in tropical ecology as a model for several hotly debated topics today (climate change, habitat disturbance, invasion ecology, food webs, functional traits) and discuss their role in different tropical environments through observational and experimental studies. During the symposium, we hope to bring researchers together to discuss the latest findings in tropical myrmecology and identify knowledge gaps for fruitful ideas and future collaborations.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Tropical ant diversity and biomass: progress and gaps in knowledge

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Ants are among the most abundant groups of tropical invertebrates and make important contributions to many ecosystem functions. There has been a significant progress in the last decades in our understanding of the ant distribution over global scales. In particular, global databases such as GABI, GLAD, and Antmaps and Antweb online tools proved to be an important step in forward, using an unprecedented collation of data. These global efforts showed that both ant species diversity and abundance peaks in the tropical realm. In my presentation, I will give a brief overview of the ecological importance of ants and the current state of knowledge about the global patterns of their diversity, abundance and biomass. As an introduction to the symposium "*Ants in tropical ecosystems: diversity, abundance and functional ecology*", I will highlight progress and gaps in our knowledge of these aspects. I will argue that while global studies of patterns are useful, we need to continue to conduct and build on detailed local studies that use standardised sampling in different habitats and strata. Although such studies are laborious in the tropics, they can help us better assess both local and global ant diversity and biomass and understand their drivers.

Funding: The Czech Science Foundation standard grant (21-00828S).

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T135 – Thursday 10:45 - 11:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

The abundance, biomass, and distribution of ants on earth

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Knowledge on the distribution and abundance of organisms is fundamental to understanding their roles within ecosystems and their ecological importance for other taxa. This is currently lacking for insects, which are the “little things that run the world”. Even for ubiquitous insects, such as ants, which are of tremendous ecological significance, there is currently neither a reliable estimate of their total number on Earth nor of their abundance in particular biomes or habitats. We compile data on ground-dwelling and arboreal ants to empirically estimate the global ant abundance. We conservatively estimate the total abundance of all ants on Earth to be almost 20×10^{15} individuals, corresponding to a biomass of ~12 megatons of dry carbon. This exceeds the combined biomass of wild birds and mammals and is equivalent to ~20% of human biomass. Ants are more abundant in tropical and subtropical regions and vary across habitats. Ant density is highest in forests, while actively ground-foraging ants are highest in arid regions. This study highlights the central role ants play in terrestrial ecosystems but also major ecological and geographic gaps in our current knowledge.

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T136 – Thursday 11:00 - 11:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology
Land-use change affects biodiversity and functions of Sumatran ant communities across strata

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Ants are diverse and abundant keystone elements of tropical ecosystems. However, uncertainty remains regarding their actual biodiversity, functional roles, and vulnerability to land-use change, especially across different strata. We address these questions by examining ant communities along a land-use change gradient from lowland rainforest via extensively used 'jungle rubber' to monocultures of rubber and oil palm in central Sumatra, Indonesia. Based on >300,000 individuals from >350 morphospecies, collected in several rounds of sampling in canopy, litter and forest floor, we show how

- we handled the largely undescribed diversity of ants by online and print documentation of our collection, including updates to existing identification literature
- canopy ant abundance and biodiversity plummets from rainforest to monocultures, where tramp ants dominate communities
- land-use change favours generalist nesters and feeders from genera that build large colonies, and
- effect sizes of ant community declines (biomass, taxonomic and functional richness) are comparable between strata, but absolute species losses are by far highest in the canopy.

Our work offers a rare glimpse into the largely unexplored biodiversity of ants on Sumatra, their community-level responses to land-use change, and the possible consequences of their decline for ecosystem functioning in a tropical biodiversity hotspot.

Funding: Deutsche Forschungsgemeinschaft (DFG), project 192626868 / SFB990 „EFForTS“

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T137 – Thursday 11:15 - 11:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Functional and phylogenetic consequences of disturbance on tropical canopy ants

HOENLE Philipp O.¹, PLOWMAN Nichola S.^{1,2}, MATOS-MARAVÍ Pavel³, DE BELLO Francesco^{2,3}, BISHOP Tom R.^{4,5}, LIBRA Martin¹, IDIGEL Cliffson⁶, RIMANDAI Maling⁶, KLIMES Petr¹

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Tropical rainforest canopies host a highly diverse arthropod fauna that contributes to ecosystem function through their functional and phylogenetic diversity. However, despite playing a big role in tropical ecosystems, our understanding of the effects of human disturbance on arboreal invertebrates is very limited. In this talk, I will present our research on the effects of disturbance on an abundant insect group of canopy dwellers, the ants. We assessed disturbance effects with one of the most comprehensive arboreal ant collections to date, which were conducted in Papua New Guinea. By constructing the ant species-level community phylogeny and after measuring 10 functional traits, we reveal how ant phylogenetic and functional diversity changes with disturbance by comparing secondary and primary forest communities. While primary forests had higher ant phylogenetic diversity than secondary forest, we surprisingly discovered higher functional diversity in secondary forests. We explored the hypothesis that disturbance induced increased competition among closely related ant species in the secondary forest, which lead to trait overdispersion. Finally, I will give an outlook into the next step, which is to explore the interaction of elevation with disturbance, and how invasive ant may have impacted the functional structure of ant communities of tropical forests.

Funding: The Czech Science Foundation standard grant (21-00828S).

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T138 – Thursday 11:30 - 11:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Diel foraging activity of ants between primary and secondary forests in Papua New Guinea

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The three-dimensional structure of tropical rainforests, coupled with diel fluctuations in environmental conditions, generates environmental gradients affecting species composition and activity across spatiotemporal scales. Despite being small ectotherms, ants display consistent diurnal foraging across all forest strata, indicating their independence from diel environmental fluctuations. Nevertheless, whether this pattern persists in the harsher conditions of secondary forests remains unknown. Here we study the variations in diel ant foraging of vertically stratified ant communities between primary and secondary forests in Papua New Guinea. Using tuna baits, we sampled ant communities of disturbed and pristine forests during day and night. We found that the diel foraging activity of ants, although predominantly diurnal, exhibits considerable variation among and within ant communities found in primary and secondary forests. Specifically, in contrast to ant communities dwelling in lower forest strata, arboreal dwelling ants showed significantly higher foraging activity during the day than at night in primary but not secondary forests. In addition, we observed that the overall foraging patterns within ant communities were dictated by predominantly diurnal numerically dominant ant species. Our findings indicate that the diel foraging activity of ants can change between primary and secondary forests, but this variation is likely community or species-dependent.

Funding: ERC - BABE 805189

Web and/or Twitter account: NA

T139 – Thursday 11:45 - 12:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Dear neighbor: trees with extrafloral nectaries facilitate defense and growth of adjacent undefended trees**STAAB Michael¹, LIU Xiaojuan²**¹*TU Darmstadt, Ecological Networks, Schnittpahnstraße 3, Darmstadt, 64287, Germany*²*State Key Laboratory of Vegetation and Environmental Change, Institute of Botany, Chinese Academy of Sciences, 20 Nanxincun, Beijing, 100093***E-mail:** michael.staab1@tu-darmstadt.de

Plant diversity can increase productivity. One mechanism behind this biodiversity effect is facilitation, i.e. when one species increases the performance of another species. Plants with extrafloral nectaries (EFNs) establish defense mutualisms with ants. However, whether EFN plants facilitate defense of neighboring non-EFN plants is unknown. Synthesizing data on ants, herbivores, leaf damage, and defense traits from a forest biodiversity experiment, we show that trees growing adjacent to EFN trees had higher ant biomass and species richness, and lower caterpillar biomass than conspecific controls without EFN-bearing neighbors. Concurrently, the composition of defense traits in non-EFN trees changed. Thus, when non-EFN trees benefit from lower herbivore loads due to ants spilling over from EFN tree neighbors, this may allow relatively reduced resource allocation to defense in the former, potentially explaining the higher growth of those trees. Via this mutualist-mediated facilitation, promoting EFN trees in tropical reforestation could foster carbon capture and multiple other ecosystem functions.

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T140 – Thursday 12:00 - 12:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Phylogeny and ecological history of *Philidris* ants reveal a broad relationship with myrmecophytes

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Many ants have symbiotic interactions with plants ranging from opportunistic to obligate interactions. The most diverse group of myrmecophytic plants is Hydnophytinae, distributed across the Indo-Pacific region. They form a hypocotyl tuber with interconnected galleries, often inhabited by ants. Among the most prominent are members of the genus *Philidris* Shattuck, 1992 (Dolichoderinae). The genus currently includes nine described species and many subspecies around Indo-Pacific. The limited knowledge of *Philidris* species boundaries, their distributional ranges and uncertain phylogenetic relationships hindered our investigations about the origin and specificity of their mutualisms with plants.

Here, we provide a robust phylogenetic framework for the genus for the first time based on a broad selection of specimens and genomic markers (Ultraconserved Elements). We use comprehensive molecular and ecological data to investigate the evolutionary, biogeographic and population genetic history, test species-level boundaries, and evaluate ant-plant relationships of the *Philidris*. Our analyses confirm that the diversity of the genus is centred in New Guinea, with only a few species expanding to the east and west. Most *Philidris* ants can inhabit a broad range of Hydnophytinae plant hosts, and their associations seem to be defined by overlapping distribution and shared ecological preferences rather than co-phylogenetic history.

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T141 – Thursday 12:15 - 12:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 4: Ants in tropical ecosystems: diversity, abundance, and functional ecology

Composting in ant-plant nests? Metabolic potential of bacterial communities for degrading chitin- and cellulose-rich substrates in ant-made patches

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Ant-plant associations recently emerged from bipartite relationships to multi-species networks involving many different organisms. One of the most widespread associations in the Neotropics is the pioneer tree *Cecropia* spp. and its partner *Azteca* spp. ants. In domatia of *Azteca* ants, fungi, bacteria, and nematodes are found inhabiting ant-made specialized structures named as "patches". Since *Azteca* ants continuously deposit organic matter to the patches, we hypothesize that these structures serve as nutrient recycling spots like an *in-situ* farming compost. Although cellulose and chitin degradation activity was recently detected in patches, which specific microbial taxa contribute to the decomposition of these compounds remains unknown. To investigate the metabolic potential of patch microbial communities, we analyzed metagenomics data from patches of 10 *Azteca* colonies and obtained 150 bacterial MAGs (Metagenome-Assembled Genomes, >90% completeness, <5% contamination) belonging to 21 different taxonomic classes. By identifying genes involved in the degradation of each biopolymer in these MAGs, we determined which bacterial taxa are potentially involved in nutrient transformation in the ant-made patches. This study provides the baseline for elucidating the potential roles of bacterial communities in this complex multipartite association, which will increase our understanding of the potential nutrient recycling functions of patches in ant-plant nests.

Funding: Austrian Science Fund (FWF)

Web and/or Twitter account: NA

T142– Thursday 12:30 - 12:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Chairs: Ute RADESPIEL, Pablo OROZCO-TERWENGEL, Tobias VAN ELST

Tropical environments are under threat for a variety of reasons including human population expansion and encroachment, habitat loss and fragmentation, and climate change. At the same time, tropical biodiversity often remains poorly understood or completely undescribed, so that many species may go extinct before being discovered. Species living in tropical environments are highly challenged, since they are generally adapted to relatively stable environmental conditions with narrow ecological niches but need to modify life history strategies and/or change distribution ranges in response to environmental changes. However, increasing landscape discontinuities in addition to natural barriers to gene flow (e.g., rivers, mountains) constrain movements, population dynamics and consequently the biogeographic plasticity of most species. Modern genetic and genomic techniques are excellent tools to investigate the evolutionary processes responsible for current patterns of biodiversity and the impacts of anthropogenic challenges (e.g., demographic changes, hybridization, extinction, inbreeding). This is of utmost importance for estimating the viability of populations and entire species and implementing effective conservation measures in the future. We aim to bring together a collection of contributions that address these and related questions in tropical biota from around the world. This session will provide the opportunity to present new data, critically review existing evidence and discuss important avenues for future research in tropical molecular ecology.

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Patterns and processes of diversification in an entire primate genus: the case of cryptic mouse lemurs

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Madagascar has long been recognized as a model for species diversification and a major conservation priority given the high levels of endemism and critically endangered status of its biodiversity. Yet, the study of the island's biodiversity and the implementation of effective conservation strategies have likely been impeded by an inflation of its taxonomic diversity. A striking example are the cryptic mouse lemurs (genus *Microcebus*), which underwent a controversial five-fold increase in species number since 1999. Here, we integrate comprehensive genomic, morphological, ecological and behavioural data to show that the taxonomy of this genus has been inflated. Following a revised taxonomy, we provide the first comprehensive phylogeny for mouse lemurs and show that their diversification occurred during the Pleistocene, possibly facilitated through climatic fluctuations and species-pump effects of humid rainforests. In addition, we find that the cryptic nature of the genus results from morphological stasis and niche conservatism. Finally, we identify intraspecific conservation units, which should guide the conservation of both species and population genetic diversity. Our work sheds light not only on the diversification of mouse lemurs but also provides a practical framework to facilitate the study of cryptic diversity and conservation worldwide.

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**

Funding (alphabetically): Agence Nationale de la Recherche (ANR), Bauer Foundation (Deutsches Stiftungszentrum), ERA Net BiodivERsA, Fundação para a Ciência e a Tecnologia (FCT), German Research Foundation (DFG), IRP BEEG-B, National Science Foundation (NSF), North German Supercomputing Alliance (HLRN)

Web and/or Twitter account: NA

T20 – Tuesday 10:45 – 11:00 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Dispersal dynamics of four mammal species in fragmented dry forests of Northwestern Madagascar

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Animals living in fragmented landscapes generally have reduced opportunities for dispersal between isolated habitat patches. However, it is important to study the species-specific effects of habitat loss and fragmentation, since connectivity across an open matrix is not uniform between species. In this study we examined patterns of relatedness in four mammalian species (endemic mouse lemurs *Microcebus murinus* and *M. ravelobensis*, an endemic rodent *Eliurus myoxinus*, and an invasive rodent *Rattus rattus*) to infer dispersal in a fragmented landscape in northwestern Madagascar. We generated genomic data for 77 *M. murinus*, 35 *M. ravelobensis*, 77 *E. myoxinus*, and 49 *R. rattus* individuals using RADseq markers, calculated dyadic relatedness values, examined population-level genetic structure, and potential barriers to migration using EEMS. When comparing species, related dyads in both *M. ravelobensis* and *R. rattus* were spatially clumped within 200 m of close relatives. Conversely, *M. murinus* and *E. myoxinus* dyads were found farther apart and at distances greater than 1500 m, suggesting a greater capacity to cross matrix. Additionally, structure and migration analyses revealed patterns that did not correspond to habitat-matrix dichotomies. Overall, our results suggest that these species are responding differently to habitat fragmentation, and that dispersal ability may be facilitating persistence in fragmented landscapes.

Funding: INFRAGECO (no. 2015-138), German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung) (grant no. 01LC1617A), the Natural Sciences and Engineering Research Council of Canada

Web and/or Twitter account: NA

T21 – Tuesday 11:00 – 11:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Genomic adaptation to saltwater consumption and small population size in Cat Ba langurs

ZHANG Liye^{1,2,3}, LEONARD Neagha⁴, PASSARO Rick⁴, Luan Mai Sy⁴, Van Tuyen Pham⁴, Le Thi Ngoc Han⁴, Huy Cam_Nguyen⁴, VOGELNEST Larry⁵, LYNCH Michael⁶, FINE Amanda E.⁷, Nguyen Thi Thanh Nga⁸, Nguyen Van Long⁸, RAWSON Benjamin M.⁹, BEHIE Alison¹⁰, Nguyen Van Truong^{1,11,12}, Minh D. Le^{12,13}, NADLER Tilo¹⁴, WALTER Lutz¹, MARQUES-BONET Tomas^{15,16,17,18}, HOFREITER Michael¹¹, Zhijin Liu¹⁹, Ming Li³ and ROOS Christian^{1,20}.

