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KOSTELECKÉ INSPIROVÁNÍ

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Dear participants,

It is our pleasure to welcome you to the **17th Kostelecké inspirování conference**. This annual meeting provides a platform for graduate students, Ph.D. candidates, and researchers to share their work and discuss topics related to nature, landscapes, and the environment. It is built around the contributions of its participants, offering a straightforward and supportive setting for scientific discussion.

Held in the beautiful and historically rich chateau complex of **Kostelec nad Černými lesy**, the conference provides a unique setting that inspires open dialogue, curiosity, and scientific creativity. The program traditionally covers a broad spectrum of topics, including ecology, zoology, botany, environmental sciences, hydrology and water management, landscape ecology, landscape and spatial planning, and biodiversity. By bringing together researchers across these fields, this conference provides an opportunity for participants to share ideas and form potential collaborations.

We would like to express our sincere gratitude to the **Faculty of Environmental Sciences of the Czech University of Life Sciences in Prague** for its long-term support and patronage. Our gratitude also goes to all supporters and partners who generously provided gifts and prizes for the conference awardees. Finally, we would like to thank all participants, both active and passive, for their presentations, questions, and contributions. Your enthusiasm and engagement are what give this conference its unique spirit and enduring meaning.

We hope that this abstract book serves not only as a record of your work but also as an inspiration for future research, discussions, and collaborations.

On behalf of the Organising Committee

Lucie Burešová Pešková, Adéla Hemelíková, Karolina Mahlerová, Kateřina Trejbalová

Investigating the synoptic characteristics and influence of Atmospheric Rivers on Precipitation pattern over India

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Atmospheric Rivers (ARs) are narrow, elongated synoptic-scale jets of water vapor that play a crucial role in the global water cycle and are often associated with intense rainfall and significant weather events. These phenomena can strongly influence regional weather patterns, hydrology, and water resources. The Indian subcontinent, with its complex topography and monsoon-driven climate, is particularly susceptible to the influence of ARs. Using the AR detection algorithm developed by Guan et al. (2015), an AR dataset was produced to identify and characterize ARs over India. This study investigates the seasonal variation, frequency, and impact of AR events on precipitation patterns across India and its sub-regions during 1979–2018, with a detailed analysis of active and break phases of the Indian Summer Monsoon (ISM). The results reveal distinct differences in rainfall distribution and intensity between AR and non-AR days, with AR days exhibiting substantially higher rainfall and notable seasonal variability. Synoptic analyses indicate negative low-level geopotential height anomalies, enhanced moisture content, and strengthened monsoonal circulations—including cyclonic wind patterns—during AR occurrences. These features highlight the dynamic linkage between ARs and monsoonal systems. Furthermore, the contribution of ARs to extreme precipitation events underscores their role as key drivers of hydrometeorological extremes over the Indian subcontinent. Overall, this study advances our understanding of the synoptic characteristics and climatic significance of ARs over India, offering valuable insights for improving the prediction and assessment of AR-driven rainfall and flood risks in a monsoon-dominated environment.

Keywords: Atmospheric River, Indian Summer Monsoon, Active and Break Phase, Geopotential Height, Synoptic Characteristics, Extreme Precipitation Event

Spatiotemporal changes in the Czech landscape:

An analysis of historical and modern data

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Understanding landscape evolution under natural and anthropogenic impacts is crucial for sustainable land use planning. The main goal of this study is to analyse dynamics and trajectories of changes in forests, grasslands, wetlands, agricultural land, and built-up areas, influenced by climatic and geomorphological conditions, across 60 randomly selected sites with a total area of 240 km² in the Czech Republic. The methodology is based on the use of GIS functions (Union and Intersect), historical maps from the Stable Cadastre, and aerial photographs to identify change dynamics (continuous, new, extinct) and trajectories. This approach is applicable to other regions within and outside the Czech Republic. The statistical analysis showed that landscape type influenced significantly change dynamics and trajectories. New built-up areas were more common in warmer, lowland regions, while continuous forests prevailed in colder, high-elevation areas. Forests and grasslands were most often converted to agricultural land (61.2% and 49.1%, respectively), while wetlands were mainly replaced by forests (94.7%). These findings allow a better insight into landscape structure, functionality, and interactions determining change, providing a foundation for improved conservation and management strategies.

Keywords: landscape change, change trajectories, GIS, landscape management

Spatial and Statistical Analysis of Groundwater Monitoring Network, Rio Cobre River Basin

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To increase the understanding of groundwater system in a Rio Cobre Basin it is essential to examine spatial and temporal variations in groundwater levels within the basin using monitoring well data, rainfall records, and geo-statistical analysis. Temporal trends were assessed using groundwater levels from the Riffle Range well from January 2006–March 2020. The time series data showed a decreasing linear trend (b_1 = – 0.00885, R^2 = 0.5213) with low variability and near-normal distribution. Descriptive statistics indicate low standard deviation and slight positive skewness. Regression analysis of residuals reveals deviations ranging from –0.752 m to 1.418 m. Rainfall analysis based on collated average monthly precipitation data from multiple stations during 2006–2018, shows a declining trend (b_1 = –1.6972, R^2 = 0.074). Comparison of rainfall with groundwater levels shows a positive but weak correlation, attributed to the spatial separation between recharge zones in the upper basin and discharge zones near Riffle Range. Spatial trends were evaluated using groundwater level data from 39 monitoring wells in the limestone aquifer, the primary reservoir system of the basin. Frequency distributions show positively skewed hydraulic heads, with all wells above mean sea level and 60% exceeding 20 m. Variogram analysis and ordinary kriging were applied to characterize spatial continuity. A linear variogram model with no nugget and a 0.13 slope was selected, providing optimal estimates within 12 km. Kriged contour maps reveal uneven well distribution. By applying univariate and multivariate statistics the monitoring network was spatially optimized to identify redundant wells on the basis of nearby wells offering the same information. From the study, it is proven that the existing monitoring network could be optimized using the presented statistical, and geostatistical methods, without losing any essential information from the existing monitoring network.

