

# Book of Abstracts



**Nordic Board of Wildlife Research**  
**Nordic Section of Wildlife Disease Association**



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# Oral

## **A comparison of rodent and meso-carnivore abundance and diversity during an extreme drought period and a wet pulse period in the Kalahari System**

**Jade Harris**<sup>1</sup>, *Herve Fritz*<sup>2</sup>, *Chloe Burt*<sup>1</sup>, *Jan Venter*<sup>1</sup>, *Joris Cromsigt*<sup>3</sup>, *Tim Hofmeester*<sup>3</sup>

<sup>1</sup> Department of Conservation Management, Faculty of Science, Nelson Mandela University

<sup>2</sup> REHABS, International Research Laboratory, CNRS-NMU-UCBL, George Campus, Nelson Mandela University, George, South Africa

<sup>3</sup> Department of Wildlife, Fish and Environmental Studies, Swedish University of Agricultural Studies (SLU), Sweden

Pulse events are high intensity, short lived events that occur in a wide range of ecosystems. In arid areas climate change is predicted to cause more sporadic, but extreme pulse events with longer lasting and more severe droughts. Therefore, areas such as the Kalahari are predicted to become warmer, and drier thus having adverse effects on wildlife of all trophic levels.

To test the effect of pulse events on mammal abundance and diversity, we compared bioblitz survey data from surveys during a prolonged drought period (March 2019) and after an extreme wet pulse period (March 2021), at Erin Game Farm and Miershooppan Livestock Farm in the Northern Cape, South Africa. We used a combination of camera trap surveys, walking transects and live trapping to record rodent and meso-carnivore diversity and abundance. Both mammal abundance and diversity were relatively equal amongst land uses during the drought period survey. Although there was an increase in species richness and abundance in the wet period, for both land uses, the increase in abundance and diversity in the cattle ranch area were much more prominent. This unexpected result could potentially be attributed to differences in land-use history of the two sites, but further investigation is needed to test this hypothesis. The results of this study provides an understanding of the the irruption of resources, and subsequent rodent and meso-carnivore response, thus providing vital information for the management of arid landscapes. But more important, it provides a better understanding of the potential responses to global warming.

When: 2022-09-22, 16:00 - 16:20, Where: Sal N

## **A favourable reference population for the wolf in Finland - the population genetic perspective**

**Helena Johansson**<sup>1</sup>, *Jenni Harmoinen*<sup>1</sup>, *Suvi Ponnikas*<sup>2</sup>, *Mikael Åkesson*<sup>3</sup>, *Øystein Flagstad*<sup>4</sup>, *Laura Kvist*<sup>2</sup>, *Jouni Aspi*<sup>2</sup>, *Mia Valtonen*<sup>1</sup>

<sup>1</sup> Natural Resource Institute, Finland

<sup>2</sup> Oulu University, Finland

<sup>3</sup> Swedish University of Agricultural Sciences, Sweden

<sup>4</sup> Norwegian Institute for Nature Research, Norway

Since 2015 Finland's Natural Resource Institute has utilized genetic data for individual identification and monitoring of the size of the wolf population, using 17 microsatellite loci. This data now underpins the genetic component of the Favourable Reference Population (FRV) assessment for Finnish wolves, due for completion in Autumn 2022. The data is first used to describe trends in genetic diversity, inbreeding and effective population size in the Finnish wolf population over time, as well genetic patterns, substructure and gene flow across time and space. We then address the question of long-term genetic viability of the Finnish wolf population based on present levels of inbreeding, the current effective population size and patterns of gene flow within Finland. Since the Finnish wolf population is connected by migration to wolf populations in Scandinavia and Russia, long-term viability is also modelled with realized and required levels of migration in this larger geographic context. Our results suggests that the Finnish wolf population is relatively genetically diverse, without high levels of inbreeding and that the effective population size is quite stable. Furthermore, the population substructure and patterns of gene flow within Finland are somewhat complex, and the long-term genetic viability of the Finnish wolf population is ultimately contingent on good connectivity and migration to and from the wolf populations residing in neighbouring Scandinavia and Russia.

When: 2022-09-22, 13:20 - 13:40, Where: Sal K

## **A new camera and tube-lure-system as monitoring tool for European polecats in Sweden**

**Nadine Erath**<sup>1, 2</sup>, *Henrik Thurfjell*<sup>3</sup>, *Tim Hofmeester*<sup>1</sup>

<sup>1</sup> Department of Wildlife, Fish and Environmental Sciences, Swedish University of Agricultural Sciences, Umeå, Sweden

<sup>2</sup> University of Natural Resources and Life Science, BOKU, Vienna

<sup>3</sup> Swedish Species Information Centre, Swedish University of Agricultural Sciences, Uppsala, Sweden

European polecat (*Mustela putorius*) populations are reported to be declining in a large part of its range. The species is listed in Annex V of the Habitat Directive, which requires periodical monitoring and reporting of its conservation and distribution trends. However, many countries lack monitoring data for polecats and a suitable method to monitor polecats is missing. In Sweden, the only available data comes from 1) hunters that report their bags and 2) sightings. Although these kinds of data have to be handled with caution: a change can be caused by different factors including change of hunting habits or new methods to report sightings. Therefore, robust methods and systematic monitoring is needed to get updated data about the polecat distribution and population status. Here, we used the hunting and sightings data to quantify the current status of the Swedish polecat population. We also present an ongoing project where to monitor polecats using camera traps in combination with a newly developed tube-lure-system to attempt to estimate their densities using sight-resight. We hope to identify individual polecats based on their facial mask as input for density estimation. Our ultimate goal is to combine local density estimates from cameras with national sightings and hunting data to estimate the population size of the Swedish polecat population over time.

When: 2022-09-21, 09:00 - 09:40, Where: Aulan

## **African swine fever - before, beyond and between the four epidemiological circles**

**Erika Chenais**<sup>1</sup>

<sup>1</sup> National Veterinary Institute, Uppsala, Sweden

Since 2007 an African swine fever (ASF)-epidemic is ongoing in Europe and Asia, recently reaching also the Americas. ASF is a viral, haemorrhagic fever affecting domestic pigs and European wild boar with severe disease and high mortality. The current epidemic has had enormous impact on animal welfare, the domestic pig sector, wild boar populations, hunting and recreation. In some parts of Europe this epidemic mainly affects wild boar populations. The specific epidemiology and disease ecology in that context is still not completely understood. Based on experiences and knowledge from the ongoing epidemic we can conclude that cooperation between different science disciplines and with various actors are paramount for preventing and controlling ASF in wild boar. In this regard the influence of human actions on animal disease epidemiology is increasingly recognized, with human behaviour acknowledged as the main driver for ASF spread in domestic pigs, and for causing long distance jumps of ASF in wild boar. More recently we have also seen different aspects of the environment being acknowledged as important epidemiological risk factors.

This key-note presentation will discuss the epidemiology of ASF in the four epidemiological cycles, including the different hosts, vectors, virus reservoirs, disease drivers and how these are entangled with each other. Historical aspects of the diseases as well as current trends and challenges will be discussed along with thoughts on how a country free from ASF can prepare and plan for an incursion, and what we can learn from the ongoing epidemic in this regard.

When: 2022-09-22, 13:40 - 14:00, Where: Sal K

## **An improved method for determining the presence and density of wild mammals using multimedia service remote cameras**

John Phillips<sup>1</sup>, **Sarah Beatham**<sup>1</sup>, Juila Coats<sup>1</sup>, Richard Budgey<sup>1</sup>, Craig Shuttleworth<sup>2</sup>,  
Giovanna Massei<sup>1</sup>

<sup>1</sup> APHA

<sup>2</sup> Red Squirrel Survival Trust

Across Europe, native species such as wild boar (*Sus scrofa*) and non-native invasive species such as raccoon dogs (*Nyctereutes procyonoides*) cause significant environmental and economic impact, including damage to agriculture and infrastructure and transmission of diseases such as African swine fever, rabies and echinococcosis. Rapid detection of disease vectors and non-native species is essential to minimise their impact. The aims of our study were to: (1) test whether time to first detection (TFD) using multimedia service (MMS) cameras, that send real-time data via email or text, was more efficient at detecting wild mammal species than traditional camera traps; and (2) test whether TFD could be used to estimate local densities of wild boar and other mammal species. Standard camera traps were deployed in five UK woodlands to derive a density index for each mammal species. Baited MMS cameras were then trialled and the TFD measured. MMS cameras detected wild boar and five other species at all woods in an average of 1.4 days, much quicker than would typically be practical with standard cameras. Significant relationships ( $R^2 > 0.85$ ) were found between TFD and wild boar and red fox (*Vulpes vulpes*) density. In a second trial, baited MMS cameras detected two pine martens (*Martes martes*), recently released from captivity, within 2 days of camera deployment in a 50 ha woodland. We conclude that MMS cameras can be used as an efficient tool to detect wild mammals at high and low densities, and to infer local densities of wild boar and red fox.

When: 2022-09-20, 15:20 - 15:40, Where: Sal O1

## **Are we on the same page? How hunters and their organisation communicate over data**

**Emily Montgomerie**<sup>1</sup>, *Filip Ånöstam*<sup>2</sup>, *Hanna Bergeå*<sup>1</sup>, *Göran Bergqvist*<sup>2</sup>, *Bodil Elmhagen*<sup>2</sup>, *Maria Johansson*<sup>3</sup>, *Rene van der Wal*<sup>4</sup>

<sup>1</sup> Environmental Communication, Swedish University of Agricultural sciences (SLU)

<sup>2</sup> Swedish Association of Hunting and Wildlife Management (Svenska Jägareförbundet)

<sup>3</sup> Environmental Psychology, Dept of Architecture and Built Environment, Lund University

<sup>4</sup> Department of Ecology, Swedish University of Agricultural sciences (SLU)

Wildlife monitoring increasingly relies on voluntary data collection, which makes such citizen science data relational and part of social contracts. Communication over data, thereby, turns into an opportunity to understand relationships and motivations between partners in society, as well as their views on the importance of data and their use within wildlife management or conservation. We set out to study such communication and relationship building over data by focusing on the Swedish Association of Hunting and Wildlife Management (Svenska Jägareförbundet) and hunters. Hunters are asked to provide data on what has been shot, an almost century old practice taking place in large parts of Sweden. Mapping the processes of data production (by hunters) and data gathering (by Svenska Jägareförbundet), we ask how such data are perceived and used, what are the key communicative aspects of such data gathering, and what communication takes place around this. Using environmental psychology frameworks around social identity, motivation, inter-personal trust, and technology acceptance, we draw conceptual understanding from the material with direct relevance to the gathering of volunteer-based monitoring data, and tackle questions such as: What is needed for volunteers to willingly contribute with data? When are provided data considered valid? In what way does the collaboration over data challenge and contribute to trust between partners and to legitimacy of Swedish wildlife management? At a time where scientification of society has brought focus on data, our work reveals communicative dimensions of volunteer-gathered data, raising questions about reliability, legitimacy and trust.

