ČESKÁ ZEMĚDĚLSKÁ UNIVERZITA V PRAZE

FAKULTA ŽIVOTNÍHO PROSTŘEDÍ

KOSTELECKÉ INSPIROVÁNÍ 2023

Sborník abstraktů / Abstract Book

15. ročník konference / 15th conference

27.–28. listopadu 2023 / 27th-28th November 2023

Hemelíková Adéla & Pešková Lucie (Eds.)

Pořadatel konference / Organiser of the Conference:

Katedra ekologie, Fakulta životního prostředí,

Česká zemědělská univerzita v Praze, Kamýcká 129, 165 00 Praha – Suchdol

Department of Ecology, Faculty of Environmental Sciences

Czech University of Life Sciences Prague, Kamýcká 129, 165 00 Praha – Suchdol

KOSTELECKÉ INSPIROVÁNÍ

978-80-213-3331-4

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POZNÁMKY – NOTES

POZNÁMKY – NOTES

Seasonal variations in radon emanation from the dump shaft No. 15 and their impact on the surrounding atmosphere

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This contribution consists of the evaluation of the impact of radon emanation from the dump shaft No. 15 after the completion of uranium mining on the environment and the description of the radiation situation of the dump No. 15 based on field and aerial measurements of the ambient dose rate equivalent (ADRE), grab sampling air sample collections, and continuous measurement of radon activity concentration (RAC). Daily, nightly, and seasonal variations in radon concentration were created from the measured and analysed data. The results of monitoring were visualized using the QGIS software environment and other graphical outputs.

In collaboration with DIAMO s. p., o. z. SUL Příbram, the State Institute for Radiation Protection, Faculty of Nuclear and Physical Engineering at CTU, the State Office for Nuclear Safety, and the Nuclear Protection Department of National Institute for Nuclear, Chemical and Biological Protection, monitoring of the dump shaft No. 15 was conducted. The entire project took place from 2021 to 2023 in several phases. A weather station was installed on the mining tower in the shaft's area to record climatic conditions throughout the duration of the project. After identifying "hot spots" on the crown of the dump shaft No. 15 using a drone, summer and winter measurements of RAC were then conducted there and also on the adjacent meadow next to the dump.

The measured and processed values demonstrated the influence of dump material on the radon activity concentration in the external atmosphere, confirmed the impact of

temperature on the "breathing" of the dump, and demonstrated the potential impact of the dump on the indoor atmosphere of dwellings in neighbouring communities.

Keywords: radon, radiation, uranium mining, aerial measurements, QGIS

Filtration of snow facilitates the identification of pollution sources

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The Arctic is a privileged observatory of global atmospheric pollution because the ice and snow cover keep records of the state of the atmosphere throughout history. Fresh snow gathers particulates and aerosols in the atmospheric compartment that may come from local sources or be transported from long distances. Its analysis provides a snapshot of the state of the atmospheric compartment at a given time. We collected fresh snow in three Arctic and subarctic locations and chose lead stable isotope analysis to identify the origin of this metal, often related to anthropogenic pollution. We filtered the snowmelt using 0.45 µm filters to separate the filtrate from the residue and analyzed them independently. We determined metal concentrations and lead stable isotope ratios, and calculated enrichment factors, natural contribution, and residue-to-total-snow ratio. From these results, we deduced that analysis of the filtrate refines the identification of sources, compared to the analysis of filtration residue or bulk snow, in which the lead signature from anthropogenic and distant sources is diluted with the local natural signal.

Keywords: lead isotopes, pollution tracing, Arctic, snow, atmospheric pollution

Acknowledgement: This work was supported by the Czech Science Foundation GAČR project [19-154055]; and the Faculty of Environmental Sciences CZU Prague IGA [2020B0033]; The authors greatly thank to all members of the Czech Arctic Polar Station, University of South Bohemia for kind help and support of the research in Svalbard.

Influence of the character of the water body and its surroundings on birds in Polabí

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Water bodies have an indispensable role in the landscape, especially in terms of water retention and the creation of microclimate. They also provide habitat for many species of plants and animals. The aim of this study was to evaluate how the environmental factors of water bodies affect species diversity of birds. The data was collected during late spring and summer in 2022 at 115 sites in the Polabí region. Birds were monitored in five habitats – water surface and in water, woody vegetation, on the ground, in reeds and in the airspace. In addition, the intensity of urbanization, the presence of forest cover, the character of the water bank, weather, water pH, noise and the presence of reeds were monitored. The effect of settlement intensity on the species diversity of waterfowl and landbirds was determined. The effect of presence of forest was significant for birds in tree cover and airspace. Furthermore, the nature of the bank namely length of woody vegetation, grass and bare soil had an effect. Birds preferred heterogeneous environments with diverse vegetation structure in the vicinity, which provided conditions for nesting and foraging. Urbanization usually did not pose a major problem for birds or even promoted species diversity in the ground bird community. The negative impact of the city on waterbirds can be mitigated by building sufficiently large water bodies with undisturbed nesting sites and islands.

Keywords: biodiversity, urbanization, forest environment

What do the macroinvertebrates tell us about the trophic state of the habitat of freshwater pearl mussel? Case study in National Park Sumava

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Vltavsky luh is one of seven places in the Czech Republic, where freshwater pearl mussels (FPM) (*Margaritifera margaritifera*) occur. This unique habitat of the oligotrophic catchment is not protected for the FPM itself, but rather because of FPM's role as a flagship, key, and umbrella species. Without the protection, the habitat would be irretrievably lost. The decline of the abundance of FPM species has rapidly begun in the last century and continues even today, despite the implementation of action plans all over Europe.

In the years 2017-2020, a complex screening of FPM's habitat in the Vltava River was done as a part of the Strengthening and protection of the freshwater pearl mussel population in the Sumava National Park Project. This project also included macrozoobenthos sampling to determine the saprobic index and water quality. The sampling was done at 6 localities and through the years 2018-2020, and a total of 114,203 individuals of macrozoobenthic fauna were found in 166 samples. *Trichoptera, Oligochaeta, Chironomidae*, and *Ephemeroptera* were the most abundant taxonomic groups. During data processing, 25 endangered species (without *Chironomidae*) were found.

This unique and extensive dataset will be used to describe not only FPM's habitat (which was never done or at least published) but also the trophic state of the upper Vltava

River, its self-purification ability, and the rate of water pollution from cities in upper Vltava catchment. Also, data of bioindication with juvenile (1+) FPM and continuously measured physicochemical parameters will be used.

Preliminary findings indicate that the proportion of functional food groups thus mirrors the gradient of a completely natural or near-natural stream (fig. A). This also challenges the supposition that episodic pollution and the general water pollution rates emanating from nearby urban areas detrimentally affect the macroinvertebrate community (fig. B).

Keywords: macrozoobenthos, bioindicator, Vltava River, freshwater pearl mussel, eutrophication, water quality, endangered species

Mercury accumulation in conifer tree rings

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Using trees as an archive of environmental pollution could be very useful for regions where pollution monitoring has not been implemented and no other biogeochemical archives are available. Mercury (Hg) is a promising trace metal for the reconstruction of historical air pollution, since its primary uptake pathway has been found to be from the air by the leaves, from where it is transported through the phloem to the tree rings. We aim to evaluate whether factors other than atmospheric Hg, such as climatic variables and tree-ring width, could affect Hg concentration in tree rings.

The study area is Ústí nad Labem, where a chlor-alkali plant near the city centre was a major local Hg emission source. Conifer species European larch (*Larix decidua Mill.)* and Douglas fir (*Pseudotsuga menziesii (Mirb.*) Franco) were sampled with an increment borer. Tree rings were measured and the cores were cut into separate annual rings and freeze-dried. Hg in each ring was measured with cold vapour atomic absorption (CV-AAS) in an AMA 254 Hg analyser. Linear mixed models were used to evaluate which factors may affect tree-ring Hg concentration.

For larch, we found a significant positive correlation between tree-ring width and tree-ring Hg concentration. This can be partially explained by a match between peak growth and peak air pollution between 1980 and 1995, as the Hg trend in larch was similar to that in fir, where no correlation with tree-ring width was found. Additionally, higher stomatal conductance in years with good growth conditions (especially sufficient summer precipitation) could result in photosynthesis products with more Hg bound to

them. Our findings suggest that Hg accumulation is related to tree-ring growth in larch on drought-affected sites.

Keywords: chlor-alkali plant, tree-ring width, Ústí nad Labem

Acknowledgement: This research was supported by a grant within the student grant competition at UJEP (Project No. 44202 15 2094).

Investigation of urban green spaces' benefits and their impact on people's well-being: Case study of Prague, Czech Republic

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The main objective of this research is to investigate the effect that UGSs may have on the well-being of people living in the city of Prague, Czech Republic. It also sheds light on the differences in the perception of urban stress among the target groups of this research that surveyed local residents, expats, and refugees from Ukraine. In particular, the work explored how are transformations in the patterns of urbanization in the city have changed since the onset of the Russian-Ukrainian war, and specifically how has this affected people's sense of well-being. This study also aims to look at park usage and highlights the degree of participants' satisfaction with the state of UGSs in the city. Based on the findings, strong positive correlations were found between visiting UGSs and improved physical health, stress reduction, and enhanced social inclusion among survey participants. The majority of respondents indicated that overcrowding is the main stress factor in the city. The interviewed local residents and expats, however, do not believe that the migration wave from Ukraine, which began after the Russian invasion in February of 2022, had a strong negative impact on their standard of living in the city or on the perceived quality of their life. Representatives of all groups expressed general satisfaction with the quantity (57,3%) and quality (51,2%) of green areas in Prague. The study collected data on the use of green spaces, such as frequency of visits, time spent there, proximity of residence, etc. Survey participants also shared what specific qualities of green areas attract them to repeat their visit. Urban planners, decisionmakers, and landscape architects can use the results of this questionnaire-based survey to understand better the needs of different demographic groups who visit urban green spaces, recommendations for how to enhance the quality of Prague's

UGSs by making them more inclusive, and thereby contribute to the population's overall well-being.

