81st International Scientific Conference of the University of Latvia 2023

UNIVERSITY OF LATVIA
FACULTY OF BIOLOGY

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Zoology and Animal Ecology

Abstract book

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81st International Scientific Conference of the University of Latvia 2023

UNIVERSITY OF LATVIA FACULTY OF BIOLOGY

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Bioloģijas sekcija
Referātu tēžu krājums

Bioloģijas fakultāte, Zooloģijas un dzīvnieku ekoloģijas katedra
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Sastādīja: Gunita Deksne

Bioloģijas sekcija / Biology section

Zooloģijas un dzīvnieku ekoloģijas apakšekcija / Zoology and animal ecology sub-section

Programma / Programm

2023. gada 25. janvāris / 25th of January, 2023

Vadītājs/Chair**: Asoc. prof., Ainārs Auniņš, Asoc. prof., Gunita Deksne**		
10.00–10.05	***Asoc. Prof., Ainārs Auniņš*** *Faculty of Biology,* *University of Latvia*	**Atklāšana** Opening
Uzaicinātie ziņojumi / Plenary session		
10.05–10.50	**Prof. Urmas Saarma** *Department of Zoology,* *Institute of Ecology and Earth Sciences,* *University of Tartu,* *Estonia*	**Šakāļu, lapsu un savvaļā mītošo suņu ietekme uz zoonotisko parazītu izplatīšanos un uz zemes ligzdojošiem putniem** Impact of jackals, foxes and free-ranging dogs on ground nesting birds and dissemination of zoonotic parasites
Mutiskie ziņojumi / Oral presentations		
10.50–11.00	**Maira Mateusa**	***Cryptosporidium* spp. un *Giardia duodenalis* sastopamība mājas suņos (*Canis familiaris*)** Prevalence of *Cryptosporidium* spp. and *Giardia duodenalis* in domestic dogs (*Canis familiaris*)
11.00–11.10	**Agrita Žunna**	**Latvijas vilku populācijas ģenētiskā un radniecības struktūra** Genetic and kinship structure of the Latvian wolf population
11.10-11.20	**Alessandro Di Marzio**	**Eiropas pūču fluorescence** Fluorescence in European owls
11.20-11.30	**Ronalds Krams**	**Ekoloģisko slazdu loma putnu izdzīvošanas un vairošanās sekmēs** The role of ecological traps in bird survival and reproduction
11.30-11.45	**Kafijas pauze, diskusijas, stenda referāti /** Coffee break, discussions, posters	

Mutiskie ziņojumi / Oral presentations		
11.45–11.55	**Larisa Petra Kaija**	**Inbrīdinga tolerance saistībā ar reproduktīvo stratēģiju Microtus hartingi strupastu populācijās** Inbreeding tolerance in connection with the reproductive strategy in *Microtus hartingi* vole populations
11.55–12.05	**Andris Avotiņš**	**Pūču skaitliskās atbildes noplicinātām sīko zīdītāju populācijām Latvijā** Numerical response of owls to dampening of the population cycles of the small mammals in Latvia
12.05–12.15	**Valdis Pilāts**	**Zīdītāji kartē – provizoriskie rezultāti zīdītāju atlanta un Latvijas nacionālā sarkanā saraksta izveidei** Mammals on map – preliminary results for the development of atlas of mammals and the national red list of Latvia
12.15–12.25	**Tatjana Zorenko**	**Pilsētas zaļās zonas grauzēji uz Rīgas piemēra** Rodents of the urban green zone on the example of Riga
12.25-12.30	**Stenda referātu prezentācijas (1 min) /** Short poster presentations (1 min)	
	Jurģis Šuba	**Diskrēts populācijas pieauguma modelis, ņemot vērā iekšsugas konkurenci un nejaušu indivīdu izvietojumu** Discrete-time population growth model according to contest competition and spatially random distribution of individuals
	Patrīcija Raibarte	**Augsts melno mušķērāju asins parazītu infekcijas līmenis un zems reproduktīvais fitness norāda, ka meža ūdenstilpes rada ekoloģiskās lamatas** High blood parasite infection rate and low fitness suggest that forest water bodies comprise ecological traps for pied flycatchers
	Rūta Starka	**Taisnspārņu daudzveidība mitros un mēreni mitros zālājos Ķemeru Nacionālajā parkā** Orthoptera diversity in humid grasslands of Ķemeri National Park
12.30-14.00	**Pārtraukums, diskusijas, stenda referāti /** Break, discussions, posters	

14.00-14.10	**Andris Avotiņš**	**Pūču un dzeņu izplatības modelēšana mežu aizsardzības izvērtēšanai Latvijā** Distribution modelling of owls and woodpeckers to evaluate forest conservation in Latvia
14.10-14.20	**Elza Birbele**	**Pirmais Ranavirus novērojums savvaļas abiniekiem Latvijā** First report of Ranavirus in wild amphibians in Latvia
14.20-14.30	**Māris Munkevics**	**Visas mušas nedodas pretī gaismai: riska izlīdzināšanas stratēģija *Drosophila melanogaster* gaismtieces mainībā** Not all flies go toward the light: a bet-hedging strategy in the phototactic variability of *Drosophila melanogaster*
14.30-14.40	**Ringolds Rutkis**	**Taisnspārņu aktivitātes analīze, izmantojot sikspārņu detektoru ierakstus** Analysis of orthopteran activity, using recordings from bat detectors
14.40-14.50	**Edgars Lediņš**	**Automātisko kameru izmantošana putnu gredzenu nolasīšanā** The use of automatic cameras in reading bird rings
14.50-15.15	**Kafijas pauze, diskusijas, stenda referāti /** Coffee break, discussions, posters	
15.15-15.25	**Arvīds Barševskis**	**Ģints *Cleomenes* Thomson 1864 (Coleoptera: Cerambycidae) Filipīnu faunā** Genus *Cleomenes* Thomson 1864 (Coleoptera: Cerambycidae) in the fauna of the Philippines
15.25-15.35	**Jānis Ozols**	**Saproksilie organismi un kāpēc to monitorings ir nepieciešams Latvijā** Saproxylic organisms and why is their monitoring necessary in Latvia
15.35-15.45	**Rūta Starka**	**Taisnspārņu apdraudētības izvērtējums pēc IUCN kritērijiem Latvijā** IUCN Red-List Assessment of Orthoptera in Latvia
15.45-15.55	**Māris Strazds**	**Tie nav tikai skaitļi. Vai mēs saprotam, ko publicējam?** These are not just numbers. Do we know what are we presenting?
15.55-16.05	**Andris Avotiņš**	**Novērotā un modelētā sugu izplatība un populāciju lielumi: izaicinājumi un ieguvumi** Observed and modelled species distribution and population size: chanllenges and gains

