

International conference: Safeguarding Biodiversity:

Red Lists and Beyond

Riga, Latvia, September 18-20, 2024

Institute of Biology,
Faculty of Medicine and Life Sciences,
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INTERNATIONAL CONFERENCE

SAFEGUARDING BIODIVERSITY: RED LISTS AND BEYOND

Riga, Latvia, September 18-20, 2024

Book of Abstracts



Riga, 2024



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Biodiversity of longhorn beetles (Coleoptera: Cerambycidae) from Pakistan

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From the beginning, news about Pakistan long-horned beetles still soundless. There are still a well-defined faunistic studies and old checklists with no new scientific information after publication. The country splits into two geographical regions, Palaearctic and Oriental which has good hotspots for biodiversity, and a great task is to obtain new inventory in overlapped boundaries of countries. The underestimation of the importance of faunistic studies on a global scale has led to the fact that many species do not have actual information on their distribution for hundreds of years since their description, and we currently do not know whether they are present or extinct in the fauna of Pakistan. The authors of this report have been studying Pakistan long-horned beetles (Cerambycidae) since the last year, awaiting numerous new species descriptions and publishing news on the ecology of some long-horned beetles. The results of our research demonstrate that the fauna of Pakistan is incompletely studied while the country is experiencing very intense deforestation, which is considered the main threat to the biodiversity of long-horned beetles. The broad gap of species in Pakistan will become more vulnerable without assessment faunistic survey with new inventory. Present species which housed in museums have no or limited information about their presence, as proven by the first author visiting all national collections and finding nothing. The global climatic changes could change the number of species, emphasis emergence time short and over cutting the forests in future. Faunistic survey now is essential for this task. Many species of long-horned beetles are forest dwellers, especially the Prioninae and Lamiinae, which highlights the need for awareness in peoples using/cutting the jungle wood for their purposes. Some new records and rare species confined from forests of those areas which cannot treat easily, for instance *Agelasta bifaciana* White; *Arhopalus exoticus* (Sharp); *Nupserha lenita* (Pascoe), *Osphranteria lata* Pic, and *Trinophylum cribratum* Bates. Current knowledge of the 56 species, excluding last year's data, focuses on their known characteristics, behaviors, and conservation statuses, largely based on historical data. While this information is crucial, it may not reflect recent developments, such as new conservation efforts, discovered behaviors, or updated population trends. . Present study deals with 12 species of long-horned beetles from various localities of Pakistan. Some specimens from genera like *Apomecyna* (Audinet-Serville) and *Niphona* (Mulsant) show morphological features differing from those in described species, indicating a need for further study and potential revision.

Key words: biodiversity; Cerambycidae; faunistic data; new records; Pakistan.

Achieving the EU Habitats Directive 30/10 targets in Latvia: challenges and solutions

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MPAs are local nature conservation measures, that imply local management, but the threats are usually not local. Most challenges of protecting marine areas come from eutrophication, wind energy industry, and invasive species. Every challenge has its own possible solution. For reducing negative impact of eutrophication, effective implementation of WFD River Basin Management Plans and Baltic Sea Action Plan nutrient reduction targets must be enforced. To avoid negative impact of wind energy development in marine waters, effective communication and collaboration between industry and nature conservation bodies should be introduced and enforced. To reduce the negative impact of invasive species on nature values, a science-based, effective fishery management should be elaborated.

Key words: MPA; strict protection.

Uncovering what lies within: The first scientific account of cave-dwelling ground beetles (Coleoptera: Carabidae) in the Philippines with the description of a new genus, new subgenus, and four new species from Mindanao

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For the first time in the Philippines, cave surveys were carried out in search of cave beetles (Coleoptera). In this report we present a new troglobitic genus *Kweba* gen. nov. with two new species *K. magbabaya* sp. nov. and *K. diwata* sp. nov. We describe a new subgenus: *Trogloabacetus* subgen. nov. in the genus *Metabacetus* Bates, 1892, with the addition of two new species, *M. (T.) baltazarae* sp. nov. and *M. (T.) desideratus* sp. nov. from various limestone caves of Mindanao Island. *Anaulacus* (s. str.) *fasciatus* (Schmidt-Goebel, 1846) is also reported from the cave habitats. A key to the new and related genera, images of habitus and genitalia, and distribution maps are provided.

Key words: Cavernicolous; Pterostichinae; Abacetini; taxonomy.

Results of the extinction risk assessment of nationally protected vascular plant species in Latvia

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The extinction risk assessment in accordance with the IUCN criteria and categories has been carried out in Latvia (2021-2023) for all 228 legally protected vascular plant species in the country, except for five species as according to our recent data they should be considered NA. Justifications for skipping assessments of these species were prepared. For *Dianthus arenarius* L. both subspecies occurring in Latvia were evaluated, and *T. balticum* Dahlst., *T. lissocarpum* Dahlst., and *Taraxacum suecicum* G.E.Haglun were assessed instead of *Taraxacum palustre* Lam. et DC. All four nationally protected species of restricted use were also considered. The majority of 230 assessed taxa met the criteria for EN (126 taxa), fewer - for VU (36), CR (30), LC (20), NT (7), DD (8), and RE (3). The criterion B (Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy)) was the most common criterion applied followed by criterion D (Very small and restricted population). Our results suggest that the majority (18 species) of the CR nationally protected vascular plants species occur in semi-natural grasslands. Therefore, the state agricultural policy appears of the high significance for the survival of these species. Regarding to other habitat types of the CR species, forests (four species), clear-water lakes (3), mires and springs (3), as well as coastal habitats (2) are represented. According to the criteria developed during the project, 90 other vascular plant species, which had been assessed during the LIFE FOR SPECIES project, also require legal protection in Latvia, but 13 species were proposed to be excluded from the list of specially protected species (11 species) or species of restricted use (2 species). Arguments are presented. We want to emphasize that to ensure a long-term survival of rare and endangered vascular plant species, not only their legal protection status is required, but also research as well as site protection, on-site management, and spatial planning. Last, but not least, the state policy in forestry and agriculture plays a crucial role in the long-term maintenance of rare species in their natural habitats.

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Key words: IUCN categories; legally protected vascular plant species; Latvia.

Assessment of socio-economic impact: focus on benefits

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One of the tasks within the project LIFE FOR SPECIES (LIFE19 GIE/LV/000857) is to update the lists of specially protected and micro-reserve species, and to compile updated drafts for legislative amendments.

As a part of this task, we have assessed the potential socio-economic impact of the project-driven changes to national legislation, focusing on the updates for the lists of specially protected and micro-reserve species. This involved a quantitative analysis of socio-economic benefits and costs for those changes. We would like to highlight the benefit side (aspects, methods and results) of socio-economic assessment.

We used an incremental approach for the assessment, defining a change scenario and evaluating its socio-economic costs and benefits compared to a base scenario, where:

1. Base Scenario reflects the situation if proposed changes in legislation are not approved (measures to prevent decline of species populations are not implemented);
2. Change Scenario models the situation if the proposed regulatory changes are accepted and implemented, ensuring the protection of newly listed species and preventing their populations decline.

For the base scenario, the assessment considered expected trends in species deterioration as considered by experts. For the change scenario, socio-economic (including cultural or intangible) benefits and costs were identified, assessed, and compared to the base scenario using a socio-economic benefit-cost analysis.

Socio-economic benefits in the change scenario include the following types of benefits:

1. Intangible Value: The preservation of species, preventing their reduction.
2. Reduction of Greenhouse Gas (GHG) Emissions due to the lower intensity of economic activity in agriculture.

In spring 2024, a survey of Latvia's population was conducted to gauge public willingness-to-pay (WTP) for the preservation of endangered species by implementing additional protection measures. The survey results allowed us to assess the intangible value of species conservation as part of the socio-economic benefits arising from the change scenario, i.e., if the proposed changes to the national legislation are approved and implemented.

To assess the benefits of reduced GHG emissions due to decreased agricultural intensity, we assumed in the change scenario that intensive crop production in protected areas is replaced by organic crop production. This would result in reduced direct emissions of nitrous oxide (N₂O) and ammonia (NH₃), as well as reduced indirect GHG emissions from nitrogen oxides (NO_x) and nitrate ion (NO₃) runoff/leaching, which were evaluated as socio-economic benefits.

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Key words: socio-economic assessment; socioeconomic benefits; willingness-to-pay.

Little and a lot of data, both with their own challenges: approaches used for the red listing of birds in Latvia

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Red listing often involves species with limited available data. However, sometimes the abundance of species-wise data is overwhelming. When dealing with larger suit of species, e.g. larger taxonomic group such as birds, experts are challenged to find solutions that produce results that are comparable within the group. Here we present the workflow and approaches used for the red listing of birds in Latvia.

To begin evaluation, a clear frame that follows IUCN guidelines needs to be set. We chose to evaluate every species observed in Latvia since 1900 in three population types – breeding, wintering and passage. As species in breeding category, we selected those with at least probable breeding in Latvia for at least a decade. If wintering or passing population could not be clearly differentiated from breeding population, the latter one was used in further evaluation. For the remaining species, we evaluated data availability for red listing. As the final general criterion, we set out to use only observations from 2012 to 2021 when estimating current population size and range.

To calculate distribution metrics, we combined information from the database ‘Ozols’ and the citizen science geoportal ‘dabasdati.lv’. We filtered these observations to ensure as much reliability as possible without individual evaluation, which we performed only in rare species. Finally, we produced distribution maps and sent them for evaluation to the bird conservation experts.

For the population sizes we used data from the national reports for the Article 12 of the Birds Directive. Whenever possible we used monitoring data to obtain a quantitative estimate of the population change and compared population estimated of two time periods otherwise. We calculated both linear and loess estimates with MSI tool. We collected each of 10000 MCMC estimates representing population change over three generations and calculated support for every red list category.

We combined the results of IUCN criteria A, B, C and sometimes D to obtain a total red list category. Finally, we considered overall population statuses in neighbouring countries for the final step in the evaluation.

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Key words: observation filtering; linear and non-linear trend estimation; data rich and data poor species; national red list; application of IUCN red list criteria.

Conservation of biodiversity in intensive agricultural areas: engaging farmers through living labs

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The decline in insect populations in the world has recently been described as apocalyptic in both protected areas and intensive agricultural areas, where the decline can reach 95 % in the most exposed areas. The major causes of the decline are pesticides, habitat loss and climate change. This observation is alarming given the key role played by insects in the provision, regulation, and dynamics of many ecosystem services such as pollination or biological control. One of the levers for mitigating this problem is Ecological intensification, i.e., using natural processes to replace anthropogenic inputs such as pesticides and fertilizers. However, it is often hindered by insufficient acceptance and/or adoption by conventional farmers in Europe. Indeed, most of the value of the ecosystem services provided by insects is outside the market and best considered as non-tradable public benefits. This may imply the absence of a market price for this type of asset. The actions to be taken must be performed by farmers, who can usually derive no immediate benefit from them. In this context, how can conventional farmers be involved? Enhancing awareness of related benefits provided by ES is a prerequisite for successful biodiversity conservation in the agricultural ecosystems. In local Living labs, farmers, stakeholders from all backgrounds, scientists and non-scientists, work together on projects that aim at improving habitats in local agroecosystems for biodiversity conservation. It engages them to envision solutions and collectively devise a conservation strategy to promote long-term biodiversity preservation. Participants may also benefit from such an approach as it may change perceptions, value systems and skills through informal learning. Consequently, social benefits including environmental democracy and social well-being upon co-production of knowledge and co-decision of adopted measures may balance perceived economic costs. This communication focuses on the presentation of the Biodiversa ConservES project, which involves conventional farmers in different living-labs on a gradient between Brittany in France to the Czech Republic in order to increase biodiversity in conventional agricultural cereal fields.

Key words: biodiversity conservation; intensive agriculture; ecosystem services; living-labs.

