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LATVIJAS UNIVERSITĀTE
**BIOĻĢIJAS
FAKULTĀTE**

**“Zooloģija un dzīvnieku ekoloģija”
78. zinātniskā konference**

**Bioloģijas fakultāte, Zooloģijas un dzīvnieku ekoloģijas katedra
Referātu tēžu krājums**

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Latvijas Universitātes
78. zinātniskās konferences
Bioloģijas sekcijas
Zooloģijas un dzīvnieku ekoloģijas apakšsekcijas
Programma

| Laiks / Time | Prezentējošais autors / Presenting author | Tēmas nosaukums / Title |
|----------------------------|---|--|
| 10:00 | Auniņš/Deksne | Ievads |
| Sesiju vada: Auniņš/Deksne | | |
| 10:05 | Jānis Birzaks | Ūdens temperatūras un caurplūduma tendi Salacas upē: iespējamā klimata pārmaiņu ietekme uz laša un taimiņa mazuļiem un smoltiem / Water temperature and discharge trends in the Salaca River: possible climate change impacts on salmon and sea trout parr and smolts |
| 10:20 | Jānis Ķuze | Jūras ērgļa <i>Haliaeetus albicilla</i> populācijas dinamika Latvijā / Population dynamics of White tailed eagle <i>Haliaeetus albicilla</i> in Latvia |
| 10:40 | Jurgis Šuba | Latvijas vilku un lūšu populācijas dinamikas un reprodukcijas vērtējums ar virtuālas analīzes un rekonstrukcijas metodēm / Estimation of Latvian wolf and lynx population dynamics and reproduction by virtual analysis and reconstruction methods |
| 11:00 | Andris Avotiņš | Latvijas plēsīgo putnu populāciju lielumi un pārmaiņu rādītāji Putnu direktīvas 12. panta ziņojamam (2013-2018) / Population size and trend estimates for Latvian birds of prey and owls in report for the Article 12 of the Bird Directive (2013-2018) |
| 11:20 | Kristaps Vilks | Lapkoku praulgrauža <i>Osmoderma barnabita</i> (Motschulsky, 1845) aizsardzības stāvoklis Latvijā / Conservation status of the Hermit beetle <i>Osmoderma barnabita</i> (Motschulsky, 1845) in Latvia |
| 11:40 | Stenda referātu prezentācijas (1 min) | |
| 11:45 | Kafijas pauze / Stenda referāti | |
| Sesiju vada: Auniņš/Deksne | | |
| 12:00 | Alessandro Di Marzio | Primārie rezultāti par Eiropas kokvārdes (<i>Hyla arborea</i>) uzskaiti Kurzemē / Preliminary results of the census of European tree frog (<i>Hyla arborea</i>) in Kurzeme |
| 12:20 | Voldemārs Spuņģis | Ornamentētā pļavērce <i>Dermacentor reticulatus</i> Latvijā – zināmais un nezināmais / Ornate dog tick <i>Dermacentor reticulatus</i> in Latvia - known and unknown |
| 12:40 | Ronalds Krams | Attīstības ātruma ietekme uz circeņu <i>Gryllus integer</i> Scudder, 1902 ķermeņa elementu sastāvu, metabolismu un uzvedību / The effect of developmental speed on elemental body composition, metabolism and behaviour in western stutter-trilling crickets (<i>Gryllus integer</i> Scudder, 1902) |

| | | |
|--------------|--|--|
| 13:00 | Jānis Ozols | Ainavekoloģisko faktoru ietekme uz aizsargājamajām saproksilajām vabolēm priežu mežos / Landscape ecology factors affecting protected saproxylic beetle (Coleoptera) species in pine forests |
| 13:20 | Alma Plivča | Eiropas platauša (<i>Barbastella barbastellus</i>) nakts aktivitāte Odziena apkārtnē / The night activity of Western barbastelle (<i>Barbastella barbastellus</i>) in region of Odziena |
| 13:40 | Pusdienu pārtraukums / Stenda referāti Sesiju vada: Auniņš/Deksne | |
| 14:20 | Ksenija Pankratjeva | Strupastes <i>Microtus hartingi</i> uzvedības pārmaiņas atklātā lauka testā pēc stresa sociāla stresa ietekmes / Impact of social stress on the behaviour of harting's vole <i>Microtus hartingi</i> in an open-field test |
| 14:40 | Rūta Rozenfelde | Purva siseņa <i>Stethophyma grossum</i> populāciju ģenētikas raksturošana Engures ezera dabas parkā, izmantojot iPBS molekulāro marķieri / Characterizing large marsh grasshopper <i>Stethophyma grossum</i> population genetic structure in Lake Engure Nature park, using iPBS as a new molecular marker in insect population genetics |
| 15:00 | Edgars Bojārs | Ieteikumi brūnā lāča monitoringa metožu papildināšanai Latvijā / Recommendations for improving brown bear monitoring methods in Latvia |
| 15:20 | Mārtiņš Kalniņš | Abinieku uzskaites nelielās ūdenstilpēs pēc ikru kamoliem un vizuāli novērotajiem eksemplāriem / Amphibian surveys in small water bodies by egg masses and visual encountered specimens |