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**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**

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Many mammal species are threatened with extinction or have declining populations, but and the consequences of effective population size reductions on the genomic make-up of species still need a comprehensive exploration. We here investigated the genetic load, adaptive potential and population history of the Cat Ba langur (*Trachypithecus poliocephalus*), a primate species endemic to Vietnam's famous Ha Long Bay and with less than 100 individuals one of the most threatened primates in the world. Using whole genome data at high coverage of four wild individuals we revealed a 5-fold decline in effective population size N_e over the last 100 years. Compared to other primates and mammals, the Cat Ba langur showed extremely low levels of genetic diversity and the longest runs of homozygosity, but genetic diversity has been maintained in protein-coding genes and on chromosome 19, an autosome known for its unusual high gene density. We further observed large-scale purging of deleterious mutations and the putatively only true gene loss, affecting CDH26, may even have contributed to saltwater tolerance. The Cat Ba langur exhibits a large number of unique non-synonymous variants and positively selected genes that are related to calcium and sodium metabolism, muscle contraction and cardiovascular system, which may have improved adaptation to saltwater and high calcium intake as well as climbing ability. Our study provides important baseline data for conservation and more evidence on harsh habit adaptation. Also we showed that species exhibiting low overall genetic diversity can still preserve diversity in functionally important regions.

Funding: NA

Web and/or Twitter account: NA

T22 – Tuesday 11:15 – 11:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

How can we infer recent fragmentation using genetic data?**TOURNEBIZE Rémi¹, BOITARD Simon², MAZET Olivier³, CHIKHI Lounès^{1,4}**¹*Laboratoire Evolution & Diversité Biologique, UMR 5174, Université Toulouse III Paul Sabatier, Toulouse, France*²*Laboratoire CBGP, INRAE, Montpellier, France*³*Institut de Mathématiques de Toulouse, Université Toulouse III Paul Sabatier, Toulouse, France*⁴*Instituto Gulbenkian de Ciência, Oeiras, Portugal***E-mail:** remi.tournebize@univ-tlse3.fr

The increasing availability of genomic data from non-model species provides exciting opportunities to investigate the role of environmental and demographic changes in shaping the genetic diversity of present-day species. This is particularly important for endangered species since it can help conservationists disentangle the main factors which have influenced genetic loss and which could condition species survival. Although we have increasing evidence that past population structure and fragmentation have shaped the genomes of temperate and tropical species, it is often difficult for current methods to provide similar evidence for very recent demographic or environmental changes. The current and ongoing environmental and biodiversity crisis calls for an assessment of how the very recent demographic changes (i.e., last ~200 years) have impacted the genetic diversity of endangered tropical species. In this talk, we will present genetic data simulated under various scenarios of habitat fragmentation (i.e., reduction in genetic connection) where we try to identify the statistics most able to detect, date and quantify recent changes in connectivity. We will try to identify the challenges of inferring recent fragmentation events and to uncover the most promising research space (in terms of sequencing data and statistical methods) to help researchers infer fragmentation history using spatially-structured genomic data.

Funding: DevOcGen (BIODIVOC, France)**Web and/or Twitter account:** NA

T23 – Tuesday 11:30 – 11:45 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 5: Tropical molecular ecology
Life on the edge: a new informatic toolbox to predict population vulnerability to global change

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Global change is affecting biodiversity in unprecedented ways, with environmental changes compounded by anthropogenic activities to introduce new selection pressures. Species responses to these pressures depend not only on the magnitude of change occurring, but also on the adaptive capacity of individuals and populations. To date, most climate change vulnerability assessments have focused at species level, lacking insights into population vulnerability, though this is beginning to change with the growing availability of large population level datasets. Assessing the adaptive capacity of populations and quantifying their vulnerability under future global change has therefore been a neglected area of biodiversity research. These insights are essential for conservation as they provide an early warning system to detect the initial signs of population and species declines. The 'Life on the edge' project integrates environmental (climate and landscape connectivity), molecular (neutral and adaptive diversity) and ecological (species distributions and traits) data, in an automated climate change vulnerability assessment framework applicable to multiple species and geographic regions. The project leverages a large number of recently published population level datasets, addressing an important knowledge gap in biodiversity and global change for multiple threatened and non-threatened species, linking with conservation goals aimed at maintaining or enhancing genetic diversity.

Funding: Individual postdoc grant to CDB from sDiv (Synthesis centre of iDiv), funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)—FZT 118.

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T24 – Tuesday 11:45 – 12:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 5: Tropical molecular ecology
Demographic history of Malagasy palms: climate and humans leading to population declines

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Madagascar, a biodiversity hotspot with alarming rates of biodiversity threat, has experienced severe changes since the Quaternary (e.g., paleoclimate change, deforestation and defaunation), but whether it has led to population size declines and the loss of migration between populations remains unknown. Here, we test these hypotheses by using double-digest restriction-site-associated DNA sequencing (ddRAD) across eight species of Malagasy palms (Arecaceae). We revealed that all species experienced a decline in effective population size compared to historical conditions, but migration rates declined in some species, whereas they remained constant or indicated secondary contact in others. Interestingly, human use and rainforest habitat (linked to human effects, e.g., deforestation) or fruit size (linked to defaunation effect) did not consistently explain differences in demographic histories between palm species. However, human-used savanna palms in the west did not show a disruption of migration, whereas the largest-fruited species showed a recent migration disruption, consistent with the loss of seed dispersal by nowadays extinct megafrugivores, such as giant lemurs and elephant birds. We conclude that Quaternary global changes linked to paleoclimate and anthropogenic impacts have led to the consistent decline of Malagasy palm populations, but human-use by assisted gene flow may safeguard populations for some species.

Funding: German Research Foundation (DFG–FZT 118, 202548816)

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T25 – Tuesday 12:00 – 12:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Genomic signatures of inbreeding depression and mutation load in a threatened African timber tree, *Pericopsis elata* (Fabaceae)

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Pericopsis elata is a large, light-demanding tree that is highly exploited in Western and Central Africa for its timber and is listed as endangered by the IUCN. It is a peculiar tropical tree as it has a mixed-mating system, with a high selfing rate, and a lack of regeneration throughout its natural distribution range. Previous results from Democratic Republic of Congo show a lower growth rate for selfed than outcrossed seedlings, and lower heterozygosity for seeds and seedlings than adults, indicating inbreeding depression. We also observe a steep westward decay of heterozygosity in Cameroon, and we hypothesize that this is a recent range expansion facilitated by selfing. Our aim is to assess inbreeding depression and mutation load along this westward expansion. Whole genome resequencing data of individuals along this East-West gradient will be used to detect the runs of homozygosity (ROHs). These ROHs will be used to detect deleterious variants and infer demographic history. On the range expansion front, we expect longer ROHs, an increase in inbreeding coefficient and mutation load towards the west. These analyses, combined with phenotypic data, will help in identifying the effects of inbreeding and informing sustainable management strategies for this threatened timber tree.

Funding: NA

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T26 – Tuesday 12:15 – 12:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Phylogeography of a tree species with high economic potential of the African tropical rainforests: *Coula edulis* Baill (Coulaceae)

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In the face of ongoing global changes, African tropical rainforests are increasingly threatened and it is becoming imperative to conserve their genetic resources. However, the conservation of these resources requires knowledge of the evolutionary history of the species they contain, particularly the tree species on which local populations depend for their food and economy. Here, we study the phylogeography of *Coula edulis* Baill (Coulaceae), commonly known as the African walnut tree, which is present in the Guineo-Congolese forests and whose fruits are highly valued by the villagers. Using recently developed highly polymorphic nuclear microsatellites (nSSRs), we applied Bayesian genetic clustering methods (STRUCTURE) to data collected along its distribution area (from West to Central Africa). Five geographically differentiated gene pools due to ancient barriers to gene flow were detected, with low levels of genetic diversity in Upper Guinea and Southeast Cameroon. Significant phylogeographic signals were found between gene pools, indicating ancient differentiation. The genetic structure in *C. edulis* can be explained by different phenomena such as bottlenecks, founder effect, associated on the one hand with ancient barriers to gene flow and on the other hand with the very limited dispersal of genes that have contributed to the isolation of populations.

Funding: NA

Web and/or Twitter account: NA

T27 – Tuesday 12:30 – 12:45 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Seed and pollen dispersal of *Staudtia kamerunensis* Warb. (Myristicaceae), a timber species of Central African rain forests

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Previous large-scale genetic studies on *Staudtia kamerunensis* Warb. indicated a high historical dispersal capacity, and that the extent of seed dispersal might vary depending on landscape. Moreover, pollen dispersal seems to contribute more to population admixture than seed dispersal. In Gabon, we characterised the reproductive ecology and population structure of *S. kamerunensis* in a closed-canopy forest and compared it to the population structure of a savanna-forest mosaic. We used microsatellite markers to estimate selfing rates, seed and pollen dispersal, and fine-scale spatial genetic structure (FSGS). The results show varying levels of regeneration, and that *S. kamerunensis* is predominantly outcrossing, although it does self-fertilise. Levels of inbreeding decayed from $F = 0.11$ in seeds to $F = 0.01$ in adults, indicating inbreeding depression. The mean seed dispersal in the closed-canopy forest was less than 100 m, while the mean pollen dispersal was 580 m. Moreover, we detected a significant FSGS ($Sp = 0.0082$) in the closed-canopy forest, while the forest-savanna population did not have one. Overall, the type of landscape seems to influence seed dispersal and FSGS in *S. kamerunensis*. Finally, current recommended logging practices (60 cm in Gabon) are sufficient in maintaining post-logging potential.

Funding: F.R.S.-FNRS, Aspirant ASP-32740735

Web and/or Twitter account: NA

T28 – Tuesday 12:45 – 13:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Discordant phylogeographic patterns between plastid and nuclear genomes in the clade *Berlinia* (Fabaceae): are African trees evolving as syngameons?

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Discordant phylogenetic trees between markers can reveal interesting evolutionary processes, for example when unilaterally-inherited cytoplasmic genomes do not follow the phylogenetic patterns of biparentally-inherited nuclear DNA sequences. Plastome sequencing in some congeneric African tree species revealed strong phylogeographic patterns completely decoupled from species taxonomy and phylogenetic trees built using nuclear genes. Recurrent chloroplast capture between congeneric species could explain this pattern. A species could extend its geographic range by pollinating related species living beyond its natural range and back-crossing the resulting hybrids, without the need of long-distance seed dispersal. How each species maintains its identity at the nuclear genome remains unclear but the hybridizing species could function as a syngameon, whereby partial interspecific gene flow of nuclear genes would contribute to their evolution. Maternally-inherited plastomes allow then to trace the seed-mediated colonization history of the syngameon. Dated plastid and nuclear phylogenies suggest that this mechanism may well be central in the evolution of the several genera of the *Berlinia* clade (including *Anthonotha*, *Englerodendron*, *Berlinia*, *Isobertia*), which is widespread in the Guineo-Congolian forests and Sudanian savannas, and the genus *Brachystegia*, which is a dominant component of the miombo woodland vegetation in southern Africa.

Funding: Project *Berlinia*, Fonds National de la Recherche Scientifique (FNRS)

Web and/or Twitter account: NA

T29 – Tuesday 14:30 – 14:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

On the phylogeny and diversity of Microsoroideae (Polypodiaceae)**CHEN Chi-Chuan^{1,2}, HYVÖNEN Jaakko², SCHNEIDER Harald³**¹Department of Biology, University of Turku, Turku, Finland²Organismal & Evolutionary Biology, Viikki Plant Science Center & Finnish Museum of Natural History (Botany), PO Box 7, FI-00014 University of Helsinki, Helsinki, Finland³Center for Integrative Conservation, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Mengla, Yunnan 666303, China**E-mail:** ccchen@utu.fi

Microsoroid ferns (Microsoroideae) are a subfamily of the epiphytic-dominated family Polypodiaceae. These ferns are distributed throughout tropical and subtropical Asia, Australasia, the Pacific Islands, Madagascar, and tropical Africa, and include both epiphytic and terrestrial species. The relationships between groups of the microsoroid ferns have been controversial, especially the delimitation of the genus *Microsorum*. This study aimed to provide a robust phylogenetic topology by integrating molecular data and morphological characters such as spore ornamentation, to clarify the classification of subgroups and the evolution of substrate preference. The results show that the microsoroid ferns can be recognized as five tribes, consisting of about 11 genera/groups and a total of 205–225 species, with the previous *Microsorum* s. l. divided into six clades in two tribes. Most tribes contain mainly epiphytic species, with the exception of Microsoreae, which has a relatively low percentage of epiphytes. Divergence time analysis suggests that the evolution of substrate preference may have been influenced by climatic fluctuations and colonization of new geographic regions during the Oligocene-Miocene periods. Overall, this study improves our understanding of the diversity of the microsoroid ferns and clarifies their evolutionary history.

Funding: Ministry of Education of Taiwan, University of Helsinki of Finland, Chinese Academy of Sciences of China

Web and/or Twitter account: NA

T30 – Tuesday 15:00 – 15:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Species delimitation of threatened African rosewood species of the genus *Pterocarpus*, using a phylogenomic approach**ALBREHT Laura¹, BOURLAND Nils², KLITGAARD Bente³, SCHLEY Rowan^{3,4}, HARDY Olivier¹**¹Université Libre de Bruxelles, Unit of Evolutionary Biology and Ecology, Avenue Franklin Roosevelt 50, Brussels, 1050, Belgium²Royal Museum for Central Africa, Service of Wood Biology, Leuvensesteenweg 13, Tervuren, 3080, Belgium³Royal Botanic Gardens, Accelerated Taxonomy Department, Kew, Richmond, Surrey, TW9 3AE, UK⁴University of Exeter, Department of Geography, Laver Building, North Park Road, Exeter, Devon, EX4 4QE, UK**E-mail:** Laura.Albreht@ulb.be

Species is a basic unit in many biological disciplines including conservation biology, highlighting the need to accurately delimit species. Recently, the advance in molecular phylogenetics has helped to clarify species delimitation in many taxonomically complex taxa. *Pterocarpus* (Fabaceae) is a pantropical genus of trees with some species displaying high morphological variability, questioning their current classification. In our study, we tested species delimitation of all currently recognized African *Pterocarpus* species, using a phylogenomic approach. To compare different types of genetic data, we reconstructed three phylogenies using a set of 353 low-copy nuclear markers (Angiosperms353), high-copy nuclear ribosomal markers and whole plastome data, respectively. Based on our results of the two nuclear phylogenies, we confirm the current species delimitation for all *Pterocarpus* species but *P. rotundifolius*, which is paraphyletic and possibly consisting of two or more monophyletic species. Our results also show that plastid markers should be suitable for identifying most African *Pterocarpus* species. As several *Pterocarpus* species are highly threatened by overexploitation for their rosewood timber, our findings are valuable to develop DNA-based species identification tools applicable on wood tissue that could help control their trade.