Prioritising conservation action for trees at national, regional and global scales

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Trees are essential to life on earth – playing important economic, ecological, and cultural roles. However, the threats to trees are many and diverse and there is a vital need for an increased conservation focus on tree species. Without the conservation assessments of trees how can we know what are the most pressing threats to specific tree species and their habitats?

The Global Tree Assessment is an initiative to assess the IUCN Red List status of all the world's tree species, co-led by Botanic Gardens Conservation International and the IUCN Species Survival Commission Global Tree Specialist Group. This work is enabled through a global network of over 80 partner organisations and more than 1,000 tree experts, and is one of the largest global assessment project to date.

In addition to global assessments, national red list assessments are vital to set national targets and raising awareness. These initiatives are also key in the success of global conservation actions, by providing important local species information. This talk will share examples of how national and regional assessments have been used in global IUCN Red List assessments, as well as exploring ways of how global IUCN Red List assessments can be used to inform national and regional assessments.

Key words: national red list; tree diversity; extinction risk.

New insights into the growth conditions and distribution of the protected intermediate wintergreen *Pyrola media* Sw. in Latvia

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Within the LIFE FOR SPECIES project, the protected intermediate wintergreen *Pyrola media* Sw. was initially assessed as DD (Data Deficient) in Latvia. The few known localities had not been re-surveyed and only one targeted small-scale survey was carried out prior to the beginning of the project, albeit failing to uncover new *P. media* sites. Furthermore, there was a lack of data on the species' habitats, preferred ecological niches, as well as population size and dynamics. Therefore, the aim of the study was to re-survey the known localities in Latvia and determine the habitats and growth conditions characteristic to the species.

As difficulty discerning *Pyrola media* from other *Pyrola* spp. was often cited as the main issue in detecting the species, preliminary research focused mainly on species morphology. Shape and size of sepals, shape of corolla at full bloom, length and curvature of style, and positioning of stigma lobes were determined as the principal identifying features and used to verify *P. media* specimens in the University of Latvia and Daugavpils University herbaria. These also served as the main sources of information on the species occurrence in Latvia.

In 2023, 12 of the 15 known localities in Latvia were surveyed. *Pyrola media* was confirmed at five of the known localities and found at one new locality. The species was identified both morphologically, using the previously determined principal identifying features, and molecularly, using iPBS primers. The results demonstrate that the species grows in more diverse habitats in Latvia than thought previously and has broad tolerance to various ecological parameters, such as soil reaction, organic matter content and exchangeable cation concentrations, but the obtained data is insufficient to determine their optimal ranges. It is, however, hypothesized that some of these parameters, for example, shade intensity, soil reaction, soil moisture and certain exchangeable cation concentrations, might, at least partly, explain *P. media* presence or absence in suitable habitats and have a significant role in determining the number of individuals found at each locality.

Based on the results of our study, the species has been re-assessed as EN (Endangered) for the upcoming Red Data Book of Latvia.

Key words: *Pyrola media*; intermediate wintergreen; Red Data Book of Latvia; protected species; iPBS primers.

Morphology of the genus *Diphasium*

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Complanate clubmoss *Diphasium complanatum* and deeproot clubmoss *D. tristachyum* are rare and nationally protected species in Latvia. Their hybrid Zeiller's ground-cedar *Diphasium* × *zeilleri* is less studied and there is little information on its occurrence and distribution in Latvia.

The aim of the present work is to revise herbarium specimens of *Diphasium* species and a hybrid. Herbariums available in Riga (LATV, RIG, LDM) and Daugavpils (DAU and TVR) were determined and examined. There is a possibility that the hybrid may backcross with one of the species of *Diphasium*, which can make species identification even more challenging. So, it appeared important to check what are the differential morphological characters of the species and a hybrid of *Diphasium*.

The results demonstrated that in Latvia *Diphasium complanatum* was previously misidentified as *Diphasium* × *zeilleri* several times. *Diphasium tristachyum* is less commonly confused with *Diphasium* × *zeilleri*. Species of the genus *Diphasium* can be differentiated using branch angle, arrangement, lateral leaf position, width and length of unattached pair of ventral leaf, and sporophyll bract shape.

Key words: genus *Diphasium*; clubmoss; morphological characters.

The Search for Lost Species: Removing data deficiencies, preventing extinctions

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This presentation will introduce Re:wild’s Search for Lost Species, a program committed to halting extinctions and conserving biodiversity. The fate of more than 4,300 described species on the IUCN Red List remains unknown due to an extensive list of drivers - exploitation, invasive species, habitat loss, disease, climate change, human-wildlife conflict, and political or geographic inaccessibility. Nearly 30% are listed as Critically Endangered Possibly Extinct, another 30% as Data Deficient. The longest lost has not been seen since 1778, with 20% having been lost for more than a century. The vast majority are concentrated in the tropics, with distributions in ‘mega-diverse’ countries or biodiversity hotspots, many with high rates of endemism but dark datasets.

Through intense data analysis, innovative conservation strategies, scientific advancements, and collaborative efforts, Re:wild is spearheading the revival and safeguarding of endangered species on the brink of extinction. The recent publication, “What factors influence the rediscovery of lost tetrapod species?” (Lindken et al., 2024) outlines the probability of recovering these species.

Rediscoveries through the Search for Lost Species program trigger Key Biodiversity Area (KBA), Area for Zero Extinction (AZE), and Marine/Protected Area (MPA/PA) evaluations. Emphasis is placed on integrating gathered species data into policy, including local conservation decision-making processes.

Key words: lost species; rewilding; biodiversity loss; preventing extinctions; darkspot data.

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Rare hawthorn species in Latvia and their protection status

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Seven wild hawthorn species of the genus *Crataegus* are known in Latvia, with *C. laevigata* and *C. lindmanii* being extremely rare and included in the Latvian Red Data Book.

Crataegus laevigata is an endemic species in Europe distributed in temperate zone. In the Baltic countries, the species is found only in Latvia, very rarely, only in the southern part of western Latvia on the slopes of the ancient shore of the Baltic Ice Lake. In 2021, 120 individuals were recorded in Medze Nature reserve. Population decline is likely happening due to hybridization with the common *C. monogyna*. In Medze Nature reserve, the species is threatened by the overgrowth of the habitat with bushes, including the faster growing, more productive and more competitive hybrid *C. x media*.

The natural range of *C. lindmanii* includes Western and Central Europe, southern Scandinavia and the Baltics. It is rare in Estonia (Saaremaa Island) and Lithuania (Nemunas and Minija river valleys). In Latvia, it is very rare and primarily found in the western part of the country. In 2021, nine previously known (HBA herbarium data) *C. lindmanii* localities were surveyed, of which the species was confirmed in three places only, up to 30 specimens in total, with the largest locality in the surroundings of Kandava. In most sites, only hybrids of *C. x dunensis* (*C. rhipidophylla* x *C. lindmanii*) were observed, therefore it can be assumed that the population decreased due to hybridization with other hawthorn species.

Another species of hawthorn, *C. plagiosepala*, is included in the previous edition of the Red Data Book of Latvia. This species is distributed in Latvia in Zemgale plain inhabiting riverbanks, as well as in the form of isolated localities in Kurzeme. In internationally recognized databases, the species is considered either an ambiguous taxon or a synonym. Evaluating the material deposited in Latvian herbaria (HBA, DAU) it has been found that the herbarium specimens of the species are unclear, overlapping with the similar, relatively widespread in Latvia *C. x dunensis* and one of the more common Latvian hawthorn *C. rhipidophylla*. In the European scientific literature species is considered as taxonomically uncertain, the species is not even recognized in the flora of Poland, from where it was originally described by Russian botanist A. Pojarkova. Latvian herbarium material is also indistinguishable from other similar species and in this case, it should be considered doubtful and uncertain, and therefore the taxon cannot be assessed in the context of the Latvian Red Book.

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Key words: Latvia; Red Data Book; *Crataegus*.

Nature communication – who is “the public”? Experience of the Latvian Fund for Nature

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Nature is one of the most important values of Latvian society – historically tied closely together with establishment of an independent nation and state (Schwartz 2006), according to public opinion surveys considered to be unique (Kantar TNS, 2017) and a factor that most of all fosters positive attitude towards Latvia (Kantar TNS, 2018). At the same time the present state of biodiversity in Latvia is declining - the latest habitat inventory demonstrated that grassland habitats have dramatically decreased and cover less than 1 % of Latvia's territory. Various actors in Latvia are active in implementing nature conservation projects, including LIFE funded projects. However, existence of two parallel realities of environmentalism in Latvia (Pavasars, 2016) there can be observed – the official one and people’s reality.

The results of a survey on awareness about the LIFE programme demonstrate that 72 % of respondents are not informed about it (Kantar TNS, 2017). Also nature conservation practitioners often experience negative attitudes towards implementation of practical nature conservation measures. But we are carrying out various awareness raising and involvement activities - what are we doing wrong?

In my presentation I will talk about the experience of the Latvian Fund for Nature in nature communication – how an NGO can make our voice heard in the oversaturated informational environment, what communication approaches we have used, what are the main obstacles and what are our strengths in communication. My proposition is that we need to strongly focus on strategic, purpose-oriented nature communication and to include social science component in nature restoration projects and consider communication as inherent part of all our activities.

Key-words: nature communication; nature conservation; nature awareness; strategic communication.

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Innovative calling amphibian male count-based evaluation system for their community state and wetland ecological quality assessments

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IUCN-based assessments have demonstrated that in Latvia 23% of amphibian species are threatened, but 23 % - near threatened, and 85% of all Latvian amphibian species are included in various national or EU protected species lists. Calling amphibian male counts (CAMC) is a cost-effective non-invasive acoustic monitoring method that has been widely used in Latvia since 2015. In the development of our newly proposed CAMC-based amphibian community state evaluation system, we considered breeding amphibian assemblages as entities having three main ecological traits - size, richness and evenness - and searched for metrics with best performances in separation of strongly impacted vs natural amphibian breeding sites. In our research we used data from 2016-2023 years CAMC studies that covered 400 breeding sites across Latvia. First we tested responses of 11 calculated metrics (5 CAMC for community size, 2 richness metrics, 4 evenness and dominance indices) to five sets of predictors (two sets of anthropogenic land use variables, two natural/mixed effect sets, and a climate variable set) using generalized linear models to find out the variables important for the amphibian communities, including those that were best in separating strongly impacted vs natural sites. Then we compared metrics from strongly impacted and natural breeding site by Wilcoxon rank-sum tests and Box plots and assessed metric congruences in site classifications to find out best indicators for anthropogenic impacts. Based on their properties, for our community state evaluation system we selected three metrics, each being best in representing their own breeding amphibian assemblage trait: the total number of calling males, the community completeness, and the reciprocal form of Berger-Parker dominance index. The breeding amphibian communities in the top-quality state in Latvia could be described as a taxa assemblages of 4 species or more, with more than 45 calling amphibians total and at least 7–15 ones from individual taxa, where the dominant species yields no more than one-third of all individuals. The communities in the worst quality state contained only single calling male. Our proposed CAMC-based community evaluation system can be further used in the evaluation of the success of amphibian breeding pond restoration projects, in the assessments of the ecological quality of smaller, especially semi-permanent or ephemeral waterbodies, where they may substitute fish-based metrics, and in the ecosystem service value indicator systems in the open-air semi-natural aquaculture ponds.

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Key words: bioindicators; anthropogenic impacts; Latvia.

