



**82nd International Scientific
Conference of the
University of Latvia 2024**



**UNIVERSITY OF LATVIA
FACULTY
OF BIOLOGY**



**82nd International Scientific
Conference of the
University of Latvia 2024**

Zoology and Animal Ecology

Abstract book

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**FACULTY
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Biology section / Bioloģijas sekcija

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31st of January 2024 / 2024. gada 31. janvāris

Chair / Vadītājs: Asoc. prof., Ainārs Auniņš, Asoc. prof., Gunita Deksnē		
10.00–10.05	Asoc. prof., Ainārs Auniņš <i>Faculty of Biology, University of Latvia</i>	Atklāšana Opening
Plenary session / Uzaicinātie ziņojumi		
10.05–10.40	Dr. Vaidas Palinauskas <i>Nature Research Centre, Vilnius, Lithuania</i>	Avian Malaria: Yearly Guests and Future Risks Putnu Malārija: Ikgadējs viesis un nākitnes riski
10.40–11.15	Dr. Alessandro Di Marzio <i>Department of Science and Education, Riga National Zoological Garden, Latvia</i>	On the path of the giants. Census of Montain chicken frog in Dominica Milžiem pa pēdām. Karību milzu vardes monitorings Dominikā
11.15–11.30	Coffee break, discussions, posters / Kafijas pauze, diskusijas, stenda referāti	
Oral presentations / Mutiskie ziņojumi		
11.30–11.45	Maija Selezņova	Endoparasitic fauna of The Baltic grey seal (<i>Halichoerus grypus</i>) Baltijas jūras pelēko roņu (<i>Halichoerus grypus</i>) endoparazīti.
11.45–12.00	Sabīne Rasa Vīra	Diversity of <i>Taenia</i> species found in red fox <i>Vulpes vulpes</i> and raccoon dog <i>Nyctereutes procyonoides</i> population in Latvia <i>Taenia</i> ģints lenteņu sugu daudzveidība rudajās lapsās <i>Vulpes vulpes</i> un jenotsuņos <i>Nyctereutes procyonoides</i> Latvijā
12.00–12.15	Betija Rubene	Changes in bee (Hymenoptera: Anthophila) diversity during forest stand succession after final felling Bišu (Hymenoptera: Anthophila) daudzveidības izmaiņas mežaudžu sukcesijas gaitā pēc galvenās cirtes
12.15–12.30	Sigita Elza Lukstiņa	Determining factors of the distribution of water rail (<i>Rallus aquaticus</i>) and little crane (<i>Zapornia parva</i>) in the lakes of central Latvia Dumbcāļa (<i>Rallus aquaticus</i>) un mazā ormaniša (<i>Zapornia parva</i>) izplatību noteicošie faktori Latvijas centrālās daļas ezeros
12.30–12.35	Stenda referātu prezentācijas (1 min) / Short poster presentations (1 min)	

	Elīza Āboltiņa	Spatial use analysis of Mishmi takin <i>Budorcas taxicolor taxicolor</i> in the Riga National Zoological Garden: preliminary results Mišmi takina <i>Budorcas taxicolor taxicolor</i> mītnes telpiskā izmantojuma analīze Rīgas Nacionālajā zooloģiskajā dārzā: primārie rezultāti
	Elza Birbele	Colour me interested: frog colour aberrations in Latvia Varžu krāsu aberāciju novērojumi Latvijā
	Ilze Rubenina	Benzanthrone luminophores: are they suitable for a rapid and high-resolution imaging of parasites by confocal laser scanning microscopy? Benzantrona luminofori: vai tie ir piemēroti ātrai un augstas izšķirtspējas parazītu attēlu veidošanai, izmantojot konfokālo lāzerskenējošo mikroskopiju?
12.35-14.00	Break, discussions, posters / Pārtraukums, diskusijas, stenda referāti	
14.00-14.15	Maija Štokmane	Spatial distribution modelling of spiders within mire habitats in Latvia by using the remote sensing and machine learning methods: a brand new approach Zirnekļu telpiskās izplatības modeļošana zāļu purvu biotopos Latvijā, izmantojot tālziņas un mašīnmācīšanās metodes: pilnīgi jauna pieeja
14.15-14.30	Digna Pilāte	The use of bridges and culverts and their importance in Eurasian otter (<i>Lutra lutra</i>) monitoring in Latvia Tiltu un caurteku izmantošanas iespējas un nozīme ūdru monitoringā Latvijā
14.30-14.45	Meta Milda Ruņģe	Wolf-dog hybridization in Latvia and its determination with genetic markers Vilku-suņu hibridizācija Latvijā un tās noteikšana ar ģenētiskiem marķieriem.
14.45-15.00	Klinta Kupče	The autumn migration phenology of Nathusius' pipistrelle <i>Pipistrellus nathusii</i> in Pape, Latvia in 2020 Natūza sikspārņa <i>Pipistrellus nathusii</i> 2020. gada rudens migrācijas fenoloģija Papē, Latvijā
15.00-15.15	Larisa Petra Kaija	Heritable epigenetic effects of stress on occlusal disharmony in <i>Microtus hartingi</i> vole Pārmantojamie epigēnētiskie stresa efekti uz <i>Microtus hartingi</i> strupastu sakodiena disharmoniju
15.15-15.30	Coffee break, discussions, posters / Kafijas pauze, diskusijas, stenda referāti	
15.30-15.45	Indriķis Krams	Feeding behavior, blood glucose and blood microbiome in wintering greenfinches (<i>Chloris chloris</i>) Ziemojošo zaļzubiņu (<i>Chloris chloris</i>) barošanās uzvedība, glikozes daudzums asinīs un asins mikrobioms
15.45-16.00	Ance Priedniece	Multi-sensor geolocators unveil details of in-flight behaviour of Common Starlings Multi-sensoru ģeolokatori atklāj mājas strazdu uzvedību lidojumu laikā
16.15-16.30	Ronalds Krams	Feeders impact on the survival of wintering great tits (<i>Parus major</i> Linnaeus, 1758) Barotavu ietekme uz ziemojošo lielo zīliņu (<i>Parus major</i> Linnaeus, 1758) izdzīvošanu
16.30-16.45	Vadims Kolbjonoks	Altered walking patterns connection with improved survival in fruit flies (<i>Drosophila melanogaster</i>) grown with predators during larval development