Stenda referāti:

| Prezentējošais autors / Presenting author | Tēmas nosaukums / Title |
|---|---|
| Rebeka Šķērstiņa | Kontrolētas dedzināšanas ietekme uz bruņērču (Acari: Oribatida) sugu sabiedrībām Aizsargājamo ainavu apvidus "Ādaži" priežu mētrāja augsnēs / Effects of prescribed burning on armoured mite (Acari: Oribatida) communities in a scots pine forests in the protected landscape area "ĀDAŽI" |
| Antra Stīpniece | Nomedīto ūdensputnu monitorings / Waterfowl harvest monitoring |

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MUTISKIE ZIŅOJUMI

WATER TEMPERATURE AND DISCHARGE TRENDS IN THE SALACA RIVER: POSSIBLE CLIMATE CHANGE IMPACTS ON SALMON AND SEA TROUT PARR AND SMOLTS

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Hydrometeorological conditions are important determinants of the distribution, abundance and growth of *Salmo salar* Atlantic salmon parr and smolts in rivers. Water temperature and streamflow in the River Salaca have been monitored for a long time, providing the opportunity to examine these long-term changes and their effects on juvenile Atlantic salmon and sea trout.

Average water temperature in the River Salaca has increased over time, particularly in autumn, winter and spring. River discharge has increased in winter and summer, which is obviously determined by an increase in precipitation in the form of rain.

However, the sizes of the smolt once they age, has increased.

The results we obtained show that in the period from 1992 – 2017, with the significant change in the seasonal water temperature and discharge, the abundance of salmon parr has increased, but their growth in the first year of life in summer up to August has decreased.

Our results show that warmer winters and earlier springs obviously ensure the survival and smoltification of a greater proportion of parr. There is an increase in the proportion of the fastest-developing number of parr that undergo smoltification at a younger age as one-year old smolts in the Salaca River. There has been an improvement in conditions for parr growth in autumn until the commencement of winter and in spring up to migration, because of which the average size of one-year old salmon and sea trout smolt in the river has increased. The average length of the older smolt has also increased.

We found changes in smolt migration patterns in the River Salaca because of climate change. Smolt migration takes place over a shorter period, i.e., more intensively and its rate correlates negatively with the water temperature during migration.

The overall production of smolt in the Salaca has increased, by increasing the abundance of sea trout.

It can be concluded that in the last 50 years, environmental conditions like water temperature and discharge in the Salaca has changed, directly or indirectly affecting the abundance, distribution, growth and migration patterns of young salmon and sea trout. Overall, the results show that the age of smolt has decreased, but length at age - increased, which is caused as a response to the warming of the climate, or an improvement in their feeding conditions, or both.

This will continue in future, corresponding with climate change scenarios and will influence salmon and sea trout resources accordingly. Resource management and a better understanding about the influence of environmental conditions on the dynamics of fish populations in the region is of importance for the observation and research of these connections.

ON THE POPULATION DYNAMICS OF WHITE TAILED EAGLE *HALIAEETUS ALBICILLA* IN LATVIA

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White tailed eagle *Haliaeetus albicilla* is a species of diurnal birds of prey that has recovered from depression period and now is increasing in most of its European breeding range (BirdLife 2004). Considered as “not a rarity” in late 19th century in Latvia (Transehe, Sināts 1936), it has disappeared as a breeding species in 1960ies with first breeding territory found afterwards in 1971 in surroundings of Lake Engure (Липсберг, Приедниекс 1975). Numbers has increased since, in 2003 population was estimated at 30-40 pairs (Bergmanis 2003), although only 13 actual breeding territories were known in 2000. In 2009 numbers were estimated at 60-80 pairs (Kuze u.c. 2010).

Population of White tailed eagle is monitored yearly in Latvia with most known breeding territories visited to control the nest occupancy and breeding productivity. Due to this, the increase in numbers of breeding pairs has been well documented. Re-establishing of breeding range was recorded from two main directions – Kurzeme recently holds ca two thirds of national breeding population and numbers in most suitable areas (surroundings of large fishpond complexes) reach 3 pairs per 100 km sq, with nearest simultaneously occupied nests being in distance of 2,2 km from each other. In E part of the country surroundings of Lake Lubans is another region with high breeding density (ca 15 breeding territories known, up to 3 pairs per 100 km sq) and the rest of Vidzeme and Latgale is gradually being recolonized.