When the North Meets the South: Contact between *Bombina* Lineages on the Moravian-Silesian Border

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The fire-bellied toad (*Bombina bombina*) and yellow-bellied toad (*Bombina variegata*) meet in a contact zone in the Czech Republic, where even their intraspecific evolutionary lineages may occur. The aim of this study was to evaluate local phylogeographic structure in the genus Bombina on a fine scale.

We analyzed 27 individuals from six sites in the Moravian-Silesian region. Mitochondrial cytochrome b sequences (the final length of 1096 bp) were obtained using Sanger sequencing, sequence homology verified via the BLAST server, and analyzed in the PopArt using the Median-Joining network algorithm.

From six surveyed sites, we obtained 26 high-quality cytochrome b sequences, revealing seven distinct haplotypes. In *B. bombina*, both the "northern" and "southern" lineages were detected, whereas *B. variegata* exhibited only the Carpathian lineage. Several previously unreported local variants were found in both species. The haplotype network indicated very short

intraspecific mutational distances (up to four steps), consistent with recent divergence and/or limited range gene flow. Spatial patterns suggest local contact between the northern and southern *B. bombina* lineages in the Odra/Opava river drainages, and the occurrence of Carpathian *B. variegata* in lowland near Ostrava city.

Despite the initial sample size, our targeted mtDNA survey uncovered previously unrecorded haplotypes in both species, a local occurrence of the two *B. bombina* lineages, and lowland populations of Carpathian *B. variegata*. These findings underscore the conservation importance of shallow, fish-free water bodies mosaics in the Odra/Opava river basin.

Keywords: fire-bellied toad, *Bombina bombina*, yellow-bellied toad, *Bombina variegata*

Engineered Water Architecture for Better Hydration and Health

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Hydrogen bonding plays a crucial role in defining the functional behavior of water across biological, agricultural, and food systems. This study examines structural modifications induced by piezoelectric treatment, in which pressurized water passes through piezoelectric materials and undergoes mechanical stress that reorganizes its hydrogen-bonding network. FTIR and NIR analyses showed redshifts in OH-stretching bands, indicating strengthened and restructured hydrogen bonding. Complementary ^{1}H NMR revealed slight upfield shifts consistent with altered proton environments. Physical measurements confirmed a modest increase in density alongside reductions in surface tension and viscosity. Molecular dynamics simulations further demonstrated higher hydrogen-bond density, supporting a more compact and ordered molecular arrangement. A working hypothesis suggests that this thermodynamic reorganization lowers energetic barriers for diffusion and permeability, potentially enhancing bioavailability in biological systems. Supporting observations include improved radish growth under piezoelectrically treated water (PTW), indicating more efficient nutrient uptake. In beer production, PTW produced notable sensory and physical differences, including improved clarity, enhanced foam quality, and modified saturation behavior. Morphological improvements in red blood cells also suggested potential benefits for cellular hydration and membrane stability. Low levels of dissolved salts further modulated hydrogen-bond characteristics, offering a tunable mechanism for tailoring PTW properties. Collectively, these findings indicate that PTW functions as a novel medium with potential advantages in hydration, nutrient delivery, and food and beverage quality. The structural and thermodynamic insights presented here provide a basis for future research on how

reorganized water structure influences biological interactions, transport processes, and material behavior.

Competition and colonisation potential of bark beetle (*Taphrorychus bicolor*) on beech logs: implications for forest pest management

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The bark beetle *Taphrorychus bicolor* has been considered a secondary pest of European beech (*Fagus sylvatica*). However, increasing host availability and climate-induced stress may promote its importance in forest ecosystems. Despite its growing abundance, little is known about its reproductive biology and interactions with other xylophagous species. To address this knowledge gap, we conducted three complementary experiments on beech logs and logging residues across five forest sites in Central Europe. In the first experiment, *T. bicolor* consistently dominated the colonising beetle community, while ambrosia beetles were rarely observed, suggesting low interspecific competition. Colonisation intensity was significantly reduced under full sun exposure but was unaffected by log size or pheromone lure presence. The second experiment revealed a marked year-to-year decrease in both trap catches and entry hole densities, indicating that local population levels were not directly linked to pheromone trap numbers. In the third experiment, we assessed reproductive success by comparing entry and exit holes with the number of emerged adults. Exit holes showed a moderate correlation with emergence, whereas entry holes were a weaker predictor, possibly due to beetle mortality or re-entry behaviour within emergence traps. Our results demonstrate that *T. bicolor* can successfully reproduce in small-diameter beech residues with minimal interspecific pressure. Moreover, exit holes serve as a reliable proxy for emergence and could improve pest monitoring. These findings highlight the importance of reassessing the ecological role of *T. bicolor* under changing climate conditions and its potential impact on forest health and management strategies.

Keywords: *Taphrorychus bicolor*, *Fagus sylvatica*, colonisation success

Mosses that don't cry wolf: predation on model prey after simulated herbivory

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In vascular plants, herbivory is known to induce the production of volatile organic compounds (VOCs), which serve as a key component of indirect defence and can attract the natural enemies of herbivores. Although bryophytes have a surprisingly rich set of secondary metabolites, their ability to use VOCs for defence is yet unexplored. Given their clonal growth, the relatively large impact of damage on a small body, and the generally low intensity of bryophagy, one might expect that they could respond to attack with a pronounced release of VOCs.

The aim of our field experiment was to determine whether different types of moss damage influence the level of predation on a model prey. On tufts of *Polytrichastrum formosum*, we tested four different treatments: (i) control, (ii) mechanical damage, (iii) damage combined with an extract of bryophagous beetles (*Cytilus sericeus*: Byrrhidae), and (iv) damage combined with an extract of non-bryophagous beetles (*Phyllobius pomaceus*: Curculionidae). After applying the treatments, we repeatedly placed modelling clay "caterpillars" on the moss tufts and recorded the attack rate.

Overall predation differed only slightly among treatments. Surprisingly, the lowest values were recorded for mosses treated with the extract of bryophagous beetles. The results also showed that the baits were attacked predominantly by invertebrates, whereas vertebrate attacks were far less frequent.