When: 2022-09-22, 16:20 - 16:40, Where: Sal O1

## **Assessing animal welfare during trapping and culling of wild boar (*Sus scrofa*) in corral-style traps**

**Johannes Lang**<sup>1</sup>, *Katharina Westhoff*<sup>1</sup>, *André Fetzer*<sup>1</sup>, *Zarah Schwan*<sup>1</sup>, *Michael Lierz*<sup>1</sup>

<sup>1</sup> Justus-Liebig-University Giessen, Clinic for Birds, Reptiles, Amphibians and Fish, Working Group for Wildlife Research, Frankfurter Strasse 108, 35392 Giessen, Germany

Capture of wild boar in corral-style traps with subsequent culling is increasingly used as management tool. The method is debated due to animal welfare concerns making welfare studies in traps necessary. While previous studies focus on behavioural assessment and injuries, this study also includes the physiological aspect. We investigated behaviour, trap induced injuries and serum cortisol levels in wild boar caught in different types of corral-style traps (50-80 qm<sup>2</sup>, n=138 wild boar culled during 27 trapping events) in Hesse, Germany. Inside traps animals were killed by headshot within 2 h after trapping. Behaviour was documented by video recordings and selected behavioural traits measured and compared between age groups, group sizes and type of trap. Carcasses were thoroughly inspected for trap induced injuries and the heads collected for subsequent investigations by radiological and pathological examinations. Blood samples were collected immediately after culling of the last individual and sera purified by solid phase extraction and analysed via radioimmunoassay. Cortisol levels were compared to those killed by individual (n=42) and driven hunts (n=90) in the same area to exclude background stress levels. Behavioural alterations indicative of capture-induced stress (e.g. running into the trap walls) was strongest upon closing of the trap doors. Trap-related pathological findings due to trauma were documented in 44 out of 138 animals and differed between trap types. Cortisol levels from driven hunts and trapping showed a wide variation but with clear differences. The mean cortisol level was lowest in individual hunts.

When: 2022-09-21, 11:00 - 11:20, Where: Sal N

## **Assessing patterns of resource-use at the landscape scale: a case study on fallow deer (*Dama dama*) in North Wales**

**Owain Barton**<sup>1</sup>, *John Healey*<sup>1</sup>, *Line Cordes*<sup>2</sup>, *Graeme Shannon*<sup>1</sup>

<sup>1</sup> School of Natural Sciences, Bangor University, Bangor, Gwynedd, LL57 2UW, UK

<sup>2</sup> School of Ocean Sciences, Bangor University, Menai Bridge, Anglesey, LL59 5AB, UK

The numbers and geographic ranges of ungulates are expanding in many countries worldwide, which presents a range of management challenges and opportunities. Ungulate species are important ecosystem engineers and key game species for tourism and recreational hunting. However, their behaviour can have detrimental effects on biodiversity, ecosystem functioning, crop production, the spread of diseases and human health. Managing populations to mitigate these impacts has become an important global conservation challenge. Many ungulate species are wide-ranging and so, to be effective, management must be coordinated at the scale of the landscape or region. Understanding the ecological processes that drive species distributions and their use of resources is essential in developing sustainable management strategies to meet a range of conservation objectives.

In this study, we monitored a population of fallow deer (*Dama dama*) in the Elwy Valley region of North Wales, which descend from a captive herd that escaped enclosure around 100 years ago. Since then, they have remained relatively isolated and so provide a rare opportunity to study a wild ungulate population at a tractable landscape scale. We deployed an array of 29 motion-activated camera traps in woodlands for two years, which captured over 120,000 fallow deer images. Our aims were to (i) identify the key environmental and anthropogenic drivers of resource-use and (ii) investigate how daily patterns of deer activity vary seasonally and in relation to human disturbance.



When: 2022-09-20, 14:00 - 14:20, Where: Sal N

## **Atypical porcine pestivirus—A widespread virus in the Swedish wild boar population**

**Hedvig Stenberg**<sup>1</sup>, *Elena Leveringhaus*<sup>2</sup>, *Anna Malmsten*<sup>3</sup>, *Anne-Marie Dahlin*<sup>4</sup>, *Alexander Postel*<sup>2</sup>, *Maja Malmberg*<sup>1, 5</sup>

<sup>1</sup> Section of Virology, Department of Biomedical Sciences and Veterinary Public Health, Swedish University of Agricultural Sciences, Uppsala, Sweden

<sup>2</sup> Institute for Virology, University of Veterinary Medicine Hannover, Hannover, Germany

<sup>3</sup> National Veterinary Institute, Uppsala, Sweden

<sup>4</sup> Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden

<sup>5</sup> SLU Global Bioinformatics Centre, Department of Animal Breeding and Genetics, Swedish University of Agricultural Sciences, Uppsala, Sweden

The recently identified causative agent of congenital tremor in domestic piglets, atypical porcine pestivirus (APPV), was detected in serum from Swedish wild boar. A previous study from Sweden described APPV in domestic piglets suffering from congenital tremor, but the APPV situation in the wild boar population was unknown. In this study, 595 serum samples from wild boar originating from 13 counties in the south and central parts of Sweden, collected between 2000 and 2018, were analysed for the presence of the APPV-genome and for antibodies against the APPV-glycoprotein Erns. The results revealed that APPV is highly abundant in the Swedish wild boar population; 12% (73/595) were APPV-genome positive in serum and 72% (433/595) of the tested wild boars displayed APPV-specific antibodies. The present study also shows that APPV has been present in the Swedish wild boar population since at least the year 2000. The viral sequences obtained from the wild boars were highly similar to those obtained from Swedish domestic pigs positive for APPV and suffering from congenital tremor, suggesting a viral exchange between wild boars and domestic pigs. The high proportion of viraemic and seropositive wild boar is indicative of wild boar being an important reservoir for APPV.



## Autoethnography: A transdisciplinary tool for reporting best methods and practice in applied ecological and environmental research

Kilian Murphy<sup>1</sup>, Laura Griffin<sup>1</sup>, Amy Haigh<sup>1</sup>, Grace Nolan<sup>1</sup>, Tamara Hochstrasser<sup>1</sup>, Simone Ciuti<sup>1</sup>, Adam Kane<sup>1</sup>

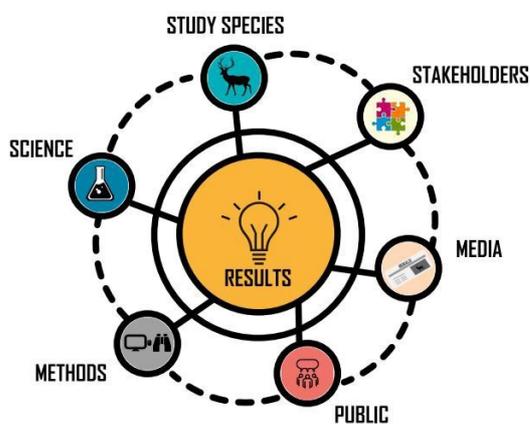
<sup>1</sup> University College Dublin

Applied research regularly involves communication between different organizations - academia, industry, government etc. Yet, we often omit this aspect from scientific manuscripts which masks the social, professional and cultural considerations that are critical to a project's success.

We propose autoethnography as a method in ecology and environmental research to establish an evidence-base of methods and practice for communication and decision making. Autoethnography is a form of qualitative research whereby the researcher uses personal experience to contribute to cultural, social, and scientific understanding.

We demonstrate this method as an effective medium to communicate the reasoning behind decision-making in project design and methodology. Our method of applied autoethnography aims to report on the specific biases and context whereby researchers encountered problems, devised solutions and learned from the experience. We propose that these reports can be included as case studies in scientific publications.

Ecology and environmental science will continue to intersect with organisations that help or hinder research efforts depending on their beliefs, cultural context and biases toward the project. Using case studies to record these experiences and disseminate lessons to the wider community will improve how we approach problems in applied research.



When: 2022-09-20, 11:00 - 11:20, Where: Aulan

## **Beyond Moose: key findings on the ecology and management of multispecies ungulate systems in Sweden**

**Joris Cromsigt**<sup>1</sup>, *Navinder Singh*<sup>1</sup>, *Fredrik Widemo*<sup>1</sup>, *Annika Felton*<sup>2</sup>, *Wiebke Neumann Sivertsson*<sup>1</sup>, *Anna Widén*<sup>1</sup>, *Robert Spitzer*<sup>1</sup>, *Sabine Pfeffer*<sup>1</sup>

<sup>1</sup> Department of Wildlife, Fish and Environmental Studies, SLU

<sup>2</sup> Southern Swedish Forest Research Centre, SLU

During the last 2-3 decades, ungulate communities have changed dramatically across many parts of Europe, and this process is continuing. These multispecies ungulate communities inhabit landscapes that are increasingly modified by humans in ways that affect the ungulates, but also increase human-wildlife conflict. There is an increasing call for improved understanding of the ecology and management of these multispecies systems and their interactions with landscapes and human land use. Here we present some of the key findings of our research program Beyond Moose, which has been in place since 2015. Beyond Moose has looked at the consequences of ungulate community changes in Sweden, where diverse communities with up to 5 different species are increasingly common in areas that, up to the late 20<sup>th</sup> century, hosted only one or two species (moose and/or roe deer). We will present key findings of our program, including results from intense observational studies, spatial analyses using existing national databases, and experimental tests at the landscape level. These findings provide further insights into the; (1) trophic interactions among the different ungulate species in human-modified landscapes, (2) impacts of multispecies ungulate systems on forest and agricultural landscapes, (3) monitoring of multispecies ungulate systems, and (4) opportunities for ecosystem-based management practices of multispecies ungulate systems.

When: 2022-09-20, 11:00 - 11:20, Where: Sal N

## **Black Stork Back: The return of the Swallow of Odin to Sweden**

**Carl-Gustaf Thulin**<sup>1</sup>, *Malin Sörhammar*<sup>2, 3</sup>, *Jonas Bohlin*<sup>4</sup>

<sup>1</sup> Department of Anatomy, Physiology and Biochemistry, Swedish University of Agricultural Sciences, Uppsala

<sup>2</sup> Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, Umeå

<sup>3</sup> Svenska Cellulosa Aktiebolaget (SCA), Skepparplatsen 1, SE-851 88 Sundsvall

<sup>4</sup> Department of Forest Resource Management, Swedish University of Agricultural Sciences, Umeå

A reintroduction of a species is worthwhile given the prerequisites for its existence has improved. An increased understanding of the need to save endangered- and locally extinct species has also led to restoration or preservation of populations through reintroductions. However, background information about a species' habitat requirements is important for introduction programs to be successful. The black stork (*Ciconia nigra* L.) is considered to be extinct from Sweden. However, repeated recent observations and potential breeding have been suggested, and this may indicate that the conditions for black stork in Sweden have changed. In this study, we use Geographical Information System (GIS) to create a habitat model to identify suitable habitats for a potential reintroduction project of black stork to Sweden. The results indicate several suitable black stork habitats in the former distribution range in the southern part of Sweden. Seven counties contained more than 18 % suitable habitats in relation to the total area of each county. We suggest that these areas should be the primary target areas for black stork reintroduction in Sweden.

When: 2022-09-22, 11:20 - 11:40, Where: Sal N

## Can spermatozoa remain viable in the epididymis for several days after death for conservation breeding?

Alexandra Walfridsson<sup>1</sup>, Anders Johannisson<sup>1</sup>, Eduardo Aisen<sup>2</sup>, Jane Morrell<sup>1</sup>, **Theodoros Ntallaris<sup>1</sup>**

<sup>1</sup> Swedish University of Agricultural Sciences

<sup>2</sup> Instituto de Biotecnología Agropecuaria del Comahue (IBAC-CITAAC). Universidad Nacional del Comahue-CONICET Cinco Saltos (RN), Argentina

*Post mortem* recovery of epididymal spermatozoa can be used to preserve gametes from genetically valuable individuals and/or wild animals. However, animals do not necessarily die within easy access of laboratories with the equipment needed to process samples. The purpose of this study was to determine the effect of storage time of tissue *post mortem* on motility, viability and chromatin integrity of bull epididymal spermatozoa, as a model for wild species.