		Kustības modeļu izmaiņu saistība ar uzlabotu izdzīvošanu augļu mušām (<i>Drosophila melanogaster</i>), kuras kāpura stadijā audzētas ar plēsējiem
16.45-17.00	Tatjana Grigorjeva	Link between serotonin concentration changes and the lateral movements of fruit flies (<i>Drosophila melanogaster</i> Meigen, 1830) Serotonīna koncentrācijas izmaiņu saistība ar augļu mušu (<i>Drosophila melanogaster</i> Meigen, 1830) laterālajām kustībām
17.00-...	Student award announcement, conclusions, discussions Studentu konkursa uzvarētāja paziņošana, noslēguma diskusijas	

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PLENARY SESSION

PLENĀRIE ZIŅOJUMI

AVIAN MALARIA: YEARLY GUESTS AND FUTURE RISKS

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Each year, birds contract a range of pathogens, including viruses, bacteria, and parasites. Malaria, caused by the Plasmodium parasites, is globally widespread and diverse, with over 1,300 avian malarial parasite haplotypes identified, causing diseases of varying severity. Annual bird migrations to southern regions expose them to infections in wintering areas. Birds with tropical malarial parasites act as reservoirs in Europe, where the absence of suitable vectors and other factors currently prevents local spread. However, global warming and changing environments may introduce invasive blood-sucking insect species, altering this dynamic.

Despite extensive research, limited knowledge exists about haemosporidian vectors and virulence for vertebrate hosts. Detailed studies are crucial to understanding the spread potential and effects on avian populations. Experimental studies presented will highlight the varied effects of tropically transmitted parasites on local birds depending on the Plasmodium species, ranging from mild to severe disease, impacting bird health. The presentation will demonstrate that lethal outcomes may result from both high and low parasitemias, as parasites disrupt blood cell production or cause cerebral paralysis.

Understanding parasite biology and host-parasite interactions is vital for assessing virulence, predicting malaria spread, and conducting epizootiological studies on vector-borne infections.

Funding source: The Research Council of Lithuania (LMTLT) (Project No. S-MIP-22-52).

ON THE PATH OF THE GIANTS. CENSUS OF MOUNTAIN CHICKEN FROG IN DOMINICA

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The mountain chicken frog (*Leptodactylus fallax*) is a Critically Endangered (CR) species of frog, native to the Caribbean. It is one of the largest frogs in the world, with females weighing up to 1 kg and is considered one of the top predators within its range of distribution. The species was widespread in seven islands of the Lesser Antilles in the past, but the impact of the introduction of invasive species, human activities, and natural phenomena such as volcanic eruptions and hurricanes caused the extinction of the species from many islands. Currently a wild population of mountain chicken frog survives on the island of Dominica while on the island of Montserrat a population survives in semi-wild conditions, due to the work of the Mountain Chicken Recovery Programme. Since 2002 the population of both islands have been heavily impacted by the amphibian chytrid fungus *Batrachochytrium dendrobatidis*. Recent research has shown that the Dominica population has a higher genetic variability than Montserrat, which has resulted in resilience to the effects of *Batrachochytrium dendrobatidis*, allowing the population to survive. Therefore, in 2023 the Government of Dominica in collaboration with the Government of Montserrat and other national, regional, and international partners, including Rīga ZOO, developed the first mountain chicken frog population census on the island of Dominica since Hurricane Maria in 2017. The main goals of the study were to estimate the size of the wild population and to collect genetic material to identify the individuals carrying the genes responsible for resilience to the fungus. The next step will be the implementation of a captive breeding program. Although preliminary sampling data seem to estimate the population at 21-46 individuals, the discovery of resilience to *Batrachochytrium dendrobatidis* and a timely project implementation to exploit the benefits of this discovery can bring optimism for the conservation of this iconic species.