16.05–17.--	**Studentu konkursa uzvarētāja paziņošana, noslēguma diskusijas** Student award announcement, conclusions, discussions

SATURS / CONTENT

PLENARY SESION

PLENĀRIE ZIŅOJUMI

IMPACT OF JACKALS, FOXES AND FREE-RANGING DOGS ON GROUND NESTING BIRDS AND DISSEMINATION OF ZOONOTIC PARASITES

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Wild mammalian predators such as jackal and foxes, but also free-ranging dogs, are a potential risk for ground nesting birds and transmission of zoonotic pathogens to domesticated animals and humans. Matsalu National Park (MNP) in western part of Estonia is a valuable habitat for many bird species. However, the abundance of ground-nesting bird species in MNP is decreasing and predation could be one of the key factors. Earlier studies have suggested that the red fox (*Vulpes vulpes*) could be the main predator of ground-nesting birds, but in my talk, I will present data showing that jackal (*Canis aureus*) and free-ranging dogs play also important role.

Zoonotic parasites distributed by wild predators and domestic dogs are a potential One Health concern. I present data of zoonotic helminths disseminated by jackals, red foxes, and free-ranging dogs in MNP that demonstrate high helminth prevalence and large overlap of helminth fauna between wild predators and rural dogs.

PRESENTATIONS

MUTISKIE ZIŅOJUMI

PREVALENCE OF CRYPTOSPORIDIUM SPP. AND GIARDIA DUODENALIS IN DOMESTIC DOGS (*CANIS FAMILIARIS*)

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Food-borne and water-borne protozoans – *Cryptosporidium* spp. and *Giardia duodenalis* - are important zoonotic parasites that can cause diarrhoea and other intestinal tract disorders in both humans and animals. Dogs can carry and spread these parasites, therefore posing a risk for human health. The aim of the present study was to determine the prevalence of *Cryptosporidium* spp. and *Giardia duodenalis* in dogs.

Faecal samples from 170 domestic dogs were prepared using flotation-centrifugation method and stained with immunofluorescence staining technique using AquaGlo™ (Waterborne INC, USA). A questionnaire filled out by the owner was obtained together with the faecal sample, to gather information about the dog's age, sex, living conditions, daily routine and feeding habits. Two-tailed Fisher's exact test was applied to calculate the differences between potential factors affecting *Giardia* in dogs, p-value of <0.05 was considered statistically significant.

Cryptosporidium spp. and *Giardia* prevalence was 12.58% (N=19; 95%CI: 8.13-18.89) and 13.33% (N=20; 95%CI: 8.73-19.77) respectively. Both parasites were found in 40.00% (N=8; 95%CI: 21.83-61.40) of positive dogs. Mean intensity for *Cryptosporidium* was 6545.66 (200-30800) OPG, but for *Giardia* 30870 (200-330000) CPG. The highest *Cryptosporidium* prevalence was observed in adult dogs (15.57%), followed by senior (10.87%), puppies (5.56%) and geriatric (0.00%), but *Giardia* was observed more in adult (16.88%), followed by geriatric (9.09%), puppies (8.55%) and senior (6.52%) dogs. Dogs, which were walked outside urban environment, had higher ($p<0.05$) potential of being infected with both *Cryptosporidium* and *Giardia*. Irregular deworming could be a potential risk factor for *Cryptosporidium* and *Giardia* infections ($p=0.04$; $p=0.02$ respectively). Factors, such as age, sex, living conditions (apartment or private house/cottage) frequency in walking activities (regularly, irregularly), walking area (public park, meadow, forest, city), feed (raw diet, commercial feed, slaughter by-products, game) had no statistical significance on both parasite prevalence in dogs ($p>0.05$).

This research was funded by the Fundamental and applied research "Transmission of Foodborne Parasitic pathogen from animals to humans: TRANSPAR" (lzp-2021/1-0055).

GENETIC AND KINSHIP STRUCTURE OF THE LATVIAN WOLF POPULATION

Agrita Žunna, Jānis Ozoliņš, Dainis Edgars Ruņģis, Alda Stepanova, Gundega Done, Viktorija Sirsniņa, Guna Bagrade, Aivars Ornicāns, Jurģis Šuba
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Nowadays methods of molecular genetics are used not only to survey genetic structure of populations but also to study kinship and social structure, distribution and dispersal of individuals and many other parameters of the populations. Such information is important for the management of harvested species in order to evaluate effects of hunting on social and genetic status of the populations.

Wolves live in packs that are usually formed of related animals – a breeding pair and their offspring. Loss of a breeder due to hunting or other mortality factors can lead to pack disruption and abandonment of the pack's territory, inbreeding in the pack or hybridization with other species. Such occurrences can contribute to negative changes in population's demography, behaviour of the animals, dispersal, breeding and hunting habits and gene flow among packs. Therefore it is important to understand if and how harvesting influences genetic and social structure of the wolf population.

Genetic material was obtained from the wolves harvested in Latvia since 2009 till 2021. Several genetic parameters were evaluated and kinship analyses were performed to determine parent-offspring and sibling relationships.