Sperm samples from cauda epididymis were collected at four time points (Day 0; day 1; day 2 and day 3 after slaughter) from one epididymis from each of 13 bulls, stored at 5 °C between sampling times. The other testis from each bull was stored untouched at 5°C until the last day of sampling, as a control. A small incision was made in the cauda epididymis with a scalpel blade; epididymal spermatozoa were recovered using a pipette and then extracted into Optixcell® semen extender. Sperm motility and kinematics were analysed using computer assisted sperm analysis (CASA); plasma membrane integrity and chromatin integrity were evaluated by flow cytometry.

Total and progressive motility decreased with time during storage of the organs ( $p < 0.0001$ ). There was no significant difference in sperm viability or DNA fragmentation index with storage; damaged chromatin were low in all samples. Therefore, although sperm motility was affected by the storage time of tissue *post mortem*, other sperm characteristics were maintained. Additional studies are needed to determine whether they are capable of fertilization with subsequent development into a blastocyst.



Figure 1: Extracting epididymal spermatozoa from bull organs. The cut is then sealed and the tissue stored at 5 °C for further extractions. The extracted spermatozoa are mixed with OptiXcell® semen extender.

When: 2022-09-22, 15:20 - 15:40, Where: Sal K

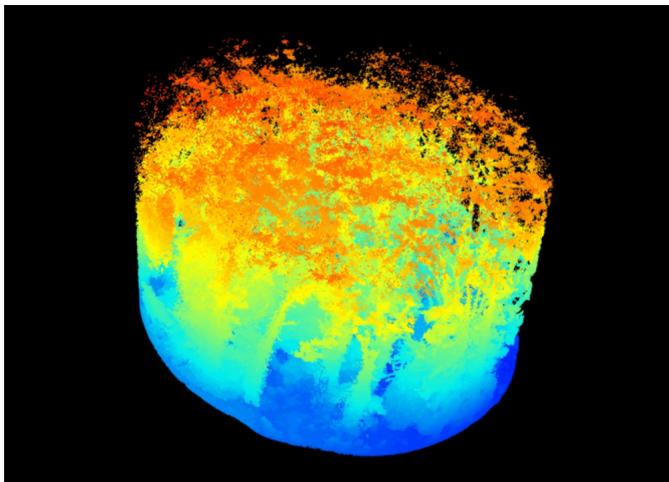
## **Can the deer see for the trees? Quantifying sightline occlusion in woodlands for fallow deer (*Dama dama*) using mobile terrestrial laser scanning**

**Amy Gresham<sup>1</sup>**, *John Healey<sup>1</sup>*, *Markus Eichhorn<sup>2</sup>*, *Graeme Shannon<sup>1</sup>*

<sup>1</sup> Bangor University (UK)

<sup>2</sup> University College Cork (Republic of Ireland)

Prey animals such as ungulates rely on complex habitats for shelter and to hide from danger. However, when habitat structure becomes so dense that the sight of an animal is obstructed, the risk of occupying that habitat may be elevated. We investigated how tree size structure influenced sightline occlusion for fallow deer (*Dama dama*) in woodlands of North Wales. We collected sightline data from 71 circular sampling plots across 10 woodland sites using a ZEB-Revo mobile terrestrial laser scanner. The resulting point clouds were analysed using the R package viewshed3D to compute how quickly sightlines in a 360-degree view were occluded with distance from the centre of each plot at deer eye height (1 metre from the ground), summarised as a visibility coefficient (VC). Tree size structure data were collected as Diameter at Breast Height (DBH) measurements. Trees were categorised as small (< 10 cm DBH), medium (10 – 20 cm DBH), large (21 – 30 cm DBH) and very large ( $\geq$  30 cm DBH). While the VC was negatively related to frequency of small trees, the relationship flattened out with medium and large trees and became slightly positive with very large trees. Dense regeneration of saplings can lead to short sightlines, while canopy closure of very large trees can lead to a more open understory, resulting in longer average sightlines. This may have implications for how ungulates such as fallow deer use different habitat types.



When: 2022-09-22, 15:20 - 15:40, Where: Sal N

## **Carrying capacity of Finland's wolf population**

Ilpo Kojola<sup>1</sup>, Vesa Nivala<sup>1</sup>, **Samuli Heikkinen**<sup>2</sup>, Mia Valtonen<sup>3</sup>

<sup>1</sup> Natural Resources Institute Finland, Ounasjoentie 6, FI-96200 Rovaniemi, Finland

<sup>2</sup> Natural Resources Institute Finland, Paavo Havaksentie 3, FI-90570 Oulu, Finland

<sup>3</sup> Natural Resources Institute Finland, Latokartanonkaari 9, FI-00790 Helsinki, Finland

How many wolves fit into a certain area is a question which is attributed for example to prey abundancies and conflicts with humans. According to our simulations, the present landscapes and prey populations outside the reindeer husbandry region of Finland could sustain 150-162 wolf territories occupied by packs or pairs, which is about three times the current estimate for the number of territories. Wolves recolonized eastern Finland in the 1990s and western Finland in the 2010s but only very few territories have been existing in central Finland which is a cause of concern for the genetic viability of Finland's wolves. A 'nomen est omen' analysis indicates some correspondence with the present locations of wolf territories and locations of wolf-related place names, suggesting also historical wolf presence in those regions. To understand better the reasons for the current distribution we analyzed the fates of GPS-collared vagrant wolves and regional population trends. Our results provided evidence that the current distribution pattern stems from a wolf-human conflict, especially by the risk at which wolves kill domestic dogs. The risk is much higher in eastern and central Finland than in the western part of the country decreasing the possibility that the total number of wolf territories could exceed 150 in Finland.

When: 2022-09-20, 09:00 - 09:40, Where: Aulan

## **Chronic Wasting Disease, an emergent health threat to European cervids**

**Jørn Våge<sup>1</sup>**

<sup>1</sup> Norwegian Veterinary Institute, Post Box 64, 1431 Ås, Norway

Chronic wasting disease (CWD) detection amongst wild Norwegian reindeer (*Rangifer tarandus*) in 2016 was a game changer for European cervid health. This neurodegenerative and fatal prion disease was new to the continent and to wild living reindeer. Modelling of prevalence and intensified surveillance resulted in eradication attempts with culling of the entire population within the affected management area, ca 2400 animals, finalized spring 2018.

Albeit with atypical characteristics as compared to reindeer, CWD were also found in moose (*Alces alces*) and two red deer (*Cervus elaphus*). Nordic CWD strains has also proven different from North American strains.

In autumn 2020, CWD was detected in a new population of approximately 6-7000 reindeer in Hardangervidda management area. This is by far the largest wild reindeer population in Norway and Europe, meaning that the eradication has faced new challenges.

CWD, although considered an animal disease, has impact on human lives given prions' uncertain zoonotic potential. Precaution to include these "mysterious" agents in the human food chain give effects of this emerging disease further than biology.

Strong Nordic cultural traditions of cervid hunting and keeping of semi-domesticated reindeer are a central economic and social aspect of the indigenous Sami populations. Fighting a disease as detrimental as CWD, in wild populations, has challenged management and surveillance since the 2016 detection.

This talk will enlighten on the disease, strain diversity, surveillance efforts and geographic distribution of CWD.

When: 2022-09-22, 11:40 - 12:00, Where: Aulan

## **Consensus and dissonance in evaluations of goose management among stakeholder groups in Sweden**

**Louise Eriksson**<sup>1</sup>, *Maria Johansson*<sup>2</sup>, *Johan Månsson*<sup>3</sup>, *Camilla Sandström*<sup>1</sup>, *Ann Eklund*<sup>2</sup>, *Johan Elmberg*<sup>4</sup>

<sup>1</sup> Umeå University

<sup>2</sup> Lund University

<sup>3</sup> Swedish University of Agricultural Sciences

<sup>4</sup> Kristianstad University

Geese provide various ecosystem services but the increase of several goose populations in Europe has resulted in overgrazing, ecosystem disruption, and a rise in crop damage. Geese are migratory species and the European multi-level management system has conservation objectives, but also an ambition to avoid negative impacts on diverse human interests. To facilitate goose management that receive support from the broader society, the aim of this study was to examine how different stakeholder groups evaluate geese and goose management in Sweden. Data on wildlife value orientation, acceptance of geese, trust in the management system, and acceptance of goose management measures were collected in a sample of the general public (n = 898), farmers (n = 1068), and ornithologists (n = 5010). Attitudes towards geese ranged from neutral to positive, but goose numbers were generally considered too high. Whereas e.g., economic compensation to farmers and hunting during the annual hunting season were generally accepted by all stakeholder groups, hunting of goslings and capturing of adult birds when they are flightless were not. Derogation shooting without requirement of a special permit and hunting free zones may be most likely to create dissonance, since there were large differences in acceptance of these measures among the groups. Differences in wildlife value orientation, acceptance of geese, and trust in management were found to be relevant for explaining acceptance of the disputed measures. This study highlights the need to consider interests in the broader society to develop widely accepted goose management practices.

When: 2022-09-20, 14:20 - 14:40, Where: Sal N

## **Detection of *Salmonella enterica* subsp. *enterica*, serovar *Choleraesuis* in wild boar in Sweden**

**Linda Ernholm<sup>1</sup>** , *Anna Malmsten<sup>1</sup>*, *Karin Olofsson Sannö<sup>2</sup>*, *Emil Wikström Lassa<sup>2</sup>*, *Erik Ågren<sup>2</sup>*

<sup>1</sup> Department of Epidemiology and Disease Control, National Veterinary Institute, Sweden (SVA)

<sup>2</sup> Department of Pathology and Wildlife diseases, National Veterinary Institute, Sweden (SVA)

*Salmonella Choleraesuis* is a pig-adapted salmonella that can be fatal in pigs and wild boar and has zoonotic potential. It has not been detected in Swedish animals since 1979. However, in fall 2020, this pathogen was detected during annual salmonella surveillance in a pig farm in Skåne and in diseased, captive wild boar from Södermanland. Increased surveillance was therefore initiated to investigate the prevalence and distribution of *S. Choleraesuis* within the Swedish wild boar population. Faeces and intestinal lymph nodes from hunter-harvested wild boar and wild boar submitted to the National Veterinary Institute (SVA) for post-mortem examination were analysed for *Salmonella* spp. in accordance with ISO 6579:1. Isolates suspected of *S. Choleraesuis* were whole genome sequenced. Surveillance is ongoing, and by mid-November 2021, 461 wild boar were sampled. *Salmonella* spp. was detected in 71 wild boar of which 54 were *S. Choleraesuis* positive. To date, *S. Choleraesuis* has been found in four counties. The source of the infection is still unknown.

To conclude, *S. Choleraesuis* is prevalent in at least parts of the Swedish wild boar population. The effect of this pathogen on the wild boar population is unknown and risk of transmission to domestic pigs should not be neglected. Disease emergence in wild boar causing deaths and threat of transmission to domestic pigs can serve as a proxy for an incursion of African swine fever. Studying the *S. Choleraesuis* situation increases our knowledge on disease detection and transmission between Swedish wild boar and domestic pig populations.