PRESENTATIONS

MUTISKIE ZIŅOJUMI

ENDOPARASITES OF THE BALTIC GREY SEAL (*HALICHOERUS GRYPUS*)

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The Baltic grey seals (*Halichoerus grypus*) are apex predators in the Baltic Sea. Seals are hosts to parasite species, which use fish as intermediate hosts, such as acanthocephalans, trematodes and nematodes as well as zoonotic protozoans. The aim of this study was to investigate the prevalence and infection intensity of endoparasites found in Baltic grey seals from the Gulf of Riga and coastal waters of Latvia.

From spring 2022 to autumn 2023 in collaboration with local fishermen the Baltic grey seals that had become tangled in the fishing gear and died were collected in Baltic Sea's ICES coastal subdivisions 28.1 and 28.2. Internal organs (heart, lungs, liver, stomach, small and large intestines) were removed and tested for endoparasites. Demographic data on the gender, age, weight, length, blubber thickness, location of catching etc. of the animals were collected. Parasite species were identified through morphological characteristics and molecular methods.

There were six parasite genus and species identified: *Parafilaroides gymnurus* (in lungs), *Pseudamphistomum truncatum* (in liver), *Contracaecum* spp. (in stomach), *Corynosoma strumosom* and *C. semerme* (in intestines), *Giardia duodenalis* (in fecal samples). Median parasite richness was 3 with a range of 2-5. All grey seals were infected with *Contracaecum* spp., infection intensity ranging from 6-10 090, and *C. semerme* with an infection intensity range of 4-3422. *G. duodenalis* had the lowest prevalence – it was found in only 3.5% (n=2) of animals. A significant medium negative correlation was observed between *C. semerme* infection intensity and blubber thickness (R=-0.33; p=0.01).

The obtained results show that the Baltic grey seal is a host to high intensities of *Contracaecum* spp. nematodes, which may be linked to higher prevalence and infection intensities reported in such intermediate hosts as Baltic cod (*Gadus morhua*). *G. duodenalis* samples were not further genotyped, therefore it is not possible to conclude, whether seals are relevant hosts in spreading zoonotic strains of this pathogen.

This research was funded by the Fundamental and applied research “Baltic cod (*Gadus morhua*) condition and health status in the changing ecosystem of Eastern Baltic: CODHEALTH” (lzp2021/1-0024).

DIVERSITY OF TAENIA SPECIES FOUND IN RED FOX *VULPES VULPES* AND RACCOON DOG *NYCTEREUTES PROCYNOIDES* POPULATIONS IN LATVIA

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The red fox *Vulpes vulpes* is the most abundant predator in Latvia and an important parasite vector. Sharing living space with the less abundant but not native raccoon dog *Nyctereutes procyonoides* these animals carry parasites that can also infect humans and common pets like cats and dogs. With growing populations in a limited living space and the allure of unsupervised compost and trash, these animals are often seen foraging for food in cities or near human settlements. Therefore, it is important to assess what parasites these wild animals carry and which of them we should pay more attention to.

This study focuses on the tapeworm genus *Taenia* species diversity in foxes and raccoon dogs in Latvia. During the years 2013-2022, 191 tapeworms were collected from 107 foxes and 25 raccoon dogs. A total of 180 DNA sequences were acquired and analyzed, of which 175 were identified to belong to *Taenia polyacantha*, two – cat tapeworm *Hydatigera* sp., previously known as *Taenia taeniaformis*, one – *Taenia crassiceps*, and two – *Mesocestoides litteratus*, which is another tapeworm species abundant in foxes and raccoon dogs but does not belong to the genus *Taenia*. A phylogenetic tree was created to see the genetic differences between the samples and a genetically homogenous *Taenia* population was determined with very little differences between the samples.

No genetic analysis of the genus *Taenia* in carnivores has been done previously in Latvia.

CHANGES IN BEE (HYMENOPTERA: ANTHOPHILA) DIVERISTY DURING FOREST STAND SUCCESSION AFTER FINAL FELLING

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Over the last century, natural and semi-natural grasslands in the temperate zone have been lost or degraded due to habitat conversion and lack of traditional habitat management. As a result, many grassland specialist insect species have been forced to inhabit roadsides, quarries, ruderal areas and other anthropogenic sites. It has already been shown that clear-cuts are suitable as a habitat for various species of insects found in grasslands and other open habitats, especially those that feed on flowers, including pollinators, of which bees are the most dominant in most ecosystems. However, it is not entirely clear how bee communities change over time in clear-cuts, as these sites undergo rapid early succession after final felling.