Funding: Université Libre de Bruxelles**Web and/or Twitter account:** <https://ebe.ulb.ac.be/ebe/Albreht.html>

T31-32 – Tuesday 15:15 – 15:30 Poster 6 + Lightning Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 5: Tropical molecular ecology

Population structure and local parasite assemblages in the conservation flagship species, the grey-necked picathartes (*Picathartes oreas*) in changing landscape in Cameroon: conservation implication

TSETAGHO Guilain^{1,2}, AWA II Taku¹, ABWE Ekwoje E.^{2,3}, MORGAN Bethan J.^{2,3}, ANGWAFO Tsi E.⁴, ALBRECHT Tomáš⁵, MUNCLINGER Pavel⁵

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Most threatened species are threatened by habitat loss, land-use change, overexploitation and climate change. These could lead to the changes of species' ranges, behavior, and population structure, which can result in a loss of local adaptations. The disrupted population structure can facilitate the spread of pathogens and disrupt established local parasite-host associations. Nevertheless, little is known about the population structures, dispersal patterns and pathogen lineages for many threatened species with restricted range like the Grey necked Picathartes, *Picathartes oreas* (hereafter referred to as GNP), making it difficult to develop practical conservation management and monitoring plans. This study examined population structure, level of local isolation, and parasite-host associations of the GNP in a changing landscape in Cameroon. Molecular approaches were used to identify *Plasmodium*, *Haemoproteus* and *Leucocytozoon* blood parasites lineages. We also used the mtDNA control region (CR) and microsatellites to describe the population genetic structure and local isolation of populations.

Funding: Rufford Small Grant and San Diego Zoo Wildlife alliance.

Web and/or Twitter account: NA

T31-32 – Tuesday 15:15 – 15:30 Poster 7 + Lightning Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Chairs: SIVAUULT Elise, VEJMĚLKA František

In times of climate change and heavy anthropogenic pressures, it is crucial to understand the changes in the diversity and community composition of mammals. As consumers, predators and prey, or dispersers of seeds and spores, the loss of mammal diversity has significant consequences for the integrity and stability of the ecosystems. However, measuring mammal diversity in the tropics, a zone containing the most diverse ecosystems, can be extremely challenging. Here we will explore the limitations we can encounter in such hyper-diverse ecosystems while studying mammals – volant or non-volant, small or large – from tropical rainforests, savannahs, and agroforests. We will discuss the benefits and constraints of commonly used methods (e.g., traps, nets, recorders) and more recent and promising ones (e.g., eDNA).

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Recording diversity of non-volant mammals in the rainforest-covered mountains of New Guinea

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Rainforest small to medium sized non-volant mammals are very challenging to study, as they are nocturnal, shy, silent, dull-coloured, inhabiting hardly accessible habitats. During our study of non-volant mammals in a complete elevational gradient (spanning up to 3700 m asl), we employed a number of methods to record their diversity. First, due to the elusive nature of local mammals, we focused on trapping. We used live box traps, tent traps, pitfalls, cage traps of various types, as well as death snap traps. Second, we took advantage of the intimate coexistence of indigenous people with their forest, their hunting skills and knowledge. We accompanied them on their night hunts, purchased hunted specimens and trophies such as bones and skins, and conducted interviews on local mammals at each of the nine elevational localities. The most successful method in terms of recorded species richness proved to be pitfall trapping, while the most individuals were captured by means of snap trapping. Tent and cage traps were the most unsuccessful, respectively. The hunters appeared to be truly invaluable source of additional diversity recordings, especially for medium sized arboreal mammals. Thus, for wide diversity records of non-volant mammals, wide range of recording methods should be applied.

Funding: NA

Web and/or Twitter account: <https://zoo.prf.jcu.cz/index.php/staff-item/vejmelka-frantisek/?lang=en>

T88 – Wednesday 10:30 – 10:45 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Is bat diversity easily determined in the tropics? A field comparison between Papuan rainforests and Peruvian agroforests

SIVAUTL Elise^{1,2}, KOANE Bonny³, AYCART Pablo⁴, SAM Kateřina^{1,2}

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Bats exhibit remarkable diversity and make up for 20 % of all mammal species. More than half of all bat species are found in tropical regions, which presents significant challenges for studying them. We have employed various techniques, including mist nets, harp traps, and recorders, to survey bats in understories of Papua New Guinean rainforests and Peruvian cocoa plantations. Despite insectivorous bats dominating bat communities worldwide, preliminary results indicate that frugivorous and nectarivorous species were more commonly captured, regardless of elevation or land-use, making the study of insectivorous bats challenging. These findings suggest that using recorders is essential to fully determine bat diversity in tropical areas. However, identifying bat species acoustically is constrained by several knowledge gaps in the tropics. This talk will explore these limitations and propose recommendations to improve the identification of tropical bat species in the future.

Funding: ERC StG BABE 805189 and GAJU n. 014/2022/P

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T89 – Wednesday 10:45 – 11:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Day and night in a rainforest: there is a rich obscure animal diversity in there**FORGET Pierre-Michel¹, GUILBERT Eric¹, BALTZINGER Christophe²**¹*Muséum National d'Histoire Naturelle – CNRS, UMR MECADEV, AVIV Department, 55 rue Buffon, Paris, 75005, France*²*INRAE, Forest Ecosystems Research Unit, ECODIV Department, Domaine des Barres, Nogent-sur-Vernisson, 45290, France***E-mail:** pierre-michel.forget@mnhn.fr

Tropical tree species depend on frugivorous vertebrates for their dispersal and recruitment. We studied the effects of anthropogenic pressures on the health status of forests by monitoring the activity of terrestrial and arboreal vertebrates in French Guiana. Methods used (Kilometric Index of Abundance, camera traps, eco-acoustic) have advantages and disadvantages (drawbacks) but complement each other. Although they prove to be very informative and efficient, especially for cryptic, diurnal and nocturnal animals, camera trapping data obtained from the canopy of tropical forests still need to be provided (are still too few). We proposed to test a monitoring protocol for terrestrial, arboreal and flying frugivorous vertebrates' guilds. We use continuous, non-invasive and non-destructive automated monitoring using camera traps deployed at the base and in the canopy of mature forest species and a unique team of tree-climbing ecologists. Methodological tests will enable the sampling strategy to be optimised (duration, period, camera numbers/tree, numbers of trees) to assess the targeted communities' taxonomic and functional diversity and contribute to the definition of ecological change indicators according to the magnitude of human pressure. Preliminary results will be presented, and the difficulties encountered during camera trap setting, image identification and analyses will be highlighted and discussed.

Funding: LabEx DRIIHM, LabEx CEBA, UMR MECADEV CNRS INEE, INRAE Val de Loire**Web and/or Twitter account:** <https://mecadev.cnrs.fr/index.php?category/ECOTROP>, @Ecotrop_MNHN

T90 – Wednesday 11:00 – 11:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Human disturbance modulates the species-area relationship among mammals in insular forest fragments

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Ongoing fragmentation of the world's tropical forests presents one of the leading drivers of global biodiversity loss. However, in many regions with high human presence or agricultural footprint, small forest patches are all that remain, and are vital towards the maintenance of biodiversity. Human disturbance is thereby likely to influence the species diversity levels sustained in these fragmented forest landscapes. We utilized a system of island fragments in multiple hydropower reservoirs spread across a gradient from low to high human disturbance to assess the interaction between fragmentation and disturbance towards the maintenance of species diversity. We surveyed small, medium, and large mammals and measured the species-area relationship across island fragments in reservoirs with low, medium, and high degrees of human disturbance. Our results show that areas with high disturbance levels had reduced species diversity levels, with a flattened species-area curve. These results highlight the importance of minimizing human disturbance in fragmented forest landscapes in the aim to preserve biodiversity.

Funding: China Thousand Young Talents Program, K18291101

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T91 – Wednesday 11:15 – 11:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

How to study ecology and diversity of tropical mammals living belowground?**ŠUMBERA Radim¹**¹*Faculty of Science, University of South Bohemia, Branišovská 1760, 370 05 České Budějovice, Czech Republic***E-mail** sumbera@prf.jcu.cz

Direct observation of free-living subterranean mammals is almost impossible. Their existence is confined to self-constructed systems of burrows and most of their activities including foraging, searching for mates and reproduction occur belowground. Due to burrowing and herbivory, their role in ecosystems is extremely important, because they create a dynamic mosaic of soil characteristics and nutrients that influence plant communities. Digging burrows also creates niches for other animals including vertebrates. Evolution of about 300 mammals with subterranean activity has been shaped by a period of global cooling, aridization and the emergence of geophytes, i.e., plants with belowground storage organs. Their occurrence in tropic regions is limited to strictly seasonal habitats such as different savannah types. Due to a cryptic way of life, it is very difficult to access their even fundamental life history and ecological characteristics. These mammals are very trap shy, so special traps need to be developed. If behavioural characteristics, information about spatial activity, home range size, and dispersal are needed, advanced technological approaches have to be employed. In my presentation, I review traditional and modern methods how to trap these elusive members of tropical ecosystems and how to study their ecology and diversity.

Funding: NA**Web and/or Twitter account:** <http://zoo.prf.jcu.cz/index.php/resarch-small-african-mammals-research/?lang=en>

T92 – Wednesday 11:30 – 11:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Evolutionary inspections of large (African) mammals: some advances and limitations**ROBOVSKÝ Jan¹**

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Our knowledge of the evolutionary diversification of large mammals has increased dramatically in recent decades, making our conservation management much more effective, but there are still some limitations. Since the current collections of some large mammals are limited by sample size, there is a need for better documentation of the genetic and phenotype parameters of currently preserved populations, ideally with calibration by the previous diversity in extirpated populations documented by older collections. The digitisation of the current collection and further biobanking are of great scientific significance. Considering various modes of taxonomy and limited phenotype differences in some taxa, which makes species identification risky, thoroughly documented voucher specimens are crucial for the proper interpretation of any comparative assessment of biological diversity. And as the current discussion about the taxonomy of many larger mammals is too focused on the number of species, the plurality of taxonomic and conservation approaches might be recommended, so special attention should be focused on autochthonous populations which could be assessed by various concepts paralelly (e.g., MU—management unit, ESU—evolutionary significant unit, and ECU—elemental conservation unit) in order to minimise the risk that some valuable taxa/populations would be neglected by future conservation prospects.

Funding: Faculty of Science, University of South Bohemia

Web and/or Twitter account: <http://zoo.prf.jcu.cz/index.php/staff-item/robovsky-jan/?lang=en>

T93 – Wednesday 11:45 – 12:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Understanding iDNA detections with occupancy models

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The use of environmental DNA (eDNA) is becoming commonplace for monitoring biodiversity, especially for rare or elusive species. Sources of eDNA can include water, soil, air, and blood-feeding invertebrates. However, each of these has inherent issues of imperfect detection. In the case of blood-feeding invertebrates, the behaviour and movement of the samplers themselves might add to sources of error. Occupancy modelling is a powerful statistical tool that can account for imperfect detections in biodiversity surveys, but which has rarely been applied to molecular data. Here we apply multi-state occupancy models to mammal DNA isolated from leeches sampled from across different forest types in Malaysian Borneo. We calculate changes in probability of occupancy, availability, and detection for commonly detected taxa, and show that probabilities change with ecological and technical covariates for a given species. We find that mammal occupancy increases with habitat quality, and that detection probabilities are also impacted by technical factors such as sampling effort and DNA concentration. While we find general trends, our results also reveal species specific patterns. Overall, this study demonstrates the usefulness of combining occupancy models with invertebrate-based eDNA approaches for understanding imperfect detections but highlights the potential caveats of drawing general conclusions across species.

Funding: Natural Environment Research Council UK (NERC)

Web and/or Twitter account: NA

T94 – Wednesday 12:00 – 12:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 6: Challenges in measuring mammal diversity in the tropics

Evaluating density estimation methods for unmarked wildlife with trail cameras in a Neotropical forest

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Effective wildlife conservation efforts require accurate estimation of population sizes, which is often difficult for species that cannot be individually identified. Although several models have been developed to estimate population sizes for unmarked animals, many of these methods lack empirical testing, particularly in tropical forests. This study aims to address this gap by comparing three camera trap modelling approaches for density estimation of unmarked mammals and birds with line transect distance sampling in a forest in French Guiana. The models evaluated were the Random Encounter Model, the Time-to-Event Model, and Camera Trap Distance Sampling. The study found that all three models provided comparable estimates to those of line transects, but with increased precision. We provide estimates of required sample sizes for density estimation of terrestrial wildlife communities in rainforests and note how model assumptions may be violated in this setting. Nevertheless, the models appear robust and are expected to become a standard tool for conservationists in the future, particularly as advancements in camera trap and image processing technologies continue to improve.

Funding: NA

Web and/or Twitter account: NA

T95 – Wednesday 12:15 – 12:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Chairs: Antonin MACHAC

Tropics harbour dramatically more diversity than other regions of the Earth. What causes these dramatic differences, however, remains among the enigmas that have fascinated biologists ever since Humboldt. Current research suggests that tropics might be more diverse because they foster species coexistence. But they might also act as the cradle of diversity (high speciation), diversity museum (low extinction), and the engine of diversity from which species expand toward the temperate. Each of these mechanisms has been well-supported, but their relative effects and possible interactions remain unclear. The aim of the symposium is to explore the patterns of tropical diversity and the mechanisms behind them across a variety of organismal systems, continents, and scales. We will focus on considering how even seemingly conflicting mechanisms might complement each other and how they could be combined to formulate more integrated perspective concerning the origins and the maintenance of tropical megadiversity.

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Genome size and trait flexibility affect evolutionary radiations in a tropical plant family**BHADRA Sreetama^{1,2}, LEITCH Ilia J.³, BELLOT Sidonie³, BAKER William J.³, ONSTEIN Renske E.^{4,1,2}**¹German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, sDiv, Evolution and Adaptation, Puschstraße 4, Leipzig, 04103, Germany²Leipzig University, Ritterstraße 26, 04109 Leipzig, Germany³Royal Botanic Gardens, Kew, Kew Green, Richmond TW9 3AE, UK⁴Naturalis Biodiversity Center, Darwinweg 2, 2333 CR Leiden, The Netherlands**E-mail:** sreetama.bhadra@idiv.de

Functional traits affect diversification rates and therefore biodiversity across lineages and ecosystems. However, it is unclear how 'trait flexibility', i.e., the evolvability of traits over macroevolutionary times, affects diversification rates, and whether genome size evolution underlies trait flexibility. Here, we answer this question by integrating genome size, functional trait, distribution, and phylogenetic data for palms (Arecaceae)- a pantropical family comprising ca. 2600 species. We used macroevolutionary and structural equation models to show that palm lineages increased diversification rates ca. 20 million years ago, concordant with increased variation in genome sizes and traits. However, rates of genome size evolution were not associated with diversification rates, but with fruit size and stem diameter evolutionary rates. Instead, fast diversification rates were found for species with relatively large genomes, small fruits, and fast rates of stem height, fruit length, or leaf size evolution. This suggests that genome size acts as a potential driver of trait flexibility, and fast evolution of traits provides the adaptability for lineages to persist and diversify. Our results provide evidence for the important role of genome size and trait evolution underlying palm diversification and hence tropical biodiversity.

Funding: German Research Foundation (DFG FZT 118, 202548816), specifically funding through sDiv, the Synthesis Centre of iDiv

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T39 – Tuesday 10:45 – 11:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution**Ancient paleoenvironment shaped biogeographic patterns and processes in the megadiverse Southeast Asian flora****JOYCE Elizabeth M.¹**

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The evolution of the megadiverse Southeast Asian flora was impacted by the collision of the Sunda continental shelf (Peninsular Malaysia, parts of Indonesia and the Philippines) and the Sahul continental shelf (Australia and New Guinea) approximately 25 Mya. This collision triggered widespread geological change, and transformed the biodiversity of the region by facilitating the exchange of previously isolated floras. Despite the importance of this Sunda-Sahul Floristic Exchange (SSFE), much remains to be understood about the processes and patterns underlying it. To address this, we generated phylogenomic data to build the most densely sampled phylogenetic tree of angiosperm order Sapindales to date. We then integrated the phylogenomic data with Sanger data to produce a dated, species-level phylogenetic tree of Anacardiaceae. Biogeographic analysis of the Anacardiaceae tree supports a Sundanian origin for the family, confirms an eastward bias in exchange from Sunda to Sahul, and highlights the importance of Wallacean emergence in facilitating the SSFE. The results indicate that ancient paleoenvironment – specifically the Miocene aridification of Sahul – likely drove the eastward directionality bias in the SSFE. This study emphasises the importance of considering ancient biogeographic history when attempting to understand recent and contemporary processes that have shaped the megadiversity of Southeast Asia.