Genetic variation of the population was high (He – 0,718, Ho – 0,709), inbreeding coefficient was low – 0,013. Allelic diversity varied through the years but differences were not statistically significant.

During the study period 223 groups of related animals were determined. Typical social and kinship structure of the wolf population was observed, however most related groups (67,1%) lasted only for one or two hunting seasons. Groups that lasted for four seasons and longer were harvested mostly in Kurzeme (47,5%) and Vidzeme (26,2%). Breeder loss was observed in 64,6% of the groups. Abandonment of pack territories was suggested in seven groups and probable in other 38 groups.

Genetic structure of Latvian wolf population shows high genetic variation that has lasted for the whole study period. While in terms of numbers and distribution lethal control of wolf population has been sustainable, impact of hunting on the social and territorial structure of the population was observed.

FLUORESCENCE IN EUROPEAN OWLS

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Ultraviolet light can stimulate fluorophores (chemical compounds responsible for fluorescence), producing fluorescence. This phenomenon has been observed in a wide range of animals, from invertebrates to mammals. The colour of the fluorescence varies with the type of fluorophore. In many bird species' feathers the principal fluorophore is porphyrins - an abundant biological pigment group, that is mainly found in brown to red feathers and produces a reddish-orange fluorescence. Although fluorescence records exist for some owl species, a systematic study of all the species inhabiting the European continent has never been carried out. We investigated the thirteen species of owls present in Europe and found, for the first time, fluorescence in all of them. Particularly interesting was the finding of fluorescence in the snowy owl (*Bubo scandiacus*), which is the only European owl species that has been previously reported as "non-fluorescent". We examined the body and feather distribution of fluorescence in owls, showing similarities between species. Further investigations are needed to clarify if fluorescence may have some biological functions for owls.

THE ROLE OF ECOLOGICAL TRAPS IN BIRD SURVIVAL AND REPRODUCTION

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In general animals prefer habitats of the highest quality. Less favored habitats may become more attractive, caused by rapid environmental changes. Habitats that reduce animal survival, reproduction and fitness can also be populated. Such habitats are defined as ecological traps.

The aim of the study was to find whether human nature conservation activities can lead to ecological traps for bird populations and whether areas around forest water bodies with high levels of biodiversity can cause reduced survival of the bird offspring.

At first, we assayed whether breeding great tits (*Parus major*) in Scots pine (*Pinus sylvestris*) forests severely damaged by an outbreak of the great web-spinning sawfly (*Acantholyda posticalis*) suffer fitness costs. We discovered that great tits inhabiting sawfly outbreak territories had a similar clutch size compared to birds that reproduced in intact forest areas. In the affected parts of the forest the number of new-borns was significantly lower and the condition of them was worse.

Second, we investigated whether there is a positive relationship between distance to the nearest forest water bodies and the prevalence of blood parasites in nesting European Pied Flycatcher (*Ficedula hypoleuca*), and are the tree stands further away from wetlands considered as areas free from avian parasites. Parasite prevalence and their transmitter profusion decreased overall with distance increase from the water sites. New-borns were less numerous and in poorer condition near water bodies compared to those in areas 1 km from lakes, streams, and bogs.

Lastly, we researched whether the prevalence of bird blood parasite infection is associated with the proximity to hydrological objects where the parasites breed, from the wintering sites of the willow tit (*Poecile montanus*) and the crested tit (*Lophophanes cristatus*) flocks. Here we found that outside the bird reproductive season the avian blood infection prevalence reduced with the distance increase from forest water objects. Infectious parasite distribution was connected with low survival of willow tits compared to crested tits near the forest water sites.

INBREEDING TOLERANCE IN CONNECTION WITH THE REPRODUCTIVE STRATEGY IN *MICROTUS HARTINGI* VOLE POPULATIONS

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Inbreeding is mainly viewed as a force driving species to extinction, as increased homozygosity enforces the expression of deleterious recessive alleles (Charlesworth, 2009). However, in few cases inbreeding can cause speciation and theoretically might be a driver of evolution of sociality; social animals are often more prone to inbreeding (Tabadkani et al, 2012). On rare occasions, the synergy of founder effects, bottleneck effect and inbreeding might accelerate speciation (Matute, 2013).

Differences in inbreeding tolerance in two populations of *Microtus hartingi* vole were studied through a series of experiments on reproductive behaviour and partner's choice. Modeling an artificial polygyny via formation of triplets consisting of a brother, sister and an unrelated female has shown an uneven attitude towards inbreeding closely linked to the reproduction strategy: polygynous Rhodope population would successfully reproduce communally with only a moderate decrease in reproduction success, while monogamous *M. h. ankaraensis* voles from Central Anatolia exhibited severe social stress resulting in heavily antagonistic behaviour between females and zero reproductive success; aggression levels rose with maturation. The differences in reproductive strategy might have evolved due to habitat fragmentation and restriction of natal dispersal in the Rhodope population which has been isolated from *M. h. ankaraensis* since pleistocene. The adaptation to limited migration rates has brought to the formation of new reproductive strategy and to reaching a new level of sociality through kin selection and inbreeding.

NUMERICAL RESPONSE OF OWLS TO DAMPENING OF THE POPULATION CYCLES OF THE SMALL MAMMALS IN LATVIA

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In the boreal biome, animal communities are known to follow multi-annual population cycles. An important role in these regular, high amplitude density oscillations is played by the small mammals themselves and the biological and ecological cascades to which they contribute. The role of the small mammals ranges from influencing plant natural succession, through influence on plant and microorganism community composition to demographic processes of small mammal predators and even population processes and behaviour of directly unrelated species. However, in recent decades evidence on the collapse of the small mammal (vole in particular) cycles starting in more northern latitudes but covering most of Europe is gathered.