When: 2022-09-22, 13:20 - 13:40, Where: Sal N

## **Determining favourable reference values for the wolf population in Finland**

Mia Valtonen<sup>1</sup>, Inari Helle<sup>1</sup>, Ilpo Kojola<sup>1</sup>, Helena Johansson<sup>1</sup>, Samu Mäntyniemi<sup>1</sup>, Suvi Ponnikas<sup>2</sup>, Vesa Nivala<sup>1</sup>, Jenni Harmoinen<sup>1</sup>, Annika Herrero<sup>1</sup>, Samuli Heikkinen<sup>1</sup>, Laura Kvist<sup>2</sup>, Jouni Asp<sup>2</sup>, **Katja Holmala**<sup>1</sup>

<sup>1</sup> Natural Resources Institute Finland

<sup>2</sup> University of Oulu, Finland

Viability and long-term persistence are key concepts when assessing favourable conservation status (FCS) of a species or population. One way of assessing whether a population has attained FCS is to determine favourable reference value (FRV), which can be expressed as number of individuals that is likely to ensure long-term persistence of the population. Having a numerical value facilitates making decisions for population management and conservation.

To support the assessment of FCS of the Finnish wolf population, a two-year project was launched by the Natural Resources Institute Finland in 2021 to develop tools for determining FRV. Since there is no single generally accepted way of defining FRV, we decided to apply several approaches to FRVs instead of one.

Both demographic and genetic factors affect the population's viability, and the FRVs depend on whether demographic or genetic factors, or both, are used. We use modelling to evaluate demographic key figures such as the ecological carrying capacity and demographic minimum viable population (MVP), based on which a FRV can be determined with chosen factors. A completely new approach has also been developed, in which the reference values are based on the demographic MVP and on the risk the decision-maker is ready to accept for the population to drop below the predefined MVP level.

Genetics is used to assess the genetic status of the Finnish wolf population and to estimate its connectivity with neighbouring wolf populations of Russia and Scandinavia, which enables the determination of FRV also from the genetic point of view.

When: 2022-09-20, 10:40 - 11:00, Where: Sal N

## **Do large herbivorous waterfowl change the aquatic ecosystems they breed in?**

**Elsie Kjeller**<sup>1</sup>, *Henric Djerf*<sup>1</sup>, *Johan Elmberg*<sup>1</sup>, *Sari Holopainen*<sup>2</sup>, *Pär Söderquist*<sup>1</sup>, *Jonas Waldenström*<sup>3</sup>, *Gunnar Gunnarsson*<sup>1</sup>

<sup>1</sup> Department of Environmental Science, Kristianstad University

<sup>2</sup> Department of Forest Sciences, University of Helsinki

<sup>3</sup> Department of Biology and Environmental Science, Linnaeus University

During the last decades, several goose and swan species have increased remarkably both in population numbers and in geographical distributions in Europe. At the same time, many wetlands are undergoing environmental degradation such as eutrophication, brownification, and vegetation and biodiversity loss. An important question to ask is whether geese and swans contribute to such changes, or merely benefit from them. We studied 39 wetlands in southern Sweden during April-July 2021, and compared those with and without breeding geese and swans. More specifically, we investigated differences between the wetland groups in the composition and abundance of other waterbird species and invertebrates, as well as in water chemistry. In total, 29 breeding waterbird species were observed, of which mallard *Anas platyrhynchos* was the most common (95% of wetlands), followed by common goldeneye *Bucephala clangula* (67%) and Eurasian coot *Fulica atra* (59%). There were more breeding waterbird species on wetlands with breeding geese and swans compared to “non-geese/swan” wetlands (24 *versus* 13). Mallard and goldeneye were breeding in most of the wetlands in both groups, but goose/swan wetlands usually (>50%) also hosted breeding coot, tufted duck *Aythya fuligula*, and red-necked grebe *Podiceps grisegena*. Goose/swan wetlands were more productive in terms of abundance and number of taxa of invertebrates. Moreover, pH, turbidity, total nitrogen and phosphorous were significantly higher in goose/swan wetlands than in “non-geese/swan” wetlands. In contrast, water colour was browner in the latter group. To address the causality behind some of these patterns we suggest that enclosure experiments should be carried out.

When: 2022-09-21, 11:20 - 11:40, Where: Aulan

## **Ecological fallout of African swine fever (ASF) outbreak in wild boar population**

Michał Bogdziewicz<sup>1, 2</sup>, Dries Kuijper<sup>3</sup>, Rafał Zwolak<sup>2</sup>, Stanisław Miścicki<sup>4</sup>, **Tomasz Podgórski**<sup>3, 5</sup>

<sup>1</sup> INRAE, LESSEM, University Grenoble Alpes, 2 rue de la Papeterie, BP 76, Saint-Martin-d'Hères, 38400 France

<sup>2</sup> Department of Systematic Zoology, Faculty of Biology, Adam Mickiewicz University in Poznań, Ulica Uniwersytetu Poznańskiego 6, Poznań, 61-614 Poland

<sup>3</sup> Mammal Research Institute, Polish Academy of Sciences, Ul. Stoczek 1, 17-230, Białowieża, Poland, Mammal Research Institute, Polish Academy of Sciences, Białowieża, Poland

<sup>4</sup> Department of Forest Management, Geomatics and Forest Economics, Forestry Faculty, Warsaw University of Life Sciences, ul. Nowoursynowska 166, 02-787 Warszawa, Poland

<sup>5</sup> Department of Game Management and Wildlife Biology, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences, Kamýcká 129, 165 00 Prague, Czech Republic

Socio-economic consequences of ASF remain a major driver of efforts to control the disease in wild boar populations. However, infectious agents can trigger ecological cascades that affect ecosystem functioning. Potential consequences of ASF-induced trophic cascades in wild boar habitats have not been studied to date. Wild boar (*Sus scrofa*) is an efficient seed predator of European oak (*Quercus robur*), notoriously difficult to satiate through mast seeding by this tree and impeding its regeneration. We predicted that numerical crash of wild boar population following ASF outbreak could release oaks from predation pressure and provide a window of opportunity for regeneration. To test this prediction, we used data from a long-term experiment (2009-2020) which monitored acorn crop, acorn predation by wild boar, and oak regeneration in Białowieża Forest (NE Poland). ASF appeared in the study area in 2015 and caused tenfold decrease in wild boar numbers. This population crash was mirrored by the 15% decline in acorn predation by wild boars which were not able to target high-seeding trees while foraging. Pre-ASF, rooting frequency varied between 18% under low-seeding trees to 51% under high-seeding trees. Post-ASF, rooting frequency dropped to 7% irrespectively of tree-level acorn production. The number of recruited oak seedlings increased 2-fold between pre- and post-ASF period. Together, our results showed that ASF outbreak acted synergistically with masting and removed top-down control of oaks. This process can have broad effects on forest dynamics in Europe if wild boar numbers remain low in ASF-endemic areas.

When: 2022-09-22, 15:20 - 15:40, Where: Sal O1

## **Effects of drive hunts on wild boar movement - Comparison between Sweden and the Czech Republic**

**Astrid Olejarz<sup>1</sup>**, *Evelina Augustsson<sup>2</sup>*, *Petter Kjellander<sup>2</sup>*, *Miloš Ježek<sup>1</sup>*, *Tomasz Podgórski<sup>1</sup>*

<sup>1</sup> Department of Game Management and Wildlife Biology, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Czech Republic

<sup>2</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, Sweden

One of the most effective management tools to control wild boar populations are drive hunts. A hunting method based on posting hunters surrounding an area, waiting for wild boar being pushed and chased out of seclusion by human beaters and their dogs. Well performed drive hunts significantly reduce local population size, but do they also impact wild boar spatial behaviour? Possible disruptive effects on spatial behaviour are predicted and may vary between populations as habitat, population density and differences in drive hunt methods will play a crucial role. For this purpose, we collected drive hunt data over three hunting seasons (2019 - 2022) from four different hunting areas with contrasting wild densities and located in two countries (Sweden and the Czech Republic). Wild boar movements during drive hunts were followed through animals equipped with GPS collars. We analysed individual space use by calculating the spatial overlap in daily home range size and hunting ground before, during and after a given hunt. Furthermore, we calculate Net Square Displacement (NSD) distances of the wild boar to determine changes in movement behaviour. We expect drive hunts with less hunters and beaters to result in less range displacements and shorter flight distances. Furthermore, we expect the reaction strength in space use and flight behaviour to decrease during the hunting season because of habituation effects to hunting disturbance. The between-country study aims to provide new insights into the spatial behaviour of wild boar during drive hunts and will thus add new facts to wildlife managers' toolbox.

When: 2022-09-22, 15:40 - 16:00, Where: Sal K

## **Environmental and anthropogenic features mediate human hunting risk and wolf predation risk for moose**

**Giorgia Ausilio**<sup>1, 2</sup>, *Camilla Wikenros*<sup>2</sup>, *Håkan Sand*<sup>1</sup>, *Petter Wabakken*<sup>1</sup>, *Ane Eriksen*<sup>1</sup>, *Barbara Zimmermann*<sup>1</sup>

<sup>1</sup> Faculty of Applied Ecology, Agricultural Sciences and Biotechnology, Inland Norway University of Applied Sciences, Evenstad, NO-2418, Elverum, Norway

<sup>2</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, SE-739 93 Riddarhyttan, Sweden

When predators have different hunting modes, the combined effects of multiple predators are mediated by the physical landscape and can result in overlapping or contrasting patterns of predation risk. Humans have become super predators in many anthropogenic landscapes by harvesting game species and competing with large carnivores for prey. Here, we used the locations of wolf (*Canis lupus*)-killed and hunter-killed moose (*Alces alces*) in relation to random locations inside two wolf territories in south-central Scandinavia to investigate how the landscape affects the spatial patterns of risk. We found that relative hunting risk increased with increasing moose density but decreased with increasing building density, terrain ruggedness, distance to bogs and distance to main and secondary roads. During the moose hunting season, relative wolf predation risk decreased with increasing building density, distance to young forests and distance to secondary roads, but increased with increasing wolf space use. After the moose hunting season, relative wolf predation risk increased with increasing moose density, wolf space use and terrain ruggedness, but decreased with increasing building density, distance to main and secondary roads and distance to young forests. Because we accounted for the spatial distribution of both predator and prey, our results indicate that environmental and anthropogenic features shape where hunters and wolves kill moose.

When: 2022-09-20, 14:00 - 14:20, Where: Sal K

## **Estimating densities of rodents using camera-traps for wildlife management: the grey squirrel**

**Sarah Beatham**<sup>1, 2</sup>, *Phil Stephens*<sup>2</sup>, *Julia Coats*<sup>1</sup>, *John Phillips*<sup>1</sup>, *Giovanna Massei*<sup>1</sup>

<sup>1</sup> Animal and plant health agency, UK

<sup>2</sup> Durham University, UK

The North American grey squirrel (*Sciurus carolinensis*) is a highly invasive non-native species in Europe. The species has established populations in the UK, Republic of Ireland and Italy and could spread to France and Switzerland within the next decade. There are 2.5 million grey squirrels in the UK, which cause an estimated £37 million in tree damage per annum and are responsible for the massive decline of the native red squirrel *Sciurus vulgaris*. The grey squirrel is currently controlled through culling trap and dispatch, kill traps and shooting and the Animal and Plant Agency is developing a bait-delivered contraceptive to reduce grey squirrel numbers. For successful wildlife management, it is important measure the impact of interventions on population size, therefore reliable methods to estimate numbers of animals are required. Camera-traps have been used to estimate the population sizes for a range of mammalian species. The aim of this study was to test whether an index, calculated using photographs from baited cameras, could accurately estimate populations of grey squirrels in UK woodlands. In trials conducted in nine woods in summer, a significant linear relationship ( $R^2=0.805$ ) was found between the index and densities of grey squirrels (between 2 and 10 squirrels per hectare) trapped and dispatched in each wood. We conclude that a camera trap index can accurately and cost-effectively estimate a wide range of grey squirrel densities in woodlands. This method could be used to assess the efficacy of the grey squirrel management and could be adapted for other mammal species.