Funding: NA

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T40 – Tuesday 11:00 – 11:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Predicted biodiversity loss in the Afromontane flora under different emission scenarios

VIDAL Junior Joao^{1,2}, **CARBUTT Clinton**³, **CLARK Vincent**², **PLUMPTRE Andrew**⁴, **SENBETA Feyera**⁵, **WOLFEDEMARIAM Tadesse**⁶, **CHAPANO Christopher**⁷, **DAVID Chuba**⁸, **AIAH Lebbie**⁹, **TOVAR Carolina**¹⁰, **LULEKAL Molla Ermias**¹¹, **KENNEDY Matheka**¹², **UWASE Aimee**¹³, **KORDOFANI Maha**¹⁴, **KAPLIN Beth**¹⁵, **CHELENE Ines**¹⁶, **LANGA Clayton**¹⁷, **PEARCE Timothy**¹⁰, **LENOUILLE Benoit**¹⁰, **ANTONELLI Alexandre**¹⁰, **SCHMITT Christine**¹

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¹⁶ Herbarium LMA, Avenida das FPLM, 2698, Mozambique,

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African mountains host one of the most diverse and vulnerable communities of plants worldwide. With the increase in temperature, mountain plants may shift their distribution to track their environments along elevation and latitudinal gradients. In Africa, this will take place in a topographic-complex continental-scale geographic extent with implications for conservation. In this study, we applied community-scale models to investigate how climate change scenarios will affect the distribution of vascular plants in African mountains. Using regional and global datasets, we compiled over 2 million records, from which we retrieved the distribution ranges of 28,053 native species occurring within mountains. Only 4,146 species were suitable for modeling, from which we selected the upper 25% with higher distributions within mountains. The final dataset included 618 species from 128 families. We generated distribution models and projected them using dispersal estimates to three scenarios (RCP 126, 370, and 585) for 2100. Our preliminary results indicate that 38-67%



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of these species will decrease their distribution areas, and 0.5-1.8% may undergo a total displacement between their current distributions and suitable environments. Our results provide evidence for the disproportional impact of climate change on mountains and highlight regions and species requiring more intensive conservation and sampling efforts.

Funding: Alexander von Humboldt Foundation Climate Protection Fellowship

T41 – Tuesday 11:15 – 11:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Fiddlehead fever: 23 new species discovered in the Neotropical fern genus *Danaea*

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Biogeographical work requires solid species delimitations. The Neotropical fern genus *Danaea* (Marattiaceae), however, has contained several species complexes. A combination of phylogenetics, herbarium work, and field studies have helped us untangle this morphologically difficult group. We recently discovered 23 new species, which leads to a tripling of species in the genus during this millennium. We found cryptic and morphologically overlapping species that have biogeographically sensible distributions and form monophyletic clades in a chloroplast phylogeny. The revised species concepts form a solid basis for future ecological and evolutionary studies. Our studies show that even large and widespread plants can still be unknown to science. Many of the new species of *Danaea*, however, are rare and endemic to a small area, making them vulnerable to human impact.

Funding: Finnish Cultural Foundation, University of Turku Graduate School, Academy of Finland

Web and/or Twitter account: NA

T42 – Tuesday 11:30 – 11:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Large old tropical trees as pools of biodiversity: the Life On Trees program

LEPONCE Maurice¹, BASSET Yves², ARISTIZÁBAL-BOTERO Ángela¹, ALBÁN CASTILLO Joaquina³, AGUILAR RENGIFO Guillermo⁴, BARBUT Jérôme⁵, BUYCK Bart⁵, BUTTERILL Phil⁶, CALDERS Kim⁷, CARRIAS Jean-François⁸, CATCHPOLE Damien⁹, D'HONT Barbara⁷, DELABIE Jacques¹⁰, DRESCHER Jochen¹¹, ERTZ Damien¹², HEUGHEBAERT André¹³, HOFSTETTER Valérie¹⁴, LEROY Céline¹⁵, LEVEQUE Antoine¹⁶, MACEDO Cuenca Victor⁴, MELKI Frédéric¹⁷, MICHAUX Johan¹⁸, OCUPA HORNA Luis¹⁹, PILLACA HUACRE Luis³, POIRIER Eddy²⁰, RAMAGE Thibault²¹, ROUHAN Germinal⁵, RUFRAY Vincent¹⁵, SALAS GUERERRO Marcos⁴, SCHEU Stefan¹¹, SCHMIDL Jürgen²², SILVA DÁVILA Diana³, VANDERPOORTEN Alain¹⁸, VILLEMANT Claire⁵, YODJOU Nabil¹, PASCAL Olivier¹⁷

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The aim of the Life On Trees (LOT) program is to generate baseline knowledge about the number of eukaryotic species a single large aged tropical tree can host and to understand how these communities of organisms are assembled. The program is conducted in the Amazon and Andes biodiversity hotspots. Our first project,

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LOT-Amazon 2022, was performed on a spectacular *Dussia* tree (Fabaceae), which was 50 m high and 45 m wide. The sampling was carried out by professional climbers, guided by experts of the different eukaryotic groups studied (plants, fungi, animals, protists). To better understand the contribution of different tree components (bark, leaves, fruits, flowers, living and dead wood) to overall tree biodiversity, we assigned observations into communities based on height zone or microhabitat and will examine similarities and nestedness in the composition of these communities. The first results show that a single tree can host a tremendous diversity (e.g., 42 orchids, 28 ferns, and more than 200 bryophytes, 180 lichen species identified, which are world records considering the 400m elevation). This confirms that large old tropical trees are important pools of biodiversity probably in relation with the variety of local microhabitats and tree age.

Funding: Fonds de Dotation Biotope pour la Nature

Web and/or Twitter account: www.lifeontrees.org

T43 – Tuesday 11:45 – 12:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Comparing bird assemblages of rivers with different geological histories

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The first observations that Amazonian rivers can limit species distributions were done by Wallace in 1852 and the matter is still discussed two centuries later. The effects of rivers as a barrier for species dispersal vary according to both species traits and the characteristics of the river itself, such as flow rate, width, age, meandering patterns. The landscape evolution of river basins has a profound impact on the interfluvial biota. Rivers that are young or have dynamic pasts would be expected to have less differentiated fauna between their banks than older, more stable rivers. In this study, we use data from birds captured by mist nets to compare bird assemblages between opposite banks of rivers with different landscape histories: The Juruá River (an actively meandering white water river that runs within the sedimentary basin), and the Tapajós River (a clearwater river with a stable channel in the ancient Brazilian shield). We used ordinations and dissimilarity index analyses to compare the bird assemblages in the two regions and discuss how river history relates to the observed differentiation patterns. We found that, unlike many of the largest Amazon rivers, the Juruá is not a relevant dispersal barrier to bird species, but has allowed for gene flow between the banks, while the Tapajós does act as an effective barrier to gene flow. These results agree with the proposal that rivers with a more dynamic past have more uniform biotas on opposite banks, and that the evolution of the landscape and of the biota are intrinsically linked in Amazonia.

Funding: Erasmus+ International Credit Mobility

Web and/or Twitter account: NA

T44 – Tuesday 12:00 – 12:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Müllerian mimicry: one ring to bring them all, and in the jungle bind them

PÉROCHON Eddie^{1,2}, ROSSER Neil^{3,4}, KOZAK Krzysztof^{5,6}, KEITH Willmott⁷, ELIAS Marianne^{1,5}, DORÉ Maël^{1,8}

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Understanding mechanisms of species distributions and coexistence is both a priority and a challenge for biodiversity hotspots such as the Neotropics. Here, we investigated whether positive interactions can outweigh the effects of competition in mutualistic communities at a macroecological scale. We focused on Müllerian mimicry in the neotropical butterfly tribes Ithomiini (Nymphalidae: Danainae) and Heliconiini (Nymphalidae: Heliconiinae) as an emblematic and historical case study of mutualistic interactions among unpalatable butterflies separated by 85 My of evolutionary time, yet harbouring similar warning signals. Employing species distribution modelling, we showed both tribes display high diversity and concentration of rare species and mimicry patterns in the Northern Andes, where anthropogenic pressures levels are high. Overall, we showed that co-mimetic species cooccur more than expected at random, both within and across tribes. Furthermore, comparative phylogenetic analyses suggested that mimetic interactions drive the evolutionary convergence of the climatic niche of comimetic species within and even across tribes, thereby strengthening their co-occurrence. Altogether, our study supports the unfolding at large spatial of the predictions of Müller's historical model and highlights the power of mutualistic interactions in shaping large scale distribution patterns and driving species niche convergence across evolutionary distant lineages.

Funding: ANR (CLEARWING, SPECREP), HFSP, ATIP

Web and/or Twitter account: NA

T45 – Tuesday 12:15 – 12:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 7: The origins and the maintenance of tropical biodiversity: current lessons from biogeography and macroevolution

Unraveling the biodiversity and formation of *Adiantum* in South America: insights from phylogenetic analysis**CHEN Chi-Chuan¹, LEHTONEN Samuli², TUOMISTO Hanna¹**¹Department of Biology, University of Turku, Turku, Finland²Biodiversity Unit, University of Turku, Turku, Finland**E-mail:** ccchen@utu.fi

Adiantum is a genus with approximately 225 species distributed worldwide and with especially high diversity in South America. However, species delimitations, phylogenetic relationships and niche evolution remain poorly understood. In this study, we aim to 1) clarify the phylogenetic relationships of *Adiantum* in South America, focusing mainly on the *A. tetraphyllum* and *A. peruvianum* groups; 2) explore how the diversification of *Adiantum* species is related to their niche evolution. To achieve the first aim, we inferred the Sanger phylogeny with over 250 species using four chloroplast markers (*atpA*, *chlN*, *rbcL*, *rpoA*), and conducted targeted enrichment data with limited sampling (28 species) for hybridization analysis. The Sanger phylogeny suggests that some species complexes that have been challenging to identify using morphological characters are proving difficult to distinguish from one another even genetically. Initial results from targeted enrichment data suggest that this may be due to hybrid species being more common than previously recognized. Further taxonomical investigation using morphological characters may complement DNA information to clarify the complex evolution of *Adiantum*. To explore niche evolution, data on species edaphic niches will be integrated with a newly generated phylogenetic tree and geographical distribution data to explore the potential important of niche shifts and geographical isolation on species diversification.

Funding: Turku University Foundation, Academy of Finland**Web and/or Twitter account:** NA

T46 – Tuesday 12:15 – 12:30 Poster P8 + Lightning talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**Session 8: The state of the art of tropical vegetation modelling**

Chairs: Mateus DANTAS DE PAULA

Process-based dynamic models of vegetation are being increasingly used in ecology, in order to tackle theoretical and applied questions in larger temporal and spatial scales, often making extensive use of remote sensing datasets. Single or model ensembles have provided recently valuable insights for the future of biomes under climate or land use change, in scenarios where field experiments would be impractical or costly. Nevertheless, real-world complexity of climatic and biological systems has led to many model inconsistencies, in particular due to the application of high-latitude developed models to tropical areas. In order to consistently simulate these ecosystems, a new generation of models is being developed with features such as new growth forms, inclusion of the phosphorus cycle, biotic interactions and trait diversity. Models which include these features, relevant to tropical ecosystems, have shown improved fit to observations, the impact of future scenarios to diversity and explored concepts such as resilience and plant physiology. These are therefore better equipped to answer many urgent scientific questions which are pertinent to the tropics. This session aims to showcase recent advances in tropical process based vegetation models, the use of ecological theory for the development of simulated processes and stimulate exchange with empirically focused researchers from diverse backgrounds, due to the holistic nature of vegetation models. Also, model applications to a wide range of large-scale scenarios should be particularly of interest to those focused on conservation issues, providing science-based results for policy makers.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 8: The state of the art of tropical vegetation modelling

The challenges and importance of dynamic vegetation modeling in the tropics**DANTAS DE PAULA Mateus¹, HICKLER Thomas¹**¹*Senckenberg BiK-F, Data and Modeling center, Senckenberganlage 25, Frankfurt am Main, 40325, Germany***E-mail:** mateus.dantas@senckenberg.de

Dynamic vegetation models have been typically developed using data and processes related to temperate ecosystems, and in spite of this, simulated and given results for tropical ecosystems. With increasing model complexity and new questions related e.g. to biodiversity loss and CO₂ fertilization, the inclusion of processes relevant to tropical ecology are coming into focus in order to improve model fit to reality and produce realistic projections. Here I will present an example of this current trend through the LPJ-GUESS-NTD (Nutrient-Trait Dynamics) model development. LPJ-GUESS-NTD was incorporated into a recent large scale project in southern Ecuador (RESPECT), benefitting from the wealth of available data, and demonstrating the importance of models in driving new and old questions for empirical ecology. The LPJ-GUESS-NTD model was able to show along the altitudinal gradient: (1) Is nutrient limitation an important factor in shaping vegetation traits? (2) What is the importance of the inclusion of the phosphorus cycle for tropical vegetation modeling? (3) What is the future of the forest in terms of structure, function and trait composition under increasing nitrogen deposition caused by forest fires in the lowland Amazon? I suggest in conclusion which factors would be invaluable to parameterize and validate future model implementations.

Funding: DFG, FOR2730**Web and/or Twitter account:** @mateusddp

T83 – Wednesday 16:15 – 16:30 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 8: The state of the art of tropical vegetation modelling
Effects of soils in driving biogeographic and plant use patterns in Amazonia

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Plant ecological patterns are known to be strongly affected by edaphic properties. However, the effects of soils are often underestimated due to problems of soil digital maps. Therefore, I developed a map of soil nutrient concentration in Amazonia using machine learning and a set of remote sensing, climatic and biophysical variables as predictors. To alleviate typical data paucity of tropical regions, I complemented the soil dataset using the indicator species approach, which consists in using plant occurrences with known soil affinities as a proxy for soil measurements. The map reveals the patchiness of nutrient concentration in soils of Amazonia. Moving further, I investigated the effects of soils on 1) the interplay of ecological, historical, and societal factors in shaping distributions of palm uses; 2) biogeographical vegetation patterns and 3) the distribution of selected plant species under climate change. Soils were the main drivers of variations in all these cases. Traditionally, the relative importance of soils as opposed to climate as drivers of distributions has been considered a matter of scale. However, I conclude that soil variables are often the most important factor driving several aspects of Amazonian plant biogeographic patterns both at the regional and the continental scales.

Funding: NA

Web and/or Twitter account: utu.fi/amazon

T84 – Wednesday 16:30 – 16:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 8: The state of the art of tropical vegetation modelling

Modelling the distribution of tropical forests and tree species under changing climate: implications for conservation in India

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Tropical forests have the highest biological and genetic diversity among the terrestrial ecosystems. These landscapes are natural sinks of CO₂ from the atmosphere, helping to mitigate climate change. Currently, anthropogenic and climate driven changes have been impacting the ecology of the tropical forests. We aimed to model current and future distributions of 1) tropical deciduous forests and 2) two timber species (*Tectona grandis* and *Litsea glutinosa*) in India. We used machine learning, field data and bioclimatic predictors for current and future climate scenarios. The resulting maps describe the potential present and future distribution of species and forests. We observed an increase in the suitable area to be occupied by the two focal species under climate change. On the other hand, we found a trend of deciduous forests retracting under extreme climatic conditions. The distribution maps of tropical forest are useful in the identification of suitable conservation and management locations and provide a basis for restoration planning under the changing climate.