Keywords: urban green spaces, urban green space benefits, well-being, urban resilience, Russian-Ukrainian war 2022, refugees, urban stress

Acknowledgement: I would like to express my deepest gratitude to my supervisor, doc. Peter Kumble, M.L.A., Ph.D., for his invaluable patience and feedback, for supporting and motivating me throughout my study period, especially while I was working on this research.

A history of climate change: UNFCCC & Conferences of Parties synthesis review

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From Stockholm UN conference (1972), through UNFCCC bases creation (IPCC - 1988), UNFCCC signature in Rio Earth Summit (1992) and Berlin COP1 (1995) until the most recent Dubai UNFCCC COP28 / CMP18 / CMA 5, our society has witnessed an unprecedented period in which international politics have focused on worldwide cooperation in order to fight against climate change. A constantly growing number of countries have been sending their representatives to find a common solution intended to mitigate the ecological impact that humans are having on the world and its ecosystems. After almost five decades since the first time that the environmental subject was considered, multiple implementation plans, agreements and technical guidelines for application have been adopted in order to move in the direction of reducing the damage caused by climate change, global warming, ecosystem destruction and pollution. Land and forest cover assessment has also been a key element of this process in which landscape planning analysis has become one of the main tools used. Nevertheless, it's important to see and analyze from an objective approach the real impact of the measures carried out so far. The actions taken so far, although optimistic, do not seem to fully accomplish the requirements needed to avoid the worst projected future scenarios. The uncertainty of the effectivity or even the achievement of the 1.5ºC goal as well as the ignorance of the real changes that our activities may cause over the global climate have brought us to a time in which there is not space for hesitating. Nevertheless, there are many factors that seem to affect the agreement and the application of the measures suggested in each conference. Therefore, it is necessary to understand the reason why those conferences and their outputs are, maybe, not a real solution to the current environmental situation. The differences between countries with

regards to development, the weakness and inefficiency of the current democratic systems, the lack of proper consciousness by society, the economic interests and the lack of enough powered arbitration seem to be the main reasons for this shortage of results that is hindering the implementation of effective actions.

Hence, the analysis of the difference of expected and observed outputs as well as determining the main obstacles that generate this difference between them is the essential element to point out the social, economic and political features of our society that cause this and to correct its effect. This is the key element to create a world in which the ecology principles and their derived methods can be truly applied.

Keywords: environmental consciousness, environmental policies, global economy, developing countries, climate change, landscape planning

High Latitude Dust as an air pollutant, environmental – and climate driver

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Dust particles from high latitudes have a large local, regional, and global significance to climate and the environment as short-lived climate forcers, air pollutants, and nutrient sources. HLD was recognized as an important climate driver in Polar Regions in the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate in 2019. Sand and dust storms, including HLD, were identified as a hazard that affects 11 of the 17 Sustainable Development Goals. It is estimated that HLD contributes 5 % to the global dust budget with about 100 million tons of dust and active HLD sources cover > 1,500,000 km2. Arctic HLD sources are estimated to contribute 1-3 % of the global dust, but during dust enhanced activity years, about 5.5 % of the Arctic land areas (with area of > 1,000,000 km2) are active dust sources. Several studies have shown that Icelandic and other HL dusts can travel distances > 3000 km in High Arctic as well as to Europe.

There are newly two online models (DREAM, SILAM) providing daily operational dust forecasts of HLD. DREAM is first operational dust forecast for Icelandic dust available at the World Meteorological Organization Sand/Dust Storm Warning Advisory and Assessment System (WMO SDS-WAS) at https://sds-was.aemet.es/forecast-products/dust-forecasts/icelandic-dust-forecast. SILAM from the Finnish Meteorological Institute provides HLD forecast for both circumpolar regions. The Icelandic Aerosol and

Dust Association (IceDust, https://icedustblog.wordpress.com/) is newly member aerosol association of the European Aerosol Assembly.

Icelandic volcanic dust has impacts on atmosphere, cryosphere, marine and terrestrial environments, as well as socio-economic sectors. Volcanic dust has similar impacts on snow/ice as Black Carbon in terms of albedo reduction and water retention capacity of snow. In atmosphere, Icelandic dust is an efficient ice-nucleating particle (INP) having impacts on the mid- to high-latitude mixed phase clouds. In this talk, new HLD observations, atmospheric measurements and long-term dust storm – erosion aeolian rates relation identified in dwarf shrub roots will be shown.

Keywords: volcanic dust, air pollution, cold deserts, aerosol, Arctic, erosion, vegetation

Influence of different concentrations of CO2 and temperature during tree growth on the nutritional value of tissues for larvae of *Lymantria dispar*

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The ongoing climate change on Earth has a major impact on the interaction between forest pests and their host tree species. Increasing CO2 concentration and constantly rising air temperature may affect the ontogenetic development of these pests. Increased CO2 concentration is considered to reduce the nitrogen content of plants and thus prolong the development of leaf-chewers, which must increase the amount of food they consume in order to get the necessary nitrogen. Our experiment focused on the development of spongy moth (*Lymantria dispar*) larvae, which were fed on different kinds of diet. These diets were prepared from seedlings grown under well-defined growth conditions: a certain CO2 concentration (410 ppm and 820 ppm) and air temperature (20°C and 25°C). We focused on differences in the development of larvae, which were fed on spruce and oak diets, to see if there would be differences. We used the nutritional indexes ECD (Efficiency of conversion of digested food) and RGR (Relative growth rate) to evaluate larval performance. Neither the ECD nor the RGR index differed between treatments; i.e., even twice higher CO2 concentration did not lead to worse larval performance. We found that larvae grew better on food prepared from oak than the spruce. Thus, the results suggest that the host plant has a primary influence on insect performance than the effects of climate change, which change the quality of the host tree.

Keywords: *Lymantria dispar*, CO2, temperature, oak

Economical and Ecological Benefits of Green Buildings

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The research is conducted in the Environmental Studies Pavilion on the premises of the Czech University of Life Sciences in Prague. This newly constructed building has elements of blue-green infrastructure and water conservation - a green roof and green facade, a biotope and a root purifier, into which grey water from the sinks and showers of the whole building is discharged. Compared to conventional green roofs, this is an experimental design that allows for a deeper research of the whole operation; specifically, two types of green roofs are created where sensors are installed to monitor temperature, humidity, rainfall and irrigation delivery.

The benefits of the green roof and facade are investigated, both from an ecological and economic point of view. The condition of the substrate, the quantity and quality of water in the habitat, the amount of grey water and the associated savings in sewage charges or the cost of purification of the water that is retained at the point of runoff and does not burden other infrastructure capacities thanks to the installed green roof, facade and pond system. Environmental benefits such as cooling of the surrounding environment and the ability to absorb rainfall and debris will also be examined.

Keywords: blue-green infrastructure, building, green roof, green facade, water harvesting

Dead reckoning as a unique tool for calculating traveled distance in movement analysis

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Biologging technology combined with the Global Positioning System (GPS) can provide a range of precise positions for free-range animals with short, fixed intervals, which makes them suitable for long-term monitoring. Speed and distance traveled provide quantifiable links between behavior and energy and are among the metrics most often estimated from animal tracking data. We focused on the speed of the animals, more precisely, the daily distance traveled (DDT). We compared the values of this parameter obtained by two different methods i) based on GPS telemetry and ii) dead reckoning calculation (DR). We used data for wild boar tracked by a GPS collar with high-resolution accelerometer and magnetometer sensors. We analysed data from 29 collared wild boar with an average tracking period of 53 days (total monitoring time 1533 days). The DDT was calculated in each 30 minutes of monitoring. We also included behavior based on accelerometer data to improve the analysis. We determined nine types of wild boar behavior, and for each, we calculated a coefficient that makes the DR track more precise. Using DR was recalculated the exact path of the animals based on the data from the accelerometer and magnetometer with the operating frequency of 10 Hz and ground truth as a correction factor. There was a considerable difference between the DDT calculated based on GPS and DR method. Preliminary results show that lower values were obtained based on GPS telemetry, and higher values were found by DR. This is the first study to compare the mentioned methods. Thus, the results can be applied to the DDTs already obtained in the past, which were based on older methods with limited

recording frequency. The study of wild boar behavior and movement is crucial because it can help act against the spreading of African swine fever and define the measures in different environments. It is a unique approach that will allow us to improve wildlife management.

Keywords: VeDBA, biologging, distances, wild boar, behavior

Acknowledgement: This study was supported by grant No. QK1910462 financed by Ministry of Agriculture of the Czech Republic and Project A_25_22 of FFWS CZU

Spatial and temporal extents of natural disturbances differentiate deadwood-inhabiting fungal communities in spruce primary forest ecosystems

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Deadwood-inhabiting fungi represent an essential component of forest ecosystems through their association with deadwood decomposition and the cycling of nutrients and carbon. Although we have sufficient evidence for the fundamental role of deadwood availability and variability of decay stages for fungal species diversity, the influence of long-term natural disturbance regimes as the main driver of deadwood quantity and quality has not been sufficiently documented. We used a dendroecological approach to analyse the effect of 250-years of historical natural disturbance and structural variables on local (plot-level) and regional (stand-level) species richness of deadwood-inhabiting fungi. We used data collected from 51 study plots within nine best-preserved primary spruce forest stands distributed across the Western Carpathian Mountains. Historical disturbances shaped the contemporary local and regional species richness of fungi, with contrasting impacts of disturbance regime components at different spatial scales. While local diversity of red-listed species has increased due to higher disturbance frequency, regional diversity of all species has decreased due to higher severity historical disturbances. The volume of deadwood positively influenced the species richness of deadwood-inhabiting fungi while canopy openness had a negative impact. The high number of observed rare species highlights the important role of primary forests for biodiversity conservation. From a landscape perspective, we can conclude that the distribution of species from the regional species pool is - at least to some extent - driven

by past spatiotemporal patterns of disturbance events. Natural disturbances occurring at higher frequencies that create a mosaic forest structure are necessary for fungal species - especially for rare and endangered taxa. Protection of intact forest landscapes is recommended to support habitats of diverse fungal communities and their associated ecosystem functions.