When: 2022-09-22, 11:20 - 11:40, Where: Aulan

## **Evaluation of wild goose damage on farmland in northern Hesse, Germany and potential management tools to solve this human-wildlife conflict**

**Johann David Lanz**<sup>1</sup>, *Johannes Lang*<sup>1</sup>, *Prof. Dr. Michael Lierz*<sup>1</sup>

<sup>1</sup> Justus-Liebig-University Giessen, Clinic for Birds, Reptiles, Amphibians und Fish, Working Group for Wildlife Research

Populations of free-ranging geese are increasing and colonizing new habitats across Europe. Most goose species are grazing herbivores, feeding mainly on highly digestible food sources with high protein content such as agricultural crops. During the last 20 years, Greylag geese (*Anser anser*) and Egyptian geese (*Alopochen aegyptiaca*) have also established new breeding populations in northern Hesse, Germany. The feeding pressure of geese on farmland leads to new conflicts with local farmers in this region. In order to quantify the amount of harvest loss due to goose grazing, we investigated the effects of their grazing on crops over three consecutive winters.

A total of 120 fenced enclosure plots were established on 9 different winter wheat fields and 3 rape fields. For each enclosure plot, an unfenced reference plot was established 5m north of the enclosure plot. We collected all plants within the enclosure and reference plots prior to harvest and compared the grain dry mass in winter wheat and number of shells in oilseed rape to test for potential yield reduction due to goose grazing. To provide alternative food sources for the geese we encouraged farmers to sow catch crops to distract gees from the crop. For winter wheat, yield reductions were not significant or at low levels, ranging from 6.7-11.4%. For oilseed rape, the level of losses varied between 16.3-34.3%. During the third winter, scare shooting was carried out on a heavily grazed oilseed rape field and the results showed lower yield losses on this site.

When: 2022-09-20, 16:00 - 16:20, Where: Sal K

## **Explaining the extent of scavenging by wolves in a human-dominated landscape**

**Camilla Wikenros**<sup>1</sup>, *Cecilia Di Bernardi*<sup>1, 2</sup>, *Barbara Zimmerman*<sup>3</sup>, *Jenny Mattisson*<sup>4</sup>, *Aimee Tallian*<sup>4</sup>, *Miake Demski*<sup>1</sup>, *Mikael Åkesson*<sup>1</sup>, *Øystein Flagstad*<sup>4</sup>, *Petter Wabakken*<sup>3</sup>, *Håkan Sand*<sup>1</sup>

<sup>1</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, SE-739 93 Riddarhyttan, Sweden

<sup>2</sup> Department of Biology and Biotechnologies "Charles Darwin", University of Rome La Sapienza, Viale dell'Università 32, 00185, Rome, Italy

<sup>3</sup> Faculty of Applied Ecology, Agricultural Sciences and Biotechnology, Inland Norway University of Applied Sciences, Evenstad, NO-2418, Elverum, Norway

<sup>4</sup> Norwegian Institute for Nature Research (NINA), P.O. Box 5685, Torgarden, NO-7485, Trondheim, Norway

In landscapes with high anthropogenic impact and especially during specific time periods, humans provide food that scavenging species may utilize. We quantified the magnitude of killing versus scavenging by wolves (*Canis lupus*) in Scandinavia in a landscape modified by humans through hunter harvest, land use practices, and infrastructure. We investigated the cause of death of different species utilized by wolves and examined how variation in the proportion of scavenging by wolves was affected by season, social affiliation by wolves, their level of inbreeding, density of main prey species, large carnivores, and humans. We used data from 82 predation surveys of GPS-collared wolves (n = 39, 2001-2019), composing 3198 study days year-round. Wolves utilized 1426 food sources of which the major part was wolf-killed (79%) and the remaining due to natural death (2%), anthropogenic-caused death (5%), and unknown cause of death (14%) with wild ungulates being the most common species. The proportion of wolves' consumption time (based on GPS locations) devoted to scavenging was 6-14%. Scavenging increased with increasing inbreeding coefficient of the adult wolf pair during winter, possible due to reduced hunting success resulting from decreased body condition. Higher human density also increased the proportion of scavenging, especially for solitary wolves. This was likely due to more anthropogenic food sources in the landscape and that solitary wolves being less skilled hunters. This study increases the knowledge of the use of anthropogenic food sources by wolves and their ecological role depending on human impact in the landscape.

When: 2022-09-22, 14:20 - 14:40, Where: Sal N

## **fresh meat: women hunters and the motivation to hunt for ethical meat**

**Lara Tickle**<sup>1</sup>

<sup>1</sup> The Swedish University of Agricultural Sciences

Demographic changes such as urbanisation, globalisation and gender accessibility are all having an effect on hunting culture along with the societal re-evaluation of nature relationships. One of the significant demographic changes is the increase of women choosing to become hunters, often with the intention of acquiring ethically sourced meat. These women are helping to slow down the declining numbers of hunters and, therefore, research around this trend has been focused on their retention or marketing strategies for products geared towards women. By taking this research further using qualitative methods, it is possible to build a better understanding for cultural and ethical dynamics in modern hunting. In this presentation I focus on the popular motivation to hunt for wild-meat and tie it to the symbolic significance of female hunters. The harvesting of game meat is inextricably linked to legitimacy of hunting amongst both hunters and non-hunters. The attraction towards “ethically sourced” good quality meat has accompanied the rise of the eco-movement, the “greening” of hunting and has broadened its appeal to non-traditional demographic groups. Yet, as a phenomenon, women entering hunting is also a politicised game with often attractive female hunters obscuring a reality where women, although empowered to hunt, are still subjected to conditions, stereotypes and pressures that undermine their role as hunters today.

The presentation asks: what challenges are women wanting to hunt facing and what are the implications of this new demographic for the hunting community and access to wildlife?

When: 2022-09-22, 14:00 - 14:20, Where: Sal K

## **Game camera traps: valuable tools for the monitoring of the endangered Saimaa ringed seal**

**Vincent Biard**<sup>1</sup>, *Marja Niemi*<sup>1</sup>, *Milaja Nykänen*<sup>1</sup>, *Mervi Kunnasranta*<sup>1, 2</sup>

<sup>1</sup> University of Eastern Finland, Joensuu, Finland

<sup>2</sup> Natural Resources Institute Finland (Luke), Joensuu, Finland

Although game camera traps are commonly used in terrestrial wildlife research, some might think that their deployment for marine mammals is relatively unrealistic. However, they have been successfully used for over 10 years in Lake Saimaa, Finland, to monitor the endangered ringed seals (*Pusa hispida saimensis*). Saimaa ringed seals spend 80 percent of their total time in the water, but some stages of their life history are connected to terrestrial or ice platforms. In early summer, they moult on rocks; and in winter, they dig subnivean lairs in snowdrifts on the shoreline of islets to haul out or give birth. It is during these time periods that we set our camera traps. We follow individuals over the years, using the photo-identification method, and gather behavioural ecology and social interactions data. Furthermore, we monitor weather conditions, predator pressure, tourism activities and other human caused disturbances in the vicinity of breeding and moulting sites. Finally, we use camera traps to monitor the usage of artificial seal nests that have been tested in recent years for mitigating the negative effects of climate change. Our studies show that camera trapping can provide a non-invasive and cost-effective approach to study pinnipeds. All the methodological knowledge gathered over the year by the Saimaa ringed seal research team at the University of Eastern Finland is benefiting other endangered seal populations worldwide, notably the Ladoga ringed seal (*P. h. ladogensis*) in Russia and the Baltic ringed seal (*P. h. botnica*) in the Southwestern Archipelago of Finland.

When: 2022-09-22, 14:40 - 15:00, Where: Sal K

## **GrenseFORUM - Proposal of a new cooperation platform for cross-border wildlife management In the Nordic countries**

**Anders Esselin<sup>1</sup>** , *Barbara Zimmermann<sup>2</sup>*, *Maria Falkevik<sup>3</sup>*

<sup>1</sup> Man & Nature AB

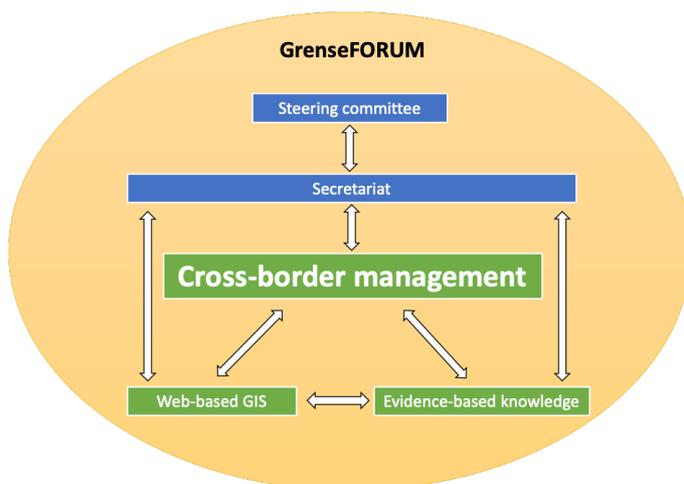
<sup>2</sup> Inland Norway University of Applied Sciences

<sup>3</sup> County Administrative Board of Värmland, Sweden

In the Interreg Sweden-Norway projects GRENSEVILT 1 & 2 (2017–2022), researchers from the Swedish University of Agricultural Sciences and the Inland Norway University of Applied Sciences, have studied transboundary moose migration, wolf predation and wolverine recolonization with implications for wildlife management, hunting and forestry along the national border between Värmland and Dalarna counties in Sweden and Innland county in Norway. Challenges, needs and opportunities with cross-border wildlife management have also been discussed within GRENSEVILT's reference group and with representatives of moose management groups in Sweden and Norway.

Based on research results and discussions within GRENSEVILT, existing collaborations between managing authorities in Sweden and Norway, and lessons learned from previous projects (e.g. “Sve-Nor-Elg” and “Älg i MittSkandia”), we propose a new cooperation platform – GrenseFORUM – for an improved cross-border management of wildlife and forests in the border areas of Värmland’s, Dalarna’s and Innlandet counties.

The ambition with GrenseFORUM is to create conditions for researchers and managers at different organizational levels to be able to contribute with all their knowledge and capacity in a continued and developed mutual dialogue across administrative boundaries with a common agreement on how wildlife and forest should be managed together. The proposed cooperation platform also offers possibilities for upscaling, i.e. an expansion of the geographical scope, the inclusion of other species of wildlife, as well as addressing other pertinent issues concerning wildlife that move across Nordic borders.



# Habitat availability alters the relative risk of a bovine tuberculosis breakdown in the aftermath of a commercial forest clearfell disturbance.