These findings suggest that neither moss damage alone nor the presence of insect extracts resulted in increased predation, as is commonly observed in vascular plants. Predator responses to potential "moss VOCs" may therefore follow a different dynamic than in higher plants. To our knowledge, this is one of the first studies (if not the very

first) to address this topic in bryophytes, and the unexpected results underline the need for further research on these interactions.

Spatio-Temporal Analysis of Short-Term Weather Variability and Dengue Transmission

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The transmission dynamics of vector-borne diseases, particularly dengue fever, are heavily influenced by climatic variables, including temperature, rainfall, and humidity. These factors are crucial for understanding the epidemiological patterns of dengue and predicting potential outbreaks. Although previous research highlights the significant role of weather variables in influencing the life cycle, biting rates, and incubation periods of the Aedes aegypti mosquito, which is responsible for transmitting the dengue virus, short-term associations between meteorological conditions, like daily or weekly, and dengue transmission dynamics are still limited. The study aims to analyze the spatio-temporal relationship between short-term weather variability and dengue transmission across 17 Regional Health Departments (DRSs) in the state of Sao Paulo, Brazil, from 2016 to 2022, standardized by population count in each DRS; additionally, weather data of the 17 DRSs (ambient temperature, relative humidity, wind speed and precipitation) from Copernicus's ERA5 reanalysis. We used Distributed Lag Non-Linear Models (DLNM) to assess the association between weather variables and dengue incidence in Sao Paulo, considering lags of up to 15 weeks. The results showed that the dengue risk (RR) was 1.5-2 times higher in regions with higher temperatures (24-26 degree Celsius), precipitation (above 50 mm), and relative humidity (above 80%). Temperature influenced dengue incidence with a 6-week lag, and precipitation had an impact with a 15-week lag. The multivariate meta-analysis further confirmed these weather-disease associations across 17 DRSs. The results of this analysis will enable us to develop a predictive model by using weather variables with historical dengue incidence data to forecast future transmission risks.

Keywords: climate, epidemiology, predictive model

Predictive Analysis of Occupational Health Hazards Among Tobacco Cultivators and Processors in Halda Valley, Bangladesh

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The study aims to identify the prevalence and associated risk factors in tobacco cultivators and processing workers in Halda Valley, Manikchari Upazila, Khagrachari District, Bangladesh. **Methods:** A cross-sectional study was carried out on 100 tobacco farmers and workers along with face-to-face interviews, supported by related literature. Also, demographic, occupational, and health data (respiratory problems, skin disorders, gastrointestinal problems, urinary tract problems) were collected. Logistic regressions have been performed for each condition with age, gender, occupation, tobacco smoking habits, and duration of work involvment as predictors. The performance of each model was evaluated with predicted probabilities, accuracy, and Receiver Operating Characteristic (ROC) curves. **Results:** Workers were susceptible to Respiratory, Skin, Gastrointestinal, and Urinary Tract infection (UTI) complaints. Usually, male workers were affected in the farming and harvesting processes, whereas the females were involved in tobacco processing time, due to exposure of various volatile organic compounds (VOCs) and direct exposure to nicotine emission inside kilns. The findings revealed significant health issues, with respiratory problems affecting 78.0% of the workers, skin problems in 91.0%, gastrointestinal issues in 48.0%, and UTIs in 29.0%, was found in high percentages in female respondents. Whilst respiratory problems in more prevalent in both gender groups. The model accuracy for distinguishing disease presence was: 70.7% respiratory diseases, 89.1% skin problems, 69.6% gastrointestinal problems, and 75% UTI. ROC curves showed strong discrimination of models for these health outcomes. **Conclusion:** Tobacco workers in Halda Valley are at substantial risk for multiple occupational diseases, with specific vulnerabilities by gender and processing stage.

Pattern in reproductive success in Tufted Duck: Comparison of urban and fishpond habitats

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Urbanisation increasingly modifies aquatic ecosystems and affects waterbird populations across Europe. Although the loss of natural habitats often leads to population decline, urban environments can also function as a refugia for many species by reducing predation risk for nests, young and adults. The Tufted Duck (*Aythya fuligula*), a habitat-generalist diving duck, represents a suitable species for studying these contrasting effects of urbanisation due to its broad ecological tolerance and ability to use both natural and artificial water bodies. This study is based on long-term (2009-2025) data comparing reproductive parameters of Tufted Duck breeding in urbanised Prague and in the semi-natural managed fishpond system of South Bohemia. Clutch and brood data were collected in the field during the breeding season. There were no significant differences in laying date, clutch size, and egg mass among the compared habitats. Hatchability was higher at urban sites; however, this pattern did not consistently translate into higher reproductive output because post-hatching survival was lower in Prague. The habitat or site itself explains only little of the variation in reproductive outcomes, suggesting that other environmental or management factors may play a greater role than the simple urban-non-urban distinction. These findings underline that urban environment cannot be universally characterised as either favourable or detrimental for waterbirds. Instead, the ecological quality of individual sites, local habitat management and broader environmental pressures together determine reproductive success. Understanding these factors is essential for identifying the conditions under which urban habitats can support a viable breeding populations of Tufted Duck.

Keywords: ducks, breeding success, reproduction success, urbanisation, waterbirds

Cultural Relict or Native Species? Genetic Insights into the Historical Dispersal of *Vinca minor* L.

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Vinca minor L. is a clonal, evergreen groundcover plant commonly found in cemeteries, historical gardens, and abandoned villages across Europe. Its distribution raises questions about its native status and the role of humans in its spread. We analysed 286 individuals from 10 European countries using 12 SSR markers. Results from STRUCTURE and Principal Coordinate Analysis identified six genetic clusters, with southern populations (Italy, Slovenia, Austria) showing greater homogeneity, and central/northern populations exhibiting high admixture. A dendrogram based on SSR data revealed no clear grouping by habitat type or geography. Identical genotypes were found across culturally significant but geographically distant sites, suggesting long-distance vegetative spread through human activity. These findings support the idea of a "cultural lineage" of *Vinca minor* maintained over centuries, likely via deliberate propagation in religious, funerary, and ornamental contexts. The study highlights the influence of anthropogenic factors in shaping the genetic landscape of a historically cultivated species.