Keywords: old-growth forests, Saproxylic fungi, Carpathians, biodiversity, dendrochronology, forest structure

Acknowledgement: This study was supported by the Czech Science Foundation (grant GACR no. 22-31322S) Czech University of Life Sciences (Grant IGA A_19_11), and EVA 4.0 project: CZ.02.1.01/0.0/0.0/16_019/0000803). M. Svitok was supported by the Operational Programme Integrated Infrastructure (OPII), funded by the ERDF (ITMS 313011T721).

Streamlining linkages between EIA and SEA towards more effectiveness monitoring and designing mitigation measures

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The consequences of global megatrends are becoming increasingly unpredictable. Both living and non-living nature are significantly damaged by human activities, whether in direct or indirect effects, and the speed of this devastation is increasing in some parts of the world, surpassing its natural regenerative capacity.

The integration of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) processes is crucial for achieving comprehensive environmental governance. This study investigates the current practices and potential synergies between EIA and SEA in order to streamline linkages for more effective monitoring and designing of mitigation measures.

In general, this is a theoretical study in which specific habitat factors and various characteristics of individual locations are not taken into account, which would not be possible even within the huge scope of the study.

The results of the assessment and individual predictions from the EIA process, archived in the EIA Information System, can no longer be overlooked. While they may be locally specific, their ability to create an overall context of future burdens/utilization becomes

evident with temporal and spatial aggregation. This context is crucial for sustainable planning and effective strategic evaluation.

In achieving more efficient and accurate outputs from the SEA processes, it is essential to work with regionally aggregated results of the EIA and outputs of more extended meta-analyses.

By fostering a more cohesive and inclusive approach, our research aims to contribute to the development of a robust and streamlined framework that aligns EIA and SEA practices with sustainable development goals and environmental protection objectives.

Keywords: environmental impact assessment, Strategic Environmental Assessment, effectiveness, environmental burden

Genomic and phenotypic characterization of the endophytic bacterium *Pantoea agglomerans* isolated from hops

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The poster presents new information on *Pantoea agglomerans* isolated from fresh hops, which shows potential for use in sustainable agriculture based on genome and phenotype analysis. Currently, it seems essential to study the microorganisms that inhabit plants and provide them with natural protection to be able to use them as sustainable alternatives to agricultural chemicals. The Czech Republic is famous for its Pilsner beer, in which hop (*Humulus lupulus*) is irreplaceable feedstock. However, hop plant research has focused on topics other than the natural colonization of the hop plant by endo- and epiphytic bacteria. This study aims to demonstrate the versatile metabolism of *P.agglomerans* DBM 3697 isolated from fresh green hop cones in the Steknik hopyards (Czech Republic) along with identification of significant metabolites, as well as the complete genome and its comprehensive analysis, stressing plant growth promoting beneficial properties.

Keywords: *Pantoea agglomerans*, *Humulus lupulus*, gluconic acid

Acknowledgement: The research was supported by the TACR NPO project No. TN 02000044 01.

Ghost Nets – Environmental Side Effects of Fishing Systematic Literature Review

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Ocean pollution from anthropogenic waste is a growing global environmental issue threatening marine species and ecosystems. A significant type of waste in the oceans is residues from fishing activities. Abandoned, lost, or otherwise discarded fishing gear, known as ALDFG or ghost gear, includes all kinds of fishing nets or fragments, fishing hooks, traps, rods, and lines. ALDFG has been responsible for the uncontrolled fatal entanglement of marine animals, polluting critical marine habitats and without any economic gain. In order to understand the problem holistically, the project has undertaken a systematic literature search of international literature, which focuses on the evolution of the state of the issue at the global level over the last decade. A total of 794 publications from Web of Science, Scopus, and Google Scholar databases are analyzed based on selected keywords. Individual publications are assessed based on their content into (i) informational content only, (ii) content addressing the impact of ALDFG on marine fauna and ecosystems, (iii) content addressing ghost net detection methods, (iv) content addressing recommended measures or new technologies to limit the spread of ALDFG, (v) studies addressing general anthropogenic marine waste including ALDFG, and (vi) content addressing the issue of a specific type of ALDFG. A thematic map has been created to visualize how to address this issue globally spatially. The project will be complemented by monitoring the marine ecosystem's state in selected sites by observation using diving equipment. The conclusion will assess the gaps in current knowledge and propose measures to minimize ghost nets' presence and environmental impacts in the seas.

Keywords: ghost fishing, ALDFG, fishing gear

Acknowledgment: The study was supported by IGA/FLKŘ/2023/004.

Diversity of growth responses of *Fusarium oxysporum f.* sp. conglutinans isolates to essential oils

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Fusarium oxysporum f. sp. conglutinans is responsible for yellow wilt, a serious disease of cabbage. This study evaluates the inhibitory effects of six essential oils (oregano, thyme, clove, cinnamon, lemongrass, litsea) at different concentrations on eight isolates of different origins. Our investigation involved the use of multicriteria discriminant analysis to evaluate the results with respect to the common effects of all essential oils. Differences in inhibition rates between isolates and essential oils were examined using the Kruskal-Wallis test. Probit analysis was used to determine EC50 values, which revealed significant efficacy of oregano oil. The essential oils tested showed clustering based on the content of the primary constituents (oregano and thyme, clove and cinnamon, lemongrass and litsea), a classification that is somewhat consistent with their inhibitory potential. The response of the isolates to the oils varied considerably and showed more differences within groups of isolates than between races. Our findings suggest that sensitivity to essential oils may be more related to the geographic origin of the isolates than to their race.

Keywords: FOC pathotypes, fusarium clonal lineages, yellow wilt of cabbage, sensitivity to essential oils

Acknowledgement: The authors are grateful for the financial support provided by the Czech Ministry of Agriculture RO0423

Analysis of the sex ratio and the presence of the bark beetle *Taphrorychus bicolor* pathogens in the pheromone traps

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This study deals with analysis of sex ratio and presence of pathogens of bark beetle Taphrorychus bicolor. The partial aim is bark beetle flight activity indication and comparison of population density of beetles on logging residues to number of captured individuals in pheromone traps.

Pheromone traps type Theysohn with bicolorin have been installed at study sites in March 2022 and logging residues were located near to them. Flight activity started on 8th of March 2022 at an average weekly temperature 15,1 °C and finished on 21st of August 2022 at an average weekly temperature 21,9 °C. A total of 113234 individuals of Taphrorychus bicolor were caught in pheromone traps. The flight activity culminated in the middle of May and second peak occured at the turn of June and July. The male/female ratio was determined as 1:1,6. For dissected individuals the presence of five groups of antagonists of Menzbieria sp., Gregarina sp., intestinal nematodes, extraintestinal nematodes and a larval endoparasitoid from the order Hymenoptera was found. In general it can be stated that the antagonist infestation percentage was low. There was no significant difference between infection levels and antagonist attacks to male and female individuals. There was no significant relation between number of entry holes on logging residues and number of bark beetles caught in pheromone traps. The average number was 425 entry holes/m2.

Pheromone traps with bicolorin can be used as a reliable measurement for Taphrorychus bicolor monitoring and its flight activity indication. Low number of individuals attacked by pathogenic species does not prove the use of antagonists as an effective way of biological control. A larger amount of logging residues left in stands provides appropriate

conditions for further spreading of this bark beetle and can cause its overpopulation. Preventive and consistent removing of logging residues performed well in advance is necessary.

Keywords: pheromone traps, nematodes, flight activity, logging residues, bicolorinThe ability to sense weak electric fields is widespread and likely ancestral in vertebrates.

Assembly and comparative analysis of genomes and transcriptomes for inference of genetic signatures of convergent evolution in rove beetles (*Aleocharine*) and scuttle flies (*Phoridae*)

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The ability to live in symbiosis with termites (*termitophily*) has evolved at least 40 different times independent of each other throughout several insect orders. It is especially prevalent within rove beetles (*Aleocharine*) and scuttle flies (*Phoridae*) where it has evolved tens of times convergently. This project aims to explore the genetic signatures of the convergent evolution of thermophily within these two groups by means of comparative genomics and use this group as a model system for the study of convergent evolution on a gemonic scale. This includes genome assembly and comparative analysis of full genomes and transcriptomes of 20 Aleocharinae and Phoridae species covering eight transitions from free-living to termitophilous. The dataset will ultimately include high-accuracy PacBio HiFi long-reads produced by circular consensus sequencing of DNA libraries prepared with a combination of the Low Input and Ultra-Low input DNA protocols and sequenced on PacBio Sequel II. Currently PacBio Hifi long-reads have been obtained from 10 species. The first assemblies suggests that the genomes are very small, with genome sizes ranging from 120-250 Mbp. The next stages will be to gather Hi-Fi data and transcriptomes for the initial genome set and expand the sampling towards the target 20 genomes. The results of this study will be a part of a larger study on the genomic and phenotypic evolution of convergently adapting insect lineages. With the use of this model system we aim to contribute to the greater

understanding of the genetic mechanisms behind of convergent evolution and explore potential patterns.

Keywords: Comparative Genomics, Convergent Evolution, Aleocharinae, Termitophily

Acknowledgement: This work was supported by GAČR Junior STAR grant 23-08010M "Trajectories of genome evolution in convergent organisms".