Spider (Araneae) species assessed in accordance with IUCN criteria in Latvia: results and recommendations

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Ten spider species with different occurrence in territory of Latvia were assessed in accordance with IUCN criteria for the new Latvian Red Data Book. Four of them are included in the previous edition of the Red Data Book of Latvia. For all of them the category changed. *Pardosa wagleri* and *P. hortensis* were last found in Latvia in 1960s (DD, Data Deficient), but *Arctosa cinerea* and *Dolomedes plantarius* appear much more widespread in Latvia as previously thought. For all assessed species of spiders, a large proportion of data comes from observations of citizens and spider enthusiasts from the citizen science portal www.dabasdati.lv while smaller but important amount of data is taken from reports of various studies of spiders in protected sites. *Micaria lenzi* and *Eresus sandaliatus* were found only once one individual each, for the former the proposed category is DD (Data Deficient), but for the latter - EN (Endangered). Both species require specific habitats. Other species assessed DD are *Arctosa alpigena lampetri* and *Leptotrix hardyi*, both found in specific habitats in more than one individual. Near threatened (NT) are considered *Arctosa cinerea*, *A. perita* and *Dolomedes plantarius*, all of them are easy to identify in the field and there are sufficient data available for species status assessments. *Ozyptila gertschi* is evaluated Vulnerable (VU). For all species the final category was set after discussion with an independent reviewer. There is still a need for more research on occurrence and distribution of spiders, as well as on ecology, especially for those spiders which are rare or with limited amount of available data.

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Key words: spider species; distribution; evaluation; Latvia.

Cross-sectoral cooperation for conservation of rare species in Slovakia

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The main objective of the LIFE IP NATURA 2000 project in Slovakia is to ensure long term conservation of threatened habitats and species through implementation of specific management and restoration plans, which combine interests of various stakeholder groups. Selected habitats are restored and integrated nature conservation and landscape management for selected highly threatened species is implemented in close cooperation with local target groups. The cross-sectoral cooperation is seen as the most effective approach to sustainable management of protected areas.

Meadows with extremely rare species are being restored in central Slovakia to revive traditional farming practices. These practices, which have safeguarded plants and animals for generations, fell into decline in recent decades, leading to the rarity of many species.

Agroforestry systems are being re-established in western and central Slovakia to support threatened species of plants and invertebrates. This new approach to managing protected areas aims to bolster populations of threatened species while simultaneously boosting the local economy by reviving traditional practices among local farmers.

The protection of the threatened Western capercaillie requires cooperation among state and non-governmental nature conservation organizations, foresters, hunters, and local farmers. To facilitate this, a detailed plan has been developed, and measures are being implemented in close collaboration with all relevant stakeholders.

Eastern Slovakia is home to a unique population of the rare European pond turtle. Long-term conservation of this species can only be achieved through habitat restoration and management measures. Planned interventions aim to restore the water regime and create temporary wetlands, including vernal pools, floodplain pools, and other shallow depressions that follow a periodic annual pattern of filling and drying. These efforts will also benefit many other species. Successful conservation requires close cooperation among the State Nature Conservancy, the Slovak Water Enterprise, and local farmers, each contributing crucially to the project.

To ensure proper assessment of the effectiveness of management measures and interventions within the Natura 2000 network, a new methodology is being developed and tested as part of the project.

Awareness and public acceptance of Natura 2000 among stakeholders and the general public are being improved through comprehensive campaigns. These campaigns highlight the ecosystem services provided by Natura 2000 and target various groups, including families, students at all educational levels, university students, environmental education specialists, foresters, farmers, hunters, and authorities from local to national levels.

Key words: habitat restoration; cooperation; conservation; threatened species.

New Red List of Latvian fungi (Agaricales s. l.) based on IUCN criteria

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The previous Latvian Red List of fungi was compiled as a part of the Red Data Book in 1996 (Piterāns, Vimba, 1996). It accounts 38 fungi species. Their conservation state assessments were based solely on expert opinion. In national legislation of Latvia, protection requirements of species and habitats are defined by the Law of Protection of Species and Habitats (ratified by the Parliament on 16.03.2000) which accounts 62 fungi species. In 2021-2023, during the preparation of a new Red List, species conservation status assessments were carried out accordingly to the standardized and worldwide acknowledged IUCN criteria (IUCN Standards..., 2019). The outcome of this project will be an important and long-lasting step for conservation of fungi in Latvia. Currently, 112 species have been nominated to be red-listed in Latvia. 46 or 40% of them are Agaricales s. l. species. Ten species of Agaricales s. l. appear critically endangered in Latvia, 20 species - endangered, 16 species are vulnerable.

Fungi conservation status assessments were carried out in accordance with the IUCN guidelines for using the Red List categories and criteria (IUCN Standards and Petition Committee, 2019). The distribution data are based on the species records available at the Nature Conservation Agency database 'OZOLS', citizen science portal dabasdati.lv, the Latvian fungi website fungi.lv, and on the data from the Latvian National Museum of natural history fungi collection (nmkk.lv).

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Key words: fungi; Red Data List; IUCN; Latvia.

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The first Red List of Latvian lichens based on the IUCN criteria

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Lichens are well-known bioindicators and exhibit high sensitivity to environmental changes due to their unique biological characteristics. Despite their ecological significance, lichens are often overlooked in conservation policies both at the European Union (EU) and global levels. The situation is better at the level of national Red Lists that can provide candidate species for regional or global Red Lists, thereby helping to prioritize conservation efforts. During 2022–2023, for the first time in Latvia, IUCN categories and criteria were applied to assess 85 lichenized species and one lichenicolous fungus (ca. 12% of the total number of lichen-forming and lichenicolous species in the country). Of these species, three were classified as Least Concern (LC), two as Data Deficient (DD), eleven as Near Threatened (NT), and 68 were ascribed the threatened categories: 14 to Vulnerable (VU), 27 to Endangered (EN), 27 to Critically Endangered (CR). The high proportion of lichenized species assessed as threatened evidently results from the fact that the current assessment focused mainly on nationally protected species. Most of the assessed Latvian lichenized fungi that belong to threatened and NT categories prefer woodlands as the main habitat, particularly old-growth forests, which are threatened by intensive forest management. Other identified threats for lichens are land drainage, peat extraction, landslides, various recreational activities (e.g., overtrampling), and overgrowing of their habitats due to afforestation, eutrophication, cease of grazing or lack of natural dynamic processes. The new challenge is to extend efforts for approximately 650 not yet evaluated lichen species. The most important limitation lies in the fact that the occurrence data of common lichen species in Latvia are, for historical reasons, scarcer than data of nationally protected species. In addition, the suboptimal lichenological research capacity in Latvia and the lack of digital data from RIG herbarium also complicate the further activities.

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Key words: lichenized fungi; national red-listing; lichen habitats; threatened species.

Biodiversity and conservation of Latvian coastal hard substrate benthic habitats

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The Latvian coast of the Baltic Sea, including the Gulf of Riga and the open coast, hosts vital habitats such as stony reefs (*1170*), which are protected under the Habitat Directive (Annex 1, Council Directive 92/43/EEC). Reefs are local biodiversity hotspots, providing essential ecosystems for invertebrates, fish, birds, and plants. Comprised of hard substrates such as rocks, boulders, and pebbles, interspersed with patches of sand, they exhibit clear ecological zonation dictated by depth and are closely associated with specific flora and benthic fauna communities.

This study aimed to conduct a comparative analysis of the biodiversity and ecological status of stony reefs in two distinct research areas: the eastern part of the Gulf of Riga (Skulte – Ainaži) and the open coast of Latvia (Pāvilosta – Ventspils). The objective was to assess the current condition of these habitats and develop strategies to enhance their conservation and management, with a specific focus on benthic key species.

We used advanced seabed mapping techniques by a Remotely Operated Vehicle (ROV) equipped with a high-definition underwater camera. Mapping was done in transects placed perpendicular to the shore at every depth meter from 2 m to 20 m depth. This approach allowed us to document seabed composition, physical features, and associated biota.

Our findings indicate that benthic species composition differs significantly between the Gulf of Riga (dominated by *Amphibalanus improvisus*, perennial and annual algae) and the open coast of Latvia (dominated by *Mytilus trossulus* and perennial algae). Our study placed a priority on identifying and understanding the role of benthic key species, which are crucial for maintaining the ecological balance of the stony reefs. The identification and monitoring of these key species provide insights into the overall health and stability of the reef ecosystems.

Effective conservation of stony reefs requires not only scientific research but also public awareness and support. This study incorporates communication techniques aimed at enhancing public understanding of the importance of these habitats. By utilizing community engagement activities, we aimed to educate the public about the ecological significance of stony reefs and the threats they face.

By focusing on benthic key species and employing effective communication techniques, we can better understand the ecological dynamics and develop targeted actions to preserve these ecosystems. The findings from this study offer valuable insights that can guide future conservation policies and actions, ensuring the sustainability of these ecologically significant reefs.

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Key words: Reefs 1170; Baltic Sea; species protection; biodiversity; MPA.

Genetic diversity of yellow lady's-slipper (*Cypripedium calceolus* L.) populations in Latvia and Estonia

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The yellow lady's-slipper orchid, *Cypripedium calceolus* L., is a rare and endangered orchid across its temperate and boreal range in Europe. Recognized for its high conservation priority, it's included to the lists of protected plants under the Bern Convention, Washington Convention, and the Annexes of the EU Habitats Directive. In Latvia, *C. calceolus* has experienced a significant decline, with documented occurrences during the last 50 years dropping from over 50 sites to just 25-30. Despite most remaining Latvian and Estonian populations residing within protected areas (including 17 Natura 2000 sites), habitat degradation due to human influence remains the main threat. Genetic diversity within plant populations serves as the foundation for adaptation and survival in changing environments. This study aimed to characterize the genetic diversity of *C. calceolus* populations across Latvia, including selected populations in Estonia. Samples from over twenty geographically distinct and ecologically diverse habitats were analysed. A cost-effective and informative method iPBS (Inter-Primer Binding Site), developed by Kalendar et al. (2010), was implemented for the genetic analysis. This universal retrotransposon-based approach allows for efficient analysis of large number of samples while potentially revealing the impact of environmental changes on populations. Analysis of the lady's-slipper orchid samples from Latvia revealed three distinct clusters of genetically similar plants. Notably, these clusters grouped individuals from geographically close and distant localities (hundreds of kilometres apart). Nei's genetic diversity coefficient further identified variations in relatedness even within the same location. Some populations harboured groups of highly related individuals, while others displayed a mix of genetically close and more diverse individuals. Interestingly, some localities exhibited a higher degree of overall genetic diversity. Based on the internal genetic structure observed, the study categorized the investigated *C. calceolus* populations into three main groups:

- Localities with a high degree of genetic similarity among plants,
- Localities with relatively high genetic diversity,
- Localities harbouring both closely related and genetically distinct individuals.

Population fragmentation (limited number and size of suitable habitats), variations in dispersal patterns and methods, and the inherent vitality of micropopulations within different localities are potential explanations for the observed genetic structure.

Overall, this study provides valuable insights into the genetic diversity of *C. calceolus* in Latvia and Estonia. The findings can be informative inducing future conservation efforts aimed at protecting and restoring this endangered orchid species.

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Key words: *Cypripedium calceolus*; iPBS; interspecific genetic diversity.

Novel approaches to improve flying squirrel conservation in practice: joint planning and nature detection dogs

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Flying squirrel (*Pteromys volans* L.) is a Eurasian arboreal rodent which is endangered in the western edge of its global distribution. In the EU, flying squirrel is now found only in Finland and Estonia. It is a strictly protected species in both countries: population in Finland has rapidly declined and its distribution in Estonia quickly contracted. Flying squirrels prefer mature mixed forests and the main threat for the species is habitat loss and fragmentation, mainly due to forestry and other land use. As flying squirrel habitats often have a high monetary value, conflicts of interest are unavoidable.

In the Flying Squirrel LIFE project (2018-2025) covering Finland and Estonia, we applied two novel approaches to improve conservation practices: co-operation between different professionals to develop flying squirrel-friendly forest management plans on true forest planning cases and test the skills of species-detection dogs to see how well they locate traces of the flying squirrel.