In this study, we aimed to find out how bee diversity changes in clear-cuts during succession (1-30 years), and which landscape (stand age and area) and vegetation descriptors best explain these changes. Wild bees were sampled in July 2022 with coloured pan traps. Using generalised additive mixed effects modeling, we found that bee diversity was highest in younger forest stands and decreased until 10 years of age, after which it remained consistently low. Higher bee diversity was found in forest stands with larger areas. Of the vegetation describing factors only flowering plant genera diversity was significant, while flowering plant flower cover and specific plant genera abundance were not.

The results show that clear-cuts are exploited by bees and can support their populations, therefore sometimes even used as conservation units for pollinators in extremely intensified agricultural landscapes. However, it is important to consider the conflict of conservation targets between locally hosting temporal bee populations and negatively influencing numerous forest specialist species. Therefore conservation efforts should focus on long-term suitable habitats, such as grasslands.

DETERMINING FACTORS OF THE DISTRIBUTION OF WATER RAIL (*RALLUS AQUATICUS*) AND LITTLE CRAKE (*ZAPORNIA PARVA*) IN THE LAKES OF CENTRAL LATVIA

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The Water Rail and the Little Crane are difficult species to detect because they are active during the darkest hours of the day and inhabit wetlands. Therefore, the size of their populations is difficult to assess, and the ecology of these species has been little studied in Latvia.

As a part of the work, 60 lakes in central Latvia were visited between April and July 2023. There were 87 survey points placed in these randomly chosen lakes and visited up to three times during the survey. The chosen survey points cover the different lake configurations regarding emergent and submergent vegetation cover. Both target species were provoked by voice recordings of their own species during the surveys. The area within a radius of 150 meters around each survey point was described by different metrics of the configuration of vegetation, the composition of plant species, and open water.

In this study, Water Rail was detected at 15 points, and the Little Crane was recorded at 6 points. Single season occupancy models of MacKenzie et al. (2002) for Water Rail and the generalised mixed effects linear models for Little Crane were fit to find out the determining factors of distribution of each species. According to the best model, the Water Rail prefers reeds growing in water with mud substrate and floating emergent vegetation stands, but for the Little Crane, the essential factors are cattails or sawgrass with mixed vegetation. A chorus of frogs and birds negatively affected the detection of the Water Rail at the time of the survey.

References:

MacKenzie, D.I., Nichols, J.D., Lachman, G.B., Droege, S., Andrew, J., Langtimm, C. a, 2002. Estimating Site Occupancy Rates When Detection Probabilities Are Less Than One. *Ecology* 83, 2248–2255.

SPATIAL DISTRIBUTION MODELLING OF SPIDERS WITHIN MIRE HABITATS IN LATVIA BY USING THE REMOTE SENSING AND MACHINE LEARNING METHODS: A BRAND NEW APPROACH

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Spiders are playing an important role in the balance of nature since they act as regulating agents in terrestrial arthropod communities and are important food source for higher organisms. In recent decades, however, the declining of spiders and other arthropods is becoming more widespread, emphasizing the need for conservation management actions aimed at preserving these organisms. Though, in order to design meaningful conservation strategies, consistent and reliable information on the distribution of species is required. Overall, however, it is very complicated to acquire such information purely on the basis of field assessments and monitoring. Consequently, the use of remote sensing methods in species distribution studies is gaining more popularity recently. At the same time, however, the capability of remote sensing techniques to map the distribution of spiders (and arthropods in general) is rather poorly studied. The current trend of studies on arthropods shows an emphasis on insects that are considered pests, while the use of remote sensing in broader aspects of studying arthropod, including spider, ecology and conservation is still very rare.

The aim of this study was to demonstrate a new approach of studying spider distribution by using the remote sensing and machine learning techniques. It should be also mentioned that due to the small body size of spiders, their recognition in satellite and airborne images is practically impossible, but since it is well-known that spiders are very closely connected with vegetation (i.e., with its composition, structure etc.), then the vegetation might be used as a surrogate for mapping spider distribution. This approach was also used in the present study.

The reference data were collected in the field – we established 57 sample plots within the studied mire, and in these plots we obtained the data on vegetation, as well as collected spiders by using pitfall traps and a sweep net. Based on the field data, we performed a cluster analysis to classify mire vegetation into discrete groups, and based on these data we performed a supervised classification on mire vegetation by using a high-resolution airborne image. In order to determine the affinity of spider species to each vegetation group, we calculated the fidelity (i.e., frequency of occurrence) for each of the collected spider species in each vegetation group. Also, we converted the spider quantity data from the point-based representation to the surface-based one, to graphically display these data on the map. Finally, by combining all the previous data together, we could model the spider species distribution in the studied mire as well as prepare the distribution maps for each of the spider species.

