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Abstract book

Keynote address

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Bryophyte ecophysiology for a changing world

10 min oral presentation

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Unravelling pseudocryptic diversity along elevational gradients in the Himalayan *Lewinskya hookeri* complex (Orthotrichaceae, Bryophyta)

A central challenge in biodiversity studies is to determine whether phenotypic variation along climatic gradients reflects environmentally induced variation or hidden evolutionary diversity. During fieldwork along Himalayan elevational transects, we repeatedly observed morphological variation associated with elevation in *Lewinskya hookeri* (Wilson ex Mitt.) F. Lara, Garilleti & Goffinet, a widespread epiphytic moss of the Sino-Himalayan region. To assess whether recurrent morphotypes correspond to 1) distinct lineages distributed across transects and associated with characteristic elevations, 2) independently evolving ecotypes adapted to shared environmental factors, or 3) environmentally induced variants that lack genetic structure, we combined morphological assessment, genotyping-by-sequencing and phylogenetic analyses of nearly 500 specimens collected across replicated elevational transects. We compare lineage distributions along elevation, model their conditional occurrence along the gradient, and quantify changes in lineage composition with elevational separation. This study evaluates whether the elevational structuring observed in the field reflects overlooked evolutionary diversity within a widespread bryophyte complex, highlighting the potential of bryophyte systems for studying evolutionary differentiation along elevational gradients.

Keywords: Bryophytes / elevational gradients / integrative taxonomy / phylogenomics / species turnover

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Conserving bryophyte diversity in the Mediterranean: the role of Mount Etna (Sicily)

By creating and reshaping habitats, active volcanoes are among the most dynamic environments on Earth. Climate, geographic location, and elevation gradients strongly influence the biodiversity they support. Sicily boasts a remarkable rate of endemism in its vascular flora, making it one of the primary biodiversity hotspots in the Mediterranean Region. Moreover, the Island is a precious field for bryological studies as it hosts about 600 bryophytes, with more than the 80% of the species found on its mountains. Within this scenario, Mt. Etna (3403 m asl) stands as the highest active volcano in Europe and ranks among the tallest mountains in the Mediterranean area. Although its bryological diversity have been extensively investigated, recent surveys have uncovered some phytogeographically significant mosses, new records for Sicily and very rare in Italy.

Keywords: Bryophytes / conservation / climate change / Mediterranean / Etna

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The role of bryophilous fungi and functional bryophyte ecology in biological N₂ fixation across the boreal and temperate forests for Quebec.

Bryophytes contribute significantly to forest nitrogen cycling through associations with N₂-fixing microorganisms. Uncertainties regarding the variability of these interactions across forest types and bryophyte genera remain. Previous bryophyte-associated biological nitrogen fixation (BNF) studies focus on boreal N₂-fixation in the feather moss species *Hylocomnium splendens* and *Pleurozium schreberi*, without examining the diversity of bryophytes and their role in BNF across both boreal and temperate forest stands. This study examines BNF inputs across a diverse range of bryophyte species to further our understanding of functional bryophyte ecology in differing bio-geoclimatic zones. Our sampling design focused on bryophyte compartments: epixylic, tree-base, tree-trunk, soil, and stump. Collected specimens were processed using an acetylene reduction assay (ARA) to measure potential N₂ fixation. We compared potential BNF rates under equivalent

summer average temperatures in boreal and temperate forests to investigate whether conspecific bryophytes occupying the same compartment display similar rates. Preliminary findings show that liverworts have a greater impact on potential nitrogen rates than previously considered. Future sequencing will allow us to link bryophyte microbiome composition with N₂-fixation rates and fungal interactions, providing functional insights into nitrogen cycling in these systems and the Bryosphere at large.