A joint planning process was developed with several professionals representing forestry and nature conservation to make good forest management plans as examples of how to achieve both nature conservation and landowner's goals. Baseline information was gathered, and drafts of plans worked out together until a commonly accepted version was ready. Examples were used in an education material, which will help stakeholders to take living conditions of the flying squirrel better into account.

Locating essential habitats of an endangered species is crucial for its conservation. Since flying squirrel is nocturnal and silent species, detecting its presence is mostly based on its distinctive, yellowish droppings. We compared the skills of nature detection dogs with nature surveyors to find traces of the flying squirrel. Comparison revealed that dogs notice the same traces as humans, but often also more smaller traces which humans were not able to detect. Thus, using nature detection dogs may help locating forest patches, which are seldom used by flying squirrels but are important parts of the habitat network.

Both findings have a value for future practical use in nature conservation and indicate that temporary project resources are important to enable exploration of novel approaches.

Key words: flying squirrel; nature detection dog; forest; co-operation; land-use planning.

Boosting the conservation of a rare endemic mammal by LIFE funding

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The endangered (EN) Saimaa ringed seal (*Pusa hispida saimensis*) is a land-locked seal that lives only in the Lake Saimaa in southeastern Finland. The present population size estimate is 480 individuals scattered over a labyrinthine lake complex spanning ca. 3 000 km² with 15 000 km of shoreline. During the last decade, 60-100 pups have been born annually and the population has increased steadily. However, the population is still small and threatened by climate change and by-catch mortality. The Saimaa ringed seal needs ice and snow during February-April for sheltering the new-born pups from weather and predators. Mortality in especially gill-nets is the most common cause of mortality of young seals.

The most important conservation measures include man-made snowdrifts plowed each winter in known nesting sites. They complement naturally occurring snowdrifts which are prone to melting during unusually warm periods or may not occur at all in very warm winters. In addition, artificial nest boxes have been developed and tested. By-catch mortality is controlled by fishing restrictions in the Saimaa ringed seal range. Seal-safe fyke nets have been developed, including a bar structure that prevents the seals from entering and drowning in the trap. In addition to these direct conservation measures, population studies have been enhanced by identification based on photographing of individual patterns on pelage, and extensive involvement of volunteers in monitoring the nesting sites in the shoreline in late spring.

The measures described above have been carried out since 2010. They have been developed and implemented in two LIFE projects, the LIFE Saimaa Seal (LIFE12 NAT/FI/000367, 2013-18) and Our Saimaa Seal LIFE (LIFE 19 NAT/FI/000832, 2020-25). LIFE funding has enabled intensive upscaling and developing of the measures, which are normally funded with a substantially lower funding by the state. For example, artificial nests were first visioned and tested in the first LIFE project, and in the second one we have been able to do extensive developing and testing of various models, aiming for a protocol for volunteers to maintain the nests after the LIFE project. Development of coordination for voluntary work has been a key aim of the second project. Voluntary work ensures much of the conservation measures after the project.

Key words: *Pusa hispida saimensis*; conservation; voluntary work; LIFE funding.

Creating artificial habitats for hollow tree beetles

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Old hollow trees are very rare elements in a modern landscape, and the beetles inhabiting hollows are among the most threatened organism groups in Europe. Experiments to artificially mimic this microhabitat (tree hollows) have been going on in Sweden for 20 years and have been successful. The best versions of the wooden boxes of different size and shape filled with wood carvings and leaves have been colonized by 70 % of the beetle species, but also several species of hover flies, crane flies and pseudoscorpions, living in natural trunk cavities on old oaks. Many of these species are on the national red lists in European countries.

Key-words: artificial habitat; veteran hollow trees; saproxylic insects.

The challenge of anthropogenic impacts on *Betula nana* L. population (the case of Šepeta peatland in Northeastern Lithuania)

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According to the historical data (Brundza, 1940), Šepeta peatland at the beginning of the 20th century held the largest population of the glacial relict *Betula nana* L. ever known in Lithuania. Due to peat extraction in 90 % of the peatland territory, *B. nana* has survived only on the edges of the former raised bog.

Our research of *B. nana* population structure was carried out in four study plots under different drainage impact, as assessed by distance from the drainage ditches surrounding the exploited peatland. The following population parameters were estimated: percentage cover of *B. nana*, its ramet density, age of the ramets, number of twigs, ramet length and stem diameter, leaf sizes (length, width and area), number of generative individuals and number of catkins. The ramets in the study areas differed in age and in various size parameters. Drainage was found to have the greatest negative impact on the fertility of the cenopopulations, both in terms of the number of fertile ramets, and in terms of the number of male and female catkins per fertile ramet.

The research was funded by the Research Council of Lithuania (LMTLT), agreement No S-LIP-22-63.

Key words: raised bog; glacial relict; drainage; ramets; historical data.

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Reviving of Estonian freshwater pearl mussel population and habitat

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At the beginning of the 18th century freshwater pearl mussels (*Margaritifera margaritifera* (L.)) were present in a total of 45 streams and lakes in Estonia and that-time Livonia. In the last century, the species was still found in large numbers in its current habitat in the North Estonia and in four or five rivers in South Estonia. By the end of the 20th century, the species had disappeared from South Estonia, and the number in North Estonia dropped significantly. All Estonian pearl mussels live as aging and declining population in one river in Lahemaa NP. Almost all juveniles perish in the fine sediments. A 6-year LIFE Revives project led by the University of Jyväskylä started in 2021 to revive pearl mussel populations and habitats. The poster presentation describes the project activities in Estonia and focuses mainly on the glochidia infected fish, captive rearing of young mussels at the RMK Põlula fish farm and the follow-up activities under the controlled conditions (on Buddensiek plates or rearing boxes) in the river during their first years of life. Restoration and monitoring of river habitat (incl host fish) and catchment area are also discussed, the monitoring part is done by University of Tartu. The project is an example of very good cooperation between academic and non-academic institutions.

Key words: freshwater pearl mussel; *Margaritifera margaritifera*; captive breeding; restoration; catchment monitoring.

Extinction risk assessment of the Latvian regional population of freshwater pearl mussel *Margaritifera margaritifera* (L.) (Mollusca: Bivalvia) in accordance with the IUCN criteria

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The extinction risk assessment of freshwater pearl mussel *Margaritifera margaritifera* was performed in 2022-23 in accordance with the IUCN guidelines. Area of occupancy (AOO) was calculated 184 km² which corresponds to the EN category and extent of occurrence (EOO) – 3 564 km² which corresponds to EN as well. The distribution of the species in Latvia has been relatively well studied and discovery of new localities is unlikely. Species’ range is highly fragmented – there are 8 subpopulations separated by distances of ~5 - 70 km. The total present Latvian regional population is estimated ~18 700 mature individuals. No juvenile specimens were observed. The reduction recorded in research is 26 % within ~15 years. Within one generation, or 100 years, the calculated reduction will overreach 50 %; the quantitative data is for ~30-50 years, but not for the entire population.

The species habitats are fast-flowing rivers with the presence of salmonid fish. Out of the 8 subpopulations of *M. margaritifera* 5 or 63 % are located in specially protected nature territories (Natura 2000). Three other possible subpopulations are located outside the specially protected nature territories.

Existing dams and reservoirs, through changes in the natural hydrological regime and reduced impact of floods cause decrease of quality of suitable habitats. The swells created by the dams are considered unsuitable for the species, fragmenting the regional population, as well as hindering the migration of the host fish, thus also negatively affecting the exchange of genetic material. Part of the population is negatively affected by the activity of beavers, constructing swells in which *M. margaritifera* specimens die, sediments accumulate, water temperature increase and oxygen level decrease. As a result of water pollution, water quality become unsuitable for the survival of juvenile *M. margaritifera* specimens due to the increased proportion of nitrogenous compounds. As a result of more frequent droughts, when some rivers inhabited by the species dry out, the mortality of *M. margaritifera* was recorded in both summer and winter periods. *Margaritifera margaritifera* has been assessed Endangered in Latvia (EN A2ac+A3c+B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)+E).

Acknowledgments. The research was carried out within the framework of the project "Threatened species in Latvia: improved knowledge, capacity, data and awareness" LIFE19 GIE/LV/000857 “LIFE FOR SPECIES” with the financial support of the LIFE Program of the European Union and Latvian State Regional Development Agency.

Key words: *Margaritifera margaritifera*; IUCN assessment; Latvia.

First national-level extinction risk assessments of Latvian dragonflies (Odonata) using the IUCN criteria

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The National Red List of dragonflies for Latvia is a result of an extinction risk assessment of Latvian dragonfly species performed in accordance with the IUCN regional Red Listing guidelines. The red listing process highlights species threatened with extinction at national level, so thereafter appropriate conservation actions can be undertaken to improve status of these species. There are 67 dragonfly species present in Latvia (Hawkes et al., 2024) and all were assessed within the LIFE project framework. One species was assessed Endangered (*Aeshna crenata*), two species - Vulnerable (*Coenagrion armatum*, *C. johanssoni*, *Somatochlora arctica*), and six species assessed Near Threatened (*Aeshna subarctica*, *Aeshna viridis*, *Cordulegaster boltonii*, *Nehalennia speciosa*, *Ophiogomphus cecilia*, *Stylurus flavipes*). All remaining species assessed Least Concern, except for two Data Deficient species (*Ischnura pumilio*, *Sympetrum depressiusculum*).

The most recent published recommendation for the Latvian national Red List of dragonflies contains 17 species (Kalniņš, 2017). The difference between the number of species recently assessed as Endangered/Vulnerable/Near Threatened (10 in total) and the previously recommended number of species (17) partly can be explained by the status of species protected under the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, but not assessed regionally threatened in Latvia.

The main threats to dragonfly species in Latvia are related to the changes in boggy habitats due to anthropogenic activity and natural factors, the likelihood of construction of new large hydroelectric power plants and ongoing eutrophication of natural flowing waters. The impact of the general insect decline phenomenon (mainly explained by wide use of agricultural chemicals) on dragonfly populations in Latvia remains unclear. We consider insufficient human resource capacity the most significant factor limiting long-term dragonfly protection and conservation activities in Latvia. There is a limited number of available qualified specialists, which automatically results in the underrepresentation of dragonfly (and invertebrates in general) interests in various aspects - from drafting legislative and planning documents to performing specific activities in field.

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Key words: Odonata; IUCN assessment; Latvia.

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Bird threat status: a step-in setting priority

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Though the threat status cannot be directly interpreted as the indication of priority level for species conservation, it can be an important step in setting priorities. When setting priorities for conservation on a national level, other factors, e.g., the global significance of the national population, should be taken into account. Here we demonstrate an approach to priority setting and the resulting priorities for bird conservation in Latvia.

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Key words: species conservation; IUCN categories; priority species.

Inventory of Eastern pasqueflower (*Pulsatilla patens* (L.) Mill.) populations in Latvia and prospects for conservation of this rare species

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The Eastern pasqueflower (*Pulsatilla patens* (L.) Mill.) is protected as a rapidly declining species in all European countries where it occurs, including Latvia. To find out the degree of danger to the species and its survival chances in Latvia, the study was carried out by implementing the Nature Protection Board commissioned project “Investigation of the populations of forest pasqueflower *Pulsatilla patens*, data updating and monitoring of management”. A total of 17 725 specimens of *P. patens* were counted, surveying 624 Latvian locations. In 263 of these locations the presence of the species was not confirmed. When surveying historical localities, we found out that many sites have undergone major habitat changes due to the low quality of the habitats for the species, forestry activities, or data inaccuracy. The largest number of specimens, moreover, with better seed quality, were found near highways, along forest roads and trails, that is, in sun-exposed areas where there is less competition with other species and light conditions more suitable for the species. In forests, *P. patens* was found in comparatively smaller numbers and specimens - more scattered. The demographic status of *P. patens* is closely related to the conditions of each growing site. Significant demographic diversity was found in terms of the proportion of generative specimens and large tussocks, thus indicating plants at different stages of ontogenesis. The occurrence of *P. patens* was significantly negatively affected by the overall moss floor cover and the occurrence of *Hylocomium splendens* (Hedw.) Schimp., as this moss species forms thick and dense cover through which *Pulsatilla* seeds cannot be sown and sometimes flowers and leaves were deformed due to the thick moss layer. Areas of open soil have positive effect on quantity of *P. patens*.