Keywords: historical horticulture, genetic diversity, population genetics, Archaeophyte

Understanding habitat selection of wolves in relation to movement strategies in a Central European human-dominated landscape

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The recovery of grey wolf (*Canis lupus*) populations stand as a remarkable large carnivore recolonization event. The range expansion is particularly striking in Central Europe (CE), where wolves have established territories across various habitats, including intensively managed, human-dominated landscapes. Wolf spatial ecology is inherently linked to distinct movement strategies (residency, floating, dispersal), yet whether these behavioral modes correspond to divergent habitat selection patterns remains poorly understood. To address this, we employed integrated step selection functions to quantify fine-scale habitat selection of 77 GPS-collared wolves across seven CE countries. Our analysis compared habitat selection across movement strategies, revealing how these modulate behavioral responses to landscape features. The modelling framework considered selection for habitat composition, topographic features, and a hierarchy of anthropogenic infrastructure, incorporating individual/area random effects and day-night interactions to capture behavioral plasticity. Our results revealed three distinct behavioral patterns of movement strategies. Territorial residents adopted a risk-averse strategy, showing the strongest avoidance of built-up areas and intensifying their motorway avoidance during night. In stark contrast, dispersers prioritized movement efficiency over safety, exhibiting near-neutral selection for motorways in a high-risk strategy during their movement. Floaters, nomadic non-territorial individuals, displayed a flexible, opportunistic strategy with intermediate risk-avoidance patterns. Our findings provide the first systematic evidence that habitat selection in wolves is fundamentally state-dependent, with each strategy representing a unique solution in navigating through anthropogenic landscapes. This behavioral

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plasticity is a key ability in their success and shall have important implications in conflict management and generally in connectivity conservation.

Green turtle (*Chelonia mydas*) nesting and hatching activity in Bangkaru Island, Indonesia

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Bangkaru Island, part of the Pulau Banyak marine reserve off the west coast of Sumatra in Indonesia, is an important nesting site for green turtles (*Chelonia mydas*) and leatherback turtles (*Dermochelys coriacea*). The green turtle nesting and hatching success on the island were examined using data collected during daily patrols run by Ecosystem Impact's Ranger Program from 2023 to 2025. The study assessed the effects of nest position relative to the tide, coastal micro-location (front slope of dune, area on top of dune, dune in grass, area near the forest, beach), month, and specific beaches on nesting and hatching success. Binomial GLMs were used to evaluate nesting success, while beta-binomial GLMMs were applied to hatching success. Nesting success varied significantly across nest positions ($p < 0.001$), micro-locations ($p < 0.001$), beaches ($p < 0.001$), and also showed seasonal differences ($p < 0.001$). The lowest probabilities were observed in nests placed below the high-tide line (BL ≈ 0.22) and on open beach areas (B ≈ 0.46), suggesting higher exposure to waves, erosion, or disturbance. In contrast, hatching success remained stable and was not affected by any of the examined factors, indicating that incubation conditions on Bangkaru are generally suitable and relatively uniform across beaches, making nesting hatching success (incubation success) the primary limiting factor.

Keywords: *Chelonia mydas*, reproductive ecology, seasonality, beach zones, conservation

The Awareness-Resilience Gap: Understanding Farmer's Resistance to Crop Change Around Chand Baori, Rajasthan, India

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Resilience in socio-ecological systems is shaped not only by ecological processes but also by how people respond to environmental change. In the agricultural landscape around Chand Baori, Rajasthan, India, this balance is increasingly strained. The stepwell itself reflects a long tradition of vernacular water management that once supported local communities in a semi-arid setting. Today, however, farmers in the surrounding villages continue to grow water-demanding crops even though they openly acknowledge that groundwater levels are declining every year. Based on interviews with local farmers, available groundwater records, and landscape observations, the study finds that several factors discourage crop change. These include fear of uncertain yields, limited market options, labour availability, and a strong cultural attachment to long-practised crops. Together, these drivers create a gap between awareness and actual adaptation. The results suggest that resilience in such cultural landscapes is weakened not only by environmental pressures but also by social and economic path dependencies. Supporting more adaptive farming in the Chand Baori region will therefore require approaches that combine behavioural insights, community values, and more accessible institutional guidance.

Keywords: Chand Baori Rajasthan India, socio-ecological resilience, agricultural adaptation, groundwater decline, vernacular landscapes

New data on the distribution of necrophagous beetles (Silphinae, Histeridae) in Kazakhstan

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The fauna of necrophagous beetles in Central Asia remains poorly studied. The existing literature on the beetle fauna of the countries of the former Soviet Union is outdated and insufficient to provide a comprehensive understanding of the region's Coleoptera diversity. The objective of this bachelor's thesis is to fill the existing knowledge gaps regarding the species diversity of carrion beetles (Staphylinidae: Silphinae) and clown beetles (Histeridae). The fieldwork was conducted during the summer of 2024 in the city of Almaty, southeastern Kazakhstan, and included two series of baited pitfall traps on 3 localities. In addition to common species of the temperate palearctic zone, extremely rare species were also captured, including the burying beetle *Nicrophorus reichardti* (Kieseritzky, 1930) and the clown beetle *Saprinus austerus* (Reichardt, 1930), which was recorded in Kazakhstan for the first time. These findings confirm the importance of the studied area for researching the species richness of necrophagous beetles in Kazakhstan and highlight the need for further investigation into their ecology and distribution. This topic constitutes the basis of my forthcoming master's thesis and the subject of several faunistic publications prepared in collaboration with entomologists from southeastern Kazakhstan.

Key words: carrion beetles, Kazakhstan, faunistic, Silphinae, Histeridae

Distribution of microplastic in coastal waters in Guam

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Microplastic pollution is a growing global problem threatening marine ecosystems. This study investigated microplastic distribution in Guam's coastal waters, a biodiversity-rich island in the Western Pacific. As the first local survey, it aimed to fill data gaps, identify hotspots of contamination, and provide a baseline for future research on coral reef impacts. Using a neuston net (300 µm mesh), 24 transects were sampled across sites influenced by human activity, river mouths, and current convergence zones. Samples were analyzed in the Czech Republic with the hot needle method. Concentrations ranged from 18.7 to 152.4 particles/m^3 (SD 36.92), with Pago Bay showing the highest levels. In total, 1061 particles were detected, sized <0.25–46 mm. These findings offer the first insight into Guam's microplastic pollution, supporting monitoring and conservation planning. Long-term studies, including seasonal sampling and current dynamics, are needed to guide effective strategies for protecting coral reefs and marine habitats.