Kilian Murphy<sup>1</sup>, Virginia Morera Pujol<sup>1</sup>, Andrew Byrne<sup>2</sup>, Eoin Ryan<sup>2</sup>, Philip Breslin<sup>2</sup>, Simone Ciuti<sup>1</sup>

<sup>1</sup> University College Dublin

<sup>2</sup> Department of Agriculture

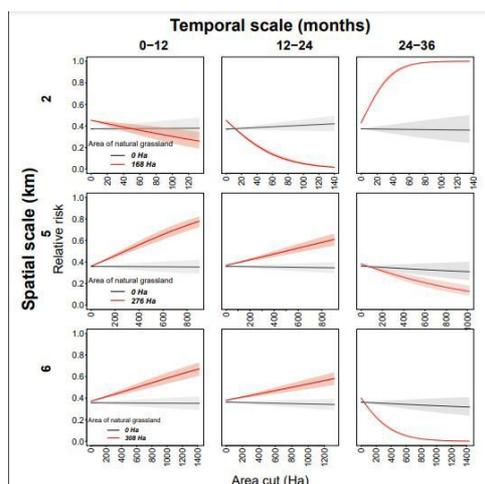
Human modification of landscapes and their associated disturbances may facilitate the emergence and spread of zoonotic diseases. Policy-makers need better understanding of the link between anthropogenic disturbances and wildlife disease vectors at the interface of human society and the natural environment, e.g. agriculture, forestry and aquaculture.

We aimed to examine the link between ecological disturbance and relative bovine tuberculosis (bTB) risk using Ireland as a study case. We analysed clearfell forestry operations and assessed bTB breakdowns within cattle farms across different spatio-temporal scales and environmental conditions.

We found a significant interaction between the extent of clearfell forestry and the extent of habitats present which affected relative bTB risk. This interaction was dynamic, leading to an increase or decrease of the relative bTB risk depending on where and when the clearfell operations occurred.

Our study provides empirical evidence of the link between forestry operations and relative bTB risk. We hypothesize that wildlife vectors may abandon the area subjected to clearfell when disturbance is highest but are subsequently attracted back to these sites as they regenerate, potentially affecting the contact rates with livestock and the relative variation in bTB risk.

Our analysis demonstrates that landscape modification is correlated with a change in disease risk that is dynamic in time and space, opening new research scenarios aimed at clarifying the mechanism behind it and informing policy accordingly. Landscape-level longitudinal studies are necessary to unveil subtle ecological processes, shifting research efforts away from herd-centric and toward macroecological assessment of bTB risk.



When: 2022-09-21, 10:40 - 11:00, Where: Aulan

## **Health surveillance during repopulation of Dinaric - southeast Alpine lynx population**

**Magda Sindičić<sup>1</sup>**, *Vladimir Stevanović<sup>1</sup>, Matko Perharić<sup>1</sup>, Tomaž Skrbinšek<sup>2</sup>, Jakub Kubala<sup>3</sup>, Branislav Tam<sup>4</sup>, Mihai Pop<sup>5</sup>, Teodora Sin<sup>5</sup>, Andrea Gazzola<sup>5</sup>, Tomislav Gomerčić<sup>1</sup>, Ira Topličanec<sup>1</sup>, Rok Černe<sup>6</sup>*

<sup>1</sup> Faculty of Veterinary medicine University of Zagreb, Heinzelova 55, 1000 Zagreb, Croatia

<sup>2</sup> Biotechnical Faculty University of Ljubljana, Biology department, Večna pot 111, 1000 Ljubljana, Slovenia

<sup>3</sup> Technical University of Zvolen, Department of forest protection and game management, Ul. T. G. Masaryka 24, 96001 Zvolen, Slovakia

<sup>4</sup> National Zoological garden Bojnice, Zamok a okolie 6, 97201 Bojnice, Slovakia

<sup>5</sup> ACDB, Str. Ion Creanga, nr. 12, Focani, Romania

<sup>6</sup> Slovenian Forest Service, Večna pot 2. 1001 Ljubljana, Slovenia

Health risk assessment should be of primary importance in reintroduction and repopulation project, as diseases may decrease the fitness of translocated animals and threaten the receiving population. Thus, rigorous protocol was implemented in LIFE Lynx project (LIFE16 NAT/SI/000634) during translocation of Eurasian lynxes (*Lynx lynx*) from Slovakia and Romania to Croatia and Slovenia. In 2019 - 2021 period 12 free-living adult lynxes (9 males, 3 females) were captured and one male was included in the project after rehabilitation due to the leg injury. After chemical immobilization captured animals were examined by a veterinarian; blood, faeces and mucosa swabs were collected, rabies vaccination was administered, and animals were transported to the quarantine. Samples were tested for Feline Leukemia Virus (FeLV), panleukopenia virus (FPV), Feline Immunodeficiency Virus (FIV) and feline herpesvirus-1 (FHV-1) by PCR; and genetic testing were done to exclude closely related animals. Protocol defined that animals younger than 1 and older than 12 years; FeLV and FIV positive animals will not be translocated, while injured or animals showing signs of diseases will be individually evaluated. Thirty days after capturing rabies antibody titer was checked and all animals acquired necessary titration of at least 0.5 IU/ml. All captured animals showed no clinical signs of any disease, however two adult males from Romania were positive for FPV (15%). They were kept in the quarantine and tested weekly until shedding of the virus stopped and afterward transported to their destination. After the release health problems were not registered in any of the animals.

When: 2022-09-22, 14:00 - 14:20, Where: Sal N

## **How does gender matter in wildlife management? Entry points for knowledge production**

**Maria Johansson**<sup>1</sup> , *Elias Andersson*<sup>2</sup>, *Kristina Johansson*<sup>3</sup>

<sup>1</sup> Department of Pedagogy, Umeå University

<sup>2</sup> Department of Forest Resource Management, Swedish University of Agricultural Sciences

<sup>3</sup> Department of Human Work Sciences, Luleå University of Technology

Several areas related to natural resource management are male-dominated and based on this, different types of effects of persistent inequality have been identified. Examples of these effects are discrimination, restrictions in organisational development and access to and influence over resources. All these issues have consequences for e.g. innovation capacity, democratic and sustainable resource management as well as women's opportunities to take place. Correspondingly, wildlife management also has a strong intertwinement with men and notions of masculinity, which is reflected in for example the corpus of hunters consisting of an overwhelming majority of men.

Yet, while attention has been brought to both ethical aspects and social dimensions of hunting and wildlife management, little is known on the role gender plays in this context. Here, the points of departure for an exploratory research project are presented. The project aims to investigate and develop new and relevant interdisciplinary knowledge about gender aspects and conditions for gender equality in wildlife management. The project addresses several questions including (but not limited to); How does the (research) literature on social dimensions of wildlife management deal with gender and gender equality? In what ways does policy on wildlife management relate to gender equality? How can notions of gender and gender equality contribute to dealing with challenges in wildlife management, such as stakeholder conflicts, an ageing population of hunters and efficient implementation of wildlife management strategies. Questions that are vital to ensure the quality of the gender equality work that wildlife management associations already to some extent undertake.

When: 2022-09-22, 16:00 - 16:20, Where: Sal K

## **How does snow cover affect the availability and use of bilberry forage for moose?**

**Simen Moflag Talleraas**<sup>1</sup>, *Christer Kalén*<sup>2</sup>, *Barbara Zimmermann*<sup>1</sup>, *Oskar Franklin*<sup>3</sup>, *Alina Lynn Evans*<sup>1</sup>, *Ane Eriksen*<sup>1</sup>, *Simen Pedersen*<sup>1</sup>

<sup>1</sup> Faculty of applied ecology, agricultural sciences and biotechnology, Inland Norway University of applied sciences, Evenstad, Norway

<sup>2</sup> Swedish environmental protection agency, Stockholm, Sweden

<sup>3</sup> Ecosystem services and management program, International institute for applied systems analysis (IIASA), Laxenburg, Austria

The ericaceous shrub bilberry (*Vaccinium myrtillus* L.) is an essential part of the boreal forest ecosystem. Bilberry vegetation can inhibit tree seedling survival and growth, and bilberry is an important food plant for large herbivores such as moose (*Alces alces*), red deer (*Cervus elaphus*), and roe deer (*Capreolus capreolus*), in addition to rodents, hares, forest birds, invertebrates and bears. Bilberry is an important food source for moose in spring and autumn, during the transition from a grass, herb, and leaf-dominated summer diet to a tree browse-dominated winter diet. Previous research has documented how forest structure, light conditions, and productivity influence bilberry biomass, but we do not know how much of this biomass is available and utilized by moose. Snow cover and snow depth affect bilberry availability to moose, making bilberry unavailable as forage during certain periods. To document the availability and use of bilberry for moose, our study will: 1) utilize camera data from seven GPS-tracked moose wearing camera collars and 2) conduct fieldwork on moose selection of bilberry in relation to availability. The camera data consists of 20-second videos collected every other hour during daylight, with quality making it possible to pinpoint the exact species moose are foraging. The fieldwork during the summer of 2022 will map available forage in the same areas the videos are collected, making it possible to determine moose selection of bilberry relative to availability.

When: 2022-09-22, 11:00 - 11:20, Where: Aulan

## **How does stakeholder empowerment affect the management of common cranes, agricultural production, and associated conservation conflicts?**

**Lovisa Nilsson**<sup>1</sup>, *Nils Bunnefeld*<sup>2</sup>, *Jeroen Minderma*<sup>2</sup>, *Alexander Brad Duthie*<sup>2</sup>

<sup>1</sup> Department of Ecology, Swedish University of Agricultural Sciences, Sweden

<sup>2</sup> Biological and Environmental Sciences, University of Stirling, U.K.

To promote democratisation in the management of conflicts over conservation and agriculture, empowering local stakeholders by decentralizing decisions is a promising approach. The understanding of how stakeholder empowerment (*e.g.*, farmers' practical or monetary resources to change the social-ecological system) affects management effectiveness is however limited. We applied an individual-based model of management strategy evaluation to simulate the conservation conflict surrounding protected, thriving common cranes (*Grus grus*) causing negative impact on agriculture in Europe. We modelled the effect of farmer empowerment (*i.e.*, increasing budgets to affect populations and agricultural production) in four management scenarios, in which we manipulate the availability and cost of two actions farmers may take in response to crane presence on their land: non-lethal (scaring) or lethal (culling) control. We found that lower budgets lead to increases in population size due to increased use of less costly scaring instead of shooting. Higher farmer budgets lead to increased population extinction risk. Intermediate budgets allow farmers to control the population size around the management target and limit impact on agricultural production to intermediate levels. Our findings highlight that increasing number of farmers means that policies for monitoring and coordination need to be put in place to avoid the risk of rapid crane population decline or overabundance. Empowering individual farmers presents an opportunity for conflict management by making trade-offs between agricultural and crane conservation objectives more explicitly part of the decision-making process.

When: 2022-09-20, 09:40 - 10:20, Where: Aulan

## **Hunting strategies and management of chronic wasting disease in cervids**

**Atle Mysterud<sup>1</sup>**

<sup>1</sup> Centre for Ecological and Evolutionary Synthesis (CEES), Department of Biosciences, University of Oslo, P.O. Box 1066 Blindern, NO-0316 Oslo, Norway.

Chronic wasting disease (CWD) is a fatal and contagious prion disease among cervids detected among reindeer (*Rangifer tarandus*) in Norway in 2016. Red deer (*Cervus elaphus*), moose (*Alces alces*) and roe deer (*Capreolus capreolus*) are also susceptible, making CWD a challenge for management across Europe if spillover occur. A major part of CWD management rely on hunting (or culling). I review how hunting strategies in Europe can be used for better surveillance and combat of CWD. Hunting strategies needs to be specifically tailored depending on the level of home range fidelity of the involved species, the epidemiological stage (pre-establishment, transition, endemic), and the management aim (eradication or limitation). Reducing population density alone has a limited impact. 'Spatially targeted harvesting' has become a standard practice for species with high home range fidelity in USA, potentially suitable for CWD management of red deer, moose and roe deer. 'Male-biased harvesting' (for limitation) or 'de-population' (for eradication) appear as suitable options for reindeer having a nomadic space use. I give an overview of how hunting and culling was used to de-populate reindeer in the Nordfjella region in an effort to eradicate, and how male-biased harvesting enhanced early detection and provide an option for CWD limitation in the reindeer population on Hardangervidda. The heavy harvesting pressures required to combat CWD is well above normal harvest rates, and CWD management are controversial in USA, Canada and Norway. CWD has the potential for becoming a game changer for cervid management across Europe in the longer term.