Generally, our proposed method presents a novel approach of studying the spatial distribution of spiders in mire habitats. This method was developed by putting together several different techniques – on the one hand, we used the “traditional” ecological methods which are extensively utilized by ecologists to examine ecological communities (e.g., in-situ sampling, cluster analysis etc.), but on the other hand we coupled these methods with the ones that are rather unfamiliar to ecologists – the geospatial techniques (i.e., remote sensing) and the computer science technologies (i.e., machine learning). Overall, our developed method is a brand new and multi-disciplinary approach that might potentially be applied in spider and other arthropod species distribution studies in terrestrial habitats in Latvia.

THE USE OF BRIDGES AND CULVERTS AND THEIR IMPORTANCE IN EURASIAN OTTER (*LUTRA LUTRA*) MONITORING IN LATVIA

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Monitoring of otters in Latvia has been conducted every six years since 2014. A grid of 10 x 10 km squares is used for assessing otter distribution and abundance and four preliminary selected sites at banks and shores of different water bodies in each square are visited to check for the presence of otter signs. Primarily sites, where roads cross the watercourses, are chosen because such places are easily accessed and convenient to survey. Bridges and culverts are of particular attention since the signs at these constructions are inspected first. Therefore, data analysis was performed to verify compliance of bridge and culvert properties with monitoring goals regarding the assessment of otter distribution.

Data on otter occurrence were obtained from 2020 to 2023. Altogether 2676 sites were inspected, 94% of which were associated with bridges and culverts. The data of 2477 inspected bridges and culverts were used for the analysis. Each bridge or culvert was attributed to one of four types and its length, width, height above the water level, construction material, and road surface material were noted. Indirect evidences of otter presence were used, including the number of fresh signs (footprints, faeces, and territorial marks) and the number of older excrements.

The analysis revealed that the occurrence of otter marks was influenced by all the investigated parameters. The chance of finding otter marks was associated with the chosen location and signs were more likely to be found near larger bridges. Similar results were obtained by analysing the occurrence of fresh and old signs.

We conclude that otters mark their territory using different types of bridges, and their marks remain there for a long time, which agrees with the literature data. Bridges and culverts are therefore suitable for assessing otter presence and distribution in Latvia.

ASSESSMENT OF WOLF-DOG HYBRIDIZATION IN LATVIA USING GENETIC MARKERS

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One of the threats to the genetic integrity of grey wolf (*Canis lupus*) populations is hybridization with dogs (*Canis lupus familiaris*). Potential wolf-dog hybrids can be determined phenotypically, based on morphological traits, however, to precisely identify hybrids, genetic analyses are necessary. A general method of identification of wolf-dog hybrids in Latvia has not yet been developed, therefore an efficient identification system would be beneficial in the process of monitoring the status of wolf populations. Although the wolf population in Latvia is currently stable and is not experiencing noticeable changes, there have been multiple cases of the appearance of potential wolf-dog hybrids.

DNA samples of suspected wolf-dog hybrids collected from individuals legally hunted in the territory of Latvia were studied using mitochondrial genome fragment sequencing and autosomal microsatellite marker genotyping. These samples were analysed together with wolf and dog reference groups. The mitochondrial fragment sequences were analysed for species-specific nucleotide polymorphisms. Wolf, dog and wolf-dog hybrid clusters were identified based on microsatellite marker genotyping data.

THE AUTUMN MIGRATION NATHUSIUS' PIPISTRELLE *PIPISTRELLUS NATHUSII* IN PAPE, LATVIA IN 2020

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Acoustic monitoring of bat autumn migration has been conducted since 2015 in Pape, Latvia, using two automated detectors (stations) located 80 m and 130 m from the shoreline. To increase the efficiency of data processing for monitoring population changes, only recordings within three 30 min sessions per night are analysed annually. Despite the long-term application of the method, its effectiveness in representing the migration of the Nathusius' pipistrelle *Pipistrellus nathusii* and the influence of environmental factors on this species remains uncertain. It is also unclear whether two stations are necessary for monitoring. The focus of this study is to quantitatively describe the autumn migration phenology of Nathusius' pipistrelle and the weather conditions that influence this phenomenon.

A total of 28020 recordings with 15057 Nathusius' pipistrelle calls were analysed, covering every night (sunset to sunrise) from 15 July to 31 October 2020. These recordings were associated with each station and aggregated to 1% intervals (relative time of night) of the night of each monitoring day. Generalised additive modelling (GAM) was used to relate bat migration to the relative time of night, day of the year and weather conditions (wind speed and direction, humidity, atmospheric pressure, temperature, precipitation) interpolated from hourly measurements to times corresponding to the aggregated bat data. This analysis suggested similar responses of bat activity to most weather conditions between stations, with the exception of wind direction, which showed significant differences on some occasions. The start and end of nocturnal activity and, more importantly, the seasonal distribution of bat activity differed between stations, supporting the need for multiple monitoring stations.