Keywords: microplastic, coral reef, Pacific Ocean, Guam, conservation

Diversification of allotetraploid species with identical genomic composition

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Polyploidy, particularly allopolyploidy resulting from the hybridisation of species, plays a significant role in plant evolution. It remains challenging to determine whether an allopolyploid species originated once or multiple times due to the complex genomic changes that occur after formation. This study aimed to develop a robust analytical pipeline capable of distinguishing between single- and multiple-origin evolutionary scenarios in allopolyploid species. To test and demonstrate the utility of this framework, we applied it to the diverse CCDD tetraploid group within the genus *Chenopodium* L. *sensu stricto*. We used whole-genome resequencing of 140 individuals sampled across the taxonomic and geographic breadth of these tetraploids and leveraged the fact that their ancestral C and D subgenomes remain largely intact. This enabled the subgenomes to be phased and analysed independently using diploid-oriented tools, including sNMF for population structure, IQ-TREE2 for phylogenomics and SMC++ for demographic modelling. Applying these complementary approaches revealed refined species boundaries, including the identification of a previously unrecognised species. Both subgenomes exhibited highly congruent phylogenetic groupings and nearly identical demographic histories, strongly supporting the hypothesis of a single hybridisation event as the origin of all CCDD tetraploids.

Keywords: polyploidy, plant genomics, bioinformatics

Does chemical communication shape beaver dispersal decisions?

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Animal dispersal is a key ecological process shaping species distribution, population dynamics, and gene flow in ecological space. Olfactory cues help individuals navigate within complex environments and reduce dispersal risks. Resident Eurasian beaver (*Castor fiber*) territories produce chemical signals that can spread over long distances within watersheds. These signals may indicate stable occupation, sufficient resources, and potential to mate, allowing dispersing individuals to reduce the costs and risks of exploring unfamiliar environments. Due to that we tested whether dispersing individuals would visit more often streams containing scent cues from established beaver territories compared to streams without beaver settlements. We conducted a field experiment on 15 uncolonized streams in the Český les and 15 in the Šumava Mountains. All streams drained into major watercourses with similar densities of beaver occupancy, serving as sources of dispersing individuals. Beaver presence was simulated by applying anal gland secretion and castoreum in solid soap form to the water. The design included 10 single-sex (male or female), 10 mixed-sex, and 10 control stations without scent. Each treatment site was monitored by camera traps. Data from dispersal events were analysed using a zero-inflated Poisson model with scent type and distance from the nearest active lodge as predictors. From 29 recorded dispersal events, streams with simulated beaver occupancy were more frequently visited compared to streams without beaver settlements. Streams treated with mixed-sex scent were more frequently visited by dispersing individuals, while single-sex treatments showed a weaker trend. Distance to the nearest occupied lodge negatively affected frequency of visitation. These findings suggest that chemical cues guide beaver dispersal, orienting individuals toward streams with established settlements.

Keywords: beavers, dispersal, chemical communication

The thermal insulation properties of the green roof substrates and its ability to retain and to mitigate the rainwater runoff

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In Europe, there have been more frequent climate-related extremes recently. One of the principles how to face the climate change and overheated islands is blue-green infrastructure, which in cities, because of the limited space, may focus on remaining space such as green roofs. This study is focused on verifying selected theoretical assumptions in the field of the benefits of blue-green infrastructure, with a particular focus on functional role of green roofs and their capacity to mitigate urban overheating and water management. The research was conducted on the Pavilion of Environmental Studies, placed in the campus of Czech University of Life Sciences in Prague, where the green roof of two substrate thickness is positioned. The topic was the evaluation of the relationship between the type and thickness of the green roof substrate and its thermal insulation properties, as well as the substrate's ability to retain rainwater and the associated slowing of rainwater runoff. Collectively, the results underscore the value of green roofs as a multifunctional component of climate-adaptive urban areas.

Keywords: green roof, blue green infrastructure, temperature fluctuation, heat island, climate change, water retention

Pedigree establishment of wolf population in Bohemian Forest Ecosystem

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The recovery of the grey wolf (*Canis lupus*) in Central Europe represents a remarkable process of large-carnivore recolonisation. The Bohemian Forest Ecosystem (BFE), spanning the Czech–German border, has become a key area where individuals from Alpine and Central European populations meet and interbreed. Building upon extensive monitoring, this study provides new insights into the genealogical structure and reproductive dynamics of the recolonising wolf population. Using genetic and spatial data collected between 2016 and 2024, the BFE population pedigree was constructed to visualise the origin, sex, and territorial affiliation of each individual. A total of 233 confirmed wolf samples were analysed at 17 microsatellite loci. Parent–offspring relationships were established using Cervus and ml-relate, and individual-based pedigrees were visualised in R and Inkscape. The first established pack, Srní (2016/17), served as a source of both short- and long-distance dispersers, which subsequently contributed to the establishment of new territories within and beyond their natal area. Six occupied territories were identified, with successful reproduction confirmed in five of them, with 17 breeding events recorded. Of 74 genotyped individuals, 52 originated from local packs. This study presents a comprehensive pedigree of the recolonising wolf population in the BFE. It highlights it as a genetic and ecological crossroads for other parts of the European wolf population.