Funding: NA

Web and/or Twitter account: NA

T85 – Wednesday 16:45 – 17:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 8: The state of the art of tropical vegetation modelling
Lianas reduce forest-level carbon storage more than previously thought

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Liana abundance in neotropical forests has been unambiguously related to the reduction of forest carbon stocks and carbon storage capacity. Those estimates, however, neglected the impact of lianas on whole tree structure, assuming trees share the same diameter-biomass allometry regardless of liana infestation.

In this study, we refined the estimates of liana impact on forest carbon stocks using terrestrial laser scanning in a liana removal experiment in Gigante Peninsula, Panama. We scanned 8 plots for a total of 2 ha, equally distributed between two treatments (liana removal and unmanipulated plots). We extracted point clouds for 345 trees (DBH > 0.2 m, 191 and 154 trees in the two treatments, respectively). We fitted multiple tree height allometric relationships with a hierarchical Bayesian effect while controlling for species variability. We observed a strong liana effect on tree height (p-value = $1e-7$, - 3.9m on average across all DBHs), which significantly affected the previous estimates of carbon stocks (+ 1.4 T_C ha⁻¹ in removal plots; - 3.9 T_C ha⁻¹ in control plots, representing +1.4% and -4.6% of the total C stocks on average). We showed that the liana removal effect was significantly underestimated when using common allometries for liana-free and liana-infested trees.

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<https://www.ugent.be/bw/environment/en/research/cavelab>

T86 – Wednesday 17:00 – 17:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 8: The state of the art of tropical vegetation modelling

The response of oil palm, rubber and tropical forest plant functional types in the Community Land Model (CLM5) to inter-annual variations in climate

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Drought is a significant constraint of plant productivity and survival but our understanding of how tropical plant species respond to drought is still very limited. In the equatorial maritime continent, tropical plants experience El Niño–Southern Oscillation (ENSO) event, which frequently reoccurs and is one of the most distinct drivers to inter-annual regional climate variability in the tropics. In this study, we used a process-based land surface model (Community Land Model; CLM5) to investigate the spatial and inter-annual variation of biogeochemical processes of oil palm (OP), rubber (RUB) and forest (FOR) PFTs in the lowland areas of the Jambi Province located in central Sumatra in Indonesia. CLM5 predicted a clear difference in yearly net primary productivity, litterfall, transpiration, leaf area index, and soil moisture for FOR, OP, and RUB PFTs. All PFTs reduced their productivity and transpiration rates under the ENSO event, but the OP PFT decreased the average rates the most and showed significant inter-annual variability. Our study indicates clear differences in growth and productivity and associated carbon and water fluxes between oil palm, rubber, and tropical forests and that these processes could be more severely impacted during a future stronger ENSO event.

Funding: NA

Web and/or Twitter account: NA

T87 – Wednesday 17:15 – 17:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Chairs: MRAZOVA Anna, SAM Katerina

Direct and indirect effects of predation have tremendous impact on the ecosystem functioning. Predators consume the other organisms, thus directly affect nutrient cycling. However, predators also alter the behaviour of organisms, which then hide more and feed less than in absence of predators. Predation is however an interaction, which is highly elusive and difficult to study, especially in dense tropical forests. Predation happens fast, typically away from the sight of potential observers. The prey item is consumed, and typically there are no traces of the action. Similarly, indirect effects of the predation on lower trophic levels are very difficult to measure. All these problems with studies of predation are even bigger in tropical forests, which are dense and difficult to access. To fill in methodological and knowledge gaps, we propose to discuss the methodological approaches and results of studies in which direct or indirect effects of predation were measured. We will focus on the use of sentinel prey in predation experiments in tropical areas (with potential comparisons with temperate regions), direct observations of predation attempts and also various approaches to studying indirect effects of presence of predators on lower trophic levels. The symposia will focus mostly on above, and potentially below ground interactions, between predators and their prey, but we will not discuss predation in aquatic systems.

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Forest canopy insects are safer from predators in the tropics than at higher latitudes

SAM Katerina^{1,2}, FERNÁNDEZ-GARZÓN Sara^{1,2}, FINNIE Sam^{1,2}, SIVALT Elise^{1,2}, KOLLROSS Jan^{1,2}, LENC Jan^{1,2}, LIBRA Martin¹, LUDWIG Antonia³, MARAIA Heveakore^{1,2}, PHILIP Amelia Joyce^{1,2}, HOUSKA TAHADLOVÁ Markéta^{1,2}, XIAO Xue^{1,2}, VOLF Martin^{1,2}

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Theory predicts higher predation pressure in the tropics than at higher latitudes. We have tested this hypothesis for insects on the understorey and canopy forest vegetation, using a global network of six canopy cranes between 51° N and 34° S. We found opposing latitudinal gradients in predation risk between the forest understorey and the forest canopy, with the highest predation risk at the forest canopy at higher latitudes. This pattern was driven by changing relative importance of predation by birds versus arthropods and its interplay with the abundance of the natural prey items.

Funding: ERC Starting grant BABE 805189

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T143 – Thursday 14:00 – 14:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Predator exclusion in tropical forests: impacts on herbivory and arthropod communities along different vertical strata

KOLLROSS Jan^{1,2}, FINNIE Sam^{1,2}, SIVAUULT Elise^{1,2}, FERNÁNDEZ-GARZÓN Sara^{1,2}, PHILIP Amelia Joyce^{1,2}, SAM Kateřina^{1,2}

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Predation (top-down effect) and plant defence (bottom-up effect) can affect plant herbivory and arthropod communities, with differences depending on latitude and forest strata. To investigate these effects, we conducted an eight-week experiment across two sites in Australia (Cairns, Sydney), and one site in Papua New Guinea (Madang). We exposed eight plant species from the forest understory and canopy to six treatments, including the exclusion of vertebrates, birds, bats, ants, and a control treatment. We collected and identified arthropods before and after the experiment, focusing on beetles, and analysed the rate of herbivory. Our findings showed a strong vertical gradient in arthropod abundances and diversity, with different groups having opposing patterns in different strata. The exclusion of all predators led to a significant increase in arthropod abundances, particularly in the canopy and at more productive (tropical) sites. Surprisingly, excluding ants did not have a significant impact on arthropod abundances. Our data also suggests that trees in the canopy experience lower herbivory pressure compared to the understory. In conclusion, our experiment highlights the importance of predators, particularly in the canopy and at more productive sites, in shaping herbivory rates and the composition of arthropod communities.

Funding: ERC Starting Grant BABE 805189

Web and/or Twitter account: <https://multitrophicinteractions.blog>

T144 – Thursday 14:15 – 14:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Trophic cascades in tropical rainforests: effects of vertebrate predator exclusion on arthropods and plants in Papua New Guinea

HOUSKA TAHADLOVÁ Markéta^{1,2}, MOTTŁ Ondřej³, JORGE Leonardo R.¹, KOANE Bonny⁴, NOVOTNÝ Vojtěch^{1,2,4}, SAM Kateřina^{1,2}

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Insect herbivores have the potential to consume large amounts of plant tissue in tropical forests, but insectivorous vertebrates effectively control their abundances, indirectly increasing plant fitness accordingly. Despite several studies already sought understanding of the top-down effects on arthropod community structure and herbivory, such studies of trophic cascades in old tropics are underrepresented, and little attention was paid to top-down forces in various habitats. Therefore, we examine how flying insectivorous vertebrates (birds and bats) impact arthropods and, consequently, affect herbivore damage of leaves in forest habitats in Papua New Guinea. In a 3-month long predator exclosure experiment conducted at four study sites across varying elevation and successional stage, we found that vertebrate predators reduced arthropod density by ~52%. In addition, vertebrate predators decreased the mean body size of arthropods by 26% in leaf chewers and 47% in non-herbivorous arthropods but had only a small effect on mesopredators and sap suckers. Overall, the exclusion of vertebrate predators resulted in a ~41% increase in leaf damage. Our results, across different types of tropical forests in Papua New Guinea, demonstrate that flying vertebrate insectivores have a crucial impact on plant biomass, create a selective pressure on larger and non-predatory prey individuals and they prey partition with mesopredators.

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T145 – Thursday 14:30 – 14:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Top-down control of spiders in Australian forests

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Spiders are known as generalist predators, yet their contribution to keeping the forest green (i.e., controlling the herbivore population) is often overlooked compared to other predators, especially on a bigger scale. Through manipulative experiments, we investigated the top-down control by spiders on herbivory damage by excluding birds, bats, and ants from the ecosystem. These experiments were conducted in the native forests in Australia (EucFACE site, New South Wales, and Daintree Rainforest Observation, Cairns) on the forest floor and the canopy. We quantified the rate of herbivory activity by measuring the leaf area before and after a one-month-long experiment. Initial findings indicate that spiders were among the most abundant predators, with Salticidae and Araneidae being particularly dominant families. The species composition of spiders varies between forests, though the diversity was rather comparable. The differences in habitat complexity (i.e., plant species) and microclimate between forests may affect the distribution of the prey and spider communities.

Funding: European Research Council (ERC), project BABE– 805189)**Web and/or Twitter account:** NA

T146 – Thursday 14:45 – 15:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Anti-predator defences of neotropical Skipper butterflies (Hesperiidae), more complex than previously thought

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Prey organisms are under constant selective pressure by various predators, thus, multiple strategies have evolved to evade, to confuse or to mislead predator attacks. Skippers (Hesperiidae) are diurnal butterflies long suspected to utilise different strategies to evade visual predators (e.g., insectivorous birds). By using a laboratory protocol, we found that hindwing tails in artificially escaping, dummy Skippers can be learnt by a surrogate predator, thus, showing 'butterfly tails' can be effective morphological cues to advertise evasiveness, in addition to their role in deflecting predator attacks. In field experiments in Peru, we have uncovered an additional defence strategy in Skippers; some species are untasteful for domestic chicks (a common surrogate model for testing palatability). This suggests that Skippers have multimodal defences, being highly evasive and highly unpalatable as other aposematic neotropical butterflies such as *Heliconius* or *Ithomiini*. Finally, by conducting aviary experiments across seasons and habitats using local insectivorous birds, we have gathered evidence suggesting that such predators are aware of the defences and significantly reduced their attack rate to Skippers compared to control palatable and slow butterflies. Altogether, by using a combination of lab and field experiments, we are shedding light upon the possible drivers explaining multimodal defences in Skippers.

Funding: GAČR grant GJ20-18566Y, fellowship grant L20096195 (PPLZ program of the Czech Academy of Sciences) and GAJU n.014/2022/P

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T147 – Thursday 15:30 – 15:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Beta diversity in a tropical rainforest is higher for parasitoids than their caterpillar hosts.

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Understanding the patterns of multitrophic interactions is essential for elucidating the mechanisms behind the origin and maintenance of biodiversity. However, large-scale comparisons of such patterns are scarce. In this study, we analyzed the beta diversity of all trophic levels in parasitoid-herbivore-plant interactions across a 500 km stretch of continuous lowland rainforest in Papua New Guinea. We reared over 3100 parasitoids from more than 27,000 caterpillars and reconstructed their interactions. We found that the beta diversity was higher for parasitoids than their caterpillar hosts. Both beta diversity values exhibited mild but significant increases with distance, and these increases were driven by species turnover rather than nestedness. The dissimilarity of interactions between parasitoids and caterpillars significantly increased with increasing distance due to species turnover. Furthermore, the dissimilarity of interactions between parasitoids and caterpillars was higher than that between caterpillars and their host plants. Our results indicate that the lower network levels (plants and caterpillars) can create a highly heterogeneous environment for the upper trophic level (parasitoids), despite the largely homogenous environment of lowland tropical forest.

Funding: European Research Council (669609)

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T148 – Thursday 15:45 – 16:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Reforestation types impact the effect invertebrate predators on decomposition rate in tropical forest

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Ecological restoration has been globally recognized as a key strategy to mitigate tropical biodiversity losses and strengthen the provisioning of ecosystem services. Invertebrates are the most diverse organisms with the highest species richness in tropical forests and they ensure ecosystem functioning through processes such as predation and organic matter decomposition. However, how different reforestation types influence these processes remains uncertain. Here, we investigated how invertebrate predators affect the decomposition rate in two different reforestation types (eucalyptus plantation, secondary forest) and natural control (dry evergreen forest). We performed experiments with epigeic communities where we excluded invertebrate predators and observed the decomposition rate of leaves of dominant tree species. The design was complete randomized-block type: predator exclusion, fenced control, non-fenced natural control. Except decomposition rate, we also collected all invertebrates and measured their body sizes in all plots. We found that invertebrate predators reduced the decomposition rate in secondary forests, but they had no significant effect on decomposition in eucalyptus plantations and dry evergreen forests. This suggests that different reforestation types affect the function of generalist invertebrate predators. Understanding the functional role of invertebrate predators in soil communities would provide a better understanding how to increase conservation services in response to reforestation techniques.

Funding: NA

Web and/or Twitter account: NA

T149 – Thursday 16:00 – 16:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 9: Predation in tropical forests

Prey tracking and predator avoidance in tropical forest mammals: a camera-trapping approach

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Predator-prey interactions are difficult to study, especially in forest mammals. A common approach to studying these interactions among mammals is to monitor the spatial proximity of animals at fixed times, using GPS tags fitted to individuals. We used an alternative, non-invasive camera-trapping approach to monitor the temporal proximity of predator and prey animals. We deployed camera traps at 30 fixed locations across Barro Colorado Island, Panama, where the ocelot (*Leopardus pardalis*) is the principal mammalian predator and tested two hypotheses: (1) prey animals avoid ocelots, and (2) ocelots track prey. We quantified temporal proximity by fitting parametric survival models to the time intervals between subsequent captures by camera traps, and then compared the observed intervals to random permutations that retained the spatiotemporal distribution of animal activity. We found that the time until a prey animal appeared at a location was significantly longer than expected by chance if an ocelot had passed (i.e., predator avoidance), and that the time until an ocelot appeared at a location was significantly shorter than expected by chance after prey passage (i.e., prey tracking). This demonstrates that camera trapping is a viable and non-invasive alternative to GPS tracking for studying certain predator-prey interactions.

Funding: NA

Web and/or Twitter account: NA

T150 – Thursday 16:15 – 16:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Chairs: Robert TROPEK, Sailee SAKHALKAR

Understanding of interactions between flowering plants and animal pollinators is crucial for better insight into evolution of both groups, as well as into the dynamics of ecosystems. Although tropical ecosystems host majority of plant and animal diversity, our knowledge on their interactions is still highly limited. Therefore, this session aims to compile the current studies on plant-pollinator interactions from diverse tropical ecosystems. We welcome all types of pollination studies and contributions, from detailed insights into particular pollination systems, through (co)evolution of these interactions, up to dynamics and patterns in interactions networks.



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Revising the “Insect apocalypse”: Are tropical insect pollinators facing genetic erosion?