Keywords: Feather mosses / Bryophyte-associated nitrogen fixation / Bryophilous fungi / Boreal forests / Temperate forests

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Exudates in bryophytes: an overlooked (dys)functional trait

Most studies of bryophyte chemistry involve substances that are extracted from inside living cells, missing the fact that bryophytes also actively exude substances to their surrounding environments. Such a cocktail includes agents that is used to control the ambient biota by allelopathic substances. Under normal climatic conditions, exudates are washed down in the soil horizons by rainwater. Under drought conditions they will instead accumulate at the top shoots by evaporation. We have tested this effect for several peat mosses, which have been subjected to watering from above (simulating rain) or from below (inverting the water flow). The result is striking, when watering from below, exudates are gradually accumulating as brownish precipitates at the tops shoots. We show that the amounts of these exudates do not strongly depend on water level, but rather on the rate of evaporation. Accumulation of exudates is linked to reduced photosynthetic capacity and eventually to cell death. In a warmer climate with more irregular precipitation peat moss communities are expected to suffer from increasing stress effects because of exudate accumulation. Thus, a trait that evolved to govern allelopathic interactions becomes dysfunctional under climate change.

Keywords: Exudate accumulation / Climate change / Peat mosses / Drought stress / Evaporation

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New revelations about bryophyte phenology

Most bryophyte floras record oicy, plus the occurrence and seasonality of sporophytes, but provide few insights into bryophyte phenology overall, and all the more so since sexual features rarely feature in identification. Alongside season-long observations on phenology, we are discovering major taxonomic differences in archegonium numbers and neck lengths, antheridium numbers and dimensions and the incidence and morphology of paraphyses. Few species produce sporophytes year-round but the ‘annual life cycle’, from gametangium formation to spore release, typically lasts 14-18 months. Arrested development at the young embryo stage during dry or frozen periods appears to be typical of most perennial bryophytes. Archegonium numbers vary from one in Lejeuneaceae to c. 50 in *Plagiomnium* with necks lengths ranging from c. 100 µm in most leafy liverworts to 1500 µm in *Hymenophyton* and Polytrichales. The parallel antheridium numbers are from one in *Pleuridium* to over 150 in *Mnium hornum*, *Aulacomnium palustre* and *Polytrichum*, with lengths ranging from 120 µm in *Seligeria* to over 1500 µm in *Polytrichum commune*. Paraphyses are much more frequent in association with the archegonia, being often absent from male inflorescences. They always differ morphologically from axillary hairs and are non-secretory as long previously assumed. Their function remains unknown.

Keywords: Antheridia / archegonia / gametangia / life cycles / paraphyses

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Comparative analysis of the sporophyte-gametophyte junction within Funariaceae provides insights into moss parent-offspring relationships

Parent-offspring relationships are important to our understanding of plant reproductive output and fitness because of the balance of resources between the two generations. Mosses are an ideal system to study these relationships because

the offspring sporophyte is attached to and dependent upon the parental gametophyte for its entire life. Resources needed for spore production are actively transported between the two generations through transfer cells within the sporophyte-gametophyte junction. The anatomy of this region is only qualitatively understood for a few species in disparate families. We aim to examine parent-offspring relationships by quantifying transfer cell anatomical complexity for three species within the Funariaceae. Anatomical complexity was determined by quantifying mitochondria and chloroplast density. Our results show that sporophyte transfer cells are more complex than gametophyte transfer cells, indicating a relationship of conflict between generations. To expand on this research, we are collecting additional data on the tortuosity of the cell wall labyrinth, time from fertilization to sporophyte maturity and carbon movement between generations. This will allow us to connect transfer cell anatomy to carbon translocation, furthering our understanding of parent-offspring relationships as well as how mosses use their anatomy to maximize their fitness.