Considering the numbers of occupied nests in 2019 as well as numbers of historically known territories where nests are not known, recent population is estimated at 100-150 breeding pairs.

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ESTIMATION OF LATVIAN WOLF AND LYNX POPULATION DYNAMICS AND REPRODUCTION BY VIRTUAL ANALYSIS AND RECONSTRUCTION METHODS

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Wolves and lynx that inhabit Latvian territory belong to numerically and spatially large Baltic and Russian populations that exist under various management regimes and a wide range of habitats without considerable dispersal barriers between them. During the last century, due to various concerns, wolves have been intensively persecuted, but their condition rapidly recovered during following absences of persecution. At the same time, lynx has been a rare species in Latvia and their hunting has been effectively restricted. Currently, due to a favourable population status, in accordance with legal acts of the European Union, limited hunting or lethal control of these species are permitted means for Latvia to minimise game-related competition and, in case of wolves, – livestock depredation.

Data from the hunting bags, systematically collected in the past two decades, provide the only robust and comparable information on wolf and lynx populations in Latvia, because neither country-wide survey for tracks or dens, nor individual counts have been regularly conducted. By applying population reconstruction from age-at-harvest data and virtual population analysis, we estimated population dynamics, age-related survival, and reproduction of these species.

Population reconstruction models indicated a moderate increase in wolf and lynx abundance during the last two decades. According to virtual population analysis, minimum abundance estimates for wolves and lynx in the year 2019 before the harvest was 680 ± 80 and 490 ± 120 individuals, respectively. Taking into account also natural mortality, the maximum assessed wolf and lynx abundance before the harvest in the year 2019 was 820 and 620 individuals, respectively. By comparing fertility rates with estimated numbers of juveniles, average postnatal survival rates for wolves and lynx were 53,5% and 38%, respectively. This analysis also suggested improved recruitment rates for juvenile wolves during the last decade.

POPULATION SIZE AND TREND ESTIMATES FOR LATVIAN BIRDS OF PREY AND OWLS IN REPORT FOR THE ARTICLE 12 OF THE BIRDS DIRECTIVE (2013-2018)

Andris Avotins^{1,2,3}, Ainārs Auniņš^{1,2}, Jānis Reihmanis^{2,4}

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Population size and magnitude of its change are crucial parts for conservation planning and setting its goals. Therefore, each member state of European Union must report those values every six years. There are several approaches available ranging from expert's opinion to robust statistical analysis of empirical data.

Since 2014 comprehensive monitoring scheme for Birds of Prey and Owls is implemented in Latvia. There are separate censuses for nocturnal and diurnal raptors covering both acoustically and visually countable species. Volunteer-based monitoring covers 40 to 80 randomly selected census sites with four repeated observation sessions annually. Such a monitoring design provides data for the use of N-mixture hierarchical modelling. This method was used to analyse data and results are provided for reporting on 12 Bird of Prey (and Black Stork) species. Robust design of monitoring allowed it to be compiled with research census for Owls and therefore to analyse additional six species. Overall, population size and trend estimates were provided for 18 species.

N-mixture hierarchical modelling is useful tool for population size estimation, acknowledging potentially imperfect detection within any census. Model hierarchy relies on analysis of the detection probability at first, to link it with habitat descriptors afterwards, yet within the same model-system. As independent variables in the detection section, day of the year, time of the day, visibility from census station as well as general habitat descriptors were used. Two approaches were used in an abundance model – previously prepared species-specific habitat suitability map where it was available or general habitat descriptors (i.e., area of waterbodies, forests, mature forests, grasslands, agricultural lands, edge lengths etc., combined from Latvian Geospatial agency topographic map, state forest registry and agricultural field inventories databases) in landscape.

Here we report the most recent estimates of population size and magnitude of its change for diurnal and nocturnal Birds of Prey of Latvia. We accept that expert-opinion based population estimates may differ from those we are presenting here. Those often are accompanied with doubts of the results of imperfect detection analysis. This occurs mainly due to two reasons – observers are used to account for what they observe, rather than, what they cannot detect, and seemingly asymmetrical boundaries of confidence intervals in exponential families. The goal of this presentation is to give case-wise examples, where more expert-based approaches fail to imperfect detection model results and to once again explain concept of robust standard error in exponential data analysis. Furthermore, results with confidence intervals are essential in establishment of favourable reference values and calculus of population change magnitudes, when systematic monitoring data are not available. Those are two key aspects in targeted conservation planning, both of which are being already used for some of the analysed species in Latvia.

CONSERVATION STATUS OF THE HERMIT BEETLE *OSMODERMA BARNABITA* (MOTSCHULSKY, 1845) IN LATVIA

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Hermit beetle *Osmoderma barnabita* is a priority protected species of European importance, included in the Annex II of the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Currently, the European Commission has sent a letter of formal notice to Latvia for the failure to ensure adequate protection for several habitats and species of European importance. In the context of this ongoing discussion, the aim of this report is to evaluate and explain the current protection status of hermit beetle, to provide data on important case-studies affecting this assessment, and to give proposals for improvement of the conservation status of this species in the future.