Keywords: *Canis lupus*, pedigree reconstruction, population dynamics

When Does an LLM Stop Making Things Up? Quantifying the Digital-Footprint Threshold

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Large language models (LLMs) often perform poorly when the knowledge they require is sparsely represented in their training data. As web documents constitute a substantial and unevenly distributed portion of this data, online visibility serves as an imperfect yet plausible proxy for learnability. To test this theory, candidate facts must be objectively verifiable and unambiguous. They must also be invariable over time and cover all species. Furthermore, they must be quantifiable using web searches and span a wide frequency range. We propose that many national species taxonomies meet these criteria, and that the Latin-Czech combination is also very linguistically independent from each other. We quantified each species' digital footprint as the median Google hit count for its exact Czech name, using the Czech nomenclature of diurnal butterflies, which fulfils these criteria while remaining linguistically independent of Latin or English names. Paralelly we asked the internet-disconnected high-capacity GPT-o1 model for Czech names given Latin binomials and scored the answers, as correct or incorrect across repeated prompts. We used logistic regression to related accuracy to the hit counts. The outputs of prompting were strongly bimodal: most species were either always correct or always incorrect. Accuracy increased with digital footprint (x^2 = 36.96, $p < 0.001$; R^2 = 0.24), reaching 50% at approximately 7,800 hits. Manual spot-checks confirmed that, regardless of species commonness, a large percentage of connections were found between Czech and Latin names on the first pages thus validating the metric. Our results suggest that the reliability of parametric recall in LLMs only becomes measurable above a certain 'digital footprint threshold'; below this threshold, hallucinations prevail. Therefore, systematically increasing the web presence of under-represented terms could reduce factual errors and make LLM outputs more trustworthy in specialised domains.

Population level variation in *Calliphora vicina* development

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Blowflies (Diptera: Calliphoridae) play a crucial role in estimating the time of death in forensic investigations. As early colonizers, species such as *Calliphora vicina* enable entomologists to determine the Post-Mortem Interval (PMI) or the time of initial insect colonization. This study focuses on *C. vicina*, a synanthropic species, globally distributed, known for its broad thermal tolerance (2-30 °C).

The primary objective of this research is to investigate the developmental rate of *C. vicina* across five different locations under three constant temperatures. Ultimately, this work aims at establishing a standardized protocol to be used in criminal investigations. Our null hypothesis (H_0), considers that temperature and localities do not influence the Accumulated Degree-Day model (ADD). This was calculated by Kruskal Wallis analyses. When significant variability was detected, Dunn's post-hoc test was used with Bonferroni correction.

Preliminary results showed that at 28 °C, near the upper developmental threshold for *C. vicina*, no significant differences (p-value = 0,3631) were found. This leads to results that may indicate limited sample size requiring confirmation by using larger datasets. In contrast, at 21 °C and 25 °C, significant differences were calculated (p-value <0,001). The Swiss population showed the greatest variability at both temperatures, while the Prague population displayed marked variation at 25 °C. Although the four locations originate from distinct climatic regions, the current results do not allow conclusions regarding the role of climate in shaping the developmental variabilities. The temperature range tested is limited to moderate to high. Additional experiments, particularly under colder conditions, are required to fully understand its role. We therefore hypothesize that at lower temperatures, populations from colder climates such as Stockholm, may exhibit distinct developmental responses compared to those from milder regions.

Keywords: ecology, insect development, forensic entomology

Myrmecophilous beetle *Attumbra lucida* (Kraatz, 1852): larval traits and phylogenetic position

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Myrmecophily is widespread among arthropods, including many beetles lineages. Within Leiodidae, most species are saprophagous, but some have adapted to live inside ant nests. In the tribe Cholevini, the genera *Attaephilus* Motschulsky, 1844, *Attumbra* Gozis, 1886, *Catopsimorphus* Aubé, 1850, and *Philomessor* Jeannel, 1936 are associated with *Messor* Forel, 1890 and *Aphaenogaster* Mayr, 1853 ant nests, yet their biology and larval morphology remain poorly documented. This study provides a redescription of the larva of the Southern European species *Attumbra lucida* (Kraatz, 1852) and placed it within a preliminary molecular phylogeny based on COI, contributing to a better understanding of myrmecophily and morphological evolution in Cholevini. Larvae and adults of *A. lucida* were collected from *Messor* nest in Croatia, and found as conspecific using DNA barcoding. Larval morphology was examined using light and scanning electron microscopy, and COI sequences from adults were analyzed using Maximum Likelihood methods together with publicly available sequences of other members of the tribe Cholevina. Our preliminar phylogeny shows Cholevina as a monophyletic taxon and suggest tentative sister relationships among these genera. Larval morphology of *Attumbra lucida* indicates adaptations for survival in *Messor* nests, including a small limuloid body, combined with long appendages, and defensive, stout setae. Overall, our results provide a framework for understanding evolutionary relationships and myrmecophilous adaptations in Cholevini, highlighting the need for broader taxon sampling and additional molecular markers.

Keywords: harvest ant, phylogeny, small carrion beetles

Evolution of microbe-termite-termitophile tripartite symbiotic system

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Insects often acquire gut microbial symbionts from the environment or other species during interspecific interactions. Such horizontal microbial transfer can drive rapid adaptation to new diets or habitats. Termites are among the most remarkable examples of the critical role that insect gut microbiomes have in the adaptation of insects to a dietary niche. In addition, a diverse range of arthropods live in termite nests, forming a range of symbiotic relationships. These are called termitophiles, and among them, rove beetles (Staphylinidae: Aleocharinae) is the most diverse and abundant group. They have independently transitioned from free-living to termitophilous lifestyles many times, making them a great model for studying convergent evolution and symbiotic adaptation. The intimate cohabitation of termites and termitophilous beetles raises the possibility of microbial exchange between them, a question that has never been systematically addressed. For this project, I am exploring microbiome composition across a globally sampled dataset of ~119 termitophilous beetles from ~51 termite host species raw reads. I am using these Illumina reads in comparative metagenomics analyses using the metaWRAP pipeline, which bins contigs into separate microbial taxa. Also, if termitophilous beetles have a similar diet and gut microbiome to their termite hosts, we can expect convergent evolution of their gut structures to resemble those of termites rather than free-living beetles. To test this, I am constructing 3D gut models of beetles using an image processing and analytical software: Dragonfly. My preliminary data suggest a diversity of gut anatomies in termitophiles, with sometimes enlarged hindgut segments.