Keywords: Parent-offspring relationships / anatomy / microscopy / transfer cells / organelles

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Snow Cover and Vegetation Changes on a High-Elevation High-Latitude Mountain in NW Finland

The Arctic is warming rapidly, with associated changes in snow conditions and vegetation. We investigated changes in snow cover, vegetation greenness, moisture, and species composition in a barren, high-elevation tundra environment rich in cryptogams at Mt Ritničohkka, NW Finnish Lapland. We analysed satellite-derived indices of snow cover (NDSI), vegetation moisture (NDMI), and greenness (NDVI) for 2000-2024, and resurveyed vegetation transects in 2022, 32 years after the original survey. We compared total species richness, plot-level α -diversity, community composition, and ecological indicator values among vascular plants, bryophytes, and lichens. June NDSI and NDMI declined, indicating reduced snow cover and vegetation moisture, while

NDVI increased in August and September. Total vascular plant richness increased, bryophyte richness declined, and lichen richness remained unchanged. Vascular plant α -diversity showed no significant change, while bryophyte and lichen α -diversity differed between 1990 and 2022 depending on elevation and topography. Community composition changed across all three organism groups, with shifts towards more moisture-demanding vascular plants and more nutrient-demanding lichen species. Overall, the results indicate substantial reassembly of barren tundra communities under increasingly less snowy conditions, with responses differing among organism groups.

Keywords: Arctic / bryophytes / climate change / lichens / vascular plants

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Gametophyte and sporophyte morphology provide evidence for parent-offspring conflict and coadaptation in Pottiaceae mosses

Parent-offspring relationships are a crucial factor influencing offspring fitness, and consequently, evolution. The parent-offspring coadaptation hypothesis posits that the evolutionary interests of parents and offspring are shared, resulting in coordinated evolution, while the parent-offspring conflict hypothesis states that parents and offspring engage in an evolutionary arms race to shift the balance of resources in their favor. Bryophytes provide an ideal system to study these relationships because the offspring (sporophytes) are physically attached to and nutritionally dependent on their parents (gametophytes) for their entire lifespan. Noroozi & Budke (2025) examined sporophyte and gametophyte morphology and found evidence for both conflict and coadaptation in the Grimmiaceae, but it remains unclear if these findings are family-specific or more broadly applicable. To further investigate bryophyte parent-offspring relationships, we examined the evolution of gametophyte and sporophyte morphology across Pottiaceae species with differing sexual systems, correcting for phylogeny. We found significant correlations between gametophyte and sporophyte morphology in both unisexual and bisexual species. In unisexual species, capsules and setae were significantly larger than in bisexual species and

the correlation between gametophyte and sporophyte morphology was significantly stronger. Our findings, consistent with the previous study, provide evidence for both parent-offspring conflict and coadaptation in mosses.

Keywords: Parent-offspring relationships / evolution / morphology / sexual systems / mosses

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Phylogenomics reveals an ancient homoploid reticulate origin masked by incomplete lineage sorting in a multi-generic moss lineage

Interspecific barriers are increasingly recognized as more permeable than once assumed, such that evolutionary histories in many groups are not fully captured by a single bifurcating tree. Incomplete lineage sorting (ILS) and introgression can both generate topological conflict, complicating phylogenetic inference and taxonomic decisions, particularly in rapid radiations. Hybridization is expected to concentrate conflict in introgressed genomic regions, whereas conflict from ILS should be more randomly distributed across the genome. The increasing availability of chromosome-scale bryophyte genomes provides a framework for testing these predictions. Here, we use GoFlag 408 target-enrichment data to investigate the origin of a morphologically coherent clade within Orthotrichoideae comprising four segregate genera: *Atlantichella*, *Rehubryum*, *Pulviger*, and *Bryomyces* (ARPB). Previous analyses recovered ARPB as sister to either *Ulot* or *Lewinskya*, consistent with extensive ILS or historical hybridization. To distinguish these alternatives, we mapped loci to *Ulot* and *Lewinskya* reference genomes, inferred species relationships, quantified discordance across genomic regions, and tested explicitly for non-tree-like ancestry. Together, these analyses support an ancient, homoploid hybrid origin of ARPB and provide a workflow for diagnosing complex evolutionary histories through the genomic context of target-capture loci.