In recent years, the knowledge level about hermit beetle has significantly increased due to several large-scale inventories of species localities, habitat mapping and more detailed ecological research. Hermit beetle is distributed in suitable habitats throughout the whole territory of Latvia. Species has been found in 92 10km x 10km quadrates (2013-2019). The population size of this elusive saproxylic species can be assessed as 203 1km x 1km quadrates according to the standard reporting format (2013-2019). The most important hermit beetle habitats in Latvia are wooded pastures and meadows, as well as parks and alleys. Abandonment of wooded pastures and meadows and natural mortality of old deciduous trees in this habitat, removal of old deciduous trees in parks and alleys, uncontrolled burning of tree cavities, reconstruction of roads along alleys and beaver activity in some areas are the main identified pressures and threats for the hermit beetle. Habitat restoration and improvement of habitat quality both in large territories of wooded meadows and in territories with small groups or even single trees are the most important conservation measures carried out for the hermit beetle in Latvia. LIFE project “Management of Fennoscandian wooded meadows (6530*) and two priority beetle species: planning, public participation, innovation” has played an particularly important role for the conservation of this species in Latvia.

In 2014, detailed proposals were made for the establishment of new Natura 2000 territories in the context of the protection of hermit beetle, as only 41% of all known hermit beetle localities were formally protected. These proposals have not been implemented, with the exception of seven territories, which have been included in the list of protected alleys. Currently, 55,6% of 1km x 1km quadrates with hermit beetle localities are at least partially located within the Natura 2000 network, which is still less than the required 60%. In overall, the conservation status of hermit beetle is currently assessed as unfavourable in Latvia.

PRELIMINARY RESULTS OF EUROPEAN TREE FROG (*HYLA ARBOREA*) IN KURZEME

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The reintroduction project of the European tree frog (*Hyla arborea*) by the Riga Zoo Ecology Laboratory, led by Juris Zvirgzds began in 1988. At that time the species was extinct in Latvia, although several reports seem to indicate the presence of *Hyla arborea* in Latvia until the beginning of the 20th century. Between 1988 and 1992, 4110 juveniles of *Hyla arborea* were released in Kurzeme (for more information on the project, see Zvirgzds et al., 1995). The results of the project in the middle term were good, as confirmed by later censuses.

In 2019, 30 years after the first reintroductions, we began a new population census. The multi-annual census plan aims to investigate various aspects of the *Hyla arborea* population in Latvia, identifying the main threats to its conservation. The main aims for the first year were the identification of the limits of the distribution of the population, the occupation of the territory by the species and a typification of the habitats used for reproduction. In order to identify the distribution limits of the population, nocturnal activities were conducted to identify the male choirs (April-June). The same technique was employed within the area of distribution of the species, adding also the data of direct observations made by the inhabitants of the region, obtained thanks to the citizen participation campaign "Meklē Eiropas Kokvardi" (Looking for the European tree frog) organized by the Riga Zoo. All reported observations (photo, video, audio, animal description) were reviewed and validated by our team.

As a result of this first year of sampling, we carried out nocturnal listening activities to detect male choruses in 226 points and validated 115 citizen observations. In 30 cases we carried out habitat typification. Furthermore, in the absence of further studies, our data seem to indicate that some factors considered limiting for the species in other distribution areas (presence of fish on ponds, roads in their distribution area, etc.) would not represent a problem for *Hyla arborea* in Latvia.

ORNATE DOG TICK *DERMACENTOR RETICULATUS* IN LATVIA – KNOWN AND UNKNOWN

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Dermacentor reticulatus is a rapidly distributing vector in Europe (Földvári et al. 2016). Paulauskas et al. (2015) recorded species along South boarder of Latvia.

In 2019 ticks were sampled by dragging of 1m wide tick flag usually on about 200m long transect in different habitats from February to December. So, relative population density may be estimated. Localities were selected randomly or based on citizen reports. Environmental factors as climatic data, height of vegetation, abundance of dry grass, presence of animal traces, overgrowing by bushes, total cover of herbaceous plants etc. were characterised. All collected material was analysed for presence of pathogens using different PCR methods.