In this study, we present data on the relative abundance of the small mammals in different habitats in Latvia and provide evidence on the dampening of their population cycles. Furthermore, we investigate the numerical response of six owl species (Tawny Owl, Ural Owl, Long-eared Owl, Pygmy Owl, Tengmalm`s owl, and Eagle Owl) via three functional responses – diet, breeding performance, and relative population density.

We found temporarily increasing food niche breadth in tawny and Ural owls. There were no other responses in Tawny Owl, whereas the breeding performance of three forest specialist species – Pygmy, Tengmalm`s and Ural owls – were similar to the vole crash years in Fennoscandia. Moreover, the populations of forest specialist owls are decreasing, and the change in Ural Owl can be attributed to the depletion of the small mammal populations. We found evidence of carry-over effect in the Eagle Owl arising from a strong correlation of declining breeding performance with the small mammal abundance indices in the previous autumn.

We conclude that dampening of the small mammal population cycles is an important covariate to overwhelming impacts of habitat destruction with stronger response in more specialized (to prey or habitat) species.

MAMMALS ON MAP - PRELIMINARY RESULTS FOR THE DEVELOPMENT OF ATLAS OF MAMMALS AND NATIONAL RED LIST OF LATVIA.

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Large-scale project - European Mammals on Maps (EMMA2), started in 2016, is nearing completion. The main objectives of this project are to determine the distribution of 264 mammal species in Europe during the period 1999-2022 and to publish the 2nd Atlas of European Mammals. Similarly, as in the 1st Atlas published in 1999, next Atlas will contain maps of each species plotted on a 50 km UTM grid and based entirely on field observations. This is multi-national project with each country contributing data from national datasets.

In Latvia, the main sources for mammal distribution data are the National Biodiversity Monitoring Program, the nature observations portal Dabasdati.lv and some studies on raptor, especially owl, foraging. For approximately half of mapped species data from Dabasdati.lv make up most or large part of the species records. At the same time, 2/3 of these in Dabasdati.lv registered species had to be evaluated for the correctness of species identification. Reports of morphologically similar vole, mouse, shrew and mustelid species were examined. Verification of species records were done within the LIFE project LIFE FOR SPECIES (2021–2024) to prepare the threat assessments for mammal species in Latvia according to the methodology of IUCN (The International Union for Conservation of Nature).

In Latvia, 77 wild mammal species have been recorded but only 62 species is going to be mapped, while the risk assessment will be prepared for 38 species. Among unmapped species are those either occasionally observed, either vanished or simply lacking data on records. Marine mammals constitute the bulk of occasionally observed species. The most recent case of occasional visitor is the sighting of the walrus *Odobenus rosmarus* in 2022. There are five species mapped for the 1st Atlas but missed for the 2nd Atlas. The Siberian flying squirrel *Pteromys volans*, garden dormouse *Eliomys quercinus* and European mink *Mustela lutreola* most probably are vanished and thus are considered regionally extinct in Latvia. The European hedgehog *Erinaceus europaeus* and sibling vole *Microtus rossiaemeridionalis* is species supposed to be present, but no reliable records has obtained as their identification require specific methods. Consequently, within process of extinction risk assessment European hedgehog is evaluated data deficient as it was assessed threaten in previous assessment process. Another three species - tundra vole *Microtus oeconomus*, European pine vole *M. subterraneus* and golden jackal *Canis aureus* are new for Latvia, i.e., have been identified for the first time or have settled here after 1999. For almost all species supposed to be distributed all over the country a greater or lesser part of the grid cells (50 x 50km) remained without evidence of the presence of the species indicating on absence of data not species.

Results of mammal species mapping will contribute not only for the new Atlas of European Mammals and compilation of the national Red List, but they are basis for producing reports under the EU Habitats Directive and EU Invasive Alien Species Regulation, to set the conservation objectives for species listed in EU Habitats Directive as well as for monitoring long-term changes of wildlife in Latvia.

RODENTS OF THE URBAN GREEN ZONE ON THE EXAMPLE OF RIGA

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In recent decades, urban ecology has become an important area of science. Humanity is rapidly urbanizing, and by 2030 more than 60% of the world population is expected to live in cities [UN, 1997]. Data on species diversity and distribution of mammals, especially rodents, in different cities of the world are being gathered intensively. Urban settlements and cities represent the most anthropogenic part of the biosphere with unique ecological characteristics. The presence of varied food in abundance, the presence of burrows and mosaic habitats that meet the requirements of animals for climatic (especially microclimatic) and other conditions, makes the city a convenient habitat for small mammals. The city is considered as a special evolutionary new type of ecosystem, which includes industrial zones and biocenosis (1); according to the “island” theory, a city is a kind of archipelago consisting of isolated populations (2) or a city is a socio-ecological system (3). Each city is characterized by a certain proportion of built and unbuilt (green) territories, its own hydrological system and relief form, which determines the natural and ecological situation. Urban green space, comprising parks, meadows, woodlands, and other semi-natural areas, is a fundamental component of urban ecosystems. The preservation of significant open spaces in the city is a necessary condition for maintaining the comfort of the urban environment for a person. The protective ring of natural ecosystems (old forests, coasts and water spaces) stabilizes the human environment, serves as buffers in the air and water cycles, softens the temperature regime, and so on (Odum, 1986). It is economically and energetically more profitable not to destroy "green zones" rather than incur greater costs for artificially providing peoples a comfortable environment in the city.