Keywords: Phylogenomic conflict / reticulate evolution / chromosome evolution / Orthotrichaceae / bioinformatics

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Branching complexity in leafy liverworts of the Lepidoziaceae is phylogenetically correlated with habitat moisture and substrate preference

Branching in land plants evolved over 420 Ma and plays a crucial role in plant fitness. Leafy liverworts have diverse branching types that may occur simultaneously within a species, resulting in varying levels of complexity among species. The evolutionary patterns of branching complexity in leafy liverworts are unknown and have been hypothesized to be associated with the environment. However, these hypotheses have not been examined quantitatively using phylogenetic comparative analyses. Here, we investigate the role of environmental factors in the evolution of branching complexity of leafy liverworts in Lepidoziaceae. We leveraged data from GenBank for chloroplast gene regions (rbcL, psbA, trnG, trnL-trnF) from 146 Lepidoziaceae species. We tested the phylogeny with data on branching types, habitat moisture level, and substrates compiled from the literature, the bryophyte portal, and herbarium specimens. Our results showed that the combination of *Frullania*-type and *Bazzania*-type branching is the ancestral condition in Lepidoziaceae and the other three branching types evolved later independently through multiple gains and losses. Furthermore, we found that species inhabiting terrestrial substrates with high minimum moisture levels tend to exhibit more branching types than epiphytic species. These results point toward adaptive responses to environmental factors, potentially shaping the phenotypic evolution of leafy liverworts.

Keywords: Bryophytes / branching type / environment / evolution / morphology

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Bryophytes of the Western Ghats: Insights into Species Richness and Distribution patterns

Flanking the western coast of the Indian plate, the Western Ghats comprise an ancient geomorphological mountain chain recognized globally as a biodiversity hotspot. This study synthesizes the current taxonomic status and distribution patterns of bryophytes across the region. As observed in other plant groups, bryophyte distribution is primarily driven by local moisture regimes, with species richness and composition shifting significantly across altitudinal gradients and major vegetation types. Intensive systematic documentation in recent years has substantially advanced our understanding of this group. To date, a total of 1,231 bryophyte species is recorded from the Western Ghats, comprising 21 hornworts, 383 liverworts and 827 mosses. Endemism is high, with 79 species restricted to the region, including unique taxa such as *Riccia sahyadrica*, *Indocolea*, *Indopottia* and *Indomnion*. We also discuss the future research prospects and urgent conservation challenges facing these bryophyte communities under the modern environmental pressures of climate change.

Keywords: Conservation / Altitudinal gradient / Endemic species / Macrohabitat / Taxonomic status

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Filament diversity in mosses: protonemata, rhizoids, axillary hairs, paraphyses and calyptral ornamentation

Mosses produce diverse multicellular filamentous systems with functions ranging from colonization (protonemata) to nutrient acquisition (rhizoids), attachment (rhizoids), asexual reproduction (protonemal gemmae and rhizoidal tubers), external water conduction (tomentum), protection (calyptral hairs), and mucilage secretion (axillary hairs). While axillary hairs have granular cytoplasm, thin walls and minute plastids and are short-lived, paraphyses are highly vacuolate with prominent chloroplasts and long outlive the gametangia. Unlike detached rhizoids and calyptral filaments, both fail to regenerate protonemata. The function of paraphyses remains unknown. Filament diversity reaches its zenith in the Polytrichales. The perennial protonema in *Pogonatum*

does not produce gemmae or brood cells, in contrast to tuber production by the rhizoids in some species. Most remarkably the hairy calyptra in Polytrichales has never been adequately described. It comprises branched filaments with branches of progressively narrower diameters which coil round each other but do not form tight ropes as do the rhizoids. The bases of the calyptras also produce numerous vaginular hairs interspersed with remnants of old unfertilised archegonia. Surface ornamentation differs between the calyptral filaments and the rhizoids. Calyptral spines in *Dawsonia* resemble those in the Orthotrichales. This study points to a wider use of filament characters in future studies on moss phylogeny.

Keywords: Polytrichales / regeneration

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Bryophyte diversity and community composition along a rural-to-urban gradient in Antananarivo, Madagascar.