Insight into the illegal wildlife trade through publicly available non-scientific sources

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The illegal wildlife trade is the fourth most lucrative illegal trade, after arms, humans, and drugs. The risks of this type of trade are many, not least the introduction of invasive species into non-native habitats or the emergence of new diseases that can be deadly. However, the most significant risk is the loss of biodiversity in nature and the loss of irreplaceable species. Therefore, recent information and data must be collected to inform the public and mitigate illegal trade. This study examines the extent and content of public information on illegal online and physical wildlife trade through publicly available media. A quantitative content analysis of publicly available articles from selected news servers with a global reach over the last decade is used for the actual study. Preliminary results indicate an uneven relationship between the type of products offered and the reporting of conservation measures in the above-mentioned kinds of trade. The results will then be complemented by a content analysis of published reports on illegal trade in animals by governmental and non-governmental organizations, followed by an analysis of actual search queries on the internet using Google Trends.

Keywords: content analysis, environment, endangered species, animals

Acknowledgement: The study was supported by IGA/FLKŘ/2023/004.

Assessing the Applicability of Microsatellite Markers to Identify New Sources of Resistance to Downy Mildew (*Hyaloperonospora parasitica*) in Cultivars of Various *Brassica oleracea* Crops and Several Wild Brassica Species from Genebank Collections

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Breeding for disease resistance is one of the primary objectives in most crop breeding programs. Over the last decade, marker-assisted selection (MAS) has been widely integrated into breeding practices. This study's uniqueness lies in its aim to identify genotypes resistant to downy mildew (*Hyaloperonospora parasitica*) among 274 accessions, primarily from various European *Brassica oleracea* crops (broccoli, Brussels sprouts, cabbage, cauliflower, kale, and kohlrabi), as well as several wild Brassica species, obtained from the collection of Gene Banks worldwide.

The study tested five microsatellite (SSR) markers associated with loci Pp523 (CB10028 and CB10139), Ppa207 (BoGMS0900 and BoGMS0486), Ppa 3 (BoGMS0624) linked to resistance against downy mildew in Brassica species. These markers were subsequently applied to 309 individual plants from 112 selected *Brassica* accessions, exhibiting different levels of resistance to five isolates of downy mildew at the cotyledon stage.

The markers amplified 29 alleles across the analyzed accessions inconsistently, although plants of standard genotypes were used. Nevertheless, marker CB10028 demonstrated the highest consistency, indicating a 158 bp allele for resistant cauliflower and a 149 bp allele for susceptible broccoli, kale, and kohlrabi. Another relatively consistent marker, BoGMS900, indicated 146-148 bp alleles for resistant broccoli and cauliflower and a 132 bp allele for susceptible broccoli, Brussels sprouts, and wild species.

These results suggest that *Pp523* and *Ppa207* may play an important role in identifying resistant *Brassica oleracea* crops.

Keywords: *Hyaloperonospora brassicae*, marker-assisted selection, *Brassicaceae*, molecular markers, crop species

Acknowledgments: This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 774244. The authors are grateful for the financial support provided by the Czech Ministry of Agriculture RO0423.

The impact of small reservoir revitalisation on sustainable development of the city

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The purpose of this study was to establish the basis for the implementation of small reservoir revitalization in urban areas. The main purpose of revitalizing a small reservoir is to strengthen and improve its functions both landscape and storage. Subsequently, the impacts of small reservoir revitalization on the surrounding area, especially on sustainable urban development, are assessed.

The importance of revitalisation and small reservoirs, the reasons for the need for revitalisation and a description of the objectives of the revitalisation Examples of the benefits of revitalizing small reservoirs are improved, landscape functions such as: Groundwater recharge, Influencing flood flows (reduction), Increasing the amount of water in nature, Favourable environment for the development of surrounding biota (fauna and flora), Improving water quality (purity). But because it is necessary to look at revitalisation from multiple perspectives, the thesis focuses on the assessment of revitalisation, both in terms of technical and social benefits. The thesis uses social research, i.e., collecting information from randomly selected people. The research focuses on three perspectives of sustainable urban development: economic, environmental and social. Among other things, the thesis relies on the data obtained from the measurements of the pond's hydrology. The findings obtained from the planned construction of the reservoir are also used to carry out the work. It is assumed that the retained water and its quality have an impact on the surface water function, especially on landscape, economic, and recreational functions (e.g. bathing), and due to the increased pressure on water, the need to build waterworks increases. The paper highlights the potential for water retention in the landscape and its benefits for human

population. Field surveys among people, scientific articles and statistical data obtained through professional measurements are used to illustrate the result. The purpose of this work is to give a comprehensive view of the issue in order to optimize the implementation of revitalization in the area. The work can be useful for education, subsequent design of small reservoir revitalization and also as a comprehensive background on the subject.

Keywords: small reservoir, community, citizens, revitalization, sustainable development

Home range analysis and habitat preferences of wolves recolonizing central European human-dominated landscapes

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In the last 20 years, the Grey wolf (*Canis lupus*) rapidly started to re-appear in their previous habitats and establish territories in the current profile of the heavily human-altered landscapes of Central Europe. Understanding the spatial ecology of wolves in highly modified environments is crucial, given their high potential to cause conflicts and the need to reconcile their return with multiple human concerns. In five Central European areas, we equipped thirteen wolves (from eight packs) with GPS collars. We calculated the monthly home ranges for every individual with the use of the Autocorrelated Kernel Density Estimation method. Furthermore, we used ESA WorldCover to assess the mosaic of landscapes for each home range. Home range size for the majority of wolves (84.6 %) ranged from 56.4 to 259.7 km2. We confirmed the general seasonal pattern for breeding individuals with apparently smaller home ranges during the reproduction phase. Non-breeders did not show any specific pattern. Concerning landscape usage, our wolves predictably showed a general preference for

remote areas, in particular forests. Some animals in military training areas also showed a broader preference for grasslands, which could be influenced by specific land use of this habitat type and the high availability of prey. Our results brought comprehensive insight into wolves' ecology during their re-colonization of Central Europe.

Keywords: territory, *Canis lupus*, Autocorrelated Kernel Density Estimation, seasonal dynamics, habitat preferences

The application of composted sewage sludge to brownfield soil and its impact on the risk elements content and soil properties

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The study deals with the issue of sludge utilization from wastewater treatment plants and the possibility of using this type of waste for soil remediation with regard to the chemical composition of the material. The main concerns regarding the possibility of using sludge on soil involve the risk of the presence of hazardous components and their release into the environment.

The aim of this work was the field examination of soil from an experimental area after the application of composted sewage sludge, monitoring the content of risk elements: As, Cd, Co, Cr, Cu, Ni, Pb, Sb, Zn and their availability under soil conditions. For this purpose, the leaching test according to ČSN EN 12457-4 – Verification test for the leaching of granular waste and sludge was chosen. This test allows for a quick assessment of waste quality and potential environmental impact. Based on the obtained results, a suitable method for managing this type of waste can be proposed.

Monitoring the content of these elements in the soil revealed very low concentrations, ten to a hundred times smaller than the threshold values according to current legislation, and a lack of trends towards their increase. It was evident that the soil of the experimental area was not contaminated due to the conducted research. This means that under controlled conditions, especially in terms of risk element content, the application of composted sewage sludge has a great potential, for example, in the

reclamation of landfills or mines, for the revitalization of brownfields, etc. At the same time, it is a possible solution to the problem of the increasing amount of this type of waste. Nevertheless, long-term monitoring of the remediated site is necessary, further supplemented with additional environmental impact assessment. The obtained data are useful for future scientific research on the subject, the development of sludge management strategies not only at the regional but also at the (inter)national level.

Keywords: metals, sewage sludge, soil remediation, brownfield, risk element

Detection of Fusarium Head Blight Resistance Polymorphisms in Selected Barley Varieties by Single Base Primer Extension (SBE)

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Fusarium Head Blight (FHB), a persistent threat caused by Fusarium fungi, leads to substantial annual losses in cereal yield and quality, particularly in barley. Understanding the complex genetic basis of FHB resistance in barley remains a significant challenge. Recent research has revealed that resistance to FHB, as well as the rate of accumulation of mycotoxins produced by the pathogen, is influenced by small-effect genes, modulated by plant morphology and environmental factors. These genes contain single nucleotide polymorphisms (SNPs) impacting plant phenotype to various extents. In other words, the resulting phenotype is determined, among other things, by polymorphisms located at multiple positions within the plant genome. Leveraging the genome wide association mapping (GWAS) method, we localized and identified putative genetic segments. Based on the known position of the polymorphisms in the genome, we developed 15 primers targeting significant SNPs. The Single Base Primer Extension (SBE) method facilitated the identification of specific nucleotides at the SNP site. Organizing these primers into two sets enabled multiplexing of reactions, thus significantly enhancing the overall efficiency of our workflow.

Keywords: multiplex, GWAS, fungi diseases, SNaPshot assay

Acknowledgement: The authors are grateful for the financial support provided by the Czech Ministry of Agriculture RO0423 and to Institute of Experimental Botany of the AS CR for providing the results of the GWAS study.