Seed samples collected from several roadside localities demonstrated good seed viability, whereas in boreal forests with a thick moss layer *P. patens* seed viability was significantly lower. The amount of viable seeds in *P. patens* between 22 % and 62 % in Latvia can be considered potentially sufficient for the continuation of the species, as long as there is also sufficient number of flowering plants and moss-free areas for germination.

Although a wide pH range has been found for *P. patens* soils in Latvia (3.20-6.27), this species clearly prefers acidic soils with an average pH_{KCl} of 4.07. Our study suggests that an important factor that positively affects the regional population size of *P. patens* in Latvia is higher content of Ca, Mg, K, and B in the soil. A higher P and Mn content, in turn, significantly promotes flowering.

In order to ensure favourable conditions for the growth of *P. patens* and to prevent or delay the processes of forest succession, forest management activities are required, to create open soil areas where vegetation is removed, and shading is reduced.

Key words: populations monitoring; demographic assessment; seed viability; soil characteristics.

The Nature Conservation Information System in the Czech Republic: A tool for supporting assessments of the state of protected areas and species

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In the Czech Republic, the Nature Conservation Agency (NCA) has developed and continues to manage and enhance the Nature Conservation Information System (NCIS). This system serves as a unified, nationwide public administration information system for managing data related to nature and landscape conservation. The requirement for the NCIS is mandated by the Czech Law on Nature and Landscape Conservation, and its purpose is to manage and provide data to support decision-making at all levels. This includes facilitating reporting, spatial planning, access to information for the public and scientific community, and other uses.

The NCIS comprises several key components, including the Species Occurrence Database, the Register of Protected Areas, the Register of Speleological Objects, and a Database of Conservation Interventions and Management. Recently, within the framework of the completed project "The Unified Nature Conservation System in the Czech Republic – A tool for supporting the assessment of the state, changes, and trends in protected areas and species," which was funded by the EU's Operational Program Environment 2014–2020, the NCIS has undergone substantial innovations. These innovations aim to fully support the adaptive management cycle for the management of protected areas and species. As a result, several agendas, such as management planning in protected areas, planning of monitoring, realization of active management and granting compensations, have been fully digitized. This digitization enables logged-in users from nature conservation authorities to make informed decisions based on integrated data and help assessments of protected areas.

The NCIS also features a public web-based interface (<https://portal.nature.cz/>) where data is presented to the public. This includes infolists of individual species and habitats with up-to-date distribution maps and summaries from the Species Occurrence Database, as well as an interface for presenting assessments of target features of protected areas. In general, most of the data is publicly accessible and can be accessed or downloaded in several supported formats.

Future development of the NCIS will focus on the creation of a Register of Landscape Protection outside protected areas and tools for species protection, as well as the integration of other nature conservation authorities into the system's processes and agendas. Ensuring that the system is populated with quality, up-to-date, and verified data will also be a priority.

Key words: data management system; nature conservation; digitization.

Community participation in monitoring and conservation of snow leopard (*Panthera uncia* (Schreber)) at Lapchi Valley, Gaurishankar Conservation Area, Nepal

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Lapchi Valley is located in the central Himalayas and connects Nepal's Sagarmatha (Mt. Everest) and Langtang National parks with China's Qomolangma National Nature reserve. The remote Lapchi is out of modern transportation network and communication connection. People here are seminomadic and practice "Beyul" culture, they are culturally disciplined and are passionate about biodiversity and nature conservation. Wildlife and human harmoniously exist in Lapchi, however, the local yak farming people have experienced the attacks of snow leopards (*Panthera uncia* (Schreber)), and Himalayan bear (*Ursus arctos isabellinus* Horsfield) on their cattle. But people remain deeply interested in the conservation of snow leopards and their prey species. Wildlife and its conservation are always an intense curiosity in Lapchi. Thus, we enrolled the local community in the monitoring of snow leopards and their prey species through camera trapping. A total of twenty-four camera traps (CTs) were installed for fifteen months (October 2021 - January 2023) in of 4*4 km² grid. Thirty-seven community people: herders, monks and local people from Lapchi participated in monitoring and camera trapping.

The study recorded 3762 events of 23 mammalian species including snow leopard, Himalayan wolf, musk deer, golden cat, Himalayan black bear, common leopard, pika, leopard cat, blue sheep, and red fox. Recorded images and videos were used to analyses activity patterns and temporal overlapping using the R package. The camera trap study revealed a minimum of six snow leopards' individuals: two females with cubs and two males in Lapchi Valley. All wildlife frequently uses infrastructure developed by humans like bridges, water pools, and human trails. The wolves and common leopards were active in the pasture area of Lapchi and are responsible for livestock depredation which is a different from assumption that snow leopard solo culprit of all livestock loss. Himalayan bears frequently visited human settlements and are responsible for stealing ghee/butter, flour, and vegetables from houses while people are sleeping and out of home.

Regular monitoring on movement and activities pattern of wildlife buttressed local people to be alert that reduces encounter with wildlife and mitigate human wildlife conflict. Conservation and monitoring of wildlife are more effective with the participation of the community.

Keywords: mammal diversity; harmonious; "Beyul" culture; seminomadic; human-wildlife conflict.

Distribution patterns of amphipod *Monoporeia affinis* and *Pontoporeia femorata* in near-threatened muddy aphotic biotopes of the Gulf of Riga

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The distribution patterns of two brackish water amphipod species from the Gulf of Riga were compared. *Monoporeia affinis* is a glacial relict species that has remained in the Baltic Sea region after the last glaciation. It inhabits soft bottoms down to approximately 80 meters. *Pontoporeia femorata* originates from marine arctic environments. Usually, it is abundant up to 10 m depth but can be found also in deeper waters (Gosselck, 2009, Maximov, 2021). Both *M. affinis* and *P. femorata* are known as the predominantly deposit-feeding invertebrates inhabiting extensive areas of soft sediments in the Gulf of Riga. *Pontoporeia femorata* lives deeper in the sediment than *M. affinis*, nonetheless, both play a crucial role in the benthic community as active bioturbators that influences the sediment structure, nutrient fluxes and oxygen availability in the sediment.

Although both species are widespread in the Baltic Sea, latest records indicate that in context of biotope status, species abundance is fluctuating and has decreased in last decade. Baltic aphotic muddy sediment dominated by *M. affinis* and/or *P. femorata* (Code in Helcom HUB - AB.H3N1) is classified as Near Threatened biotope that causes concern about its inhabiting species; *M. affinis* is under threat and/or in decline and *P. femorata* is under threat in the Gulf of Riga. The main threats recognized are eutrophication, contaminant pollution and invasive alien species. *Monoporeia affinis* is sensitive to anoxia and due to eutrophication can move to more favourable environments. In addition, invasive polychaeta *Marenzelleria* spp. has formed competitive conditions increasing competition for resources and therefore reducing the growth rates of *M. affinis* (Kotta, Olafsson, 2003). Combining all the threats, we encounter the situation where the tolerant to anoxic conditions species – *Marenzelleria* spp. prevails in unfavourable environmental conditions forcing native species to move to other habitats.

In the studied area two amphipod species demonstrated certain zonation patterns – with or without dominance of one of the key species, dominance of worms or abundance of two or more species in the same habitat. We used the National Monitoring framework and latest soft bottom samples from years 2013-2023 collected by Van Veen grab sampler. Samples were fixed in ethanol (96%), then sorted, identified in laboratory to lowest taxonomic rank possible. Only muddy biotope samples were selected to obtain representative information.

To conclude, by this effort we have analysed multiple species from monitoring datasets and determined latest population trends in aphotic muddy biotopes. We have updated our knowledge on key species distribution and provided comprehensive map.

Acknowledgments. The study was Funded by Latvian National Monitoring Program.

Key words: Gulf of Riga; amphipods; muddy biotopes; population dynamics.

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On the path from Nature Data Management System ‘OZOLS’ to a Nature Portal – state of play and lessons learnt on state level nature conservation data management in Latvia

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Nature data management system ‘OZOLS’ (NDMS OZOLS) is a state information system that provides storage and management of spatial data for nature protection. The system was developed and implemented in 2012 to support the planning, monitoring, and surveillance of nature protection measures, taking into account the growing importance of spatial data in the field of nature conservation. The system maintains data on protected areas, habitats, species, and other areas important for nature protection, and also provides additional data such as base maps, forest register data, and property boundaries crucial for the work of nature experts.

Over time, new technological solutions have been introduced into the NDMS ‘OZOLS’ system, which improves its functionality and ensure the availability of necessary data for users, as well as facilitate data submission, processing, and analysis. Users can access the system in the WEB environment, where the data can be viewed as a map, allowing them to add or remove different data layers. For data managers, the system is also available in a geospatial database (SDE) based on ESRI software.

As part of the project LIFE-IP LatViaNature (LIFE19 IPE/LV/000010), new tools and maps are being developed to facilitate work with data and improve its use in decision-making and preparation of reports. The presentation will provide insight into the history of system development and maintenance, demonstrate examples of good practice, and outline future plans for system development.

Key words: geospatial data; nature conservation; data management.

Condition of young ash (*Fraxinus* spp.) stands after ash dieback in Latvia

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Dieback of the ash *Fraxinus* spp. has been spreading throughout Europe since the 1990s causing severe economic and ecological consequences affecting forests and related species. Five of the six most prominent *Fraxinus* species are now critically endangered as common ash *Fraxinus excelsior* L. becoming red-listed in Northern Europe. Ash planting is stopped, and the diseased mature trees have been mostly harvested, putting on the natural regeneration as the final refugee of ash.

In Latvia, ash-dominated stands decreased sharply from 0.8% of the total forest area in 1998 to 0.4% in 2015. Although the total ash-dominated area remains low, the area of young ash stands that decreased the fastest after dieback, has increased in recent years indicating regeneration. However, the results of ash density and health conditions after dieback are contrasting on the European scale. The density and height of all tree species and health conditions (in five classes) of common ash across Latvia were assessed in 31 and 69 young stands (up to 20 years) in 2015 and 2023, respectively.

In the last observation, ash was abundant in the studied plots with a mean density of 4665 ashes ha⁻¹, of which 59 % considered healthy, 36 % were infected to varying degrees, and 4 % died recently. The obtained results of ash density and health condition were similar in 2015 and 2023, indicating the stability of the local ash ecosystem with relatively abundant natural regeneration. These results are among the best in Europe, which may be related to the long presence of the disease in Baltic region enabling natural adaptation to proceed. The current stand composition suggests the development of mixed tree stands, containing a high proportion of ecologically important common ash, *Populus tremula* and *Ulmus glabra*. The tendency of ash to be strongly affected by the disease at the saplings/seedlings age, yet the surviving saplings develop into much healthier trees were observed. This indicates successful natural selection and supports the potential of early thinning to contribute to a more vital ash ecosystem.

Key words: *Fraxinus excelsior*; natural regeneration; health condition; stand composition.

Managing nature conservation data in Lithuania

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The presentation will cover how Lithuanian institutions store and manage spatial data about natural resources, their use and protection. Different approaches and solutions (databases and data management systems) as well as processes for sharing and updating the data will be compared. We will be focusing on rare species, habitats, nature monitoring data, protected areas, forest and land use plots and discussing the challenges in the field of nature conservation spatial data management.