Urbanization creates steep environmental gradients that can reshape biodiversity, yet responses of bryophytes in tropical African cities remain poorly understood. We surveyed bryophyte communities along a rural-urban gradient in Antananarivo, Madagascar, to quantify diversity patterns and community composition and to identify the roles of environmental factors in shaping these patterns. Bryophytes were sampled on all available substrates within 26 plots across rural and urban areas. We performed multivariate models to assess the effects of environmental variables on species composition and species richness. In total, 140 bryophyte species were recorded, with 38 species occurring in urban sites and 128 in rural sites. Species accumulation curves and diversity indices showed that rural communities were richer and more evenly distributed. Microhabitat types, NDVI (Normalized Difference Vegetation Index) and annual precipitation were the main drivers of among-site differences in bryophyte species composition. Species richness patterns were primarily driven by urbanization-related factors such as distance to main road and NDBI (Normalized Difference Build-up Index), while climatic variables significantly

improved model explanatory power. As the first comprehensive survey of urban bryophytes in Madagascar, this study provides insights into how multiple environmental and anthropogenic stressors shape biodiversity in rapidly urbanizing tropical landscapes.

Keywords: Bryophytes / Diversity / Urban / Ecology / Madagascar

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Distinct intraspecific trait variations in two moss species along a latitudinal gradient across 66 coastal islands

Intraspecific trait variation (ITV), a non-negligible component of functional trait diversity, represents a direct response of local populations to environmental change and significantly influences ecological processes such as species dispersal, community assembly, and ecosystem functioning. However, ITV remains critically underexplored in mosses, with strong regional and taxonomic biases. Here, we sampled two common subtropical saxicolous and terricolous mosses (*Hyophila propagulifera* and *Pogonatum inflexum*) from 66 coastal islands in southeastern China (23.4°-30.9°N), and measured their morphological and anatomical traits and water relations. For both species, shoot mass showed the greatest variation, while the shapes of stem transverse section, leaf, and leaf cells were relatively conserved. In *H. propagulifera*, stem size and internal transport capacity increased with latitude, but water-holding and retention capacities were unrelated to any environmental factors. In *P. inflexum*, no clear ITV pattern was observed except that lamella length decreased with precipitation, likely due to Polytrichaceae's unique characteristics and soil's more stable microclimate than rock. We suggest future studies focus on climatic events and combine functional traits with community structure surveys to accurately quantify their ecosystem service functions.

Keywords: Biogeography / Functional trait / Morphology / Substrate / Water relations

5 min speed presentation

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First record of *Triquetrella papillata* (Pottiaceae) in France from where ?

A population of *Triquetrella* was recently discovered near Angers (western France), the first confirmed record of the genus in France and the northernmost known occurrence of the genus. Combining morphological and molecular data, we assess its position within the *Triquetrella papillata* complex. The species occupies open, acidic, well-drained anthropogenic substrates and disperses mainly by fragile vegetative branchlets. Plastid and nuclear ITS markers show extremely low divergence. French plants differ from both Californian and Iberian material by very few substitutions. This does not demonstrate conspecificity, but it provides no support for maintaining distinct species. Morphologically, the Angers plants fall within the variability of the complex the few broader traits (stem diameter, leaf density, secondary stems, cell dimensions) are interpreted as phenotypic plasticity. Re-measured under a common protocol, several characters previously used to circumscribe *T. arapilensis* are not reproduced. We therefore treat *T. arapilensis* and *T. californica* as synonyms of *T. papillata*, to which the French population is provisionally referred.

Keywords: *Triquetrella papillata* / broad species concept / anthropogenic habitats / vegetative reproduction / range extension

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Taxonomic reassessment of historical names in South American Pottiaceae based on type material

Pottiaceae is one of the largest and most diverse families of mosses, with South America representing a major hotspot of diversity for the group. However, the reported species diversity of South American Pottiaceae may be partially inflated by numerous historical names that potentially refer to the same species. Therefore, the examination of the type material associated with these historically neglected names is essential for obtaining a more accurate

assessment of species diversity. Here, we studied type specimens of Pottiaceae taxa historically assigned to *Trichostomum* Bruch and *Leptodontium* (Müll. Hal.) Hampe ex Lindb. described from South America to clarify their taxonomic status. Morphological examination and comparison with relevant type and herbarium material indicated that five historical names do not represent distinct species and they are considered synonyms. Our findings contribute to a more accurate assessment of species diversity within South American Pottiaceae.