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Environmental changes over the next few decades are expected to have a detrimental effect on insect pollinators fitness such as loss of genetic diversity which may potentially increase extinction risk. Beyond species loss, this could cause cascading effects affecting ecosystem's function and stability. In tropical forests, where most angiosperm diversity is found, this may be of major concern since most flowering plants species rely on insects for pollination. Here, we investigate signs of genomic erosion looking at temporal changes in Single Nucleotide Polymorphisms across the genomes of 25 species of neotropical insect pollinators from Barro Colorado Island, Panama. For each species, we sequenced the whole genome from specimens collected in two different time points about a decade apart (2009-2011 and 2021-2022) and we calculated F_{st} , N_e , Tajima's D and π parameters. Our preliminary analyses show a recent increase in the abundance of rare polymorphisms, and a population expansion in the last decade after a possible population bottleneck. These results suggest a possible adaptation of these species to environmental changes in the last decade. This study is one of the few available temporal genomic comparisons for pollinators in the neotropics and provide valuable information for their conservation.

Funding: Czech Science Foundation, grant number GAČR 20-31295S.

Web and/or Twitter account: NA

T96 – Wednesday 15:45 – 16:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Resource intake of stingless bee colonies in a Neotropical rainforest

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Stingless bees (Apidae: Meliponini) are a highly diverse group of social bees and represent one major pollinator group in tropical forests. Alarming, stingless bee diversity and pollination services are threatened by tropical forests losses. Despite their diversity and importance, we still know little about their foraging behaviour, resource intake (i.e., pollen, nectar, and resin), or the floral sources visited for resource allocation. A better understanding of these factors is however essential for capturing the bees' role in tropical plant-pollinator networks.

We investigated species-specific differences in foraging activity, resource intake (pollen, nectar, and resin), and floral sources visited (obtained from collected pollen via DNA metabarcoding) at different times of the day of stingless bee species in two nature reserves in the Esmeraldas Province, Ecuador. We also show that the sometimes underestimated proportion of collected resin (which can be more than 20% of the total resource intake) plays an important role for the visited floral sources and foraging activity of stingless bees.

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**

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T97 – Wednesday 16:00 – 16:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

No “perfect fit” between bats and flowers: the ecological drivers of interactions between plants and anthophilous bats in a Neotropical savanna

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Flower-visiting bats are recognized as generalist pollinators, while chiropterophilous flowers are frequently wide and accessible to enable the visitation of such large pollinators. Therefore, it is expected that morphological specialization plays a small role in assembling bat-flower interactions, yet little is known about the driving variables of bat-flower networks. We aimed at sampling a representative assemblage of flower-visiting bats and reconstructing their interaction network while measuring the likelihood of neutrality (abundance) and niche processes (morphology and spatiotemporal overlap) in driving pairwise interactions in a highly seasonal and heterogeneous Neotropical savanna (Cerrado biome). We found that spatiotemporal overlap, particularly spatial matching, was the main driver of network microstructure. Therefore, bat-flower interactions are not neutrally structured, but also not highly constrained by morphology unlike other pollination systems, and reflect the highly heterogeneous nature of the Cerrado. The biome undergoes stark phenological transitions and is composed of a variety of patches of vegetation types, leading to a significant turnover of species of both bats and plants in response to quick environmental shifts and thus affecting network structure. The next steps include understanding network drivers in other, more homogeneous environments and testing additional explanatory variables, such as resource traits of plants and bat energetical expenditures.

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T98 – Wednesday 16:15 – 16:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Elevational patterns of specialisation in pollination networks in rainforests of Mount Cameroon

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By the altitude-niche hypothesis, specialisation of interactions was predicted to increase with prevailing importance of biotic interactions over abiotic stress, i.e. towards the higher altitudes. Nevertheless, the lack of data from tropical elevational gradients do not allow to confirm this hypothesis. From the complete elevational gradient of Afrotropical rainforest on Mount Cameroon, West/Central Africa, we bring an unusually robust dataset of pollination networks from four different elevations (650 to 2,200 m a.s.l.) sampled during from both dry and wet season. Our sampling covered all vegetation layers, from understory to canopies, as well as both day and night visitors. Altogether, we recorded 1,209 specimens of 217 plant species flowering at the studied communities, resulting in a >46,000 interactions with insect and vertebrate visitors. We confirmed the altitude-niche hypothesis, because the network specialisation continuously decreased along elevation during the favourable conditions of dry season. Contrarily, during the extreme weather conditions of rainy season, no systematic pattern of specialisation was revealed.

Funding: NA

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T99 – Wednesday 16:30 – 16:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Unveiling the role of module persistence in the spatiotemporal dynamics of pollination networks in Afrotropical forests

SAKHALKAR Sailee P.¹, JANEČEK Štěpán¹, KLOMBERG Yannick¹, MERTENS Jan E.J.¹, HODEČEK Jiří^{1,3}, TROPEK Robert^{1,2}

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Species interaction networks are influenced by variability in species composition, preferences, and abundances. However, the spatiotemporal dynamics of this variability are rarely studied, as most knowledge relies on “snapshots” of communities. Multilayer networks incorporate interlayer links that connect species across networks, allowing the explicit consideration of space and time. We hypothesised that interactions within such multilayer networks consist of spatiotemporally persistent and non-persistent modules. Persistent modules are composed of species that interact with each other across space and time, and therefore form the stable backbone of the metacommunity. Non-persistent modules differ in part of the interacting species across spatiotemporal gradients. Thus, while persistent modules contribute to overall stability, non-persistent modules may be what drives turnover between communities. We demonstrate this concept with a dataset of eight pollination networks from Mount Cameroon that span over four elevations (650m - 2200m) and two seasons (wet and dry). Specifically, we tested the relationships between species’ spatiotemporal persistence and their topological role in the networks. Additionally, we evaluated differences between traits of species in persistent and non-persistent modules and estimated to what extent turnover between networks was driven by non-persistent modules through functional and taxonomic turnover and interaction rewiring.

Funding: NA

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T100 – Wednesday 16:45 – 17:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Pollination syndrome hypothesis: the role of floral traits in shaping plant-pollinator interactions

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The pollination syndrome hypothesis predicts that plants pollinated by the same pollinator group bear convergent combinations of specific floral functional traits. Nevertheless, some studies have shown that these combinations predict pollinators with relatively low accuracy. This discrepancy may be caused by changes in the importance of specific floral traits for different pollinator groups and under different environmental conditions. Moreover, many floral features are not well understood in terms of their evolutionary history and current functions. To explore this, we studied pollination systems and floral traits along an elevational gradient on Mount Cameroon during wet and dry seasons. Using Random Forest (Machine Learning) models, allowing the ranking of traits by their relative importance, we demonstrated that some floral traits are more important than others for pollinators. However, the distribution and importance of traits vary under different environmental conditions. Further investigations and experiments on the interactions between pollinators and plants have shown that the function of certain floral characteristics may deviate from their initial assumptions. Our results imply the need to improve our trait-based understanding of plant-pollinator interactions to better inform the debate surrounding the pollination syndrome hypothesis.

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T101 – Wednesday 17:00 – 17:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023
Session 10: Pollination in tropical ecosystems
Exploring plant-animal interactions in the canopy: innovative methods reveal the flower visitors of *Handroanthus chrysanthus*, a neotropical tree species

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Pollen dispersal by animals is a major driver of plant population structure in the tropics. However, our knowledge of plant-pollinators interactions in the canopy of tropical trees remains limited due to the difficulty of reaching their crowns. Here, we conducted a pilot study to monitor plant-pollinator interactions in the neotropical tree species *Handroanthus chrysanthus*. This species is known for its charismatic yellow flowers and its value as timber resource, which has led to local overexploitation.

In our study, we used tree climbing techniques to access the canopy of *Handroanthus chrysanthus* and installed time-lapse cameras to identify its flower visitors and their activity patterns during the day and flowering season. The resulting time-lapse videos, analyzed with the BORIS software, revealed previously unobserved mutualistic and unexpected antagonistic interactions. Three hummingbird and at least two Hymenoptera species were observed robbing nectar. Florivory was performed by three bird species, while honeybees and a hummingbird species were identified as potential pollinators. These results not only highlight the importance of using innovative methods to extend our knowledge of natural history on tropical tree and animal species, but can also have practical applications, such as informing conservation efforts and management strategies for forest resources in biodiversity hotspots.

Funding: This research was funded by the Emmy Noether project "Phenology of tropical tree species – environmental cues, molecular mechanisms, and consequences for plant-animal interactions" (HE 7345/9-1). In addition, KH and SH were supported by the Eva Mayr-Stihl Foundation for Forest Genetics.

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T102 – Wednesday 17:15 – 17:30 Poster P9 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Wild bee and not honeybee behaviour on coffee plantation is the responsible of coffee pollination

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There is a diversity of studies investigating how the diversity of floral visitors and changes in their communities affect coffee production. However, very few studies have focused on understanding how insects visiting behaviour affects coffee production. Here we assessed how foraging behaviour (flower visitation-rate, collection time in flowers and contact stigma/anther) of honey and stingless bees affect coffee pollination in conventional and organic crops. For this, we quantified local floral resources, diversity of bees and recorded the behaviour of each of the most common species when visiting coffee flowers. We found that the managed honeybee *A. mellifera* and three wild bees *T. angustula*, *S. mexicana*, and *P. bilineata* are the principal floral visitors of coffee crops in Guatemala. Regarding their behaviour, we observed that *P. bilineata* time spent on flowers were positively related with both fruit weight and fruit set, the average number of flowers visited by *P. bilineata* was also positively related to fruit set, while only the percentage of *A. mellifera* collecting pollen was positive related with fruit weight, suggesting that although *A. mellifera* is found in large quantities, wild bees are efficient pollinators of coffee in the region and their populations should be conserved.

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T102 – Wednesday 17:15 – 17:30 Poster P10 + Lightning talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Do selfing rates rise with elevation as pollinator activity decreases in Afromontane grasslands?

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Self-compatibility and self-incompatibility in plants are usually not distinct categories but a continuum reflecting a plant reproductive strategy. Proportion of self-compatibility is known to change with latitude, as it is more favorable in harsh climatic conditions where the risk of not being visited by a pollinator increases. However, it is not much studied along elevation, especially in tropics, although the similar pattern towards higher elevation could be expected. We studied the intraspecific variability in plant self-compatibility with rising elevation on Mount Cameroon to compensate the decline of pollinator activity. Our study was performed in Afromontane grasslands above the timberline. We carried out hand-pollination experiments (four different treatments simulating autogamy, geitonogamy, outcrossing, and natural control) of seven flowering plant species growing along the elevational gradient. These treatments were carried out at four elevations across 1700 elevational meters (2300, 2800, 3500, and 4000 m a.s.l.). Although we expected the general increase in self-compatibility towards higher elevations, the trend differed among the studied plant species.

Funding: NA

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T102 – Wednesday 17:15 – 17:30 Poster P11 + Lightning talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 10: Pollination in tropical ecosystems

Is size important? Revealing the pollination process of African canopy trees

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The second largest block of tropical forests is located in Central Africa. Currently, 30% of this area is being utilized for timber production. Understanding the natural regeneration of timber tree species, including pollen dispersal and its impact on gene flow, is essential for effective forest management. Research indicates that there is a correlation between flower size, pollinator size, and the distance over which pollen can be dispersed. The study seeks to investigate the correlation among pollinators, pollen dispersal distances, and floral syndrome in four canopy timber tree species:

Baillonella toxisperma (Sapotaceae), *Cylicodiscus gabunensis* (Fabaceae), *Distemonanthus benthamianus* (Fabaceae), *Triplochiton scleroxylon* (Malvaceae). Over 48h to 72h, two to three cameras were placed in front of flowers in the canopies of seven trees from these species found within the canopy.

A predominance of honeybees, stingless bees, flies, cockroaches and moths was observed during the study. *C. gabunensis* and *B. toxisperma* produced small flowers that lasted a few days but demonstrated substantial levels of pollinator diversity which resulted in significant pollen dispersal; in contrast, *D. benthamianus* and *T. scleroxylon* attracted mainly honey bees and stingless bees with their larger flowers lasting less than a day. These findings suggest that the diversity of pollinators and flower lifespan might play a greater role in driving pollen dispersal than the size of the flower or its pollinator.

This unique approach to studying pollen movement provides insights into gene flow within an ecological context which can inform sustainable management practices aimed at maintaining natural population regeneration potential and adaptation ability.

Funding: NA

Web and/or Twitter account: NA

T102 – Wednesday 17:15 – 17:30 Poster 18 + Lightning talk

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023****Session 11: Free session**

The Free session is split into 5 separate parts. Posters (P12-P18) belonging to this session are presented together with Session 1 on Tuesday afternoon.

Part 1 – Tuesday 14:30 – 15:45: Chair: Leonardo RE JORGE

Part 2 – Tuesday 16:15 – 17:30: Chair: Jan KOLLROSS

Part 3 – Tuesday 16:15 – 17:30: Chair: Marketa HOUSKA TAHADLOVA

Part 4 – Thursday 14:00 – 15:00: Chair: Martin LIBRA

Part 5 – Thursday 15:30 – 16:30: Chair: Elise SIVAUULT



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 1

Impact of wildfires on biodiversity and spatio-temporal dynamics in Togodo protected area complex in Togo (West Africa)

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This paper is a contribution to a better management of the Complexe of Togodo Protected Areas (CTPA) in the context of high anthropogenic pressure on Togolese protected areas. It aims to assess LULC changes and wildfires spatio-temporal dynamic, and the floristic diversity of the vegetation stands. LANDSAT images and phytosociological data were used to monitor land cover fire dynamics from 2000 to 2020 and evaluate floristic diversity of the complex. Results indicate a regression of dry forest/gallery forest and open forest/wooded savannahs in favor of wooded savannahs/shrubby savannahs and crops/fallow lands from 2000 to 2020. During the same period wildfire increased by 8,7%. A diversity of 201 species divided into 156 genera and 56 families were identified with Poaceae (22,18%) and Combretaceae (14,80%) dominating. *Andropogon africanus* (13,12%), *Anogeissus leiocarpa* (11,25%) and *Chromolaena odorata* (8,82%) are the most dominant species. Five groups of plant stands were discriminated according to the ascending hierarchical classification of the 94 surveys: tree/shrub savannahs, wooded savannahs, open/dry forests, fallow/crops and dry/riparian forests. This study emphasizes that CTPA management needs to be better improved especially the fire management. Our results will contribute to a better evaluation of the national contributions determined in the REDD+ process.

Key words: Land use/cover, wildfire, biodiversity, Togodo's protected areas, Togo.

Funding: NA

T48 – Tuesday 14:30 – 14:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 1

Hope for a critically endangered, endemic Neotropical primate despite strong habitat fragmentation?**RUBIO VARGAS Carina L.¹, HEYMANN Eckhard W.¹**¹*Verhaltensökologie & Soziobiologie, Deutsches Primatenzentrum – Leibniz-Institut für Primatenforschung, 37077 Göttingen, Germany***E-mail:** eheyman@gwdg.de

Habitat fragmentation is a major threat to the critically endangered, endemic San Martín titi monkey, *Plecturocebus oenanthe*. We examined which characteristics of fragments and the surrounding landscape would explain the persistence of *P. oenanthe* in fragments in two areas in the Moyobamba district. We included 27 forest fragments from a previous study by the Proyecto Mono Tocón (2015); additionally, we randomly selected 18 fragments from satellite images. Each fragment was visited maximally three times (May–August 2019); the presence of *P. oenanthe* was determined through sightings, spontaneous vocalizations, and vocal response to and sightings after playbacks of their calls. Fragments were characterized by size, tree density, canopy coverage, and distance to the nearest settlement. *Plecturocebus oenanthe* was present in all fragments except the smallest one (0.2 ha). Occupied fragments had tree densities of 308–2065 trees/ha, distance to the nearest settlement varied between 0–7.6 km, and canopy cover ranged mostly between 75–100%. Our results indicate that *P. oenanthe* is capable of persisting in a fragmented forest habitat. While detailed ecological studies of this primate are not available, flexible habitat use and the capability for terrestrial traveling in other *Plecturocebus* species suggest that such traits may help to survive in a fragmented habitat.