Small mammals can be a bioindicator, which allows assessing the quality of urban green areas. Riga has a relatively large green area comprising forest parks, the total area of which is about 5018 ha (16.5%), and islands with meadows. All the forest parks researched are located in the fourth zone of Riga and meadow habitats are located in the third zone (Zorenko, Leontyeva, 2003). A stable composition of small mammals has been preserved in these habitats. Two species of rodents were identified in the meadows (common vole *Microtus arvalis* and striped field mouse *Apodemus agrarius*) and six species were registered in the forest parks (yellow-necked mouse Sylvaemus flavicollis, bank vole *Clethrionomys glareolus* and rare little wood mouse *Sylvaemus uralensis*; as well as meadow species: A. agrarius, *Microtus rossiaemeridionalis* and *M. arv*alis). Animal populations are able to maintain their structure and a certain number of individuals for a long time (three-year observations in each of the habitats). The Shannon diversity index with the degree of anthropogenic pressure was evaluated and a high negative correlation ($r = -0.86$) between these two indices was revealed. The determination of the relationship between urban green space and unbuilt areas is necessary to understand urbanization and the future development of the city.

DISTRIBUTION MODELLING OF OWLS AND WOODPECKERS TO EVALUATE FOREST CONSERVATION IN LATVIA

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Many species of Owls and Woodpeckers are recognised as biodiversity indicators and an umbrella species in nature conservation. Effective conservation of habitats of those species is likely to benefit the protection of many other forest species.

In this study, we have applied fine-grained nationwide MaxEnt analysis to six owl and seven woodpecker species over multiple scales to identify their ecological niches and habitat suitability (HS). We used HS maps to prioritise sites for conservation, dividing the landscape into priority sites for species conservation (PS) and other sites based on species-area extinction risk. We used the concentration of PS in different conservation regimes (functional zones) to describe the importance of the regime for the species. Finally, we utilised information on tree cover loss (TCL) from www.globalforestwatch.com, to quantify the habitat loss within PS and other sites and to compare this process between protected and unprotected forests.

From the 13 species analysed, we found eight to be dependent on mature and less-managed forests. The PS for any single species covers only 4-11% of the country, and every species shows preference towards functional zones with stricter forestry restrictions, though most of the populations are found outside protected areas. The TCL has been statistically significantly increasing since 2014, and it is happening significantly faster in PS than outside.

TCL is correlated between protected areas and outside them and with official forestry statistics. This suggests forestry is the main reason for the tree cover loss in PS, both within and outside protected areas. Therefore, existing species conservation statuss cannot be considered sufficient.

FIRST REPORT OF RANAVIRUS IN WILD AMPHIBIANS IN LATVIA

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Amphibians are increasingly affected by spreading pathogens in the wild. The most emerging and dangerous amphibian pathogens are chytrid fungi *Batrachochytrium dendrobatidis* (Bd) and *B. salamandrivorans* (Bsal), and the *Ranavirus* genus of viruses. These pathogens have been identified as significant drivers of amphibian diversity loss. Previously Bd has been detected in the captive collection at Riga Zoo and in the wild in Estonia. However no research or monitoring on Bd, Bsal or ranavirus in wild Latvian amphibians has been performed. We report the first finding of Ranavirus in the wild in Latvia. Multiple dead amphibians were found in one area in Embūte parish near the protected area of Blažģa lake. Skin swab samples were collected from one juvenile *Rana arvalis* and one adult *Lissotriton vulgaris*. Samples were sent to Laboklin (Germany) for PCR testing of Bd, Bsal and ranavirus. All tests for Bd and Bsal were negative, however ranavirus was detected in the sample of *R. arvalis*. This finding raises concerns and highlights the necessity for further studies of amphibian pathogens in Latvia. As concluded in previous studies, due to climate change the area of Kurzeme could become an entryway for pathogens spreading from south-west Europe furthering the importance of pathogen monitoring.

NOT ALL FLIES GO TOWARD THE LIGHT: A BET-HEDGING STRATEGY IN THE PHOTOTACTIC VARIABILITY OF *DROSOPHILA MELANOGASTER*

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Organisms deploy different strategies to cope with the unpredictability of the environment, among which are bet-hedging and phenotypic plasticity. Bet hedging occurs when an organism reduces its fitness in the current or most typical environment as a tradeoff for increased fitness in unfavorable conditions. Given that, a more unstable environment might aid the development of bet-hedging strategies.

To test this we grew fruit flies (*Drosophila melanogaster*) in laboratory conditions from wild-collected adults gathered from two contrasting environments: Kenya, with relatively stable weather, and Finland, with variable, unpredictable weather. Subsequently, we tested the developed imago flies in a high throughput behavior assay that allows simultaneous testing of repeated phototactic choices in a "T" maze of many individuals simultaneously. We registered the proportion of choices that individual flies chose to go towards the light source, calculated their light choice variability at a group level and excess variability expressed as variation beyond expectation. In addition, we grew larvae with added serotonin precursor and serotonin synthesis inhibitor and also tested their light-choice behavior.

We found that flies did not choose to go toward the light randomly. Flies that were collected in an unpredictable environment produced progeny with significantly reduced light-choice proportion, and increased variability in their phototactic choice behavior than flies collected in a more stable environment. This is consistent with bet-hedging theory and suggests that producing variable progeny might be an adaptation against environmental unpredictability in fruit flies. More so, adding serotonin precursor to larvae food, flies descendant from unpredictable environment population showed reduced variability in their light-choice behavior. Conversely, flies descended from a predictable environment population increased their behavioral variability when fed serotonin synthesis inhibitor. Altogether it suggests that serotoninergic signaling is involved in realizing adaptive bet-hedging strategy in an unpredictable environment.

ANALYSIS OF ORTHOPTERAN ACTIVITY, USING RECORDINGS FROM BAT DETECTORS

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Recordings of orthopteran stridulation can be used for species identification and activity analysis. Bioacoustics methods can be used for more time and resource effective monitoring of orthopterans, compared to traditional methods. Currently there are no active monitoring programs for orthopterans in Latvia. However, bat detectors are commonly used for bat monitoring. Bat detectors also tend to record "background noise", of which a large part are recordings of orthopteran stridulation. The goal of the study is to test the usefulness of these recordings in analysing orthopteran diurnal activity and to evaluate the possibility of acquiring data about orthopteran species presence, while monitoring bats.