D. reticulatus were found in 38 of 92 investigated localities. A range expanded about 100-150 km to the North in comparison with 2013-2014 study (Paulauskas et al. 2015). Localities cover nearly all territory of Latvia. The highest density was observed in locality Ošvalki - 152 individuals/200 m² and near Tukums – 64 individuals. Over 10 individuals in two localities in the south regions, and less than 10 individuals in the rest localities. *D. reticulatus* was rare in forests, 40 individuals collected, 13 of them in clear-cuts. While 452 ticks were found in grasslands/abandoned grasslands. Factors positively effecting ticks: amount of dead grass, cover of bushes, presence of animal traces. A height of vegetation was nearly significant. Abandoned meadows overgrowing with bushes are favourable for both ticks and their preys: small rodents for feeding of nidiculous larva and nymphs, large herbivores – for adults.

D. reticulatus as vector - 33 samples we analysed, of them: one positive for TBE; 16 positive for SFG Rickettsia; 33 positive for Francisella like endosymbionts.

In 2020 it is planned to continue study of ecology, habitat preference, possible complete life-cycle in cattle farms, distribution limits.

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THE EFFECT OF DEVELOPMENTAL SPEED ON ELEMENTAL BODY COMPOSITION, METABOLISM AND BEHAVIOUR IN WESTERN STUTTER-TRILLING CRICKETS (*GRYLLUS INTEGERS* SCUDDER, 1902)

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The elemental composition of organisms belongs to a suite of functional traits that may adaptively respond to fluctuating selection pressures. Life history theory predicts that predation risk and resource limitations impose selection pressures on organisms' developmental time and are further associated with variability in energetic and behavioural traits. Individual differences in developmental speed, behaviours and physiology have been explained using the pace-of-life syndrome (POLS) hypothesis. However, how an organism's developmental speed is linked with elemental body composition, metabolism and behaviour is not well understood. In this study we compared elemental body composition, latency to resume activity and resting metabolic rate (RMR) of western stutter-trilling crickets (*Gryllus integer*) in three selection lines that differ in developmental speed. We found that slowly developing crickets had significantly higher body carbon, lower body nitrogen and higher carbon-to-nitrogen ratio than rapidly developing crickets. Slowly developing crickets had significantly higher RMR than rapidly developing crickets. Male crickets had higher RMR than females. Slowly developing crickets resumed activity faster in an unfamiliar relative to a familiar environment. The rapidly developing crickets did the opposite. The results highlight the tight association between life history, physiology and behaviour. This study indicates that traditional methods used in POLS research should be complemented by those used in ecological stoichiometry, resulting in a synthetic approach that potentially advances the whole field of behavioural and physiological ecology.

LANDSCAPE ECOLOGY FACTORS AFFECTING PROTECTED SAPROXYLIC BEETLE (COLEOPTERA) SPECIES IN PINE FORESTS

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Protected saproxylic beetle species have been studied intensively in the last decade in Latvia, resulting in many new findings. Mostly these studies have focused on local ecological factors, but there is lack of knowledge in landscape scale. We assume that at this moment factors affecting many species (including *Boros schneideri*, *Chalcophora mariana*, *Ergates faber*, *Nothorina punctata* and *Tragosoma depsarium*) in local scale are clear enough to allow to estimate them in landscape scale also.

Data of findings of mentioned species were obtained from Nature Conservation Agency (Dabas aizsardzības pārvalde) and data of forest stands – from State Forest Service (Valsts meža dienests). We randomly selected ten times more absences than the observed number of presences. Ecological factors of landscape level were evaluated in square plots with size 100 x 100 meters.

The most important factors affecting species at landscape level were forest growth type, forest age, diversity of dominant tree species at sampling plot, forest fragmentation, distance from forest edge, distance from the sea, and geographical location of species' finding.

THE NIGHT ACTIVITY OF WESTERN BARBASTELLE (*BARBASTELLA BARBASTELLUS*) IN REGION OF ODZIENA

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The western barbastelle (*Barbastella barbastellus* Schreber, 1774) is distributed in most parts of Europe, but is considered rare or endangered in many places (according to IUCN it is classified as “Near Threatened” species with decreasing population trend). The southern part of the Scandinavian Peninsula and Latvia is the northern border of this species` distribution range. The *B. barbastellus* is considered a forest-dwelling species showing a preference for old, natural or semi-natural broadleaved woodland. *B. barbastellus* mainly feeds on moths. Foraging sites are located in places where many species of moths occur, such as riparian zones, broadleaved woodlands, forest and field edges and unimproved grasslands. The territory of Latvia is located in the boreonemoral zone, and the habitats available here are different from those in the main part of the species` distribution range. There is a lack of information on habitats used by *B. barbastellus* in Latvia. Information about habitats and roosts is needed to ensure successful species protection.

The aim of the study was to determine the prevalence of *B. barbastellus* in different habitats, as well as their occurrence in comparison with other species in a selected area.

In order to determine the habitat selection by *B. barbastellus*, we used ultrasound detectors for night-long, unattended recording of bat calls. We placed recorders in 87 different places for a night. A total 2664 recordings of bat passes were recorded and analysed, and 168 belonged to *B. barbastellus*. In most of the stations (73.6%), the calls of *B. barbastellus* were not recorded at all. In July (n=164), there were more *B. barbastellus* calls recorded than in June (n=4).