The evaluation of the effectiveness of hunting dogs used in driven hunts

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Hunting dogs have been used for driven hunts since time immemorial. They have the ability to find game, pick it up and drive it towards the hunter. This ability is mainly due to their excellent sense of smell. The details of their work in drive are not well known and most studies focus more on the game they hunt. The performance of dogs in drives is often debated, so it would be useful to extend and add to the current knowledge about the work of individual dogs and dog groups as a whole, and to assess how they can help improve hunting efficiency. The aim of this study was to analyse the extent of coverage of individual drive by hunting dogs depending on the time course of hunting, to analyse the behaviour and efficiency of hunting dogs during driven hunts using GPS technology. Data were collected from GPS collars during driven hunts in two hunting seasons 2019/2020 and 2020/2021 in the hunting area of the ČZU Forest. A total of 99 hunting dogs of different breeds were evaluated. Subsequent data editing was performed in Garmin BaseCamp, QGIS and Microsoft Excel. Further data processing was performed in a statistical program. The results showed us that the performance of hunting dogs in drives decreases with the time course of hunting during one driven hunt. The drive coverage also has a decreasing trend. Effective use of hunting dogs and good hunting management can reduce stress on both hunted game and other game present, thereby limiting damage to forest stands. Game that are frequently disturbed and stressed cannot sufficiently satisfy their food intake needs, the so-called grazing cycles. Stressed game will seek alternative food sources such as browse in the coppice. Designing proper hunt management, including movement logistics, communication between hounds in the drive and dog handlers, and effective cooperation between dogs can have a significant impact on the success and effectiveness of driven hunts.

Keywords: hunting dog, driven hunts, hunting efficiency, drive

Comparison of caught bark beetle *Ips typographus* (L.) into the pheromone traps with the volume of the bark beetle attacked trees in surrounding forest stands

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According to the current legislation, pheromone traps are used to monitor the state of the spruce bark beetle population. However, it has not been determined whether captures of the pheromone traps sufficiently reflect bark beetle abundance and the damage they caused. This contribution evaluates the relationship between capture to the pheromone traps and the volume of bark beetle harvested wood in the surrounding forest stands at different distances from the trap. In 2019-2022, pheromone traps baited by Pheagr IT pheromone were placed at 6 locations in the CZU forest property in Kostelec nad Černými lesy. Trapped beetles were checked weekly and summarized. This study used only catches during the first bark beetle generation (April to July). By comparing catches in pheromone traps with sanitation felling during the spring period and the so-called "calamitous base" on buffers 100, 500, and 1000 m, only non-significant relationships were found. The strongest relationship was the positive correlation between the calamitous base and the volume of sanitation felling. The negative correlation between trapping to pheromone traps and the volume of sanitation felling within 500 meters indicates the likely relationship between these variables. As the distance increased, this correlation turned positive, likely causing the traps' declining efficiency. Logging of bark wood in the spring up to 500 m may indirectly affect the trapping level in pheromone traps. The effectiveness of the pheromone trap, site conditions, and forest management may all contribute to these findings. Overall, it can be concluded that there is likely no direct relationship between pheromone trap catches and the harvesting of infested wood in their vicinity.

Keywords: forest pest management, mass trapping, harvests, pheromone traps, mass outbreak

Comparative analysis of DNA extraction methods from insects specimen

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Fast, cheap and above all, correct identification of species is one of the most crucial steps in biodiversity research. Our study compares the performance of different methods of DNA extraction (three DNA extraction kits and Direct PCR) using the model species, *Thanatophilus sinuatus* (Fabricius, 1775). We aim to compare performance of different extraction methods in order to allow comprehensive decision making in selecting the most appropriate tool for the proper identification of targeted species. The results of this study will provide valuable insights into the strengths and limitations of each method and their future implications in the biodiversity research. The extractions followed the protocols provided by manufacturers and the extracts were not further treated prior PCR. Each extraction methods were compared based on time efficiency, cost, and quality of obtained sequences. Overall, the NucleoSpin DNA Insect Kit was evaluated as the best extraction method, while Direct PCR method could be used in situations where the amount of samples is high and the available funds are low.

Keywords: Biodiversity, Coleoptera, cost-effective, barcoding

Acknowledgement: The project was supported by Internal Grant Agency of the Czech university of life sciences Prague (no. 42110/1312/3112)

The importance of forest continuity for rare wood-inhabiting fungi

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The loss of European old-growth forests highlights the need for research on native biodiversity and its response to habitat changes. Unlike habitat quality and quantity, which are well studied, the impact of habitat continuity on fungal diversity is poorly understood, despite its importance for forest management and conservation. We studied the influence of habitat quantity, quality, and continuity on the total and red-listed species richness of wood-inhabiting fungi in the conditions of Central European mountain spruce forest. The survey was carried out on permanent research plots, where the structural characteristics of the forest expressing habitat quality (deadwood dimensions and decay stages) and quantity (deadwood volumes) were recorded. The average age of the oldest trees and the number of >250 years-old-trees were used as indicators of habitat continuity based on dendrochronology. Fungi were recorded according to the presence of fruiting bodies during one visit of each plot. The results showed that total species richness correlated best with habitat quantity characteristics (low snags and lying deadwood volume), while red-listed species richness with habitat continuity as expressed by the number of >250 years-old-trees. Our results show that habitat continuity is critical for red-listed species richness and indicate that forest stands with uninterrupted habitat continuity and old-growth stands should be prioritised for conservation. Retention forestry practices preserving habitat continuity should also be required in production forests.

Keywords: saproxylic fungi, forest biodiversity, threatened species, Picea abies, biological legacy, habitat amount, habitat loss

Which characteristics of spoil heaps shape the communities of diurnal butterflies?

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Spoil heaps, formed from coal mining excavated material or other industrial materials like slag, are substituting the early successional stages in our landscape. These heaps, even within a single region, vary in properties, e.g. in thermal activity. Thermal activity influences plant community succession, thus potentially shaping diurnal butterfly communities.

Our study aimed to determine which spoil heaps characteristics impact butterfly community composition. We selected the Ostrava region as our study area, offering 30 diverse spoil heaps. For butterfly monitoring, we chose 10 heaps differing in total area and non-forested area (from which we calculated the area usable by most butterflies), type (coal and non-coal), presence of thermal activity, year of cessation of dumping, and year of completion of subsequent reclamation activities. Butterflies were surveyed during the 2023 season with repeated site visits, and their abundance was categorized into abundance classes. We assessed each species' commonness/rarity in the landscape based on the number of occupied mapping squares post-2009. In total, 35 diurnal butterfly species were recorded. CCA analysis revealed that butterfly communities are primarily influenced by usable area usable and thermal activity. Heaps without thermal activity hosted 'rarer' butterfly communities with greater taxonomic diversity than thermal heaps. Heaps where human activities ceased recently hosted more taxonomically diversified communities. Future research will focus on a broader set of functional traits of butterflies to understand which traits are correlated with particular spoil heap properties, and which prevail in butterflies occupying heaps compared to the surrounding landscape.

Keywords: spoil heaps, thermal activity, butterfly communities, multivariate analysis

Soil carbon stocks in unmanaged (primary) and managed forests in Central and Eastern Europe

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Forest soils store a significant amount of global carbon and act as a source and sink for atmospheric carbon dioxide. Forest management activities such as thinning and litter raking can alter the net balance between the rate of carbon input and output from the soil, thereby affecting soil concentration and pools of forest soil. Many stakeholders support planting new forests as the best strategy for higher carbon accumulation because the young forest has the highest biomass increment. On the contrary, we may be underestimating the value of old forests for carbon accumulation. The annual rate of carbon accumulation is probably lower in old forests, but the long-term carbon accumulation is higher than in regularly managed forests We do not have reliable data from Central and Eastern Europe that allows us to compare carbon accumulation in the soils in unmanaged and managed forests. Here, we explore the forest soil carbon data from primeval beech-dominated mountain forests in Slovakia with adjacent managed forests and unmanaged forests in the Czech Republic with adjacent managed forests. By using the methods described in Huntington et al., (1989) paper, 0.5m2 pits were excavated in Velká Fatra Mt, Polaňa Mt, and Klenovský Vepor Mt regions in Slovakia and, Novohradské, Vysočina, Chejlava regions in the Czech Republic to measure soil masses and collect soil samples for carbon concentration analysis. From each soil pit, humus (without litter), and mineral soil from three depth strata were taken. Three mineral soil depth strata were 0-10cm, 10-20cm, and 20-40 cm. Consequently, managed forests in Polana and Vepor Mt regions in Slovakia have significantly lower soil carbon stock compared to primary forests. Similarly, managed forests in Chejlava and Vysočina regions in the Czech Republic also have significantly lower soil carbon stock compared

to primary forests. However, managed forests in Novohradské region has significantly higher soil carbon stock than primary forests.

Keywords: soil, carbon, primary forests, managed forests, soil pits

Acknowledgement: I am grateful to my supervisor RNDr. Jenyk (Jan) Hofmeister (CZU) for providing guidance, support, and feedback since the beginning of my PhD research project. I am also thankful to Prof. Miroslav Svoboda, head of the forest ecology department (CZU), Ing. Martin Mikolas, for their encouragement and insightful comments.

Impacts of land tenure security on the conversion of agricultural land to urban use: A meta-analysis

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Land tenure security increases farmers' willingness to invest in agriculture and sustainable land management and benefit from its revenue. Hence, land tenure security and significant changes in agricultural land are interconnected. Much analysis has been done on the impacts of agricultural land conversion to urban use (ALCU). However, there needs to be a comprehensive assessment of the impacts of land tenure security on ALCU. The current study conducted a meta-analysis applying various inclusion and exclusion criteria based on the synthesized results of 56 articles. The independent variables included ownership (private land and common land), legal status (titled land and untitled land), tenure type (land farmed by owner and land farmed by tenant), and cadastral assignment (assigned agricultural land and not-assigned agricultural land). By investigating the impacts of the independent variables on ALCU as a dependent variable, the findings showed a decrease in the ratio of ALCU for a few of the variables, including private land (-1.86), titled land (-2.97), land farmed by owner (-3.42), and assigned agricultural land (-2.62). As revealed by the results, the lowest ALCU occurs when the farmers own their lands, which shows the importance of the relationship between land ownership and land use. It also shows that farmers are more inclined to preserve their lands for agricultural use due to their long-term perspective and financial stability. The second significant decrease belongs to titled land, showing that with clear land titles, there are legal protections against unauthorized land seizures or disputes. Untitled land showed the highest increase in ALCU (7.96), indicating that it is more vulnerable to land grabs or development plans by individuals, organizations, or even governments. Based on the findings, it is recommended that policymakers i) provide better support for legal management plans about agricultural lands for farmers, ii) define titled land, especially

for smallholder farmers, to promote resisting pressures for rapid land conversion, and iii) address land tenure security, primarily in underinvested areas to reduce land degradation caused by the rapid agricultural land conversion.