Keywords: Type specimen / Pottiaceae / Taxonomy / Synonymy / Morphological studies

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Efficacy of erythromycin in limiting cyanobacteria contamination in axenic cultures

Establishing and maintaining axenic cultures in bryophytes presents many challenges. Surface sterilizing sporophytes appears to be the most efficient way to establish sterile cultures, removing contaminants and allowing spores to germinate on agar. However, this method limits the diversity of material as in certain species, primarily liverworts, sporophytes can be difficult to find. Sterilizing gametophytes is much trickier, as the concentrations of sterilizing agent required to clean the gametophyte often kills the bryophyte tissue, and lower concentrations are not efficient for removing cyanobacteria contamination. Cyanobacteria contamination often leads to failed cultures, as they outcompete and consume the nutrients required for the bryophyte, as well as appear to have some allelopathic effect. Further, cyanobacteria contamination is a barrier for downstream chemical and transcriptomic analyses. Here, we suggest a novel protocol that has proved efficient in removing cyanobacteria contamination in gametophyte tissue, useful for establishing new cultures and cleaning cultures that have established infections.

Keywords: Axenic culture / bryophytes / cyanobacteria / methods

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Phenotypic plasticity of UV protection in *Polytrichum strictum* from the Subantarctic (Navarino Island, Chile)

Strong episodes of Antarctic “ozone hole” can affect sub-Antarctic areas, such as Tierra del Fuego archipelago and, specifically, Navarino Island (Chile), where the moss *Polytrichum strictum* is ecologically essential in the so-called “moss fields”. However, bryophytes from sub-Antarctic areas have been understudied in relation to the UV-B increase derived from Antarctic “ozone holes”. In this context, we first assessed the UV-B protection of 15 field samples of *P. strictum* from Navarino Island by measuring their amounts of both methanol-soluble and methanol-insoluble compounds (SUVAC and IUVAC, respectively), which are presumably located in vacuoles and cell walls. The field samples showed a strong phenotypic plasticity in SUVAC and IUVAC, despite they were collected in a linear transect of only 15 km. Afterwards, we cultivated the moss starting from a specific field population, and compared both materials regarding their morphology, absorbance spectra, HPLC chromatograms, tolerance to artificially enhanced UV-B, and metabolomics. The field and the cultivated samples showed strong differences in all the variables measured, and the field sample was more tolerant to enhanced UV-B than the cultivated sample. We conclude that *P. strictum* may be well-protected to cope with potential UV-B increases derived from the Antarctic ozone hole.

Keywords: *Polytrichum* / metabolism / subantarctic / UV / tolerance

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Drawing the Line: Integrative Species Delimitation in *Dialytrichia* (Pottiaceae)

Dialytrichia (Schimp.) Limpr. (Pottiaceae) comprises two currently accepted species, *D. mucronata* (Brid.) Broth. and *D. saxicola* (Lamy) M.J.Cano, whose delimitation remains challenging due to extensive morphological overlap and

predominantly quantitative diagnostic characters. This study evaluates species boundaries within *Dialytrichia* using an integrative morpho-taxonomic and molecular framework and examines the justification for its recognition as distinct from *Cinclidotus*. Populations from central Portugal and representative accessions from across Europe representing both *Dialytrichia* species were assessed using leaf fragility, marginal contour, border anatomy and the alignment of lamina breakage lines. Molecular sampling included the nuclear ITS region and three chloroplast regions (trnK-psbA, trnF-trnS and trnM-trnV) for both *Dialytrichia* species and three widespread *Cinclidotus* species within the phylogenetic context of closely related Pottiaceae. Particular attention was given to morphologically intermediate specimens. All analyses recovered *Dialytrichia* and *Cinclidotus* within a fully supported lineage, but only the ITS and concatenated datasets supported the non-nested, sister-group relationship between the two genera. Molecular data revealed unambiguous differentiation between *D. mucronata* and *D. saxicola*, although some short plastid regions were found identical across the two species. Morphologically intermediate specimens were consistently assigned to *D. saxicola*, with congruent nuclear and plastid signals.