Currently, our study is limited to an in-depth analysis of a single autumn migration season, which limits our ability to comprehensively account for weather variability. We aim to address this increasing the number of fully analysed monitoring seasons. Similarly, to fully evaluate the monitoring methods, we plan to extend the analysis to other bat species, leading to widely applicable suggestions for monitoring bat activity.

HERITABLE EPIGENETIC EFFECTS OF STRESS ON OCCLUSAL DISHARMONY IN *MICROTUS HARTINGI* VOLE

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Transgenerational effects remain insufficiently studied; however, they may play a role in speciation. Chronic stress and inbreeding can be the frequent drivers of gene expression changes in population level, bringing to the formation of the co-adapted gene complexes.

Current research explores the influence of stress experienced by F0 *Microtus hartingi* voles on development of teeth pathology in F1-F5. The pathology is lethal and exhibits as mandible deformation, following malocclusion and unrestrained incisor growth.

Two populations of the species have dissimilar reproductive strategies: monogamy (CAP) and polygyny (RP), and exhibit different patterns of pathology accumulation in next generations. The pathology appears in CAP in the laboratory at 0% rate, while in RP it is present at 15% level.

Animals were exposed to physical stress during (i) lactation, (ii) early childhood, (i) pregnancy, and to social stress in polygynous groups of sisters (iv) and unrelated females(v); groups are listed from the least to most pronounced effects in CAP. The monogamous subspecies appeared to be very susceptible to stress and showed a dramatic increase in pathology rates up to 30%, while polygynous subspecies remained stable. The distribution of the pathology does not follow Mendel laws, which points to the presence of epigenetic factors.

We assume that RP experienced 'founder effects' during long-term isolation in eastern Rhodopes (Golenischev et al., 2022), increased its levels of stress tolerance (Zorenko, Kaija, accepted) and developed new mechanisms for balancing the pathology rates.

The CAP might serve as a model to explain the early steps of RP adaptation to fragmented habitats and hence reduced dispersal, high inbreeding and social stress rate, resulting in enhanced natural selection.

FEEDING BEHAVIOR, BLOOD GLUCOSE AND BLOOD MICROBIOME IN WINTERING GREENFINCHES (*CHLORIS CHLORIS*)

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Wintering in Northern Europe may be a challenging season for small birds. To improve survival, humans often provide extra food to wintering birds. This study shows that wintering near permanent feeders significantly increased body mass, body mass index (BMI), and plasma glucose levels of greenfinches (*Chloris chloris*). Excess body fat and plasma glucose may suggest low-grade systemic inflammation in greenfinches wintering near permanent feeders. Low-grade inflammation is often associated with physiological stress affecting the intestinal microbiome and causes serious microvascular and intestinal pathologies. Under such conditions, we expected contamination of the blood microbiome by bacterial pathogens leaking from the intestinal microbiome. We found that the relative abundance of Bacteroidia and Gammaproteobacteria was positively correlated with BMI and excess body fat. The abundance of Bacilli was higher in the group of greenfinches wintering near permanent ad-lib feeders. Clostridia, a class of microorganisms typical for type 2 diabetes, was found only in birds wintering near permanent feeders.

MULTI-SENSOR GEOLOCATORS UNVEIL DETAILS OF IN-FLIGHT BEHAVIOUR OF COMMON STARLINGS

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Multi-sensor geolocators enable a great range of discoveries about adaptations during one of the most challenging periods in birds' lives – migration. Migration is typically composed of stopovers when energy is stored and active flight when this energy is consumed, and to minimise the energetic cost of movement, migratory birds may imply various behavioural adaptations and strategies for when in flight.

Here, we describe the in-flight behaviour of a short-distance migrant, the Common Starling, using multi-sensor geolocators attached to birds breeding in Latvia between 2020-2022. We used acceleration data to identify migratory flights, light data to distinguish between diurnal and nocturnal flights, and barometric pressure data to track flight altitudes.

It took ca. 50 hours of flight for the tracked Starlings to complete their annual migration cycle between the breeding sites in the Baltics and wintering areas in the British Isles and back. Migratory distances and flight speeds in autumn and spring migration were similar, but the average flight altitudes were higher in spring migration. Longer flights tended to be at higher altitudes in the spring but not in the autumn. The longest recorded flight, which was performed during spring migration, lasted more than 22 hours, with maximum altitudes reaching 2500 m a.s.l. Surprisingly, Starlings spent approximately 65% of flight time at night, affirming them as predominantly nocturnal migrants. Flight altitudes during the day were typically lower than during the night. However, Starlings often change flight altitude within a single flight, potentially in adaptation to wind conditions. Our study provides unprecedented details of the in-flight behaviour of Starlings and brings novel insights into how short-distance migrants complete their migratory journeys.