Keywords: ownership, legal status, tenure type, cadastral assignment, meta-regression

Temperature Dynamics in the Urban Environment

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The urban climate is receiving increased attention mainly due to climate change. Cities frequently demonstrate higher mean average air temperatures than surrounding rural areas, a phenomenon called the 'Urban Heat Island' (UHI). There are several ways to mitigate the urban climate, but urban green spaces (UGS) have an advantage over other cooling systems. The study was conducted in Zvolen, a medium-sized town situated in central Slovakia. The previous study confirmed the existence of the UHI effect during the summer months in a town with a minimum area of impermeable surfaces of over 80 % and with relatively large woodland in its vicinity. Moreover, based on the results obtained, it can be concluded that the cooling intensity and cooling distance depend on the size and structure of the UGS. The most significant cooling effect is provided by large green tree spaces. While we lacked in situ measurement validation in previous studies and focus more on remote sensing and GIS techniques, in the current study, we supplement the data with air temperature and relative humidity measurements using five fixed weather stations installed in various locations: 1. Technical university area, where maximum air temperature reached 37,6 °C and minimum -16,5 °C; 2. university park with recorded temperature 37,6 °C and -17,0 °C; 3. street with avenues of trees (38,0 °C; -16,6 °C); 4. town square (38,2 °C; -17,0 °C); 5. park on the town square (39,4 °C; -16,9 °C). Data collection spanned a two-year period, from October 1, 2021, to September 30, 2023. Preliminary results indicate that the university park had the lowest occurrence of days with temperatures exceeding 32 °C (1,7 %) while the town square recorded the highest frequency of such days (2,4 %). Consequently, it can be inferred that air temperatures at the selected locations are influenced by the extent of urban development, the presence of shading determined by tree crown height and size, building height, and street width.

Keywords: urban climate, urban greenery, air temperature

The influence of management and weather on grassland insects

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Grasslands are a natural part of the landscape of the Czech Republic. Many groups of animals depend on them, but especially grassland insects. Grassland insect populations are influenced by many factors. The aim of this study was to evaluate the influence of management and weather on selected groups of grassland insects. The species richness and abundance of diurnal butterflies and floricolous beetles, as well as the population density of honey bees, including weather and environmental variables, were recorded at 30 sites in the Polabí region. Diurnal butterflies were influenced by temperature, humidity, wind speed and floral density. Floricolous beetles responded to temperature, humidity wind speed, protection, and flowering. Honey bee were influenced by light and flowering. Both weather and management appeared to significantly affect the insects. The influence of weather should have been taken into account in any insect data collection, as the frequency of insect occurrence is strongly correlated with it. A notable effect on all groups was floral density, which was strongly dependent on mowing method. It is therefore worth reflecting on the current management of grassland communities. If mosaic mowing was preferred everywhere, instead of mowing the entire meadow at one time, the availability of flowers would be sufficient for the entire growing season. This would benefit not only pollinators but also other groups of insects.

Keywords: grassland, biodiversity, weather, management, butterflies, beetles, honey bee

Every day, the same bryophyte lunch: is it boring or dangerous?

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Dietary mixing is a beneficial feeding strategy for many animals, particularly herbivores. In this research, we explored whether dietary mixing is advantageous for bryophagous insects as well. We selected Cytilus sericeus beetles (Coleoptera: Byrrhidae) as the model organism. Our investigation comprised two experiments to examine the effects of dietary mixing. The first experiment targeted younger beetles (specifically, those in the egg-laying phase), whereas the second experiment focused on older beetles that were not laying eggs. Across both experiments, we monitored these parameters: weight changes, length of survival and egg-laying (applicable only in younger beetles) on diets containing: i) one moss species, ii) two moss species within the same order, iii) two moss species from different orders. Notably, we used nine species of mosses from tree orders in the experiment. Our findings from the first experiment revealed that dietary mixing conferred benefits to younger beetles evidenced by an increase in weight and enhanced frequency of egg-laying when fed diets comprising different moss species but from the same order. However, the positive effect was not observed in the older beetles (in the second experiment). This suggests that beetles' nutritional needs and possibly preferences change with age. This study significantly enriches our understanding of the pros and cons of dietary mixing in bryophagous insects and elucidates the impact of an individual's age on its adaptability to different host species.

Keywords: age-dependent preferences, bryophagy, Cytilus sericeus, dietary mixing, nutritional benefits

MicroChar, a Novel Biochar from Biowastes, Enhances Phosphorus Availability and Crop Productivity in Nutrient-Deficient Soils

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Within the finite global phosphorus reserves, novel techniques to enhance phosphorus availability in agricultural soils are imperative. This study explored the potential of MicroChar, produced via pyrolysis of biowastes and microbial inoculation, to improve phosphorus accessibility in nutrient-deficient soils. Combining incubation trials with two soils and pot experiments amending Regosol soil with 2% MicroChar, we examined impacts under optimal and drought conditions, using pea (Pisum sativum) as an indicator crop. MicroChar significantly increased soluble phosphorus in soil pore water up to 2000% over commercial biochar and controls, under both optimal and drought conditions, with elevations sustained throughout incubations and pot experiments. The high porosity and surface area of MicroChar likely promoted phosphorus sorption, retention, and gradual release. Under optimal conditions, MicroChar also stimulated pea root, shoot, and pod growth, implying enhanced phosphorus nutrition. However, drought stress suppressed plant response regardless of phosphorus availability. Overall, MicroChar augmented plant-accessible phosphorus in phosphorus-deficient Regosol, bearing critical implications for sustainable phosphorus management in agriculture. Strategic MicroChar application shows potential to improve phosphorus efficiency. Further trials across diverse soils and climates would extend these findings.

Keywords: Biochar, nutrient increase, phosphorus, drought soil, crop growth

Quick response code as surveying tool for trail users

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The primary industries that used Quick Response (QR) codes were the automotive and consumer markets. However, during the disruptive period of COVID-19, QR codes became widespread. This paper explores the relationship between the scanning of QR codes and the submission of filled questionnaires. It also examines if the locations of QR codes affect the submission rate. Moreover, it demonstrates the technology's ability to accurately determine from which site a QR code was scanned and how many times it gets. Furthermore, this technology could be an indispensable tool for future projects for collecting trail users' data as it is resilient to weather conditions (given the QR posters used were weatherproof), day or night. It also eliminates the necessity of deploying personnel to hand out physical questionnaires, thereby removing the intrusive manner of stopping trial users while they enjoy the trails. The study finds no statistical significance that the location of the QR code affects the submission; however, if an individual scans a QR code, they are likely to submit a filled questionnaire. This project was conducted during my ERASMUS internship at the Institute of Geography and Spatial Planning, Universidade de Lisboa, in the Estrela Geopark, Portugal, for over five months.

Keywords: QR codes, Hiking trails, Estrela Geopark, Portugal, Tourism

Acknowledgment: I am grateful to our university, the CZU ERASMUS program, for allowing me to conduct the project in Estrela Geopark, Portugal. I would also like to thank my supervisor, Inês Boavida, Ph.D. of the Institute of Geography and Spatial Planning, Universidade de Lisboa, for her unconditional support during my internship and with the project. I also want to thank the Geopark representatives for their support in fulfilling the project.

Towards smart and regenerative urbanism under the urban metabolism concept

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The rapid, uncontrolled, and unplanned urbanization combined with unsustainable consumption of resources generates negative socio-economic and environmental consequences that deteriorate the quality of life and public health. This work conceptualizes smart and regenerative urbanism under the circular urban metabolism (CUM) framework in line with the Sustainable Development Goals (SDGs) envisioning urban futures able to balance social, economic and environmental sustainability. Using the CUM framework a comprehensive grasp of the complexity of urban systems dynamics and its transformation in a circular and sustainable way is provided. It provides insights into the functioning of urban systems, including processes like transportation, energy production, waste generation, and land use while modelling, quantifying and analyzing the circular flows of materials, energy, and resources through an urban area. Smart and regenerative urbanism results in safe and secure, attractive, liveable, healthier, and more creative urban places, highlighting the need to use ICT, Big Data, and ubiquitous technologies along with ecological principles in urban planning, design and management. We perceive urban systems like ecosystems and the services provided by the different urban processes as ecosystem services. We conduct a multidimensional metabolic analysis of urban system dynamics from the perspective of ecosystem services identifying the indicators representing the smart and regenerative urban metabolic processes, along with their dimensions and subdimensions. The relationship between the urban systems under this framework is open, ongoing, and co-evolutionary

emphasizing the human-nature systemic interdependencies and the effect of ecosystem services on human well-being and survival. This work sets the conceptual framework to support policymakers and fellow academics in the implementation and operationalization of CUM.