Keywords: *Cinclidotus* species boundaries."

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Bryophyte diversity changes in Switzerland since 2001, based on the national biodiversity monitoring program BDM

Long-term biodiversity dynamics are key to understanding ecosystem responses to global change. Here we present a synthesis of bryophyte diversity trends derived from the Swiss Biodiversity Monitoring (BDM). A total of 1,600 10-m² plots on regular grid across Switzerland have been surveyed every five years between 2001 and 2025 to record bryophyte species occurrences. We applied generalized linear mixed modelling to assess, among other aspects, changes in plot-level species richness, beta diversity and mean ecological indicator values (EIVs) for different land use types, biogeographical regions, and elevational

bands. Our analyses revealed a strong overall increase in species richness (+ 22.5 %) over the past 25 years, while beta diversity slightly decreased, both with distinct spatial and ecological patterns. The steepest increase in species richness occurred in forests and the Southern Alps, while the steepest decrease in beta diversity occurred in forests, the Jura, and the Southern Alps. Furthermore, we detected a slight but significant increase in the EIV for temperature, indicating ongoing thermophilisation of bryophyte communities. Collectively, these results reveal spatially heterogeneous bryophyte diversity dynamics, with signs of recovering bryophyte richness since 2001. They emphasize the importance of context-dependent conservation approaches and underline the value of high-quality long-term monitoring programs.

Keywords: Bryophyte diversity/ long-term monitoring/ species richness trends/ beta diversity/ ecological indicator values

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The relationship of spore morphology and ecology in mosses

While most moss spores are alete or hilate and lack a distinctive aperture region that many other spore producing plants have, spore ornamentation varies significantly across the moss tree of life. However, it is unclear if this variation in spore ornamentation is structured by habitat or if it is phylogenetically conserved. Here we discuss results from an extensive SEM study of spores from approximately 300 species spanning the moss phylogeny. Our analyses reveal that spore ornamentation is correlated with substrate and with specific dispersal methods such as cleistocarpy and entomophily. Higher elements on the spore surface are correlated with epiphytism, appearing independently in multiple lineages, and that elements covering a larger percentage of the spore surface are correlated with a saxicolous substrate. Further, as proposed in previous studies, scrobiculate spores are correlated with entomophily, and that cleistocarpous taxa typically have either larger spores with highly elongated elements or, occasionally, with entirely smooth spores.

Keywords: Mosses / spores / ecology / substrate / morphology

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Diversity and Distribution of Bryaceae Rchb. (Bryophyta) in the Western Ghats of Kerala: Morphological Insights and Biogeographic Perspectives

The Western Ghats of India, a global biodiversity hotspot, harbour a rich but incompletely documented bryophyte flora. Bryaceae exhibits considerable morphological diversity and taxonomic complexity, making detailed morphological and anatomical investigations essential for accurate species recognition. This study explores Bryaceae diversity in the Western Ghats of Kerala, with a known report of around 40 species. Compilation of local records further provides a basis for examining distributional patterns and geographical affinities within the study area. The recent records of *Acidodontium indicum* (a genus hitherto restricted to the Neotropics) and *Bryum arachnoideum* (an Afro-South American disjunct) from the Western Ghats of Kerala reveal striking intercontinental disjunctions within Bryaceae in peninsular India. These findings reinforce the Western Ghats as a refugial hotspot harbouring relict Gondwanan elements and support Afro-Antarctic affinities of the southern Indian bryoflora. At the same time, they underscore the need for molecular phylogeographic analyses to distinguish between ancient Gondwanan relicts and rare long-distance dispersal events in shaping the present-day distribution of Bryaceae in the Indian subcontinent.

Keywords: Biodiversity hotspot / Bryaceae Taxonomy / Intercontinental disjunctions / Peninsular India / biogeographic patterns