## **Integrating forest damage by moose into regional forestry scenario modelling**

**Juho Matala**<sup>1</sup>, *Jari Vauhkonen*<sup>2</sup>, *Ari Nikula*<sup>3</sup>

<sup>1</sup> Natural Resources Institute Finland, Luke, Yliopistokatu 6b, FI-80101 Joensuu, Finland

<sup>2</sup> University of Helsinki, Department of Forest Sciences, Viikinkaari 1, Biokeskus 3, FI-00790 Helsinki, Finland

<sup>3</sup> Natural Resources Institute Finland, Luke, PILKE-talo, Ounasjoentie 6, FI-96200 Rovaniemi, Finland

The projections of future forest resources suggest that climate warming will increase forest productivity in the northern boreal forests. However, these simulations have rarely accounted for abiotic or biotic damage. As part of these, the browsing by cervids like moose may be important regulator of forest ecosystem and forestry. To enhance these projections, we present a study on how to integrate moose damage into forestry scenario modelling.

At first, relationship between moose population and available browsing resources and damage in forests was modelled based on the annual moose population estimate and the periodic forest resource and damage data from Finnish National Forest Inventory (FNFI) at regional scale. This produced models that showed the seedling stand area damaged by moose was best explained by the moose population density, geographic region, total forest area, the proportions of seedling stands and mature stands, and region-specific interactions with the previous parameters.

Thereafter, these regional models were implemented on the European Forestry Dynamics Model (EFDm), which was developed to simulate forest development as Markov chains of possible future events based on transition matrices derived from National Forest Inventory (NFI) data. Results provide tools for analyzing the susceptibility of the projected forest structures to moose damage in northern boreal forests of Europe and allow future scenarios for forest development where the impact of these damage are included.

When: 2022-09-20, 13:20 - 13:40, Where: Sal K

## **Integration overview of translocated Eurasian lynx into the Dinaric population**

**Ira Topličanec**<sup>1</sup>, *Magda Sindičić*<sup>1</sup>, *Miha Krofež*<sup>2</sup>, *Tomaž Skrbinšek*<sup>3</sup>, *Jakub Kubala*<sup>4</sup>, *Branislav Tam*<sup>4, 5</sup>, *Ioan-Mihai Pop*<sup>6</sup>, *Teodora Sin*<sup>6</sup>, *Andrea Gazzola*<sup>6</sup>, *Tomislav Gomerčić*<sup>1</sup>, *Urša Fležar*<sup>2, 7</sup>, *Lan Hočevar*<sup>2</sup>, *Vedran Slijepčević*<sup>8</sup>, *Rok Černe*<sup>7</sup>

<sup>1</sup> Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, 10 000 Zagreb, Croatia

<sup>2</sup> University of Ljubljana, Biotechnical Faculty, Department for Forestry, Večna pot 83, 1000 Ljubljana, Slovenia

<sup>3</sup> University of Ljubljana, Biotechnical Faculty, Biology Department, Večna pot 111, 1000 Ljubljana, Slovenia

<sup>4</sup> National Zoological Garden Bojnice (Ret.), Pod zámkom 6, 97201 Bojnice, Slovakia

<sup>5</sup> Slovak University of Agriculture in Nitra, Faculty of Agrobiological and Food Resources, Department of Small Animal Science, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia

<sup>6</sup> Association for Biodiversity Conservation,, Str. Ion Creanga, nr. 12, Focani, Romania

<sup>7</sup> Slovenian Forest Service, Večna pot 2, 1001 Ljubljana, Slovenia

<sup>8</sup> Karlovac University of Applied Sciences, Trg J.J.Strossmayera 9, 47000 Karlovac, Croatia

Prevention of the extinction of the Dinaric – Southeastern Alpine lynx population is the main goal of the LIFE Lynx project (LIFE16 NAT/SI/000634), within which we aim to increase genetic variability of the inbred Dinaric lynx population by translocating unrelated individuals from the Carpathian population. Individual's integration is considered successful if the animal survived at least one year after the release and established a territory in the area where a lynx of opposite sex is registered. In the period 2019 – 2021, we have released eight animals captured in Romania and Slovakia into the Dinaric Mountains. Four adult males were released in Slovenia and four males in Croatia. Released lynx are monitored with telemetry collars furnished with both Iridium or GSM and VHF technology. However, we lost track of two animals due to unknown reasons; first after 8 months and the other 1 day after the release. Monitored animals settled on average 23 days (SD=16.5) after the release. Two lynx left their initial home range 102 and 92 days post-release and went on second dispersal. First settled approximately 2 months later, 64 km straight-line distance from his initial home range, while the other is still in the process of establishing a territory. Current data suggest that four lynx are successfully integrated into the existing Dinaric population. Successful integration cannot be confirmed for the other four animals, among which two disappeared after the signal from the collar was lost, and other two appear to be still in the process of establishing a territory.

When: 2022-09-22, 09:00 - 09:40, Where: Aulan

## **Introductions and invasions of mammals**

### **Kjell Danell<sup>1</sup>**

<sup>1</sup> Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, Umeå

In Sweden we have about 55 terrestrial mammals, excluding bats. Of these about a third are newcomers during the last 300 years. From the east came: muskrat, raccoon dog and white-tailed deer and from the west, muskoxen. From the south came: black rat, brown rat, harvest mouse, house mouse, stone marten and striped field mouse. In the near future we may get American beaver and golden jackal. We have introduced: fallow deer, field hare, mink, mouflon, rabbit, wapiti and wild boar. During the same period only two species have gone extinct: European beaver, which was reintroduced, and wild reindeer.

Nature is dynamic and man make it even more so by land use, globalization and climate change. I will give the history of the newcomers and how they performed, and specially discuss: Their origin? How did they came here? The driving forces? Purpose of the introductions? Arguments for and against the introductions at that time? The position of the State? Were the introductions successful?

Further, I will discuss: Which life-history characters favor invasiveness? Are some environments resistant to invasions? What can we expect of future development, e.g. damages and spread of diseases? Will they decline by their own? Can we control or exterminate them? Can an invasive species be positive for biodiversity?

When: 2022-09-20, 15:20 - 15:40, Where: Sal N

## **Investigating the role of moose density in determining browsing damages on Scots pine across commercial forests in Sweden**

**Rebecca Partemi**<sup>1</sup>, *Christer Kalén*<sup>2</sup>, *Håkan Sand*<sup>1</sup>, *Barbara Zimmermann*<sup>3</sup>

<sup>1</sup> Department of Ecology, Grimsö Wildlife Research Station, Swedish University of Agricultural Sciences, Uppsala, Sweden

<sup>2</sup> Swedish Forest Agency, P.O. Box 343, 501 13 Borås, Sweden

<sup>3</sup> Inland Norway University of Applied Sciences, Campus Evenstad, NO-2480 Koppang

By browsing on young Scots pine (*Pinus sylvestris*), moose (*Alces alces*) can cause significant damage to commercial forests. The National Forest Agency monitors browsing damage annually on pre-defined plots throughout Sweden. For the first time in 2021, the monitoring included a moose pellet count as a proxy of moose density. Here, we investigated the relationship between moose pile density and the proportion of pine trees with fresh (< 1 year) browsing damages. We used mixed-effects logistic regression models with proportion of damaged stems as response and moose pile density, presence of other deer dung, pine and birch (*Betula* spp.) density and site productivity as predictors. Analysis was conducted both at national scale and sub-divided into Sweden's three regions. Unlike previous findings, moose pile density played a significant role in explaining pine damage at both country and region scale. Presence of other ungulates was positively related to pine damage in the Southern region only, and it is unclear to what extent their effect on young pine trees is direct through browsing or indirect through competition. Contrary to recent studies, pine density had a secondary role in explaining browsing damage. Instead, browsing damage was positively associated to site productivity and density of birch trees, the latter with a higher importance than moose density. These sites might be attractive to moose and therefore indirectly lead to increased browsing damage on pine. We conclude that moose pellet counts on browsing survey plots are an important add-on for the adaptive management of moose and forests.

## **Ixodes persulcatus invasion in Finland: what will change?**

**Heikki Henttonen**<sup>1</sup>, *Teemu Smura*<sup>2</sup>, *Essi Korhonen*<sup>2</sup>, *Tarja Sironen*<sup>2</sup>, *Olli Vapalahti*<sup>2</sup>

<sup>1</sup> Natural Resources Institute Finland (Luke), Wildlife Ecology, Finland

<sup>2</sup> Univ Helsinki, Dept Virology, Finland

After scattered observations of *Ixodes persulcatus* in Finland, the crowdsourcing data by Laaksonen et al. (Emerging Microbes & Infections (2017, 6, e31; doi:10.1038/emi.2017.17) showed the wide distribution in Finland. We started an intensive monitoring of persulcatus in Kuhmoinen, C Finland, in 2015. Indirect evidence suggests that the species appeared there in abundance during 2005 - 2010. Persulcatus dynamics are strongly seasonal: a pronounced peak of adults occurs from mid April to mid June. Later in summer adults are hardly seen. During the persulcatus spring peak, ricinus adults are hardly seen, while they occur later in summer and autumn. The abundance of persulcatus is at least ten times higher than that of ricinus. However, except the absence of ricinus in spring, direct evidence of interspecific competition is not seen: high or low density persulcatus sites do not predict low or high density ricinus sites later in summer.

Viromic profiles of these species differ considerably. Still, both species are hosts for TBEV. TBEV prefers persulcatus to ricinus, and in some hotspots prevalence in persulcatus can be 4%. In ricinus it is usually much lower, around 0.1%. Persulcatus invasion will increase the risk of TBE and change its seasonal epidemiology.

Our main study area in Kuhmoinen includes a TBE focus. Two cases have occurred, in 2015 and 2000, with a distance of 1600m. The phylogenetics of TBEV there are monophyletic, suggesting one introduction maybe 20 - 40 years ago. The strain in question is TBEV-Eur in persulcatus. The diameter of focus has expanded to at least 1600m.

When: 2022-09-22, 11:00 - 11:20, Where: Sal N

## **Lead (Pb) and its health effects in Scandinavian brown bears (*Ursus arctos*)**

**Helle Bernstorff Hydeskov**<sup>1</sup>, *Jon Martin Arnemo*<sup>2</sup>, *Boris Fuchs*<sup>2</sup>, *Iliia Rodushkin*<sup>3</sup>, *Amanda Høyer Boesen*<sup>2</sup>, *Alina Lynn Evans*<sup>2</sup>, *Andrea Lynn Miller*<sup>2</sup>, *Anne Randi Græsli*<sup>2</sup>, *Alexandra Thiel*<sup>2</sup>, *Chris Lloyd Mills*<sup>4</sup>, *Louise Gentle*<sup>1</sup>, *Andreas Zedrosser*<sup>5</sup>, *Jonas Kindberg*<sup>6</sup>, *Antonio Uza*<sup>1</sup>

<sup>1</sup> Nottingham Trent University, Southwell, United Kingdom

<sup>2</sup> Inland Norway University of Applied Sciences, Evenstad, Norway

<sup>3</sup> ALS Scandinavia, Luleå, Sweden

<sup>4</sup> Nottingham Trent University, Nottingham, United Kingdom

<sup>5</sup> University of South-Eastern Norway, Bø, Norway

<sup>6</sup> Norwegian Institute for Nature Research, Trondheim, Norway

The Scandinavian brown bear (*Ursus arctos*) is an omnivore that consumes a variety of food items including berries, ants, carrion and ungulates. We studied lead (Pb) exposure in Scandinavian brown bears in order to assess potential negative health effects. We found a mean blood Pb concentration of 87.1 µg/l (SD: 36.5 µg/l; range: 22.6-220.5 µg/l;  $n=239$ ), more than seven times higher than the European Food Safety Authority's threshold for developmental neurotoxicity (12 µg/l blood). However, no significant correlations were found between blood Pb concentration and standard haematological or biochemical parameters.