Keywords: urban ecosystem, urban metabolism, system dynamics

Mapping Restoration Potential: A European Index for freshwater-related ecosystems restoration

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European freshwater ecosystems are in a critical state with 60% failing to achieve good ecological status. Several pressures such as water pollution, abstractions, drought, floods, and alterations in Land Use Land cover caused by expanded urbanization and agricultural land causes hydromorphological impacts on the surface water bodies worsening the health of freshwater ecosystems. European Commission has set targets to restore the degraded ecosystems and return them to good conservation status through the Nature Restoration Law as part of the European Green Deal and its 2030 Biodiversity Strategy. This study aims to support this effort by modeling the Restoration Potential Index (RPI) reflecting the easiness of implementing restoration actions and the potential to obtain ES co-benefits from these actions as well as the areas of legal commitments present across European territory. To construct the RPI we first developed the Ecosystem Services Assessment (ESA) Indicator that expresses the potential co-benefits when restoring. The ESA was modeled by combining Multicriteria analysis and Geographic Information Systems (GIS) and using six ecosystem services related to freshwater-ecosystems (Crop Pollination potential, Water Purification demand, Flood

Control unmet demand, Soil Retention unmet demand, Soil Organic Carbon (SOC) saturation capacity, Nature-based Recreation unmet demand). The second component of the RPI was the enablers of restoration using the Natura200 sites where the implementation of restoration actions is facilitated by legal protections. We used the Human Footprint Index expressing the cumulative human pressure on the environment as the constraint to restoration. The RPI values were obtained by calculating the area created when representing the three components in a radar graph. The results of this study can serve as valuable inputs for shaping policies and making decisions by highlighting the regions in Europe with higher and lower potential upside.

Keywords: freshwater ecosystems, restoration potential, decision-making

Acknowledgment: The work has been funded by the MERLIN Project (101036337-MERLIN-H2020-LC-GD-2020).

Behavioral model of red deer based on a highly sensitive accelerometer and its applicability in telemetry studies

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Animal monitoring technology advances offer insights into wildlife behavior, impacting ecosystems. Large ruminants, the key to forest regeneration, face challenges from human activities and wolf recolonization. Understanding deer behavior in the presence of wolves is vital for game management. While predator-prey research centers on wolves as predators in the past, there's a gap in understanding deer responses as prey. Examining the predator-prey dynamic is crucial for predicting wolf damage, aiding preventive measures, and using wolves to control deer populations. The thesis focuses on constructing a behavioral model for red deer and it´s implication. For that we will use data from experimental trials conducted in closed deer farms, primarily at VUŽV Uhříněves. DailyDiary sensors equipped with a highly sensitive accelerometer will be attached to the deer, matched by video recordings for training the behavioral model. Subsequently, this model will be applied to field data collected through remote tracking of collared European deer using GPS modules and three-axis accelerometers. The research will include older deer telemetry data from 2009-2017 before the return of wolves from the Lužické mountains and NP Czech Switzerland and the Doupovské hory area from 2010-2022. The central monitoring area will be the western part of the Lužické mountains and NP Šumava, where wolves have been present for several years.

The expected results of the study are to build a behavioral model for European deer, define seasonal behavior changes, and examine changes associated with the return of wolves. The following outputs include comparisons of deer behavior before and after wolf reintroduction, with findings contributing to wildlife management and conservation strategies. This study expands our understanding of the behavioral responses of European deer to wolf reintroduction and their impact on the ecosystem.

Keywords: biologging, telemetry, deer, behavior, wolf

MEFC – A future pan-European Minimum residual flow assessment tool

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The Danube River Basin (DRB) was selected for the calculation and evaluation of various approaches to Minimum Residual Flows (or Minimum Ecological Flows); hence MEFC. This work is done within the project Danube River Lighthouse Action (DALIA), which started at the beginning of 2023. DRB, being the second largest river basin in Europe and the world's most international river basin, is the perfect lab for country-specific approaches testing. The aim of the MEFC application is to provide a simple-to use tool, oriented to the end user. To date, user can process runoffs that have been collected for the Global Runoff Data Base. The tool is available online and enables multi-perspective analysis of runoffs. The user can perform basic filtering according to date, state and gauge station. Current version provides visualization of available time series, seasonal decomposition of discharge, flow duration curves, pardé coefficients and values of quantiles of discharge. Calculation of MEF is part of the data analysis section. MEF is calculated based on state methodology, which could be changed based on users choice. Finally, there will be tools to compare the actual chosen period of observed data with calculated values of MEF and several analyses such as calculation of total deficit discharge volume will be provided. Except for analysis of predefined basins located in the Danube region, users will have the option to load their own datasets with observed data and perform the same analysis as mentioned above. Future development of the application will focus on extending the spatial domain to more basins with a minimum extent of continental Europe.

Keywords: minimum residual flow, Danube river, discharge

Spatial-temporal changes and driving forces in the development of build-up area at the landscape level in the Czech Republic

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History helps us understand how processes in the past made things the way they are today. However, those who fail to learn historical faults are doomed to repeat them.

Patterns and phenomena close to each other are interdependent and related due to the influence of spatial interaction and spatial distribution.

The ongoing project objectives are to assess the changes of urbanization in space and time at the landscape level. The aim is to analyze the correlation between drivers of urban expansion and ecological conditions. The Czech Republic's landscapes and historical development in the 19th and 21st centuries have been chosen for investigation. To illustrate the state of critical parameters of natural and semi-natural environmental conditions for six main land types randomly chosen ten cadastral areas.

Methodological process

1. The analytical part consists of selecting and evaluating current and historical LULC. The chapter includes the ArcGIS method.
2. The second part analyzes the causes and driving forces behind changes in urban areas.
3. The last chapter focuses on the problems and prospects and attempts to avoid mistakes committed in the past.

The research may have value for nature and landscape protection using multidisciplinary landscape assessment.

Keywords: build-up area, driving forces, land use (LU), land cover (LC), landscape, mapping, urbanization

Acknowledgment: I would like to extend my sincere appreciation to my supervisor, Dr. Ing. Jan Skaloš, Ph.D. for his invaluable guidance and support during my working on the project. The suggestions provided by him are of great value and proved to be extremely beneficial to me.

Long-term measurement in Zverinek experimental field

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The current era places great demands on water management in the agriculturally used landscape. The future will make these requirements even stronger. One of the ways to keep water in the place of precipitation is the application of biochar to the soil. Biochar increases the retention capacity of the soil. An experimental station has been established in the Zverínek research location. The establishment of the research site took place in 2021, since this year continuous measurement has been carried out. The site is integrated into an agricultural area. The experimental field is divided into several sections. The entire range of hydrological quantities is measured. It is primarily a measurement of soil moisture using tensiometers and FDR sensors. These sensors are supplemented by ground water level measurements and soil water sampling for chemical analyses. The state of the atmosphere is measured using an equipped weather station. In addition to temperatures, precipitation and wind, the amount of solar radiation is also measured. Long-term measurement shows the benefits of applying biochar to the soil. Using complex data from the research site, the course of water content in the soil and its continuity is analyzed.

Keywords: Long-term field measurement, moisture sensor, Volume Water Content

Acknowledgement: This research was supported by the Ministry of Agriculture of the Czech Republic (project no. QK1910056).

Historical data summarization of barley genetic resources collection from Czech Republic

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Exploration of Plant Genetic Resources plays a crucial role in crop adaptation. Over the decades, extensive datasets of phenotypic data have been collected for various crops in numerous countries worldwide. Barley, in particular, holds significant importance. Not only is it one of the most cultivated crops, but its genetic variability and adaptability to diverse environmental conditions make it a valuable resource for breeding programs. In our research, we focused on examining data from field trials conducted on the spring barley collection. A comprehensive dataset comprising nearly 500 items was collected and subsequently analyzed based on experiments conducted from the 1950s to the present. Using linear mixed model we calculated heritability and Best Unbiased Linear Estimates for the examined traits. The results of our findings will be presented.

Keywords: barley, historical data, linear mixed model, BLUEs

Acknowledgement: Research was supported by European Union's Horizon 2020 Research and Innovation Program (AGENT project: grant agreement no. 862613) & Czech Ministry of Agriculture(no. MZE-RO0423)

Modeling of forest canopy height using integration of GEDI and Sentinel satellite data

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The GEDI lidar was designed to monitor ecosystems and canopy height, however, its measurements are too sparse to provide a continuous vegetation height. Here we aimed to train and validate the model for extrapolation of the canopy height measured by the GEDI satellite based on radar and multispectral data acquired by the Sentinel satellites. The study area consisted of three mountainous regions around the borders of the Czech Republic – the Bohemian Forest, the German side of the Ore Mountains, and both the Czech and Polish sides of the Giant Mountains. For the training of the model data of the GEDI data product L2A version 002 was used. Sentinel data were processed in a resolution of 100x100 meters. Besides basic main spectral bands (NIR, SWIR, RGB, and Red edge) several vegetation indices were calculated such as NDVI, NDMI, and EVI. Radar measurements were considered as potential explanatory variables as well. The models were trained with 70 % of the data (i.e. 52 544 measurements). In the best-fitted model Red Edge, NDMI, a standard deviation of summer radar measurements, a median of the summer radar measurements, and EVI were its explanatory variables. The chosen model explained 52 % of the variability and then it was used to predict values for the testing part of the dataset. Final validation was performed with Pearson correlation coefficient (0,7) and standard error metrics (i.e. RMSE 7,60 m, ME -0,06 m). The value of RMSE achieved was approximately twice as big as in similarly focused papers, ME was on the contrary significantly smaller. It may have been caused by the variable environment in individual regions of interest, by not including topography and type of vegetation in the model, scale, or chosen explained variable (98 % quantile of canopy height). It is on the subsequent works to explain why these errors were so distant from the values in compared studies.

Keywords: LiDAR, Multispectral imaging, Vegetation indices, Boosted Regression Trees

The Vanishing Face of Gaia

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The creator of the Gaia theory is the renowned British scientist James Lovelock, who also voices an opinion on the current development of the planet and humanity - a development that seems to be increasingly accelerated and unpredictable, and as such can easily turn into an irreversible disaster. Lovelock criticizes scientists that their forecasts of climate change and responses of living organisms to a changing environment do not take into account real-world observations, and politicians that their agricultural and energy policies lead to inefficiency and corruption. Albeit, the underlying issueis that our planet feeds more people than it can support. At the same time, we do not know in which direction global changes will go, and therefore what we should actually prepare for. In Lovelock's opinion, we have already missed the boat regarding some measures that should have been adopted. Lovelock's views can be disputed in many respects, and he himself is not averse to controversy. However, it is necessary not to underestimate his warning. How to live in harmony with nature in the 21st century? Mewery strives to produce meat that would save the planet from unnecessary pollution, save animals from slaughter and feed an ever-growing population. Businessman Roman Lauš from Brno found an answer to this question thanks to Buddhism and meditation, which he taught and still practices. Buddhism is characterized by an extraordinary love and respect for living creatures. Lauš asked himself a question: What if we combined these two worlds, i.e. algae and meat cells? Scientists in the Brno laboratory multiply pig muscle and fat cells and try to grow them using serum from microalgae. Mixing algae cells with meat cells also means a significant cost reduction for the company. The meat-eating population is also growing in Europe. However, there is no room to increase meat production, so alternatives must be sought to feed people.