Funding: Promos (DAAD and Georg-August-Universität Göttingen), Primate Action Fund**Web and/or Twitter account:** <https://www.dpz.eu/en/unit/sociobiology-homepage/about-us/team/profile/person/eckhard-w-heyman.html>

T49 – Tuesday 14:45 – 15:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 1

Restoration of Andean tropical forests: Observational and Experimental plots

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The Andean tropical forests (ATF) are a diversity hotspot, store substantial amounts of carbon and supply water to urban and rural areas, sustaining more than 50 million people. Despite these ecosystem services, ATF have widely converted to pastures and crops, which has led to constant land degradation (e.g. soil erosion, loss of biodiversity, etc.). Active forest restoration is considered a critical tool to revert this degradation, however, limited knowledge exists on what factors affect ATF restoration success. As such, in our study, our main question was: what are the most important drivers for the reforestation of ATF? We implemented several observational (118 plots) and experimental (96) plots along different environmental, soil, and biodiversity gradients in Ecuador. The observational plots were implemented in 18 different reforested areas to identify the main drivers of productivity of young restored forests. Additionally, experimental plots were installed to evaluate the effect of pasture cutting and shading on the native species' performances in three different elevations (2200, 2800, and 3200 m asl.). The results showed that the productivity of young restored forests largely depends on management, with secondary effects of precipitation and species diversity. According to the experimental plots results, effects of competition with pasture and shade on survival and growth rate of transplanted seedlings depend on the species and elevation. In conclusion, management, environmental conditions, and species are principal factors of ATF restoration.

Funding: Regional and community funding: Special Research Fund (BOF), Consolidating a long-term forest monitoring network in a human modified landscape in Northern Ecuador ([VLIR-UOS](#)).

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T50 – Tuesday 15:00 – 15:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 1

Convergent evolution of termite defence

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The theoretical diversity of phenotypes that organisms can evolve is nearly limitless. Nevertheless, complex traits often evolve repeatedly and independently in the process of convergent evolution. Why some phenotypes evolve multiple times remains a largely open question. Soldiers in more than 300 species (~10% of termite species) across more than 40 genera and across tropics of all biogeographical realms have an extraordinary adaptation - spring-loaded mandibles able to deliver repeatable strike. Termites undisputedly evolved snapping at least twice independently from their common non-snapping ancestor: in non-Termitidae termites and in Termitidae. However, the up to five independent origins of snapping within Termitidae are highly uncertain due to the poorly resolved Termitidae phylogeny. Our ancestral state reconstruction along ultraconserved element-based phylogenies suggest a possible alternative to a rampant convergence of snapping mandibles - a single origin of the genetic makeup of snapping early in the evolution of Termitidae. Combination of X-ray microtomography and high-speed video recordings on seven species representing each of the known monophyletic snapping termite lineages demonstrate that the snapping mandibles have similar relative kinematic performance across the lineages. These results suggest that termite snapping mandibles might be convergently reaching biological limits of repeatable mandibular springs.

Funding: JUNIOR STAR GAČR grant 23-08010M "Trajectories of genome evolution in convergent organisms".

Web and/or Twitter account: NA

T51 – Tuesday 15:15 – 15:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 1

Unraveling the realised niches of Amazonian ferns: implications for community assembly and species richness

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Knowledge about the positions of species niches along environmental gradients helps to understand geographical variation in species composition and richness. In Amazonian rainforests, the realised niches of plant species are still mostly unknown. We used a large quantitative field dataset (>1000 transects broadly distributed across lowland Amazonia) to explore the realised niches of the fern species belonging to two abundant fern genera, *Adiantum* and *Lindsaea*. We used weighted averaging and HOF modelling to estimate species optima, niche widths, and response shapes in relation to soil base cation concentration (Ca+Mg+K). Most species had unimodal response curves along the gradient. Overall, species optima were spread across the entire gradient, but *Adiantum* optima were mostly in its upper half and *Lindsaea* optima were limited to the lower half. With increasing soil base cation concentration, local species richness decreased in *Lindsaea* but increased in *Adiantum*. Species optima were robust to different modelling approaches and also when comparing results from different regional subsets (NW, SW and central Amazonia). These results support the idea that niche-related species sorting is an important process in community assembly and in defining species co-occurrence and richness patterns in Amazonian rainforests.

Funding: Academy of Finland

Web and/or Twitter account: NA

T52 – Tuesday 15:30 – 15:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 2

Environmental drivers of fungal community composition along elevation gradients in neotropical and paleotropical forests

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Because of steep gradients in abiotic and biotic factors, mountains offer an ideal setting to study mechanisms that underlie species distributions and community assembly. There have been fungal ecological studies in temperate mountains, while this is the first study comparing fungal community structure along elevation gradients in the Neotropics and Paleotropics. We compared the structure of taxonomically and functionally diverse soil fungal communities along five elevational gradients in mountains of the Neo- and Paleotropics (northern Argentina, southern Brazil, Panama, Borneo, and Papua New Guinea). Both richness and composition of soil fungal community correlate with environmental factors, particularly temperature and soil pH, with some shared patterns among neotropical and paleotropical regions. The observed elevational turnover appears to be driven by contrasting environmental preferences among functional and taxonomic groups, resulting in the replacement of species within each functional guild. For functional groups dependent on symbioses with plants (especially ectomycorrhizal fungi), the distribution of host plants drives richness and community composition, resulting in important differences in elevational patterns between neotropical and paleotropical montane communities. The compositional and functional turnover along elevation gradients implies that tropical montane forest fungi will be sensitive to climate change, resulting in shifts in composition and functionality over time.

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**

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T34 – Tuesday 16:15 – 16:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 2

Cocoa agroforests as a tool for biodiversity conservation in human-modified tropical landscapes: the importance of landscape composition and configuration

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Agroforestry systems are a promising strategy for restoring biodiversity in human-modified landscapes while maintaining agricultural production. However, their effectiveness varies depending on many factors, and the role of landscape context is little understood. Our study aims to understand the influence of landscape context on the composition of forest bird and bat communities in cocoa agroforests in a highly fragmented tropical landscape in Mexico. Using bioacoustic methods, we identified the composition of bird and bat communities in 34 cocoa plantations. We estimated the influence of landscape composition and configuration (percentage of habitat types, edge contrast, and agroforest/forest connectivity) on alpha and beta diversity of these communities using GLMMs, while identifying the most relevant spatial scales. Our results indicate that landscape explains bird and bat alpha and beta diversity through its composition and configuration. In particular, it highlights the crucial role of connectivity between agroforests and forest fragments. Our results thus confirm that agroforests are key for biodiversity conservation in human-modified landscapes but reveal that their effectiveness depends on landscape connectivity. Our study therefore makes a significant contribution to understanding the relationship between landscape context and community composition in cocoa agroforests, which may help develop more effective conservation strategies in human-modified landscapes.

Funding: NA

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T35 – Tuesday 16:30 – 16:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 2

Effects of rainforest disturbance and recovery on tree species composition and community traits in the Yangambi area of the Democratic Republic of the Congo

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Despite their key role in biodiversity conservation, forests in the Congo Basin are increasingly threatened by human activities but it remains challenging to assess the impact of forest degradation under a more or less intact canopy. Likewise, the outcomes of forest recovery following agricultural abandonment remain poorly understood in the Congo Basin. Here, we surveyed 125 vegetation quadrats across 25 forest inventory plots in the Yangambi area. We aimed to assess both the impact of anthropogenic disturbance (selective logging) and of forest recovery on a range of forest and tree community characteristics, as compared to reference undisturbed old-growth forest. We found that undisturbed old-growth forest harboured both more tree individuals and tree species with a higher wood density as compared to disturbed old-growth forest. Whereas we could find no differences in Specific Leaf Area, also tree species composition was significantly different between undisturbed old-growth forest and disturbed old-growth forest. Whereas species diversity recovered since relatively recent (< 60 years) agricultural abandonment, species composition and forest structure remained significantly different from undisturbed old-growth forest. Our study highlights the need of proper conservation of the remaining relatively undisturbed old-growth forests and the need for more extensive vegetation surveys in the Congo Basin.

Funding: Research Foundation-Flanders (FWO; 1125221N)

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T36 – Tuesday 16:45 – 17:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 2

Legacy effects of previous climatic events on the Amazon drought response

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The intensity and frequency of extreme precipitation and drought events over the Amazon rainforest are predicted to rise, leading to significant feedback loops with the global climate. Consequently, it is important to understand how tropical forests respond to these extreme climatic events. In this study, we evaluated the Amazon forest stability (resistance and resilience) to drought in the context of past wet and dry climatic events using MODIS EVI satellite imagery and cumulative water deficit anomalies. We found significant legacy effects of prior climatic events on the forest's drought response. The resilience of the forest to an extreme drought decreased when it was closely preceded by another extreme drought, whereas the occurrence of a recent non-extreme drought also decreased the forest resistance to later droughts. Conversely, both non-extreme and extreme wet events preceding a drought event increased the resistance of the forest. Dry and wet events had similarly sized legacy effects on the drought response of tropical forests. Our findings suggest that the predicted increase in drought frequency and intensity could have negative consequences for the functioning of the Amazon rainforest. However, more frequent wet periods in combination with these droughts could counteract their negative impact.

Funding: Fonds Wetenschappelijk Onderzoek, Grant/Award Number: G063420N and G0F6922N; Flemish Government

Web and/or Twitter account: NA

T37 – Tuesday 17:00 – 17:15 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 2

How much sticky stuff is there? Estimating resin source availability for stingless bees in Southeast Asian lowland dipterocarp forests

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Plant resin is an important material stingless bees collect for nest construction, defence, and communication. Despite its importance, the extent of available resin sources in the bees' foraging range is unknown, as is their persistence in forests. In this study, we assessed trunk resin availability of dipterocarp trees in two lowland tropical moist dipterocarp forest plots, Kuala Belalong (Brunei Darussalam) and Pasoh Forest (Peninsular Malaysia). We found genera- and species-specific differences in the probability of trees producing trunk resin. Genera such as *Dipterocarpus* did not produce resin unless seriously wounded, while speciose *Shorea* had species that had high or low propensities to produce trunk resin. Plot census data over 25 years for Pasoh Forest revealed that a few dipterocarp species important as resin sources have experienced high mortality (46.33% in the case of *Shorea leprosula*), leaving their long-term persistence in the forest unknown. The diversity and occurrence of dipterocarp resin sources appears to be site-specific and important resin producers suffered high mortality in recent decades, indicating that resin availability, though not limiting presently, may be implicated in future. Understanding the spatial and temporal resin resource landscape is important in assessing the long-term viability of stingless bees in intact forests.

Funding: NA

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T38 – Tuesday 17:15 – 17:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 3

Modeling cheetah (*Acinonyx jubatus*) distribution before and after major habitat modification in south-eastern Kenya**MUTORO Noreen^{1,2,3}, ERBELE Jonas¹, WYKSTRA Mary³, HABEL Jan C¹, SCHAAB Gertrud²**¹Paris Lodron University of Salzburg, Department of Environment and Biodiversity, Hellbrunner Str. 34, Salzburg, 5020, Austria²Karlsruhe University of Applied Sciences, Faculty of Information Management and Media, Moltkestr. 30, Karlsruhe, 76133, Germany³Action for Cheetahs in Kenya, Po Box 1611, Nairobi, 00606, Kenya**E-mail:** (Noreen Mutoro): noreen.mutoro@stud.sbg.ac.at

The cheetah (*Acinonyx jubatus*) is a wide-ranging large carnivore whose current global population is declining mainly due to habitat loss and degradation. Kenya's cheetah population consists of approximately 1,200 individuals which mainly occur outside designated protected areas. Limited studies have focused on free-ranging cheetahs beyond Kenya's protected areas. Consequently, little is known about the cheetah's habitat preference and potential distribution in landscapes where they co-occur with humans. This study investigates the potential distribution of suitable cheetah habitats before and after major habitat modification in the Salama/ Athi Kapiti area of south-eastern Kenya. MaxEnt-based distribution models are run using presence-only cheetah data and a combination of environmental, anthropogenic and biotic-spatial covariates. The results show that suitable cheetah habitats are fragmented and widely distributed in the study area before major habitat modification. These habitats mainly shift to the west after the study area experienced major habitat modification. Our study thus provides insight on how cheetahs respond to various predictive factors in human-dominated landscapes. Findings from this study can be used to infer future changes that are likely to occur in Samburu, northern Kenya, where a major linear infrastructural development project will cut across an important resident cheetah population range.

Funding: Katholische Akademische Ausländer-Dienst (KAAD)**Web and/or Twitter account:** <https://www.plus.ac.at/umwelt-und-biodiversitaet/forschung/fachgebiete-der-zoologie/ag-habel/team-11/mutoro/>

T53 – Tuesday 16:15 – 16:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 3

Large-scale impacts of selective logging on canopy tree beta-diversity in the Brazilian Amazon**BOUSFIELD Christopher G.¹, MASSAM Mike R.¹, PERES Carlos A.², EDWARDS David P.¹**¹*Ecology and Evolutionary Biology, School of Biosciences, University of Sheffield, Sheffield S10 2TN, United Kingdom.*²*School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, United Kingdom.***E-mail:** cbousfield1@sheffield.ac.uk

Selective logging is one of the largest drivers of tropical forest degradation. Whilst logged forests often retain high alpha-diversity of tropical trees at local spatial scales, understanding how selective logging impacts tree beta-diversity and community composition across far larger spatial scales remains a key unresolved question. We leverage large datasets of more than 155,000 adult trees ≥ 35 cm DBH covering 3,100 hectares of Amazonian rainforest to simulate the impact of selective logging on canopy tree beta-diversity and composition across large spatial scales. Selective logging had minimal impacts on beta-diversity across the canopy tree community as a whole, but caused substantial subtractive heterogenization in community composition for larger trees, in particular very large trees > 110 cm DBH. Minimal impacts on canopy tree beta-diversity across large spatial scales points towards the retention of substantial conservation value in logged tropical forests, but strong subtractive heterogenization in very large trees indicates the breakdown of broad scale patterns of composition, with potential negative consequences for recruitment processes, fauna reliant upon emergent trees, and other ecosystem functions and services. Avoiding large-scale erosion of very large tree community composition in the Amazon thus requires stronger conservation policies, including enforced retention or maximum cutting diameters.

Funding: UKRI, NERC [grant number NE-S00713X-1]**Web and/or Twitter account:** @c_bousfield

T54 – Tuesday 16:30 – 16:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 3

Contrasting bird-plant and bird-insect phenology structured by dynamic response of arthropods to rainfall extremes**NEWELL Felicity L.^{1,2}, AUSPREY Ian J.², ROBINSON Scott K.²**¹*University of Bern, Division of Conservation Biology, Institute of Ecology & Evolution, Switzerland*²*University of Florida, Florida Museum of Natural History, Gainesville, Florida, USA***E-mail:** felicity.newell@unibe.ch

Phenological shifts are a pervasive response to climate change but remain poorly understood in the hyperdiverse tropics. Here, we employ spatiotemporal variation in montane climate in the Andes of northern Peru as a natural experiment to examine how rainfall regulates reproductive phenology across low-latitude food webs. Using five years of intensive field sampling, in situ rain gauges, and 50 years of regional rainfall, we developed a dynamic model to describe response of arthropods to rainfall extremes. Long-term phenological means from this model showed arthropod biomass shifted from dry-to-wet season maxima across a 1000–2500 mm rainfall gradient with transitional bimodality (e.g., weak post rainy season peaks followed by a second peak after the dry season). Lower 90-day rainfall leading up to the dry season reduced arthropod biomass during the dry season despite similar rainfall seasonality across the region. Rainfall-mediated shifts in arthropod biomass drove locally asynchronous nesting of insectivorous birds contrasting with regional bird-plant phenology. Rapid response of arthropods to wet and dry extremes suggest that insectivorous food webs may be especially sensitive to changing rainfall regimes.