FEEDERS IMPACT ON THE SURVIVAL OF WINTERING GREAT TITS (*PARUS MAJOR* LINNAEUS, 1758)

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Survival for birds can be challenging during the cold winter months in Northern Europe. Humans often provide food to wintering birds, thus, improving their winter survival. The optimal body mass hypothesis posits that the body reserves of wintering birds are balanced between the risk of starvation and predation.

In this study we tested whether the body mass of wintering great tits (*Parus major* Linnaeus, 1758) was higher under conditions of less predictable food resources. We compared body mass, body mass index, the speed at take-off and apparent survival of great tit adult males wintering in small urban areas, either near feeders providing permanent access to food for months, or near feeders providing irregular access to food. Body mass and body mass index were greater, while take-off speed and apparent survival were lower in birds wintering near permanent feeders than birds wintering near irregular feeders. Thus, urban birds, with their predictable access to high energy food, did not follow the fattening strategy predicted by the optimal body mass hypothesis.

This study shows that excess under skin fat reserves of great tits wintering near permanent feeders can make them slow at take-off, which increases their exposure to predators. Regular excess amounts of high-energy food may affect urban birds' physiological and behavioural strategies in a non-adaptive way.

We suggest that caution should be taken when choosing a proper place to position bird feeders to prevent making birds at feeders' easy prey for predators. We recommend irregular feeding of wintering birds and the placing of feeders in places that are safe against attacking predators.

ALTERED WALKING PATTERNS CONNECTION WITH IMPROVED SURVIVAL IN FRUIT FLIES (*DROSOPHILA MELANOGASTER*) GROWN WITH PREDATORS DURING LARVAL DEVELOPMENT

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Exposure to predator stress can cause various behavioural, physiological, stoichiometric, and biochemical changes in prey. Prior research has shown that growth under predation stress can cause the development of a diabetes-like biochemical phenotype in fruit flies (*Drosophila melanogaster*). Being exposed to predator presence during larval development decreases the walking activity of flies, resembling sickness behaviour, which improves their antipredator protection. However, it is unclear which elements of fruit fly walking behaviour make them less conspicuous to spiders.

This study confirms previous results by showing that fruit flies grown with spiders (n = 730) walk shorter distances than control flies (n = 840). Under predation risk, adult fruit flies grown with predators survived better than control flies. We also show that the acceleration of each new walk of fruit flies grown with predatory spiders was faster. In addition, flies grown with predators spent more time in a state of motion without movement (i.e., stomping in place) than control flies.

We suggest that motions without movement may make the flies look sick to their predators, which we propose as the main reason for their better survival under direct exposure to predator attacks.

LINK BETWEEN SEROTONIN CONCENTRATION CHANGES AND THE LATERAL MOVEMENTS OF FRUIT FLIES (*DROSOPHILA MELANOGASTER* MEIGEN, 1830)

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The basic chemical reactions in the fruit flies (*Drosophila melanogaster* Meigen, 1830) brain are similar to those occurring in the human brain. In the flies' brain serotonin is responsible for the regulation of locomotion, sleep, general activity, light or shadow selection, as well as the regulation of intestinal tract activity and aggressiveness.

During the study we reared the wild type (Oregon-R) *Drosophila* flies, which were divided in 1 control group and 2 experimental groups, exposed to escitalopram and tryptophan added to their food. Escitalopram is an antidepressant and a specific serotonin reuptake inhibitor. This is a type of drug used to treat depression. In a long-term escitalopram reduces the release of serotonin in the brain. Tryptophan is an essential amino acid and a precursor of the neurotransmitter serotonin. Higher amounts of tryptophan in the body stimulate the increase of serotonin concentration.

The aim of the study was to analyse effect of escitalopram and tryptophan on the lateral movement variability in fruit flies. We used the Y-maze labyrinth method, which is commonly used to determine the effects of age, hormones, medicine, nutritional supplements and stress factors on the spatial short-term memory of the study object. During the trial, HD video camera with infrared sensor was placed above the Y-maze labyrinth plate and recorded all the fruit fly motions and turns made to the specific directions. The camera was connected with computer, which has the Noldus "EthoVision XT" video tracking software that registers all the turn coordinates.

The results showed that fruit fly lateral movement variability significantly increased in the flies from escitalopram exposure group. There was no significant difference in lateral movement variability between tryptophan exposure group and the control group flies. Y-maze is another effective method to study depressive behaviour of fruit flies and to understand the basic elements of depressive behaviour overall.