Keywords: climate change, global change, disaster, food for overpopulation, cultured meat, clean energy.

Development and testing of the autonomous trap for collecting the spruce bark beetles (*Ips typographus L.*)

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An autonomous trap based on the weight method has been developed to determine the population size of the spruce bark beetle (*Ips typographus L.*). A weighing system was built into the storage container of the Theysohn trap. *I. typographus* attracted by the pheromone dispenser fall into the collection container. Trapped beetles are weighed, and their current number is determined by weight. A general assumption for using this new method is a constant mass of *I. typographus*. Water makes up most of the beetle's body weight and gradually decreases during drying. For this reason, it was important to characterize the weight change, and we tested the weight loss of beetles in laboratory conditions. Adults of *I. typographus* were divided into two groups of 100 individuals. Each beetle was assigned a pre-weighed glass vial in which their initial mass was measured. The measurement was performed by a microbalance KERN with an accuracy of 0.1 mg. After determining the exact weight of each individual, the beetles were placed in a dryer with constant temperatures 50 °C; 30 °C and 20 °C. Every 12 hours, beetles were repeatedly weighed, as long as there were weight changes. Drying at a temperature of 50 °C required 48-60 hours, 120 hours of drying were needed at 30 °C and 300 hours of drying for beetles stored at 20 °C. We determined the water content by the dry mass and fresh beetle weight difference.

To verify that the autonomous trap does not catch a different number of beetles due to the other design, an unmodified Theysohn trap was placed at a distance of ten meters from the trap. The counted number of beetles from the autonomous trap simultaneously helped to verify the correctness of our conversion of weight to a number of individuals.

Keywords: *Ips typographus*, autonomous trap, weighting

Historical Ponds in Interdisciplinary Research

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The aim of my poster is to present historical ponds as objects of interdisciplinary research. My project have studied the ponds from the perspective of environmental history and have found many promising results regarding the relationship between nature and society, including the use of water as a resources or the prevention of hazards. However, there are still many questions that cannot be answered by methods of humanities. Therefore, a multidisciplinary approach is needed. The poster suggests that cooperation between researchers from different disciplines can bring new insights and enrich the fields of study involved. It also articulates particular problems related to the historical development of ponds and invites colleagues to join the work. However, such an approach requires respect and understanding within the multidisciplinary team.

Keywords: ponds, environmental history, water management

Acknowledgement: The study was supported by the Strategie AV21 research programe „Město jako laboratoř změny; Stavby, kulturní dědictví a prostředí pro bezpečný a hodnotný život“

Analysis of Public visual Preferences toward wind turbines Via Photo Simulation and survey

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Public acceptance is a crucial factor in installing new wind farms and is mainly influenced by the visual impact on the landscape. While other studies lack realistic visualisations, in this study, the visualisations are made professionally and accurately. The aim of this study is to analyse the effects of landscape visual quality and characteristics, the number and types of wind turbines and their distance from observers. A survey is used to assess the public concerns quantitatively. The survey was distributed in a way that made it possible to compare the answers of the Czech and non-Czech nationalities. Therefore, the case study was selected from wind farms in the Czech Republic (Kryštofový Hamry Wind Farm). Considering historical and aesthetic factors in visual impact assessment was possible through comprehensive visualisations. Having respondents from different countries made it possible to assess the effect of cultural backgrounds. The findings suggest recommendations for the placement of wind turbines and landscape preservation in the planning phase and during policy-making. The final goal is to understand the connection between wind farms characteristics, visual aesthetics and public attitude to enable stakeholders to develop strategies for balancing the growing demands for wind energy and landscape preservation that assure a more sustainable and visually harmonious future.

Keywords: wind turbine, visual impact assessment, renewable energy, user preferences

Prevalence of non-tuberculous mycobacteria in gestating common noctule (*Nyctalus noctula*) females

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Reproduction is the most energy- and nutrition-demanding period throughout the life of bat females. Daily and seasonal fluctuations of ambient temperature and insect availability strongly affect their foraging activity and reproduction success. These factors are especially pronounced in temperate bat species as offspring must grow quickly during the short warm season and accumulate resources to survive the winter. However, individual female reproduction success may influence also other factors, including parasite and pathogen load. To assess the immunocompetence of 20 female noctule bat Nyctalus noctula during pregnancy we evaluated the presence of mycobacteria in faecal samples using three different methods, i.e. direct microscopy after Ziehl-Neelsen staining, culture examination and qPCR. The majority of females was positively tested to mycobacteria presence (90%) at least once but two females were negative during all study period. The prevalence of mycobacteria shading changed during the pregnancy with the highest rate in two periods i.e. after the hibernation and shortly before the parturition. The pattern of prevalence changes differed between females with twins and singletons and it was influenced by the food freshness. At the same time, the severity of infection (copies/mL DNA of NTM) increased during the course of pregnancy but the female N. noctula were able to cope with mycobacteria.

Keywords: bats, reproduction, pregnancy, immunity, faeces, NTM

How emerging diseases change wildlife conservation

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The world in the era of Anthropocene is undergoing very fast and often irreversible changes. One of the effects of human success on the planet is erosion of natural barriers followed by biological invasions. Invading pathogenic organisms have potential of changing the nature from the individual performance level up to ecosystem and landscape structure. Concept of human-caused emergence of diseases has gained visibility and infamous reputation after recognition of disease chytridiomycosis globally affecting amphibian biodiversity. The chytrid fungus has become probably the most studied pathogen of wildlife, that has no zoonotic potential and does not infect domesticated animals. After over two decades of intense research, we now understand where it originated, how it spread, where it caused the most severe impacts and which areas were not invaded yet. Chytridiomycosis can act as a model study case of what is possible if a disease spreads in wildlife unrecognized, and unchallenged. The most effective action against new pathogens remains prevention, but various options are being tried when pathogen does emerge. Raising awareness and active involvement of public in surveillance of diseases is gaining importance and has potential to identify threats before they become widespread. Active manipulations from infected individual treatment up to habitat disinfection have been tried with variable outcomes. Assurance colonies can save the species from eminent extinction for a limited period of time but the end, either pathogen is eradicated or the host species need to develop strategies to co-exist with the present threat.

Keywords: EID of wildlife, pathogen pollution, chytridiomycosis, ranavirosis, amphibian herpesvirus, amphibian diseases, Acclimation, transcriptomics, thermal limits, GxE interactions, phenotypic plasticity

Acknowledgement: The lecture is based on the outcomes of a project "Ochrana biodiverzity obojživelníků v souvislosti s invazemi nových infekčních nemocí." no. SS01010233, supported by Technological Agency of the Czech Republic (TAČR).

The role of the solid phase in the immobilization of metal(loid)s in contaminated water and soils

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The solid phase plays an important role in the immobilization of contaminants in the environment, where one of the main mechanisms is binding to the surface of reactive components, e.g., Fe/Mn/Al (hydro)oxides, clays, and/or organic substances, that occur naturally in the environment. It is the strength of the bond between the surface of the solid phase and the contaminant that is important factor influencing the potential remobilization of contaminants, e.g., when external conditions change. Although natural processes are capable of reducing the risk of contamination to some extent, it is often necessary to support natural processes for effective contaminant immobilization. Therefore, the application of innovative inorganic or organic amendments appears to be a suitable and environmentally friendly approach. In addition to the effectiveness and stability of the materials over a longer time scale, even when conditions change, the economic aspect related to the application of such materials on a wider scale also plays an important role. The addition of natural or synthetically prepared materials derived from naturally occurring soil components, such as Fe (hydro)oxides (or their precursors, e.g., zero-valent Fe), Mn (hydro)oxides, zeolites, or various types of clay materials, both anionic (e.g., layered double hydroxides) or cationic (e.g., bentonites), appears to be a suitable approach. In addition to inorganic materials, the application of organic materials, especially those originating from waste, is also growing in popularity, e.g.,the use of thermochemically treated biomass (biochar) or sewage sludge (sludgechar). However, each material has its advantages and disadvantages, which must always be considered when applying such materials on a wider scale, including a detailed study of the removal efficiency, mechanisms, and material stability.

Keywords: metal, metalloid, remediation, water, soil, chemical stabilization, adsorption, precipitation, ion exchange

Modern telemetry in ornithological studies

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Technological development, especially miniaturization, offers new dimensions for biological research of hidden processes. Small dataloggers and transmitters extended the ability to collect data on smaller species over the last decade. Telemetry is especially important in ornithological studies. It is used not only in basic research but also in conservation issues and most reintroduction projects. For many bird migrants, we are still discovering unknown pathways, excellent navigational skills, and surprisingly enormous endurance. Our projects, which have made a significant contribution to this, will be discussed. Besides a substantial number of locations, we also gain additional data about their flights and other activities. In some cases, if the tags are charged well, we can have more than 1 million lines of data per individual. Such large datasets are difficult to analyse in a standard way.

Keywords: telemetry, radiotracking, migration, flight speed

Seznam registrovaných účastníků konference/ List of registered conference participants

Příjmení / Last Name	Jméno / First Name	Pracoviště / Company Name	
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