Funding: Ordway Foundation, Association of Field Ornithology, University of Florida**Web and/or Twitter account:** @FelicityNewell

T55 – Tuesday 16:45 – 17:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 3

Through the taxonomic jungle: towards an integrative taxonomic revision of the mahogany tree genus *Toona* (ENDL.) M.ROEM.**JENNERT Pauline¹, EBERSBACH Jana^{1,2}, HAUENSCHILD Frank¹, MUELLNER-RIEHL Alexandra^{1,2}**¹Leipzig University, Molecular Evolution and Plant Systematics, Johannisallee 21, Leipzig, 04103, Germany²German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Puschstraße 4, Leipzig, 04103, Germany**E-mail:** pauline.jennert@studserv.uni-leipzig.de

The tree genus *Toona* (ENDL.) M.ROEM., member of the mahogany family (Meliaceae), is highly valued for its timber and other socio-economically and culturally important uses (e.g., medicine) across its native range from East Pakistan to East Australia. However, the long-term conservation of the genus' biodiversity is hindered by an immense lack of knowledge: Neither the total number of species nor their delimitation and distribution are clear. Taxonomic revision of the genus has proven to be a complex endeavor outside the scope of traditional morphological analyses. Here, we are therefore introducing our comprehensive multi-level approach in which we systematically combine morphological and phylogenomic analyses with assessments of niche evolution, chemodiversity and genome sizes to not only trace *Toona*'s evolutionary history, but to identify important drivers of diversification. Next to targeted field sampling campaigns, we strive to thoroughly make use of all available resources to fully complete the picture: herbaria, botanical gardens, and open biodiversity data spanning the entire taxonomic and geographic distribution range of *Toona*. Besides facilitating the conservation of *Toona* in the future, resolving the historical taxonomic riddle of *Toona* will provide an important framework for other taxonomically complex plant groups and further our understanding of rainforest diversity evolution.

Funding: Leipzig University, Pre-Doc Award, DFG, German Research Foundation – FZT 118, iDiv Flexpool Support Fund Project No. 346001206-23

Web and/or Twitter account: NA

T56 – Tuesday 17:00 – 17:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 3

Bats of Atlantic Forest in the state of Paraná

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The last compiled list of bat species in the state of Paraná, Brazil was published 18 years ago by Miretzki (2003), with 53 species distributed in five families. This work aimed to update the list of chiropteran species in the state of Paraná, through a survey of manuscripts published between 2004 and 2020 and following mapping. We calculated species richness and number of studies per quadrant in grid squares of 30' latitude by 30' longitude ($\frac{1}{2}$ latlong). From 70 works analysed, 71 species were registered, with 2 new families and 18 new species. The metropolitan regions of Londrina, Curitiba and Maringá presented, in this order, the greatest species richness and number of studies. This likely reflect the significance of research institutions in advancing scientific knowledge in the region. Fifty-four (58.1%) of 93 squares overlaid onto the map of Paraná presented no records of species nor studies. The scarcity of studies (< 5) in the region of the Iguaçu National Park, one of the largest conservation units in the state, in the time frame analysed stands out. The results indicate areas that need more attention to bat diversity inventories and suggests that Paraná may harbour an even greater bat species richness.

Funding: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

Web and/or Twitter account: NA

T57 – Tuesday 17:15 – 17:30 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 4

Natural pest control in smallholder agroecosystems of sub-Saharan Africa is modulated by functional diversity of natural enemies and landscape composition

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Yield losses caused by agricultural pests can threaten tropical smallholder farm productivity. This might be mitigated by natural pest control, but it is unclear how pest-natural enemy interactions are influenced by the relationship of local habitat and landscape context. Agroecological management can enhance natural pest control and improve crop yields, but little is known about how landscape-level shifts in the functional diversity of natural enemies can modulate these effects, especially in sub-Saharan Africa. In a field exclusion experiment, we measured the separate and combined contributions of three functional groups of natural enemies (bats/birds, flying insects and ground-dwelling arthropods) to pest control in maize monoculture and maize-pigeon pea intercrops in 24 smallholder farms along a gradient of seminatural habitat in northern Malawi. Higher natural enemy guild diversity led to lower foliar maize damage from fall armyworm (*Spodoptera frugiperda*) and higher dry plant biomass and yield. There was, however, no intercropping effect. Compared to simple landscapes, complex landscapes had higher relative pest damage reduction and relative yield increase from natural enemies, but also lower yields, likely due to underlying soil characteristics. Our study indicates that the preservation of seminatural habitats is key to functionally diverse natural enemies contributing to tropical smallholder food security.

Funding: This research was funded through the 2017-2018 Belmont Forum and BiodivERsA joint call for research proposals, under the BiodivScen ERA-NetCOFUND program, and funded by the Natural Sciences and Engineering Research Council of Canada, the National Science Foundation, the German Federal Ministry of Education and Research and the Research Council of Norway.

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T127 – Thursday 14:00 – 14:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 4

Unveiling the extent and magnitude of overhunting impacts on tropical bird communities

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Overhunting is one of the main drivers of biodiversity loss in tropical ecosystems, yet, unlike deforestation, its extent cannot be properly monitored by remote sensing approaches. In order to map the impacts of hunting on the abundance of tropical birds, we derived Bayesian regression models based on the most extensive database to date on hunting impacts, comprising 2247 abundance estimates in hunted and non-hunted sites for 510 tropical bird species. Changes in abundance due to hunting were expressed as the response ratio (RR) between the abundance of each species in hunted (Xh) and unhunted (Xc) sites within each study ($RR = \log(Xh/Xc)$) and subsequently modelled employing predictors of hunting pressure and species traits that render species sensitive to hunting pressure, while accounting for spatial and phylogenetic autocorrelation. We found positive relationships between bird abundance and distance to the nearest hunter's access point and travel time to major cities, a proxy of accessibility to urban markets. Abundance declines were higher for traded compared to non-traded species, and for large-bodied species. We further employed these large-scale macroecological models to map the extension of hunting impacts on bird communities across tropical ecosystems and to identify preliminary hotspots of defaunation at a pantropical scale.

**EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023**

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T128 – Thursday 14:15 – 14:30 Talk





EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 4

Impact of land-use change on abundance, biomass, and functional and phylogenetic diversity differs between Sumatran beetle families

HARTKE Tamara^{1,2}, KASMIATUN¹, LAURENT Valentine¹, BUSSY Mathieu¹, SAWASKORN Radit¹, BUCHORI Damayanti³, SCHEU Stefan¹, DRESCHER Jochen¹

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Conversion of rainforest to intensively managed crops threatens the astonishing abundance and diversity of arthropods in Southeast Asian tropical rainforests. This has been clearly demonstrated for many taxa, from ants to spiders to springtails, however variability in responses within a taxon has received little attention. Using around 60 000 beetles collected by canopy fogging within the framework of the EForTS project, we investigate the effects of lowland rainforest conversion to rubber or oil palm monocultures via jungle rubber. Overall, abundance and biomass declines were similar for Chrysomelidae, Elateridae, and Staphylinidae, but differed in Curculionidae due the introduced oil-palm pollinator *Elaeidobius kamerunicus*. Functional diversity of canopy beetles was over 11 times higher in rainforest and jungle rubber than in plantations. Dietary homogenisation and shifts toward predation, measured through stable isotope analysis, occurred in rubber and oil palm monocultures. Within Chrysomelidae and Staphylinidae, comparative phylogenetic analysis recovered depauperate communities in monoculture plantations, with some subfamilies disappearing completely following rainforest conversion. Despite the notorious undersampling problem in rainforest canopies, these comparisons between rainforest and converted agro-ecosystems indicate that the negative responses of beetles to tropical land-use change vary between and even within families, highlighting multi-level effects which are obscured at broader taxonomic levels.

Funding: Deutsche Forschungsgemeinschaft, Grant/Award Number 192626868

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T129 – Thursday 14:30 – 14:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 4

Structure and diversity of the forests of the Lomami, Democratic Republic of the Congo

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Tropical forests provide many ecosystem services, hosting over two-thirds of terrestrial species and storing important carbon reservoirs. Despite their primary importance for global biodiversity and their status as threatened ecosystems, tropical forests are among the least studied terrestrial ecosystems, such as the Lomami complex in the Congo Basin. The Lomami is located southeast of the Democratic Republic of Congo and covers 8,874 km². We used a network of 89 50 m × 50 m (0.25 ha) plots, covering 22.25 ha in total, and distributed across the four forest types: dryland forests on clay soils, dryland forests on sandy soils, seasonally flooded forests on clay soils, and on sandy soils, sampled in the northern and southern parts of Lomami. We detected a significant difference in stem and wood density between northern and southern Lomami and forest types. However, there was no difference in the basal area or aboveground biomass due to offsets between tree number, size, and wood density. We also identified variations in floristic diversity and composition, with a high variety in dryland forests on clay soils and significant floristic differentiation between seasonally flooded and dryland forests, and to a lesser extent, between clay and sandy soils within dryland forests.

Funding: Fonds de la recherche scientifique (FNRS) / FRIA

Web and/or Twitter account: NA

T130 – Thursday 14:45 – 15:00 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 5

Camelid herding regulates biotic homogenization in Andean grasslands**SANDOVAL-CALDERON AP^{1,2}, SOONS Merel B⁴, VAN KUIJK Marijke¹, VERWEIJ Pita A⁴, BARRY Kathryn E¹, HAUTIER Yann¹**¹*Ecology & Biodiversity Group, Department of Biology, Utrecht University, Utrecht, The Netherlands **;²*Herbario Nacional de Bolivia (LPB), San Andres University, La Paz, Bolivia;* ⁴*Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, The Netherlands***E-mail:** a.p.sandovalcalderon@uu.nl

Global biodiversity loss is one of the most pressing concerns of our time. Maintaining high levels of plant diversity at multiple spatial scales is needed to safeguard the functioning of our ecosystems and their contributions to people. This is particularly important for biodiversity hotspots including the tropical Andes in which grassland plant diversity is threatened by livestock grazing intensification and climate change. Despite growing recognition that the homogenization of plant diversity across space is as important as the loss of local plant diversity, research often prioritizes the latter. Here, we quantified the biotic and abiotic factors that regulate plant species composition within and between communities in seven sub-humid grasslands in northwestern Bolivia along a grazing intensity gradient. We found pH best explained changes in local diversity (species richness and inverse Simpson), with more acidic soil being associated with lower local plant diversity. In contrast, grazing intensity best explained dissimilarity in species composition among local communities, with lower dissimilarity at higher grazing intensity. This indicates that higher grazing intensity may homogenize plant communities across this landscape. Furthermore, increasing grazing intensity led to communities dominated by acquisitive species, which may be more sensitive to higher variability in climate. Our findings highlight the need to examine multiple facets of plant diversity to get a comprehensive understanding of the environmental processes regulating them and therefore the potential drivers of their loss.

Funding: Schlumberger Foundation, and the Prince Bernhard Chair for International Nature Conservation, Utrecht University, the Netherlands.

Web and/or Twitter account: NA

T131 – Thursday 15:30 – 15:45 Talk



EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 5

The importance of semi-captive population for Western Derby eland conservation

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We aimed to update the population size estimates and document demographic parameters of wild and semi-captive population of the critically endangered Western Derby eland (*Taurotragus derbianus derbianus*) restricted to a savanna zone in Senegal. This subspecies has survived on a small area of occurrence and the existence of a semi-captive population in two fenced reserves in Senegal (based on six founders only) seems to play a critical role for this conservation unit survival. We used the data from 72 camera traps from Niokolo Koba National Park from 2021 and direct observations of semi-captive WDE in both reserves. Images from camera traps were sorted into events, animals identified individually when possible, and population size estimated using spatially explicit capture recapture. In the semi-captive population, all animals were individually documented. According to our results, the wild population counts 255 individuals. The semi-captive population counts 124 individuals. The semi-captive population sex ratio is biased towards males, the wild population contains almost six times more females than males. Calves represented 30% of both populations, however the calf mortality is significantly higher in the wild population (55% vs. 12%). We acknowledge the growing importance of the semi-captive population for the WDE conservation in terms of population size and structure.

Funding: IGA 20233106, Derbianus Conservation, Panthera Senegal

Web and/or Twitter account: www.derbianus.cz

T132 – Thursday 15:45 – 16:00 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 5

Population genetic structure and kinship of an endangered fossorial rodent, the giant root-rat (*Tachyoryctes macrocephalus*)

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Sufficient genetic variability is necessary to maintain species evolution potential. Habitat loss and fragmentation represents one of the causes of the loss of genetic variability, especially in species with already fragmented and/or restricted area. In order to devise adequate conservation strategies for those species, the understanding of their spatial population structure is essential. Here, we studied an endangered rodent, the giant root-rat, endemic to the grasslands in afro-alpine zone of the Bale Mountains in Ethiopia. Root-rats are fossorial, spending most of the time underground but regularly emerging on the surface in order to forage or remove soil. They live under relatively high population densities (60 individuals/ha). To reveal the root-rats population genetic structure, we captured 105 individuals from two distant sites (Sodota and Sanetti) and used 11 microsatellite markers to analyse gene flow within these populations following the patterns of relatedness and dispersal. Bayesian-based assignment test showed a distinct division between the two populations with higher genetic diversity in Sanetti (observed heterozygosity was 0.58 in Sodota and 0.674 in Sanetti). Dispersal distances estimated from relatedness analysis revealed shorter estimated dispersal distances for females and their higher relatedness to neighbouring versus distant females. This can imply that females are more philopatric than males, and dispersal is likely male-biased.

Funding: GAČR (P506/11/1512 and 31-20-10222s), GAJU (156/2013/P)

Web and/or Twitter account: NA

T133– Thursday 16:00 – 16:15 Talk

EUROPEAN CONFERENCE OF TROPICAL ECOLOGY 2023

Session 11: Free session, Part 5

The role of bushpigs (*Potamochoerus larvatus*) as seed dispersers in indigenous forests in South Africa

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Seed dispersal influences the survival and distribution of plant species and is an important mechanism for maintaining floristic diversity. Bushpigs (*Potamochoerus larvatus*) are large mammals of indigenous forests and well-wooded areas of Eastern and Southern Africa and may play a major role as seed dispersers. However, the diversity of fruits consumed and the effect of digestion on seeds remains poorly understood. This study gives insights into seed dispersal by bushpigs in the Soutpansberg mountain range, South Africa. Here, we collected bushpig faeces and assessed the number of seeds and seed species found. Furthermore, germination experiments with digested, non-digested seeds and fruits were conducted. Our results show, that bushpigs are omnivorous, consuming fruits and seeds of 126 different plant species. The proportion of seeds per plant species found in faeces was unhomogeneously distributed with few hyperabundant species, in particular *Searsia chirindensis* (55%). The germination experiments showed that gut passage did, overall, not influence germination or seedling growth rates. However, seeds remaining within fruits showed reduced growth, pointing to a high importance of fruit consumption for seed fate. Our results suggest that bushpigs are major seed dispersers of a large variety of fruiting plant species in wooded areas of Africa.

Funding: NA

Web and/or Twitter account: NA

T134 – Thursday 16:15 – 16:30 Talk