Keywords: host symbiont interaction, gut microbiome, horizontal microbial transfer

Molecular phylogeny of the genus *Thanatophilus* Leach, 1815 (Coleoptera: Staphylinidae: Silphinae)

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The genus *Thanatophilus* Leach, 1815 belongs to the subfamily Silphinae, recently reassigned to the family Staphylinidae. It comprises 23 species, mainly distributed in the Palaearctic, and contributes to carrion decomposition and terrestrial nutrient cycling. Despite their ecological importance, the phylogenetic relationships within the genus remain insufficiently resolved. Morphological taxonomy was established by Schawaller (1981) and later refined by Kozminykh (1994), but a comprehensive molecular framework is still lacking. This study presents the preliminary stage of a master's thesis project aimed at reconstructing the molecular phylogeny of *Thanatophilus*. The current dataset includes nine of the 23 known species, with all sequences retrieved from the NCBI GenBank database. At this stage, only the mitochondrial gene cytochrome c oxidase subunit I (COI) was analyzed. Sequences were aligned using MAFFT, and phylogenetic reconstruction was conducted in RStudio using the Maximum Likelihood approach under the GTR + G model of nucleotide substitution. The resulting tree offers an initial insight into relationships among species, supporting the monophyly of *Thanatophilus* and revealing several clusters with moderate support, some of which partially reflect earlier morphology-based classifications. Although preliminary, these results provide a foundation for further molecular analyses of the genus. In the next phase, the dataset will be expanded to include seven additional species, for which I extracted DNA from specimens in the collection of Prof. Mgr. Jan Růžička, Ph.D. These samples will be sequenced and incorporated into the final analysis. Additional mitochondrial markers, including 16S rRNA, will be added to enhance phylogenetic resolution and clarify evolutionary relationships within *Thanatophilus*.

Keywords: carrion beetles, Silphinae, *Thanatophilus*, phylogeny

Influence of microclimate and physiological condition of Norway spruce on mycorrhizal development

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Forest trees and ectomycorrhizal fungi form mutually beneficial relationships that enhance tree resistance to both abiotic and biotic stress, improve water and nutrient uptake efficiency, and are fundamental to the functioning of forest soil ecosystems. However, ongoing climate change—particularly the increasing frequency and intensity of drought events—poses a significant threat to this important interaction. This is especially relevant for Norway spruce (*Picea abies*), a keystone species in Czech and Central European forestry.

The theoretical component of this research investigates how microclimatic and physiological conditions of spruce influence the development of mycorrhizal associations, with particular focus on the responses of *Picea abies* and its associated fungal communities to drought. Fieldwork was conducted on experimental plots at the University Forest Enterprise near Kostelec nad Černými lesy, Czech Republic, where drought conditions were simulated using roofing. Tree growth, transpiration flow, and soil water potential were monitored for trees in both roofed and control plots. Soil samples were collected from selected trees and analysed for mycorrhizal and root parameters, including the density of active and inactive mycorrhizal tips, root dry mass, and soil pH. Throughout the growing season, fungal fruiting bodies were surveyed monthly and categorised by trophic type.

Statistical testing, modelling, and multivariate analyses were used to evaluate relationships among the measured variables, with emphasis on the effects of roofing on active mycorrhizal tip abundance, tree physiological traits, and fungal community composition.

Results indicate that roofing-induced drought stress led to significant changes in both mycorrhizal and root parameters, specifically a decrease in active and an increase in inactive mycorrhizal tips, an increase in fine root biomass, a decline in the physiological condition of spruce, and a reduction in fungal species richness.

Effect of Sucrose Concentration on the in Vitro Survival and Regeneration of Garlic from the Basal Plate

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This study aimed to determine the effect of different sucrose concentrations added in the culture medium on the growth of the garlic (*Allium sativum* L.) basal plate under *in vitro* conditions. Sucrose provides carbon and energy for plant metabolism and affects osmotic balance and tissue physiology. Therefore, optimizing its concentration is crucial for successful growth and regeneration of plant material in controlled laboratory environments. In this experiment, sucrose was added to the culture medium at concentrations of 0, 5, 10, 15, 30, 60, and 120 $g \cdot l^{-1}$. Basal plate explants were cultivated under standard *in vitro* conditions, and after the cultivation period, their morphological response, survival, regeneration, and vitality were evaluated. The results confirmed that sucrose concentration significantly affected growth and physiological condition of the tissues. The best results were obtained at 10, 15 and 30 $g \cdot l^{-1}$, where explants exhibited the most vigorous growth, healthy coloration, and high vitality. In contrast, the variant without sucrose showed the poorest growth and the lowest vitality of the explants. The findings contribute to a better understanding of the role of sucrose in garlic *in vitro* culture and can be applied in the optimization of subsequent biotechnological procedures, such as the preparation of plant material for cryopreservation. Determining the optimal sucrose concentration is therefore an important step toward maintaining tissue vitality and ensuring efficient plant regeneration after demanding preservation processes.

Keywords: *in vitro*, garlic, basal plate

RegRed Project: An Effort to Collate Regional Redlists at a Global Scale. Aims, Progress and Outcomes

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The IUCN Red List of Threatened Species is a valuable resource used by policymakers and researchers alike. While its scale and coverage are impressive, this global scope comes with an inherent limitation: a lack of regional detail. A species could be thriving globally while disappearing in parts of its range. A valuable, yet seemingly forgotten alternative lies in national and regional red lists. These documents, produced at various geographical and taxonomic scales, have been largely underutilized in large-scale analyses, mainly because they are unavailable in a digital and structured format. To address this gap, our project aims to digitise available national and regional red list data. To date, we have published a compilation of all redlist sources we could identify as a metadata data paper. This yielded 2,093 sources from 172 countries, encompassing threat data across 487 broad taxonomic groups. We have designed a geospatial database considering biodiversity data standards and interoperability. We are now in the data extraction phase of the project, and currently focused on digitising Tetrapod sources. To tackle efficient data extraction from diverse sources, we have developed EcoParse: an open-source application for extracting species-level data from literature. The application uses large language model (LLM) technology to automate the extraction of required data fields from text and images, while safeguarding against common issues like hallucinations and false negatives. Initial testing shows this approach is highly effective, achieving ~90% accuracy. The application is open-source and configurable to support other data extraction efforts.