POSTERS

STENDA REFERĀTI

SPATIAL USE ANALYSIS OF MISHMI TAKIN *BUDORCAS TAXICOLOR TAXICOLOR* IN THE RIGA NATIONAL ZOOLOGICAL GARDEN: PRELIMINARY RESULTS

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Mishmi takin *Budorcas taxicolor taxicolor* is a poorly studied subspecies of the takin *B. taxicolor* in the family Bovidae. They stay in mountainous areas inhabiting southeastern Tibet and northwestern Yunnan Province in China; however the population size is not precisely determined. Due to excessive human activities followed by habitat loss and trophy hunting takins are listed as vulnerable by the IUCN. Zoos play a major role in the conservation of endangered species. The European Association of Zoos and Aquaria (EAZA) have created an ex-situ program for the takin. The program is planning to increase the genetic variability of captive takins, therefore increasing the welfare of these animals is a priority. Animal welfare science is currently developing rapidly to obtain information on the ecology of this species in order to assist in the management and conservation of the species. Laminitis and other hoof problems are common issues in captive animals, which can be decreased by monitoring the movement of animals and improving the spatial utilization of the enclosure accordingly.

The main aim of this preliminary study is to improve the welfare of takins living in captivity in Riga National Zoological Garden. The spatial use of takin enclosure can show the activity and distribution of animal movement. The research was conducted with a new software *Zoo-Observer-App* developed at Goethe University in Frankfurt. Observations were made using the Multi-focus split method for a total of 1h 30min, changing the location of feeding places every 30 minutes. An appropriate spatial use map for each enclosure layout type was created separately to find out the best spatial use of the enclosure and improve takin movement.

From the obtained data it was found that if the feeding places are left in their current arrangement the part of the paddock is used only around those particular feeding spots. By changing the layout of feeding areas takins use more of the enclosure by moving around more. By changing the position of the branches (additional feed) the greatest movement was observed using different parts of the enclosure. The most effective was the initial placement of the feeding sites with varying the number and location of branches allowing for more movement in different areas of the enclosure.

COLOUR ME INTERESTED: FROG COLOUR ABERRATIONS IN LATVIA

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Amphibians exhibit many types of colour variation within species which can be genetic or caused by environmental factors and behaviour. However, many mechanisms of colour changes in amphibians are still unknown.

We present the observations of unusually coloured tree frogs and the first documented case of a partially leucistic green frog in Latvia. During a census of the Eastern tree frog *Hyla orientalis* in May of 2023 we observed a total of 12 frogs with colour aberrations. One location in Snepele (a small cow pond in an agricultural land) had a significant number of frogs with colour aberrations. Seven frogs had four different types of colourations. These differences in colours of frogs in the same habitat and the same temperature goes against hypotheses that tree frogs change colour to blend in the background or that the colours are affected by biotic factors. Overall, the tree frog colour variations observed during the census were: normal colour with dark spots, dark green with dark dorsal stripe, yellow, pale grey with no stripe, pale grey with green blotches and dark grey with a dark dorsal stripe.

In August 2023 an unusual looking – black and yellow – frog was reported in the media. We investigated the case and caught the individual in a private backyard pond in Gulbene. It was identified as the edible frog *Pelophylax esculentus* with a very rare genetic case of partial leucism (piebaldism). There has been no previous research with this condition in the species. Interestingly there is only one previous observation of a partially leucistic edible frog in Lithuania in 2022.

BENZANTHRONE LUMINOPHORES: ARE THEY SUITABLE FOR A RAPID AND HIGH-RESOLUTION IMAGING OF PARASITES BY CONFOCAL LASER SCANNING MICROSCOPY?

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Process when different organs and tissues are visually represented is calling imaging. Imaging tool helps to monitor anatomy of various living organisms including parasites. In recent years there are more interest for different imaging tools linked to benzanthrone luminophores or in different words fluorescent probes. Benzanthrone luminophores are known as organic luminophores which have bright fluorescence, high thermo and photo stability, moreover, excellent colour characteristics. In literature there are studies where benzanthrone probes are used as dyes for various polymers, daylight fluorescent pigments, textiles, laser dyes, to study cell membranes and biomolecules. Luminophores have confirmed their usage in biological object imaging as well. However, several studies have concluded that there is a request for specific fluorescent probes for various biological objects.

One of the essential tools in biological research is confocal laser scanning microscopy (CLSM). This technique enables the imaging of thick samples, optical slicing through tissue, monitoring of different physiological and anatomical structures and the three-dimensional imaging of biological samples.

Considering the results of literature, benzanthrone luminophores and CLSM combination is suitable for efficient and rapid investigation of Nematoda and Trematoda species. The combination even allows to differentiate larvae of the *T. spiralis* and *T. britovi* species and determine larvae's gender. This kind of benzanthrone and imaging tool combination can be used to study parasite samples stored for a years and samples recently collected from animal musculature to obtain more detailed data about parasite's muscular and anatomical arrangements.

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