Ultrasound detectors were placed in six different habitats (roads, open landscapes, forest edges, woodlands, clearings/young pine/spruce stands, and places with open water) the calls of *B. barbastellus* were recorded in all six habitats. Most often the calls of these bats were recorded along the roads (in 10 places). High activity was observed at the edge of the clearing near a known *B. barbastellus* roost tree (56 recordings during the night) and at the forest edge near the river (38 recordings during the night). In both of these sites specific feeding buzzes were recorded. Feeding buzzes were recorded only in July, and they were relatively few (n=10). The calculated bat activity index (number of recordings per hour) of *B. barbastellus* was lower (0.25) compared to activity of *Eptesicus nilssonii* (1.24) and *Pipistrellus nathusii* (0.93), but significantly higher than night activity of *Nyctalus noctula* (0.07). The highest night activity of *B. barbastellus* was observed during the first two hours after sunset (30.5%), as well as before sunrise (29.2%).

B. barbastellus have low intensity calls; therefore the probability of recording these bats is less than a species with high intensity calls. In most cases there was a relatively small amount of recorded *B. barbastellus* calls (except in two stations). However, *B. barbastellus* calls were recorded in all six habitats. They were most often recorded along the roads, which could mean they are using them as communication routes.

IMPACT OF SOCIAL STRESS ON THE BEHAVIOR OF HARTING'S VOLE *MICROTUS HARTINGI* IN AN OPEN-FIELD TEST

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The study of phenogenetic variability is an important area of knowledge that provides a deeper understanding of evolutionary and ecological processes in populations. Parallel studies of the phenological and morphogenetic responses of animals to environmental factors are common, however behavior becomes a relatively rare subject of research. Stress is one of the most important environmental factors, which can significantly change the behavior of an individual and determine its abilities of adaptation to the environment.

The stress reaction arose and become fixed during the evolution as biologically beneficial, because with a sudden and intense exposure to environmental factors, it prepares the body for activity. Experimental modeling of stress in animals most often performed by means of immobilization, pain effects of extreme muscle stress, etc. However social stress can be important as well. In polygynous groups, females experience stress, which can affect their offspring in the prenatal and neonatal period.

The *Microtus hartingi lydius* study design consisted three series of experiments: the formation of a monogamous pair (I, control), a group of a male and two related females (II) and a group of a male and two unfamiliar females (III). In the age of 60 days young voles, born in different groups, were tested in an open field to evaluate their motility, emotionality, and research activity. In total, the behavior of 70 males and 70 females was studied. One part of the animals was separate from the group in the age of 30 days and was kept in the separate cage. The second part of the animals remained in the communal group together with adult voles and the second born brood. Thereby they were in a socially enriched environment, participating in the care of the brood (separated at the age of 55 days).

The results showed that each experimental group of animals differs significantly in locomotor and research activity, as well as emotionality and anxiety.

CHARACTERIZING LARGE MARSH GRASSHOPPER *STETHOPHYMA GROSSUM* POPULATION GENETIC STRUCTURE IN LAKE ENGURE NATURE PARK, USING IPBS AS A NEW MOLECULAR MARKER IN INSECT POPULATION GENETICS.

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Large marsh grasshopper *Stethophyma grossum* is one of the species that has specialized for living exclusively in mires – mostly transition mires and fens. The area of these habitats has declined over the past century, making habitat fragmentation and degradation one of the main threats to populations of many specialized species. Alkaline fens are one of the rarest habitats in Latvia. *Stethophyma grossum*, however, is not listed as rare or endangered species in Latvia, contrary to multiple other countries in Europe. IUCN red-list emphasizes the need for research regarding population size, distribution and trends of this species. Retrotransposon-based molecular marker system (iPBS – *inter primer binding site*) is a relatively new molecular marker, originally developed in 2010, and since then has been successfully used on plants, mammals, fish and fungi. This marker can be used for quantitative comparison of multiple population genetic variability. The use of this marker hasn't been tested on insects. Therefore, the aim of this study was to determine, whether iPBS can be used as a molecular marker to characterize *Stethophyma grossum* population genetic structure.

In Lake Engure nature park alkaline fens form a mosaic of various size patches, giving a chance to conduct a metapopulation-based research. From various fen patches 72 individuals of *Stethophyma grossum* were collected with sweep net, euthanized with ethyl acetate and fixed in 70% ethanol, then stored in room temperature. Multiple DNA extraction methods were compared, and the one that resulted in the highest DNA concentration was used for further analysis. PCR was conducted using standard iPBS protocol. PCR product was analysed on 1,7% agarose gel electrophoresis. After testing 15 iPBS primers, two that showed the highest level of polymorphism (iPBS2273, iPBS2077) were chosen for population characterization.