In the study, recordings made using bat detectors that were placed in eight different stations in Salacgrīva, Latvia were used. The recordings were made in July, August and September of 2022, with two recording sessions during each month. A total of 7657 recordings were analysed. In 3144 recordings orthopteran stridulatory calls were detected. The most commonly detected species was *Tettigonia cantans*. A less commonly detected species was *Decticus verrucivorus.* The effect of the time of recording on the stridulatory activity of both species was analysed. In addition, the effects of air temperature, relative humidity and wind speed on the ability to detect both species was analysed.

The first results of the study will be presented and the advantages and disadvantages of using bat detectors in orthoptera research will be discussed.

THE USE OF AUTOMATIC CAMERAS IN READING BIRD RINGS

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Most often, automatic cameras near the nests of birds are arranged to observe their behavior, as well as to detect the food brought. But cameras of certain models can also be used to read bird rings. For reading large-sized color rings, virtually any camera can be used. In turn, metal rings and small-sized color rings with ordinary hunter cameras cannot be read.

At the Osprey nests, cameras have been placed since 2010. By 2022, cameras of six models were tested to match which ones would be suitable for reading metal rings. It was found that the two camera models had the best results. Both cameras are meant to be for photographing small birds at the feeders.

Cameras were arranged near the Osprey nests, in which adult birds with metal rings were observed during the previous nesting season. Since the cameras have a fixed distance at which it obtains the best quality images, the nests were equipped with sitting trees against which the camera was pointed. In the early years, cameras were placed near nests in the spring, before the birds had returned from their wintering grounds. In 2022, the cameras were placed both before the breeding season, checking the nests when they contain month-old nestlings, as well as during the end of the breeding season, when there are already fledged youngs.

In the breeding season of 2022, 8 cameras were placed near 14 Osprey nests. The cameras photographed 29 birds, of which 18 birds were with rings. 9 birds were with metal rings, 8 metal rings were read – five Latvian rings, two Finnish and one Swedish ring.

In 2021, three cameras of one model with specifically adjusted lens were placed in Kestrel boxes to test the use of cameras also in reading significantly smaller rings. One color ring was read that year. In 2022, 13 cameras of two models were placed in boxes - one model with specifically adjusted lens and another model meant be for photographing small birds at the feeders.

In total, in 2022, 27 Kestrels were observed with the help of cameras, of which 10 birds were with rings (four with color rings and six only with metal rings). All the color rings were read, while two were read from the metal rings – both were Finnish.

After evaluating several years of experience with the use of cameras in reading Osprey and Kestrel rings, it is found that this method gives very good results. It has been found that with a correctly positioned camera, not only large-sized Osprey metal rings (20 mm in diameter) can be read, but also small-sized Kestrel metal rings (10 mm in diameter).

GENUS *CLEOMENES* THOMSON 1864 (COLEOPTERA: CERAMBYCIDAE) IN THE FAUNA OF THE PHILIPPINES

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The long-horned beetles (Coleoptera: Cerambycidae) of the Oriental Region is being actively studied. Nevertheless, many tribes are insufficiently known. The tribe Cleomenini Lacordaire, 1869 is represented in the world fauna by 317 species of 25 genera. The genus *Cleomenes* Thomson, 1864 (Coleoptera: Cerambycidae) belongs to the subfamily Cerambycinae Latreille, 1802 and the tribe Cleomenini. Total number of *Cleomenes* represented in the world fauna now is 43 taxa (species and subspecies), from which eight species are distributed in the Philippines Archipelago, three in Borneo, three in Taiwan, two in Sumatra, one in Java, one in Japan, and 34 in continental part of the Oriental and the Palearctic regions of the Eastern Asia.

In recent years, several new species of *Cleomenes* were described from the Philippines Archipelago. E. Vives described four species: *C. copei* Vives, 2009 from Mt. Isarog (Camarines Sur, South Luzon), *C. rufonigra* Vives, 2009 from Calayan Island and North Luzon, *C. banauensis* Vives, 2009 from Banaue (Ifugao, Luzon), and *C. infuscatus* Vives, 2015 from Sierra Madre (North Luzon). In addition to these species, *C. dihammophoroides* Thomson, 1864 was also recorded from the Philippines (Mindanao) and *C. hefferni* Huedepohl, 1998 (Negros). Finally A. Barševskis & Z. Barševska in 2021 described two new for science species *C. medinai* Barševskis & Barševska, 2020 from Roxas (Palawan) and *C. cabrasae* Barševskis & Barševska, 2020 from Don Salvador Benedicto (Negros).

By revision a wide range of collection material in world museums and the beetle collection of Daugavpils University, the authors clarify the distribution of *C. dihammaphoroides* Thomson 1864. This species is only found on the Mindanao Island in the Philippines, but we could not confirm its occurrence in Borneo and West Malaysia.

All species of this genus occurring in the Philippines are narrowly distributed endemics that do not occur outside a particular island. Due to the deforestation of tropical rainforests, they are all endangered.

SAPROXYLIC ORGANISMS AND WHY IS THEIR MONITORING NECESSARY IN LATVIA

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Saproxylic organisms depend on wounded or decaying woody material of living, weakened, or dead trees during some part of their life cycle. About 20–25% of species in boreal forests are saproxylic organisms and 20% of them are saproxylic beetles. Saproxylic beetles play an important role for nutrient-cycling in natural ecosystems and many of them are pollinators. In Europe 11% of saproxylic beetle species assessed by IUCN are threatened and data are insufficient for 28% of species. Therefore, the risk of extinction of endangered saproxylic beetles is an urgent problem caused by the ecological degradation of forests, including: habitat loss due to logging and wood harvesting, decline of veteran trees throughout the landscape and a reduction of suitable micro-habitats.