Keywords: conservation assessment, conservation biology, data compilation, endangered species, IUCN, LLM, data extraction, database, Red List

Beaver Behavioural Response to Wolf Predation in the Central Europe

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Predation is a dynamic relationship characterized by a continuous evolutionary arms race. The predator constantly tries to refine its hunting strategies, while the prey develops methods to mitigate the risk of predation. A similar, relationship is re-emerging between the Gray Wolf (*Canis lupus*) and the Eurasian Beaver (*Castor fiber*) in the ecosystems of Central Europe, where beavers are a common part of a wolf diet. This interspecific dynamic is observed after both species have successfully recolonized this region, having been driven to the brink of ex-tinction in the Central Europe due to historical overhunting. Following the return of the wolf to the Šumava Mts., with an established beaver population, and the subsequent resumption of predation on beavers, we hypothesized that this dynamic would induce changes in beaver behaviour. Our research was guided by three main questions: How does the predation affect the beaver foraging patterns? What is impact of the predation on beaver territorial behaviour? Does wolf's circadian activity affect beaver's circadian rhythm? To address these questions, we utilized data of beaver activity signs collected across 28 territories between 2015 and 2019. Further we replicated the VHF telemetry of beavers that was originally conducted during the period of 2009–2011 and re-peated in 2022–2024. Using these data, we were able to calculate the sizes of beaver home ranges and analyse beavers' circadian activity. The results indicate that beavers reduced their foraging distances and modified the volume of harvested wood. Furthermore, beavers reduced their home range size by more than half after the reoccurrence of wolves. Also, the beavers' circadian activity patterns shift in an apparent effort to avoid the bimodal activity peaks of the wolf. We propose that these behavioural modifications are a result of wolf predation pressure and

represent a renewed antipredatory defence – the strategy aiming to minimize impact of wolf depredations.

Effective conservation and sustainable management of raptor species both in captivity and in the wild

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The conservation of birds of prey represents one of the most urgent and complex challenges in global biodiversity management. These species are highly vulnerable to habitat loss, poisoning, climate change, and direct persecution, yet they are also keystone species essential for maintaining ecosystem balance. The European Association of Zoos and Aquaria (EAZA) Raptor Taxon Advisory Group (TAG) provides a coordinated, science-based platform to ensure the effective conservation and sustainable management of raptor species both in captivity and in the wild. Through international partnerships, the TAG contributes to species recovery projects, reintroduction programmes, and long-term monitoring initiatives that directly support wild populations. It also advocates for stronger awareness and education programmes, engaging the public on the ecological importance of raptors and the threats they face. By working across disciplines and continents, the EAZA Raptor TAG exemplifies how cooperative frameworks can leverage zoo-based expertise and resources to complement and enhance field-based conservation. Its work underscores the critical role of integrated approaches in tackling the biodiversity crisis and offers a replicable model for other taxonomic groups.

Keywords: raptors, birds of prey, EAZA Raptor TAG, conservation, ex situ management, reintroduction

Ecological Networks in Biodiversity Conservation

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Flowering plants and pollinators are not isolated entities but interact among them, forming complex ecological networks that display recursive patterns in nature. This consistent structure, also referred to as the Architecture of Biodiversity, enables ecologists to make predictions on species assemblage processes and even pollination function. From an applied perspective, ecological network analyses can identify keystone species within communities, enhance ecosystem stability against disturbances, and even contribute to honeybee health management.

Keywords: ecological network, pollinators, honeybee, conservation

Waste-derived amendments for soil remediation

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Soil degradation and contamination represent a major environmental challenge affecting ecosystem functions and human health. Mining and metallurgical activities are among the dominant anthropogenic sources of potentially toxic metals and metalloids, which accumulate in soils, reduce soil quality and biodiversity, and pose long-term risks due to their persistence. Sustainable remediation approaches are therefore required mitigate contaminant mobility while restoring soil functions. Increasing attention has been given to the reuse of waste materials as soil amendments. Organic (e.g., composts, sewage-sludge-derived products, biochar) and inorganic amendments (e.g., iron-rich industrial residues) can improve soil structure, enhance nutrient retention, support microbial activity, and act as sorbents for immobilising metal(loid)s. Moreover, their use aligns with circular-economy principles and reduces the demand for synthetic remediation materials. However, waste materials may introduce secondary contaminants or alter soil physicochemical properties in unpredictable ways. Comprehensive evaluation of their environmental safety and long-term performance across contrasting soils remains crucial. This study investigates the remediation potential of five waste-derived materials—iron sludge/chips, compost, composted/pyrolysed sewage sludge—and selected combinations in three distinct soils. Incubation pot experiments were conducted to assess metal(loid) mobility, amendment–soil interactions, ecotoxicity, and plant uptake as integrative indicators of bioavailability. Iron-based materials showed the highest potential for reducing contaminant mobility, while organic amendments primarily improved soil properties, pointing at synergistic effects in iron–organic combinations. These findings identify selected waste-derived materials as promising amendments and provide a basis for subsequent field-scale validation.

Seznam registrovaných účastníků konference

List of registered conference participants

Příjmení / Last Name	Jméno / First Name	Pracoviště / Company Name	
Anurag	Pritam	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Audyová	Stefanie	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Baudino	Florencia	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Burciu	Irina	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Burešová Pešková	Lucie	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Cecchetto	Nicolas	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Eusebio	Leandro	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Gedefa	Mulugeta Tesema	Czech University of Life Sciences Prague	FAPPZ- Soil Science and Soil Protection
Glacová	Sofie	University of Ostrava	Faculty of Science
Goderdzishvili	Giorgi	Czech University of Life Sciences Prague	Faculty of Agrobiology, Food and Natural Resources
Hanel	Jan	Zoo Liberec	Zoo Liberec
Häusler	Jan	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Hemelíková	Adéla	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
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Hronková	Jana	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Hüttnerová	Kamila	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
Chakraborty	Sonjib	Czech University of Life Sciences Prague	Faculty of Environmental Sciences
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