The first results show that iPBS is applicable method to characterize *Stethophyma grossum* population genetics, as the tested iPBS primers give multiple strong bands that were polymorphic for individuals from different habitat patches. This is the first attempt to use iPBS in insect population genetics, and the first results show the prospects of the use of this relatively low-cost genetic marker in molecular ecology.

RECOMMENDATIONS FOR IMPROVING BROWN BEAR MONITORING METHODS IN LATVIA

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The population of the brown bear *Ursus arctos* in Latvia, although still being rather small and estimated at 20-50 individuals, is gradually expanding, mostly thanks to influx from Estonia and Russia. These estimations are based on the annual background monitoring of bear tracks in five specially protected areas of Latvia, as well as casual observations of individuals and tracks using spatial and temporal distance criteria. It shall be noted that the method works well in the periphery of the distribution area, such as Latvia at present. Measurements of tracks provide useful information about the size and potential age of individuals.

However, the current background monitoring has some flaws that may prevent correct assessment of the dynamically increasing brown bear population in Latvia:

- The small monitored area does not reflect the whole population.
- Data interpretation mistakes may occur when estimating the number of individuals.
- The monitoring does not provide information about sex structure of the population.

From July of 2018 until October of 2019, the Latvian State Forest Research Institute (LSFRI) "Silava" executed the project "Improvement of the monitoring of the brown bear population in Latvia by molecular genetic methods" (No 1-20/139, supported by the Latvian Environmental Protection Fund). The aim of the project was to develop preconditions for further improvement of the monitoring system of the species in Latvia to obtain scientifically grounded information on currently expanding brown bear population for species protection and management, according to the Action Plan for Brown Bear *Ursus arctos* Conservation.

Activities related to molecular genetic identification of individual bears was the core of of the project. Experts of the LSFRI "Silava" gathered samples of bear hair, scat and saliva for further molecular genetic analyses from specially established hair-traps, damaged apiaries, as well as abandoned apple-tree orchards.

Altogether, 85 hair samples were analysed in the laboratory applying molecular genetic methods. Most of samples were gathered in damaged apiaries. On average, 44% of samples were successfully genotyped. 18 individual bears were identified – 11 males, 3 females and the sex could not be determined for 5 individuals.

The following main recommendations were suggested according to the outcomes of the project:

- Extension of the area of the background monitoring.
- Implementation of a regular molecular genetic monitoring (using hair-traps, surveys of damaged apiaries, surveys of abandoned apple-tree orchards, laboratory analysis of collected samples).
- Wider implementation of citizen science (involvement of foresters, hunters, beekeepers, amateur naturalists) to increase the number of direct and wildlife camera trap observations and samples gathered for molecular genetic analyses.

AMPHIBIAN SURVEYS IN SMALL WATER BODIES BY EGG MASSES AND VISUALLY ENCOUNTERED SPECIMENS

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Latvian amphibian fauna consists of 13 species. Various methods have been used in surveying them: records of vocalizing amphibians, using traps, visual observations – mainly for rare, minor species. For surveys of common species in Latvia, there was an assessment awarding points used of vocalizing specimens and assessment of number of the vocalizing specimens. While these methods provide relatively accurate information over large areas (such as across the country), they do not provide accurate information on population changes in small areas, and are highly dependent on climatic and other conditions.

The amphibian surveys described in this study were carried out on a farm with 3 relatively small (0.06-0.2 ha) ponds and 4 tiny (0.002 ha) ponds. All ponds are interconnected with ditches. About half of the survey area is covered by mosaic forest stands and the other half by grasslands. Surveys of *Rana temporaria* common frogs were done by their egg masses. The egg masses are counted and mapped along the coastline of all water bodies in the area. Surveys of the *Bufo bufo* toad were carried out walking along the shoreline of all the water bodies in the area and counting the animals visually encountered. All surveys were carried out on average 3 times during spring. The maximum number of the egg masses and the maximum number of specimens was considered to be the unit to be registered.

Data on the number of the common frog egg masses were obtained from 2009 to 2019, with the exception of the years 2012, 2014, 2015. The lowest number of the egg masses found was 42 and the highest was 106 egg masses (average 69). Minor fluctuations in numbers (66, 67, 64 egg masses, respectively) were found in the surveys of the years 2009 - 2011. Whereas, large fluctuations in the numbers (74, 42, 106, 54 egg masses, respectively) were found in the surveys of the years 2016 - 2019. When assessing the eventual subjective counting error, it is estimated as +/- 5-7 egg masses. When comparing the geographical location of the egg masses in the common frog, it was found that the location of the egg masses varies from year to year. However, the determinants of this difference have not been identified.