To protect saproxylic species from the risk of extinction we need to understand their ecological niche and distribution. In Latvia saproxylic beetle species included in Appendix II of the Article 17 of the Habitats Directive are monitored as a priority. Species protected under Latvian legislation only mostly are not monitored. Furthermore, saproxylic beetle species are monitored only in Natura 2000 territories, in which only half or less of endangered beetle population occurs. Therefore, monitoring system in Latvia is not effective to evaluate all endangered saproxylic beetle species and their whole population in country.

A comprehensive monitoring system should be developed to determine the general status of saproxylic beetle populations and their trends, and to assess the availability and sustainability of suitable microhabitats for them. It is crucial that monitoring sites are selected on the basis of multi-species distribution models. This selection will allow monitoring of species in areas of higher biodiversity, as well as a more accurate assessment of population change and distribution. For qualitative monitoring such important ecological factors need to be included: amount of snags, logs, stumps, trees with cavities and old trees, stand age, tree species formula, light intensity and gaps, amount of dead wood in different decay stages, dimensions and volume of micro-habitats.

IUCN RED-LIST ASSESSMENT OF ORTHOPTERA IN LATVIA

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For the first time in Latvia, IUCN Red List assessment of extinction risk is being conducted on multiple groups of living organisms (LIFE project "Threatened species in Latvia: improved knowledge, capacity, data and awareness", LIFE19 GIE/LV/000857). The main aims of this project are to improve the species occurrence data quality and quantity, to create a new protected species list using well established criteria, and to communicate the need for species protection with stakeholders and society.
The last regional Red Book of invertebrates dates back to 1998, when four Orthoptera species, all belonging to the subfamily Oedipodinae, were assigned to different categories. With the changes in the Cabinet of Ministers regulations, three of these species were removed from the protected species list. Currently there are two Orthoptera species in Latvia that are protected by the regulations of the Cabinet of Ministers – *Podisma pedestris* and *Oedipoda caerulescens.* However, there are species that are as rare or even more at risk.
From the 43 Latvian Orthoptera species, 12 were selected for assessment as a part of this project. Species occurrence data from 2001-2021 was compiled, reviewed and mapped. Then, each species was analysed using the IUCN regional assessment criteria. The first assessment results vary from least concern (LC) to regionally extinct (RE). Six species are suggested for inclusion in the protected species list. Overall, the assessment process has highlighted the knowledge gaps on species occurrence, distribution and population trends, as well as the need for monitoring and conservation actions for multiple species.

THESE ARE NOT JUST NUMBERS. DO WE KNOW WHAT ARE WE PRESENTING?

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Various bird population estimates and trends originating from those estimates have been published recently. Some of those claim to have used the best and most sophisticated statistical methods contrary to the "best judgement" of the past. In some cases, the time periods overlap completely and figures for the start and end of a period tell one story, while the "statistically significant trends" tell another one. For example, the White-tailed Eagle population in Latvia was estimated to be 8-15 pairs around 1991, but in 2021 its estimate is 120-150. In both cases pairs were considered as counting units, so those figures should be comparable and for a lay-person the trend would look pretty straight-forward (remarkable increase). However, the recently published trend tells us that the increase is "uncertain".

This is by far not the only and even not the most striking case when the published numbers and the trends arising from them differ. Most of those cases apply to species for which census data exist, namely storks, woodpeckers and diurnal raptors. One of the (most) problematic groups are Harriers. The current international approach considers females instead of pairs as a counting unit. My own field experience in various counts tells that overwhelming majority of birds seen are males. On top of that, there is a migration going on through the entire country during the entire period of the "breeding bird" censuses.

For the Black Stork a (seemingly correct) declining trend is calculated from observations of birds seen mostly in flight, but does it reflect trend in the breeding population?

Another example of sudden change in published information is the measurement of generation length provided by BirdLife International for all bird species. This is used to estimate steepness of decline and consequently conservation status of threatened species. So a two-fold increase of generation length almost always means that the species is much less (or not at all) threatened, with all the consequences arising thereof.

On basis of the comparison of various data sets for some of the species, I shall discuss whether it is appropriate to publish possibly wrong trends and/or estimates for species of conservation concern, if data for doing that are insufficient and/or knowledge of a species biology is poor.

OBSERVED AND MODELLED SPECIES DISTRIBUTION AND POPULATION SIZE: CHALLENGES AND GAINS

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Even though globally, nature conservation has developed into a field fundamentally based on quantitative ecology, on more local scales, strong collisions with more case-wise experience occur. It is clear that quantitative methods can be used only with reliable field data and may not necessarily be cost-effective at particularly small sites. Moreover, there is ever-growing availability of opportunistic observations from citizen scientists, but they need to be carefully evaluated both for the reliability of presences or abundances and absences before further use, particularly in the case of modelling. With this presentation, we aim to clarify the necessity of scientific study design planning even in (relatively) local nature inventories, as the data generation process is strictly linked to planned data analysis methods necessary to answer the research question, i.e., fulfilling the goal of biodiversity expertise. To reach this goal, we juxtapose examples of better and worse practices we have recently met and provide suggestions for increased scientific quality.

First, national legislation does not allow the use of model predictions at microscopic scales – the establishment of micro-reserves is strictly limited to direct observations. In this case, opportunistic citizen scientist data can be used, if evaluated carefully. However, zero counts or lack of presences can not be treated as a reliable absence due to a lack of knowledge on effort if imperfect detection is involved.

Second, accounting for imperfect detection requires a large enough sample size of repeated counts. In smaller territories, it may be impossible to obtain a sufficient sample size, therefore, detailed territory mapping (again, with repeated visits) should be preferred.

Third, the fieldwork (data collection process) and data processing, as well as modelling assumptions and procedures, need to be described in such a way as to ensure repeatability and replicability. In many cases, results are based on an expert's opinion, lacking the necessary level of details. We acknowledge that the thought process of experts is likely to be data-driven, yet, if full documentation is provided, implementation of appropriate data analysis methods should be just a fairly simple step to ensure the soundness and robustness of the result.