Key words: rare species; habitats; spatial databases; maps.

Analysis of the population genetic structure of large gold grasshopper *Chrysochraon dispar* (Germar, 1834) in calcareous fens

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Currently, a global decline in biodiversity across various ecosystems is happening, as well as an increase in anthropogenic pressures, resulting in the reduction of natural habitat areas.

Calcareous fens is a rare and protected habitat in the European Union, threatened by fragmentation and extent reduction. Calcareous fens in Latvia are found in small areas and form isolated patches from the rest of the landscape. Therefore, the conditions in these fens are suitable for analysing the impact of isolation on the genetic structure of populations.

One approach to understand the impact of fragmentation on the habitat specialist species, is to assess the population genetic structure. Genetic diversity indicates that an ecosystem is functioning healthy because genetic diversity ensures the potential for species evolution, the internal diversity of populations, and their ability to survive under changing environmental conditions. As a result, genetic diversity ensures the sustainability of populations.

The large gold grasshopper is a suitable indicator species for the research of calcareous fens since it is specialized for wetland habitats. In suitable habitats, the population density of the species is high, and the species' biology and taxonomy are well known. The large gold grasshopper has low dispersal abilities, which provides a better opportunity to uncover the impact of isolation on population genetics compared to species with good dispersal abilities.

Samples of the large gold grasshopper were collected in the territories of Engure Lake Nature park and Apšuciems fens, and the iPBS molecular marker was used to characterize the genetic structure. The internal genetic diversity of the studied populations was found to be low. The genetic similarity between the populations and the impact of geographical distance on gene flow between them were assessed. It was concluded that the populations are genetically similar to each other, gene flow has occurred between them in the past, and although geographical distance affects gene flow between populations, it does not completely restrict it.

Key words: dispersal abilities; *Chrysochraon dispar*; genetic structure; retrotransposons; habitat fragmentation.

Nationwide modelling of the Flying squirrel *Pteromys volans* (L.) habitats in Finland

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Flying squirrels (*Pteromys volans* (L.)) in the EU are only found in Finland and Estonia. In Finland, they are classified as vulnerable and are protected by the EU habitat directive and the Nature Conservation Act, which prohibits destruction of their breeding or resting places. Observations of flying squirrels, around 63 000, are collected in the laji.fi database maintained by the National Natural History Museum (Luomus), though these data are not comprehensive as they rely on contributions from enthusiasts, organizations, and research projects. Consequently, many habitats may exist where flying squirrels occur but have not been mapped.

In the EU-funded Flying Squirrel LIFE -project we modelled suitable habitats for the flying squirrel in Finland. The project produced high-resolution (100m × 100 m) predictive maps over the whole occurrence area of flying squirrel. The maps have been made available through the Finnish Biodiversity Info Facility (laji.fi) open access data repository.

In the modelling we used flying squirrel observation data and the multi-source national forest inventory data (MS-NFI) as forest data. The structural features of the flying squirrel's habitat were calculated for several radii from 250 m to 2000 m from the following landscape categories: forests suitable for flying squirrels, forests suitable for movement (>10 m), young forests and clear-cuts, agricultural fields, settlements and water bodies and used as explanatory variables. The modelling was done with logistic regression model. The model compilation required division of Finland to several regions, and consequently, models due to varying forest and landscape structure.

The variables included in models and the accuracy of the models varied according to region. The sensitivity of the models varied between 60.5 and 75 and the specificity between 67.5 and 90.3 while the models' overall accuracy (Receiver Operating Characteristic, ROC) ranged from 0.78 to 0.92.

The habitat prediction maps are useful for large area assessments and regional planning. They can guide targeted conservation efforts over broad regions and inform forest planning together with forest data. However, field inventories are essential to confirm the presence of flying squirrels, as Flying squirrel are also short lived, living on average only one to two years, thus the presence of the species even in suitable forests and habitats varies considerably.

We discuss both the model building and the role of the model-based maps in the conservation of flying squirrel in Finland.

Key words: Flying squirrel; *Pteromys volans*; habitat modelling; predictive maps.

Assessment of some Latvian freshwater mollusc (Mollusca) species according to the IUCN criteria

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Altogether eight species of freshwater molluscs (Mollusca) were listed in the previous Red Data book of Latvia published in 1998. An ongoing project “LIFE FOR SPECIES” aims to update the list of protected and threatened species, to prepare proposals for changes in the national legislation, to improve data quality and availability on threatened species, as well as to increase public and stakeholders’ awareness. In the framework of this project 11 species of freshwater Mollusca were assessed according to the IUCN criteria, out of which ten are discussed in this presentation. Glutinous snail *Myxas glutinosa* (O. F. Müller) could not be assessed due to the large number of misidentifications. Solid orb mussel *Sphaerium solidum* (Normand) and capped orb mussel *Musculium lacustre* (O. F. Müller) are assessed Data Deficient (DD) since threats and stresses affecting them are not known. River limpet *Ancylus fluviatilis* O. F. Müller, river nerite *Theodoxus fluviatilis* (L.), river orb mussel *Sphaerium rivicola* (Lamarck), shining Ram's-horn snail *Segmentina nitida* (O. F. Müller) and valve snail *Valvata cristata* O. F. Müller correspond to the Least Concern (LC) category. In addition, the gravel snail *Lithoglyphus naticoides* (C. Pfeiffer) is assessed LC while previously being listed in the category 2 of the Red Data book of Latvia (1998). Current knowledge demonstrates that *L. naticoides* is not autochthonous species in Latvia though sensitive to water pollution. Depressed river mussel *Pseudanodonta complanata* (Rossmässler) is assessed Near Threatened (NT) and thick shelled river mussel *Unio crassus* Philipsson corresponds to Vulnerable (VU).

Acknowledgements: This research was done by the LIFE project "Threatened species in Latvia: improved knowledge, capacity, data, and awareness" (LIFE FOR SPECIES - LIFE19GIE/LV/000857), with the financial support of the EU LIFE program and the State Regional Development Agency (Latvia).

Key words: aquatic snails; Bivalvia; IUCN.

Present threats to and future of saproxylic beetles (Coleoptera) in the EU-importance forest habitat types in Latvia

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In the last decades, the proportion of old-growth natural forests in Northern Europe has decreased to less than 3% of the total forest area. This led to a critical decline of the amount of decaying and dead wood by 90-98%, and saproxylic insect species diversity consequently decreased by one third. One of the major saproxylic insect groups is saproxylic beetles, and many beetle species depend on old-growth natural forests and amount of dead wood, often of specific condition. During our project, we assessed threats to some Latvian saproxylic beetle species in accordance with IUCN criteria. Red List category, major threats, area of occupancy, habitats of major importance, and necessary conservation actions have been evaluated. Many saproxylic beetle species are known as indicators for forest habitat types of the EU-importance. One of the main criteria used for saproxylic beetle survival assessment is their present area of occupancy, which we compared with present area of the EU-importance forest habitats and assessed threats and necessary conservation actions for both. Assessment of the necessary area size of the EU-importance forest habitats has been done by selecting favourable reference areas, results demonstrate that necessary area is same size or larger than present forest habitat area. Favourable reference area should provide stable subpopulation for indicator species. By comparing saproxylic beetle species' current areas of occupancy with present and potential forest habitat areas and quality, we were able to select the most important territories in Latvia for saproxylic beetle species and forest habitat conservation. Our aim is to understand if selected forest habitats favourable reference areas would provide stable subpopulations for threatened saproxylic beetle species, presumed those would be high-quality forest territories, and to select most appropriate territories for saproxylic beetle conservation.

Acknowledgements. The studies were carried under LIFE program projects, funded by Life for Species LIFE19GIE/LV/000857 and Latvia Nature LIFE19 IPE/LV/000010, with financial support of European Commission and the State Regional Development Agency, Republic of Latvia.

Key words: saproxylic Coleoptera; forest habitats; favourable reference area; conservation.

Assessing population trends from museum collections – a case study on Finnish wild bees

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Natural history collections provide valuable information that can be used to estimate changes in species' distributions and abundances over longer time periods than for which monitoring data are available. However, collection-based data typically exhibit spatiotemporal biases that need to be accounted for by employing data filtering or other statistical correction procedures.

Wild bees (clade Anthophila) comprise an ecologically essential group of pollinators for which monitoring data have been unavailable in Finland until recently. To assess long-term population trends of wild bees in Finland, occurrence data from bee collections of the Finnish Museum of Natural History were combined with a smaller set of annotated citizen science data from the Finnish Biodiversity Info Facility. The resulting dataset ranging from the years 1910 and 2021 was analysed using the Sparta package in the R programming environment.

Of the 236 wild bee species in Finland, 136 had enough data for statistically significant long-term trend analysis. Nearly one third (30 %) of the species showed a declining trend, while a similar proportion (31 %) showed an increasing trend. The remaining species (39 %) were considered as stable. As many as 100 species had to be omitted from the trend analysis due to lack of data. Since many of these are rare and classified as threatened, the total proportion of declining species is probably somewhat higher than that of increasing species.

While severe declines of wild bees have been reported in many countries, most commoner bee species in Finland seem to have stable or increasing populations. However, many of the declining species are northern habitat specialists that have notable conservation value on a European scale. Reliable information on population trends is important for allocating limited resources for species conservation in a robust manner.

Key words: population trends; museum collections; citizen science; Anthophila.

Red List assessment of mammal species in Latvia

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A new national Red List assessment of mammal species has been carried out in Latvia according to the criteria set by the International Union for Conservation of Nature (IUCN). Previous species assessments were done in 1970s and 1990s. Within the framework of the LIFE project LIFE FOR SPECIES (2021–2024), the latest data on mammal species included in the previous Red List and/or in the annexes of the EU Habitats Directive were collected and evaluated. Previous Red List encompasses 24 mammal species, including data deficient (DD) and regionally extinct (RE) species. 13 mammal species are proposed for inclusion in the new Red List: 3 as regionally extinct (RE), 2 as critically endangered (CR), 2 as endangered (EN), 1 as vulnerable (VU), 2 as near threatened (NT) and 3 as data deficient (DD). The decrease in the number of Red-listed species is mainly due to improved knowledge about the species. Several species formerly classified as data deficient or threatened turned to fit well in the category least concerned (LC) nowadays. Only one species- the grey seal (*Halichoerus grypus* (F.)) has improved the status of its population thanks to conservation activities all over entire Baltic Sea region. Risk of extinction has increased for another seal species - the ringed seal (*Pusa hispida* (Schreber)). Its subpopulation inhabiting the Gulf of Riga is suffering from global warming. Another marine species- the harbour porpoise (*Phocoena phocoena* (L.)) is threatened by increased mortality due to fishing activities in entire Baltic Sea. The decrease in habitat quality is recognised as main threat for 7 of 13 Red-listed mammal species. In case of 4 species the influence of other species including alien species and predatory species as well as interspecific competition is recognised as current threat or reason for vanishment. Reason(s) for extinction of one species- the garden dormouse (*Eliomys quercinus* (L.)) is unknown.

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Key words: mammals; assessment; Red List; Latvia.

Environmental DNA as an effective monitoring method of endangered and invasive species in Latvia

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Environmental DNA (eDNA) analysis is cited as a promising approach for endangered and invasive species. Invasive species have been chosen as monitoring objects in Latvia's protected areas (PA) because it is important to monitor them in the broadest possible range to prevent their rapid spread in PA. Invasive species also can cause great economic and environmental losses, even affecting human health and well-being. They are one of the main contributors to the loss of biological diversity.

With the powerful tool of eDNA, it is possible to determine the presence of a species even if there are very few specimens in the environment, thus allowing us to respond to the threat of invasion as quickly as possible.