Data on the number of the common toad specimens were obtained in 4 of the 8 survey seasons. Climatic conditions have significantly influenced the surveys – the best results were obtained on warm, sunny, windless days when toads are active and swimming on the water surface. In the years, when the spring was cold and long, the spawning period of the toad was relatively long, there were both egg masses and vocalizing animals in the water bodies. The maximum encountered number of specimens was found in 2011 – ~ 4800 specimen. Although the number in the surveys for the years 2017 – 2019 ranged from 600 to 2300 animals per year.

STENDA REFERĀTI

EFFECTS OF PRESCRIBED BURNING ON ARMoured MITE (ACARI: ORIBATIDA) COMMUNITIES IN A SCOTS PINE FOREST IN THE PROTECTED LANDSCAPE AREA "ĀDAŽI"

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In the past century forest fires have become rarer and the affected areas – smaller. Long time periods between the burns mean that most of the organisms are not or are very poorly adapted to the burning. Mites and ticks (Acari) contribute to about 70% of all species and to about 90% of the number of arthropods that live in the coniferous forest soil. Most of them are armoured mites (Oribatida).

Armoured mites possess a relatively slow life cycle that limits their recovery after disturbances, have a worldwide distribution and a limited horizontal migration. These features make them potentially successful bioindicators. Changes in mite species composition can indicate the impact of the disturbance long after the disturbance has occurred. So far armoured mites have been rarely used in research on ecological succession, and knowledge about the soil fauna and oribatid mite response to various disturbances are limited.

The aim of this study was to determine the immediate effect of prescribed burning on soil oribatid mite communities, ground vegetation and soil parameters in a Scots pine forest. Soil samples were collected right before the prescribed burning and 16 days after. After the burning the total number of armoured mites had decreased by 93%, but the number of species – by 77%. Wilcoxon test indicated that fire caused significant changes in the vegetation cover ($p < 0,05$). No significant changes in the examined abiotic factors were found. Changes in armoured mite communities were influenced by fire severity. After the burning *Tectocephus velatus* was registered as a dominant taxon. A few other detected species characterised by a thicker exoskeleton, e.g. epigeic species *Steganacarus carinatus*, were abundant after the burn. A thicker exoskeleton could indicate increased resistance to high temperatures. *Suctobelbella* spp. was a eudominant species after the burn. This genus includes small-sized species with a thin exoskeleton that have a higher chance of withstanding light severity fire disturbances by inhabiting deeper layers of the soil.

WATERFOWL HARVEST MONITORING

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There are three sources of information about hunted waterfowl in Latvia:

- 1) **Reporting by hunters to authorities.** According to present legislation hunters register bag by species and report the totals to their hunting club. Hunting clubs report to the State Forest service. State Forest service publishes the species totals (before 2013 - species group totals) till the beginning of the next hunting season. During 2012-2018 in average annual bag of about 2000 geese, 400 Coot and 19000 ducks has been reported. In comparison with 60ties of the 20th century (Mednis 1969, the only published data about earlier total bags) nowadays more geese but drastically less ducks and Coot are reported. These data show statistically significant decrease of the proportion of Mallard among the other ducks in the hunting bag ($p=0.015$) and increase of Gadwall ($p=0.022$) in 2013-2018.
- 2) **Bag checking by ornithologists.** During period 1993-2019 boat hiring spots at Engure, Babīte, Liepāja lakes and Nagļi fish pond area during hunting opening dates in August were visited. Bird species, age, sex, hunter number, use of a dog and number of lost birds were registered (Janaus, Keišs 2018). For Kaņieris almost total checking for whole season was performed since 1993 till cessation of hunting at this site in 2005 (Vīksne et al 2008). For Lake Engure duck species, age and sex have been registered already in 70-ties (Janaus 1978). During 2004-2019 also these season opening data show increase in occurrence of Gadwall ($p<0,001$) and decrease in occurrence of Mallard ($p<0,001$) as well as decrease in Coot, Garganey and Pochard occurrence and increase in Teal occurrence during opening at these sites.
- 3) **Reporting by hunters to ornithologists.** In order to obtain bag data about all season and more habitats questionnaires from experienced hunters with good species identification skills have been collected in 2005-2019. About 100 hunters are involved, yet only 30 hunt often and report regularly. Ca 100-350 hunting events and 600-1400 birds are reported annually. Hunting activity is the highest during the beginning of the season. Mallard is the predominant species all season. In September-October the 2nd most often species has been Wigeon, in November – Goldeneye.

In order to strengthen reporting by hunters to ornithologists a site www.nomeditie.org was created in 2019. The site provides duck identification part and a tool to report about bag contents with option of attaching photos. During August 8 till November 30 952 unique visitors attended the site. 15,6% of them visited the site repeatedly. 30 hunters new to the project reported their bag via the site.