Finally, with the increasing scale of the inventory, the importance of statistically robust procedures increases. To achieve the targets of the European Green Deal, member states need to review their existing nature conservation area networks. This leads to a need for a large amount of information covering vast areas in a limited time. It might seem suitable to use citizen scientist data directly, but this may lead to biased results and a lack of recognition of high-quality sites if imperfect detection and effort are not appropriately accounted for.

Even though all the examples in this presentation are based on birds, the same principles of quantitative ecology apply to other taxonomic groups and also habitats.

POSTERS

STENDA REFERĀTI

DISCRETE-TIME POPULATION GROWTH MODEL ACCORDING TO CONTEST COMPETITION AND SPATIALLY RANDOM DISTRIBUTION OF INDIVIDUALS

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Two extremes of intraspecific competition, namely, scramble and contest competition, are generally distinguished. Scramble competition involves equal or random resource partitioning among all the individuals of the population. Contest competition implies monopolistic resource utilization by the outcompeting individuals of the local population.

Population dynamics may reflect intraspecific competition patterns as our recent study on large carnivore (namely, wolf and lynx) dynamics has demonstrated. Phenomenological two-parameter discrete-time models according to the scramble or contest competition scenarios can be derived from Verhulst's logistic equation as its exponential and hyperbolic form or from the Hassell model as its limiting cases. The site-based framework provides general underlying principles for developing population models that predict population size within a network of sites from an initial number of individuals and expected number of remaining individuals and offspring according to explicit assumptions about individual clustering and intraspecific competition. Frequently a spatially uniform or random distribution of individuals can be assumed when expected number of individuals at sites varies according to Poisson distribution. In site-based framework, the familiar Ricker model is derived from this assumption, implying also a scramble competition. Its analogue of a contest competition model is the so-called Skellam model. It was first introduced as a proper expression of transition in density of annual plants according to random seedling dispersal and competition for soil patches, which ultimately can support only a single plant to maturity. This dynamic follows particular pattern and limitation analogous to logistic growth. However, similar considerations are valid to other organisms, e.g. invertebrates.

In this study, we discuss the Skellam model and present its most well-known derivations. Our analysis of the Skellam model revealed that the relationship between its horizontal asymptote, the carrying capacity K^*, and the equilibrium density K is determined by the intrinsic growth rate of the population.

HIGH BLOOD PARASITE INFECTION RATE AND LOW FITNESS SUGGEST THAT FOREST WATER BODIES COMPRISE ECOLOGICAL TRAPS FOR PIED FLYCATCHERS

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Hosts are strongly negatively affected by blood parasites. The consequences regarding the host's fitness likely occur in the vicinity of blood parasite vectors' reproduction areas. This study aimed to determine associations between haemosporidian infection parameters such as prevalence and parasitemia, and the reproductive fitness of breeding Pied Flycatchers (*Ficedula hypoleuca*) at different distances of nesting boxes to the nearest forest water bodies.

Parasitemias, parasite prevalence, and the abundance of Diptera vectors decreased further away from forest water bodies like streams, lakes, and bogs. The number of fledglings was lower near the forest water bodies, and their overall condition was worse than that of fledglings a kilometer from respective water bodies.

Notably, adult flycatchers' body mass was not linked with the distance from the forest water bodies at the beginning of the breeding season, whereas body mass was significantly lower closer to water bodies at the end of the breeding season. The results of this study show that ecological traps for breeding pied flycatchers may exist near forest water bodies. This should be considered while installing nest boxes for cavity-nesting birds.

ORTHOPTERA DIVERSITY IN HUMID AND MESIC GRASSLANDS OF ĶEMERI NATIONAL PARK

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Grasslands are one of the most important ecosystems to grasshopper, groundhopper and bush cricket (Insecta: Orthoptera) fauna and they play an important role in grassland food-webs. Yet the grassland area and quality are declining due to land use change and abandonment. Orthoptera species diversity is known to be influenced by climate and landscape configuration, habitat management, plant species and structural diversity, cover of Poaceae and other important plants, and microclimate. It is known and locally studied, that thermophilous species prefer habitats with low, sparse vegetation and sufficient cover of bare ground. However, species that require minimal temperature fluctuations and humid microclimate are less studied in Latvia. The aim of this study was to characterize the Orthoptera species composition in humid and mesic grassland types.

Grassland habitats take up 6,3% or 2400 hectares of Ķemeri National park (ĶNP) territory, the most common being humid and mesic grassland habitat types. For this study we chose 10 grasslands around the ĶNP territory where mowing was used as habitat management. Four grasslands were mowed in July, but six – in August. In each grassland 10 pitfall traps were exposed from 30th July to 24th August 2020. The traps were aligned in the centre of the grassland, in transect manner with 2m gap between traps. Vegetation was characterized using both species and structure approach in three 1x1 meter plots along the transect. The cover of all plant species was recorded using Braun Blanquet scale. To analyse the importance of vegetation structure, the overall cover of turf, bare ground, moss, woody plants (young trees), Poaceae and *Carex* sp., as well as the cover of perennial plants with rosette foliage and the thickness of turf was estimated.

Overall 856 individuals from 20 Orthoptera species were recorded, which is approximately half of all Orthoptera species in Latvia. The three most common species were *Chorthippus biguttulus, Pseudochorthippus parallelus* and *Chorthippus apricarius.* The later species is associated with disturbance, but the other two most common species prefer humid and/or mesotrophic environment. From all 20 species, there were nine species that according to literature are characteristic to humid microclimate and mesotrophic habitats. The abundance of these species was positively associated with turf thickness and negatively with the cover of young trees, moss and bare ground (Spearman's rank correlation test, α=0.05). Species abundance, richness and diversity was significantly reduced in grasslands that were mowed in August (Wilcoxon rank sum test, α=0.05). Overall, humid and mesic grasslands are important to Orthopteras diversity and to populations of habitat specialist species.

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