The project aimed to monitor the presence of invasive species in Latvia's PA using an eDNA analysis approach. 100 eDNA samples from Latvia's PA freshwater ecosystems have been collected and analysed. Five invasive species: spinycheek crayfish (*Faxonius limosus* (Rafinesque)), signal crayfish (*Pacifastacus leniusculus* (Dana)), amur sleeper (*Perccottus glenii* (Dybowski)), freshwater jellyfish (*Craspedacusta sowerbii* Lankester) and zebra mussel (*Dreissena polymorpha* (Pallas)) have been analysed in samples. Analysed samples prove that eDNA is an effective monitoring and detection method for invasive and endangered species as well. This potential of eDNA analysis gives us hope for more effective species monitoring in the future.

Acknowledgements. Project financed by the Administration of Latvian Environmental Protection Fund: "Invasive species monitoring in EPA using environmental DNA method" (project registration No. 1-08/87/2023).

Key-words: environmental DNA; invasive species; freshwater ecosystems.

Remember me? Captive bred natterjack toad identification after release in the wild

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The natterjack toad *Epidalea calamita* is a species distributed from south of Europe and reaches its northern limit in Estonia. In Latvia natterjack toads are almost at their northern distribution limit. Regional re-assessment of their IUCN conservation status revealed that the species is Endangered (EN) in Latvia. The main drivers of natterjack toad population fragmentation in Latvia have been loss of spawning habitats and human disturbance. Rīga ZOO has been maintaining a captive bred natterjack toad population with first generation breeders from the Latvian wild. Rīga ZOO has performed a few population supplementations with these captive bred natterjack toads. The goal of this action is to maintain genetic diversity of the wild population and genetic lines from Latvia. However, besides monitoring the presence of toads in areas of release, there have been no attempts to monitor survival of the released captive bred toads. Comparing different methods of identifying toads in the field, we have chosen images-based identification using dorsal images of toads and the I3S software. Statistical analysis demonstrated that toad dorsal images have a slightly higher identification success than ventral images. The last release of captive bred toads by Rīga ZOO was in 2022 at a secluded population in Salacgrīva county. We are currently testing the image identification method in this population to use it further as a tool for evaluating population supplementation success.

Key words: images-based identification; population supplementation; monitoring.

Global Tree Assessment – overview

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Species extinctions can only be avoided if the best possible information is available and used to inform conservation decisions made by practitioners, policy makers and funders. Red List assessments, both global and national, provide invaluable prioritisation information to catalyse and enable conservation action for species of greatest conservation concern.

The Global Tree Assessment is an initiative to assess the IUCN Red List status of all the world's tree species, co-led by Botanic Gardens Conservation International and the IUCN Species Survival Commission Global Tree Specialist Group. This work is enabled through a global network of over 80 partner organisations and more than 1,000 tree experts, and is one of the largest global assessment project to date.

Threats and pressures on tree diversity vary by biogeographic realm and habitat type. For example, temperate tree species are more likely to be at risk from pests and diseases, while tropical trees are more frequently impacted by logging and land-use change. By identifying variations in threats at various taxonomic and geographic scales, conservation interventions can be better targeted, utilizing relevant expertise within the conservation community. Hence, the results of the Global Tree Assessment will have far-reaching positive outcomes in mobilising targeted action to combat threats to tree species.

Key words: IUCN Red List; tree diversity; extinction risk.

***Trifolium fragiferum* L. - why is it endangered (EN) in Latvia?**

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Trifolium fragiferum L. is distributed almost throughout Europe, except for the northern part; the Caucasus; Western Siberia; Central Asia and North Africa; widely naturalized outside its native range. In Latvia, the species is found in four distant localities - around Liepāja, Rīga, Daugavpils and Ainaži. In Latvia, the habitats of the species are coastal meadows, lakes (mainly of the lagoon-type) floodplain meadows and river floodplain meadows. In Liepāja, Daugavpils and Rīga, it was also found on roadsides. Distribution in Latvia is mainly related to the Coastal lowland but not entirely so.

Globally, the species has not been evaluated according to the IUCN criteria. The species is assessed as stable (LC) in most neighbouring countries of Latvia, for example, in Estonia and Sweden. Looking at the current situation, *T. fragiferum* has been assessed as Endangered (EN) in Latvia. There are two main reasons for that. First of all, the geographic range of *T. fragiferum* in Latvia is severely fragmented. Secondly and above all, the quality of the habitat decreases. The natural spread of the species is negatively affected by the decrease in extent and quality of natural meadows in Latvia. The key to improving the condition is the management of areas important to the species - mowing and removal of the cut material - or grazing.

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Key words: *Trifolium fragiferum*; evaluation; natural meadows.

Challenge – the invasive round goby (*Neogobius melanostomus* (Pallas)) in the Baltic Sea

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The round goby *Neogobius melanostomus* (Pallas) is one of the predominant invasive species in the Latvian coastal waters, and this taxon has caused native species to shift habitats. The round goby comes from the Ponto-Caspian region and is known as the most successful invader of European maritime waters (Hirsch et al., 2016). The round goby feeds on mussels and is a threat to reefs. Since the 1990's when it was first observed, the round goby has spread across the Baltic. For the round goby management and fishery development spatial distribution studies were implemented, habitat mapping to identify the most effective fishing grounds was performed and action plan for reducing species population is under preparation.

Key words: round goby; invasive species.

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Biodiversity data management in Estonia: sharing and caring

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In 2011, institutions holding natural history collections collaborated on the national research infrastructure roadmap project, NATARC. This project enabled a fully digital biodiversity data workflow supporting data publishing to GBIF. A key outcome of this initiative is PlutoF, a biodiversity data management platform for collecting, sharing, and analysing specimen, observation, sample, and DNA data.

Since then, multiple iterations of the roadmap project have been implemented. Today, PlutoF serves as a comprehensive tool for researchers, collection curators, and citizen scientists. The dedicated PlutoF Go app facilitates field data collection, including observations, specimens, and samples.

All Estonian biodiversity data are accessible to the public via the national web portal elurikkus.ee and through GBIF data portal.

Key words: biodiversity informatics; Global Biodiversity Information Facility; Estonia; research; citizen science.

From “paper parks” to effective management

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Most typical situation in biodiversity protection in maritime waters is to establish marine protected areas and leave them on paper only without any further plans or actions. To avoid this situation, within the framework of the LIFE REEF project, the management plan for marine protected areas in Latvia with real management actions is in development. The proposed management actions are split into six general groups:

1. **Monitoring** is responsible for key descriptors to track changes in ecosystem state and effectiveness of MPAs, for example, effective and comprehensive monitoring program for environment and biodiversity, species and habitats must be implemented with full budget.

2. **Management = Regulation + Enforcement** is the general responsibility of MPAs. Strict national legislation is an instrument to regulate the use of maritime environment and biodiversity, for example, development of aquaculture, use of dumping sites, recreational activities, removal of organic fertilization etc.

3. **Research** is responsible for future fulfilment of knowledge gaps.

4. **Involvement of stakeholders** includes key factors that make stakeholder involvement in MPA designation and management meaningful.

5. **Funding** and resources are needed for evidence-based development, involving a wide range of stakeholders and actors, monitoring, and the whole cyclical planning process. Fundings must be continuous and consistent.

6. **Education** – increased ocean literacy increases understanding of why MPAs are needed.

Key words: MPAs; management; paper parks.

Singing in the rain: IUCN assessment of Orthoptera species in Latvia

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There are 43 species present in the Orthoptera fauna in Latvia. Here, rather little is known about species distribution and ecology. In recent years, only a few studies have been aimed to research these insects and currently there is no national monitoring scheme that would allow to obtain data on the distribution and population dynamics of Orthoptera. Currently two species – *Podisma pedestris* (L.) and *Oedipoda caerulescens* (L.) - are legally protected in Latvia by the regulations of the Cabinet of Ministers. However, the question remains which Orthoptera species are most threatened and therefore should be considered for inclusion to the protected species list.

As a part of the LIFE project “Threatened species in Latvia: improved knowledge, capacity, data and awareness” (LIFE19 GIE/LV/000857), all Orthoptera species were considered for assessment. As a first step, inclusion and exclusion criteria were applied to all species. These criteria included (but not only) distribution, clear taxonomy, presence of observation data, ecology, association with rare habitats, dispersal abilities, umbrella or indicator species status and the appearance in the red lists of neighbouring countries and the EU region. As a result, 15 grasshopper and bush-cricket species were selected for assessment according to IUCN criteria in Latvia. For the assessment, occurrence data from 2001-2021 was used.

From the assessed species, one – *Bryodemella tuberculata* (F.) – is regionally extinct, three species – *P. pedestris*, *Psophus stridulus* (L.), *Sphingonotus caerulans* (L.) – are endangered and the rest were assessed as least concern. The most common threat is the deteriorating quality and area of the EU protected habitats which drives species to reduced populations in suboptimal habitats. *Podisma pedestris* and *P. stridulus* are of particular conservation interest, as both species display negative trends in Europe. Interestingly, *O. caerulescens*, currently a protected species in Latvia, was assessed as least concern, while *P. stridulus*, a species removed from the protected species list in 2004, was assessed as endangered. This highlights the necessity to review the present protected species list to ensure conservation status for the species most in need for protection.

Acknowledgements. The study was done with financial support of European Commission and the State Regional Development Agency, Republic of Latvia.

Key words: Orthoptera; IUCN assessment; LIFE for Species.

Biodiversity, ecosystem functioning and service supply

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The supply of ecosystem services is underpinned by numerous ecosystem functions and species and requires biodiversity across space. The poster illustrates the strength of links between community components and functions and the supply of nutrient regulation by nutrient incorporation in biomass in a state of good environmental status.

Key words: ecosystem services; marine environment; marine protected areas.

Egg incubation temperature effects on the European pond turtle (*Emys orbicularis* L.) sex in natural habitats

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European pond turtle (*Emys orbicularis* (L., 1758)) is an endangered species in most of European countries. Species is included to the IUCN Red List of Threatened Species and assigned to Near Threatened (NT) category in the European region. In the Red Data Book of Lithuania *E. orbicularis* is listed as Endangered (EN) and is at very high risk of extinction in the wild. Lithuanian subpopulations of *E. orbicularis* are decreasing mainly because of habitat degradation and fragmentation. The aim of this research was to perform morphometric measurements of *E. orbicularis* juveniles, identify sex according to the difference of plastron appearance and determine effect on egg incubation in natural habitats on sex and size of juveniles. The study was carried out in 2021–2023. Three types of measurements were taken each year: length and width of carapace and median height of shell. Sexual dimorphism was observed. Our study revealed that the size of *E. orbicularis* juveniles correlates with sex of measured individuals. Incubation temperature has an influence on sex determination of individuals, especially during 16th–22nd stages of embryonic development. In order to perform more studies on this topic, natural habitats of *E. orbicularis* have to be preserved or restored and size of populations need to be increased.

Key words: *Emys orbicularis*; endangered species; conservation; sexual dimorphism; Natura 2000.

Methodology of capture, breeding and releasing individuals of the endangered hermit beetle (*Osmoderma barnabita*) to their historical habitats

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Survival of the hermit beetle (*Osmoderma barnabita* Motsch.) depends on decaying wood of live broad-leaved trees, most often oaks. Endangered species dependent on microhabitats are among the most vulnerable and their conservation is highly important. Several subpopulations of *O. barnabita* are spread fragmentary in the territory of Lithuania, but the biggest of them is found in the large oak park Ažuolynas in Kaunas. The objective of the research was to establish an *ex-situ* population of *O. barnabita* and release the bred individuals to the restored historical habitats. *Osmoderma barnabita* individuals were collected in oak park and the surroundings of the Lithuanian Zoological Gardens during the summer months of 2019–2021. Pheromone traps installed on oak tree trunks were used to capture adult beetles. Trapped beetles were transferred to breeding containers with tightly fitting lids with ventilation openings. The substrate consisted of 50–60 % oak leaves composted for 6–12 months and shredded, as the main diet of larvae are decayed leaves. The rest 40–50 % of the substrate was made of oak rot affected by brown-rot fungi, which was collected from old or fallen oaks. Mating *ex situ* took place from June to August. The eggs were laid in the substrate and left undisturbed until they hatched. The larvae were transferred to the rearing containers after 60–90 days. The larvae were ready for release after 1–3 years. The larvae were placed in specially crafted nesting boxes and transferred to nature during the months of May and June. A high number of *O. barnabita* larvae (758) and pupae (160) were released during the project period, in Verkių Regional park, which is located in Vilnius, Lithuania.

Key words: *Osmoderma barnabita*; endangered species; umbrella species; LIFE project; Natura 2000.

A monitoring of beetle species (Insecta, Coleoptera) in Punios šilas nature reserve – oldest forest of Lithuania: a first survey

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The forest Punios šilas has an exceptional value from a natural point of view as a preserved primeval natural forest with the highest abundance of protected species and ecosystem components in Lithuania. In the scope of the LIFE-IP PAF-NATURALIT project "Optimizing the management of Natura 2000 network in Lithuania", it is planned to carry out a multi-component ecosystem monitoring in this unique reserve, including beetle communities. Beetle monitoring was focused on determining the structure of dead wood-related (saproxylic) beetle communities at pre-selected monitoring points. Monitoring was carried out using flight interception traps. One trap was installed in each of fifty monitoring locations, which have been operating since May 19 till July 21 in 2023. A total of 14 523 individuals of beetles representing more than 560 species were caught. A saproxylic beetles' species consist 52.6 % and individuals – 50.3 % of all yield. Most abundant saproxylic species were: *Anaspis rufilabris* (Gyllenhal), *Cetonia aurata* (Linnaeus), *Ctesias serra* (Fabricius), *Dasytes plumbeus* (Müller), *Diaperis boleti* (Linnaeus), *Isorhipis marmottani* Bovouloir, *Molorchus minor* (Linnaeus), and *Tomoxia bucephala* Costa, and individuals of these species made up 35.2 % of all trapped saproxylic beetles. Eighty species of studied assemblage of beetles are listed in the IUNC European red List of Saproxylic beetles, and four *Cucujus cinnaberinus* (Scopoli), *Dendroxena quadrimaculata* (Scopoli), *Peltis grossa* (Linnaeus), *Protaetia lugubris* (Herbst) are included in Red Data book of Lithuania. The results of this study contributed significantly to the knowledge of Lithuanian fauna, 27 species, namely: Ciidae: *Cis dentatus* Mellié, *C. reflexicollis* Abeille de Perrin; Corylophidae: *Orthoperus corticalis* (Redtenbacher); Cryptophagidae: *Atomaria ornata* Heer; Curculionidae: *Trypophloeus alni* (Lindemann); Elateridae: *Denticollis borealis* (Paykull), *Pseudanostirus globicollis* (Germar); Eucnemidae: *Clypeorhagus clypeatus* (Hampe), *Hylis olexai* (Palm), *Isorhipis marmottani* Bovouloir; Hydrophilidae: *Hydrobius subrotundus* Stephens, *Megasternum immaculatum* (Stephens); Latridiidae: *Corticaria polypori* J. Sahlberg, *Melanophthalma maura* Motschulsky, *M. rispini* Rücker & Johnson; Leiodidae: *Colon barnevillei* Kraatz; Lycidae: *Erotides cosnardi* (Chevrolat); Mordellidae: *Mordellaria aurofasciata* (Comolli), *Mordellistena neuwaldeggiana* (Panzer); Nitidulidae: *Carpophilus marginellus* Motschulsky, *Glischrochilus tremulae* Clayhills, Audisio & Cline; Ptinidae: *Dorcatoma janssoni* Büche & Lundberg, *D. substriata* Hummel, *D. punctulata* Mulsant & Rey, *Stagetus borealis* Israelson; Throscidae: *Aulonothroscus brevicollis* (Bovouloir), *A. laticollis* (Rybinski) were recorded for the first time in the country.

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Key words: Coleoptera; monitoring; nature reserve; Lithuania.

LIFE FOR SPECIES project contribution to the protection of rare and endangered species in Latvia: Results, challenges and next steps

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Biodiversity is declining globally at an unprecedented rate with around one million animal, plant and fungal species potentially at risk of extinction within the next few decades.

Several international policies are in force to tackle this crisis include those defining specific biodiversity recovery goals and targets (the Convention on Biological Diversity, the UN Sustainable Development Goals etc.). The IUCN Red List of Threatened Species, also called ‘barometer of life’, is widely recognized as the most objective and comprehensive approach for evaluating the status and extinction risk of species. Over 163 000 species have been assessed for the IUCN Red List worldwide with the situation in Europe even more extensive than in other parts of the world, providing a cradle of information on the status of about 15 000 European taxa. Until recently, Latvia (EU) was outside of this process utilizing its own national system of extinction risk assessment.

LIFE FOR SPECIES project, a pioneering activity in Latvia, allowed implementation of the IUCN criteria and categories at national level. To select taxa for IUCN assessments from over 20 000 species rich Latvian flora and fauna, a matrix of criteria was developed and applied to most speciose groups such as invertebrates. These criteria included, among others, clear taxonomy, presence of contemporary data, association with rare or protected habitats, indicator species status, dispersal abilities, and the red list category in Europe and neighbour countries. Within three years, 1636 taxa of plants, fungi and animals (includes also 161 (10 %) NA (Not Applicable) taxa which were assessed initially) were assessed, among them all legally protected species in Latvia and species of the EU importance, the Latvian regional populations of 753 (46 %) of which appear threatened. 345 taxa (21 %) assessed Least Concern and 140 (9 %) – Data Deficient.

To achieve one of the primary goals of the project - to evaluate and update the lists of specially protected and micro-reserve species, and to prepare updated drafts for legislative amendments – another matrix of criteria has been developed and reconciled with the involved parties. The 11 ‘nomination’ criteria for inclusion of threatened taxa into a draft legislative amendment of nationally protected species included, amid others, the status in the EU Habitats Directive, IUCN category (national and international), global range area (e.g., endemic or subendemic), status of regional population (e.g., depleted, below the favourable condition threshold) etc. As a result, a proposal for a new national list of legally protected taxa, including 1016 species each categorized by considered compensation measures and one or several required conservation measures is prepared. A made study of the socio-economic impact of protecting these taxa is pioneering for Latvia, demonstrated strong support from the Latvian residents to preserve our threatened biodiversity and presented a calculation of possible direct and indirect annual financial benefits of ~268 mil. EUR for the national economy. Discussions with the state authorities, specialists, stakeholders and general public are ongoing.

In parallel, the national nature data management IS ‘OZOLS’ was significantly updated to enhance the quality of data on endangered species and its applicability for nature conservation purposes at different levels and more than 100 000 database records were manually verified. Numerous activities took place in Latvia to increase public awareness and knowledge about threatened biodiversity including expert training seminars, public events, exhibitions and competitions. The identified post-project activities appear challenging for a small country, and a call for an international and regional cooperation is announced herewith.

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Key words: extinction risk; IUCN; national legislation; protected species; challenges; small country.

Project LIFE FOR SPECIES actions to improve the quality and applicability of geospatial data on endangered species in Latvia

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The planning and implementation of species conservation measures are largely based on spatial data of protected and threatened species. In Latvia, such data are stored in the Nature Data Management System ‘OZOLS’ (NDMS OZOLS) maintained by the Nature Conservation Agency (NCA). As these data contain digitized, updated, and collected data of different ages, and from various resources, they are rather inhomogeneous. Therefore, within the project LIFE FOR SPECIES (LIFE19 GIE/LV/000857) several important improvements to the database structure, storage, collection, and display of species distribution data have been made.

This presentation will introduce the Species Classifier and changes to the species database. To improve data quality, reduce the risk of errors, facilitate data submission, and provide data exchange with other databases, the project has developed and integrated the Species Classifier and improved data entry tools. The Species Classifier assigns a unique code to each species and accumulates information that would not be needed in a GIS attribute table. The introduction of the Classifier has eliminated typing errors, doubts about conservation statuses, and access to data.

In addition, the presentation will showcase two species survey tools which are based on the ESRI Survey123 app, designed to minimize the time-consuming operations for users to fill in the attributes, to auto-populate as much information as possible, and to minimize the time for experts to be involved in data preparation after fieldwork. The first tool will be on species data collection in the NDMS OZOLS both in the field or by filling in the form indoors by NCA staff and species experts. The second tool is for monitoring coastal nesting birds by volunteers.

To make it more user-friendly for interested parties to find out more about the species evaluations and distribution maps, the project has created an interactive species WEB browser where they can see distribution maps of the evaluated species, as well as statistics on species distribution and frequency of observations in the country.

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Key words: species distribution; species monitoring; fieldwork; spatial databases; interactive maps.

Giving voice to nature: Special letters from the plant species listed in the EU Habitats Directive

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Effective communication strategies are essential for enhancing public awareness and support for species protection. In the poster we will present a novel approach developed by LIFE-IP LatViaNature to increase recognition of protected plant species listed in Annex II of the EU Habitats Directive. The initiative, entitled “Letters from the EU Habitats Directive's Plants,” personifies these unique plant species through personalized letters. Each letter, written in an engaging and relatable manner, highlights the distinctive features and ecological significance of the plant it represents.

The primary goal of this initiative is to foster a deeper connection between the public and the rare plant species found in Latvia, thereby promoting conservation efforts. By giving these plants a “voice,” the letters transform abstract concepts of biodiversity and conservation into tangible and relatable narratives. This approach not only educates the public about the importance of preserving these species but also inspires a sense of stewardship and responsibility.

To date, the plant letters have reached a significant audience within Latvia, with total social media engagement reaching 3 166. The success of the project in the Latvian language <https://ej.uz/zieduvestules> has prompted the initiative to expand its reach by translating the letters into English, aiming to engage a broader international audience. This expansion is expected to further enhance awareness and support for the conservation of these species across Europe and beyond.

By showcasing this innovative communication technique, the poster will aim to provide valuable insights into effective methods for raising public awareness and support for species protection. It will demonstrate how creative storytelling and personification can serve as powerful tools in conservation education and advocacy, ultimately contributing to the preservation of biodiversity.

Key words: awareness raising; EU Habitats Directive; protected plant species.

State level nature conservation spatial data management in Estonia – an overview of Estonian Nature Information System and Environmental Monitoring Information System

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Estonian Environmental Agency manages two important state level databases that store nature conservation data: EELIS (Estonian Nature Information System) and KESE (Environmental Monitoring Information System).

An overview of the data stored in EELIS and how it's collected and published will be given in the presentation. In EELIS data from fields related to nature protection and water is stored and it can be divided into two categories: a) objects that create regulations or restrictions according to legislation, and b) natural values (e. g. Natura 2000 habitats, objects of heritage culture). KESE is a database for data collected within the framework of national environmental monitoring program and related environmental research-projects.

Species and habitats data stored in EELIS come from inventories carried out/ordered by the Environmental Board or from monitoring data entered in KESE. Protected areas data originates also from the Environmental Board or derives from legislation. In addition, EELIS also includes data about bird ringing in Estonia and nature observations. The latter is also used to collect data through citizen-science projects.

Data in both systems is made available to different user groups. The public can access most of the information, except for data that is restricted by law – for example the exact locations of the habitats of species of the national protection categories I and II.

In addition, the presentation will cover the development plans and financial solutions of both systems. Currently several projects are currently underway or in the planning stage. EELIS system is being developed so that it will change form a desktop application to a web-based one, and an analytics project is in progress which creates automatic analyses for different statistics based on EELIS data. Also, there are plans to develop an automatic interface between KESE and EELIS in the near future.

Key words: nature conservation data; spatial data; citizen-science; monitoring.