We found significant correlations between blood Pb concentrations of suckling cubs and their mothers, and between blood and milk Pb concentrations of lactating females, indicating that dependent cubs are exposed to Pb in the milk throughout their suckling period. Blood Pb concentration in sub-adult bears (aged 2-3 years,  $n=16$ ) was significantly higher during hibernation compared to the active period. Although Pb was found in the kidney and liver of hunted bears ( $N=56$ ), no Pb-associated pathology was identified in these organs by routine histopathology.

The Scandinavian brown bear population is highly exposed to environmental Pb, but the potential negative health effects in this species remain unclear. Likely Pb sources include ammunition residues in gut piles from hunted ungulates and contaminated soil from leaded gasoline and industry. Pb exposure continues to be a global One Health issue and further research into the sources, pathways and potential health effects in wild mammals is needed.

When: 2022-09-22, 16:20 - 16:40, Where: Sal K

## **Linking winter severity to space use of European bison around feeding stations in Białowieża Primeval Forest (NE Poland)**

**Beata Bramorska**<sup>1</sup>, *Rafał Kowalczyk*<sup>1</sup>, *Tomasz Kamiński*<sup>1</sup>, *Zbigniew A. Krasieński*<sup>2</sup>, *Tomasz Borowik*<sup>1</sup>

<sup>1</sup> Mammal Research Institute, Polish Academy of Sciences, Stoczek 1, 17-230 Białowieża, Poland

<sup>2</sup> Browska 1B, 17-230 Białowieża, Poland

Supplementary feeding is a commonly used wildlife management practice, but its effectiveness is frequently questioned since negative consequences often exceed positive outcomes. During winter, it significantly reduces ungulate movement, leading to increased site utilization and animal aggregation. However, intensity of supplementary feeding utilization depends on different extrinsic factors, e.g. habitat type or weather conditions. We predicted that utilization of feeding sites by European bison (*Bison bonasus*) would be positively associated with severity of winter conditions, thus, we expected bison to be closer to feeding stations on colder days and in the presence of snow cover. We analysed winter (December-March) tracking data of 43 VHF and GPS-collared European bison (24 males and 19 females) collected from 2005 to 2012 in Białowieża Primeval Forest (NE Poland). Bison were the closest to the feeding sites in the middle of winter (January-February) and on colder days, independently of time of the season. The distance was also significantly related to presence of snow, with bison being closer to feeding sites on days with present snow cover. Hence, the area occupied by bison in winter changed with weather severity – it was five times larger in the warmest periods compared to the coldest days with snow cover. This may have far-reaching ecological consequences for the ecosystem due to potential impact on seed dispersal, vegetation growth and forest succession. Given global warming and decreasing winter severity, the future management plans concerning winter supplementary feeding of ungulates should be revised and adapted to on-going climatic changes.

When: 2022-09-22, 14:40 - 15:00, Where: Sal N

## **Local hunting groups differ in the sustainable management of wildlife**

**Laura Tuominen**<sup>1</sup>, *Mikael Wikström*<sup>2</sup>, *Heikki Helanterä*<sup>3</sup>, *Patrik Karell*<sup>4</sup>, *Lauri Rapeli*<sup>5</sup>, *Timo Vuorisalo*<sup>1</sup>, *Jon Brommer*<sup>1</sup>

<sup>1</sup> Department of Biology, University of Turku, Turku, 20014, Finland

<sup>2</sup> Finnish Wildlife Agency, Helsinki, 00730, Finland

<sup>3</sup> Faculty of Science, University of Oulu, Oulu, 90014, Finland

<sup>4</sup> Bioeconomy Research Team, Novia University of Applied Sciences, Ekenäs, 10600, Finland

<sup>5</sup> The Social Science Research Institute, Åbo Akademi, Turku, 20500, Finland

Sustainable management of shared natural resources is a continuous challenge in modern societies and local communities. The multidisciplinary framework of social-ecological systems (SES) offers an extensive collection of variables, which have been found to play a crucial role in reaching sustainability in resource management. In our study, we apply the SES framework for the first time to wildlife management in Finland, concentrating on the governance of moose hunting societies. In addition, we provide a new perspective from evolutionary biology to the problem of collective management by exploring if the stability of hunting groups and relatedness between resource controllers influence its sustainability.

In Finland, hunting is controlled by the Finnish wildlife agency through licenses, but the decisions of how many licenses to apply for and how many to use are made locally by hunting societies. Some local hunting groups follow carefully the recommendations made by authorities while others don't. In addition, in some groups, the decision-making works well and it's democratic, while in others the group members are not satisfied.

We have collected data based on the SES framework about multiple variables potentially explaining if the societies work sustainably. We model sustainability by three indicators: *decision-making*, *practice*, and *ecological aspect*. We investigate if, for example, attributes of hunters or the hunting group, governance type, or local rules explain differences in these three indicators between the hunting societies. The local level of resource management offers valuable insight when planning and implementing the wider management strategies more comprehensively.

When: 2022-09-21, 13:20 - 13:40, Where: Sal K

## Longitudinal perception study reveals an increasing conflict with urban wildlife

**Syantani M. Basak<sup>1</sup>**, *Md. Sarwar Hossain<sup>2</sup>, Declan T. O` Mahony<sup>3</sup>, Henryk Okarma<sup>4</sup>, Ekaterina Rostovskaya<sup>1</sup>, Elżbieta Widera<sup>1</sup>, Izabela A. Wierzbowska<sup>1</sup>*

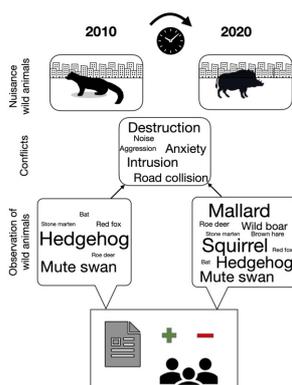
<sup>1</sup> Institute of Environmental Sciences, Faculty of Biology, Jagiellonian University, Gronostajowa 7, 30-387 Krakow, Poland.

<sup>2</sup> Environmental Science and Sustainability, School of Interdisciplinary Studies, University of Glasgow, Dumfries, UK.

<sup>3</sup> Agri-Food and Biosciences Institute, 18a Newforge Lane, Belfast BT9 5PX, UK

<sup>4</sup> Institute of Nature Conservation, Polish Academy of Sciences, Krakow, Poland

Europe is currently facing dynamic land-use changes. The reduction in natural habitats is driving species to colonise urban areas which creates increasing opportunities for human-wildlife conflict (HWC). The first step towards managing and resolving these conflicts and promoting co-existence is by understanding people's perception and tolerance for wildlife. This study aimed to identify the nature and types of conflict with wildlife, investigate people's attitudes towards wildlife and resolve conflicts and finally, understand changes in perceptions over the decade in a major conurbation. The study was carried out in Krakow, the second-largest city in Poland in 2010 (n=721) and repeated in 2020 (n=887). Results revealed that the observation of wildlife such as wild boars, squirrels, roe deer, and red foxes has significantly increased ( $p < 0.001$ ) over the decade. Wild boar and beaver displayed no fear when encountering humans. Stone marten was the most nuisance wildlife in 2010, while in 2020 wild boar has preceded as the most conflictual wildlife. The most common HWC were anxiety, intrusion to property and destruction of crops, which significantly increased over the decade, independent of responders' gender. Furthermore, non-lethal methods to mitigate nuisance wildlife were suggested. Our findings revealed that public participation in longitudinal research will not only improve scientific knowledge but generate a sense of place, which is especially missing in urban areas, where people experience a greater disconnect from nature. Thus, the remiss of urban HWC in global initiatives like Sustainable Development Goals underlines the need to incorporate policy management into future urban wildlife conservation.



When: 2022-09-22, 10:40 - 11:00, Where: Sal N

## **Mercury exposure and risk assessment for Eurasian otters (*Lutra lutra*) in Denmark**

**Miriam Dibbern**<sup>1, 2</sup>, *Morten Elmeros*<sup>2</sup>, *Rune Dietz*<sup>1</sup>, *Jens Søndergaard*<sup>1</sup>, *Anders Michelsen*<sup>3</sup>, *Christian Sonne*<sup>1</sup>

<sup>1</sup> Department of Bioscience, Aarhus University, Frederiksborgvej 399, PO Box 358, DK-4000, Roskilde, Denmark

<sup>2</sup> Department of Bioscience, Aarhus University, Grenåvej 14 Kalø, DK-8410, Rønne, Denmark

<sup>3</sup> Terrestrial Ecology Section, Department of Biology, University of Copenhagen, Universitetsparken 15, DK-2100, Copenhagen, Denmark

This study investigated the amount of mercury (Hg) found in Eurasian otters (*Lutra lutra*) from Denmark in 2011-2019. The Hg concentrations were determined in liver and fur, and the age and the sex of the individual otters were determined. The stable isotope imprint of <sup>13</sup>C and <sup>15</sup>N in muscle tissue was used to determine the habitat and the trophic position, respectively. The linear correlations among the variables were determined, and an analysis of variance was conducted among age groups, males and females. A general linear modelling approach was used in order to determine the influence of age, sex, habitat and trophic position towards Hg exposure.

Hg concentrations ranged between 0.02 and 10.1 µg/g wet weight in liver tissue and 0.30-40.0 µg/g dry weight in fur. The GLM indicates that the Hg concentrations in liver and fur increase with age (liver:  $P < 0.002$ ; fur:  $P < 0.05$ ) and with distance to the marine coast line ( $P = 0.0526$ ) and  $\delta^{13}\text{C}$  in muscle tissue ( $P < 0.001$ ). No significant difference was detected between males and females ( $P > 0.59$ ).

Mercury concentrations in the liver exceeded the No Risk threshold in 15% of the otters, and 25% had levels above the lowest observed effect level of 3.4 µg/g ww that may be associated with adverse effects on the central nervous system.

The proportion exceeding these thresholds should therefore be monitored to document possible temporal and spatial trends in Hg exposure and the potential risk to the conservation status of the otter population.

## MicroRNA: connecting the dots between pollutant exposure and disease in avian wildlife

Anne-Fleur Brand<sup>1</sup>, Junjie Zhang<sup>1</sup>, Marcel Klaassen<sup>2, 3</sup>, Courtney Waugh<sup>4</sup>, Veerle Jaspers<sup>1</sup>

<sup>1</sup> Department of Biology, Norwegian University of Science and Technology, Høgskoleringen 5, 7491, Trondheim, Norway

<sup>2</sup> Centre for Integrative Ecology, Deakin University, Victoria 3220, Australia

<sup>3</sup> Victorian Wader Study Group, Australia

<sup>4</sup> Faculty of Biosciences and Aquaculture, Nord University, Kongens Gate 42, 7713, Steinkjer, Norway

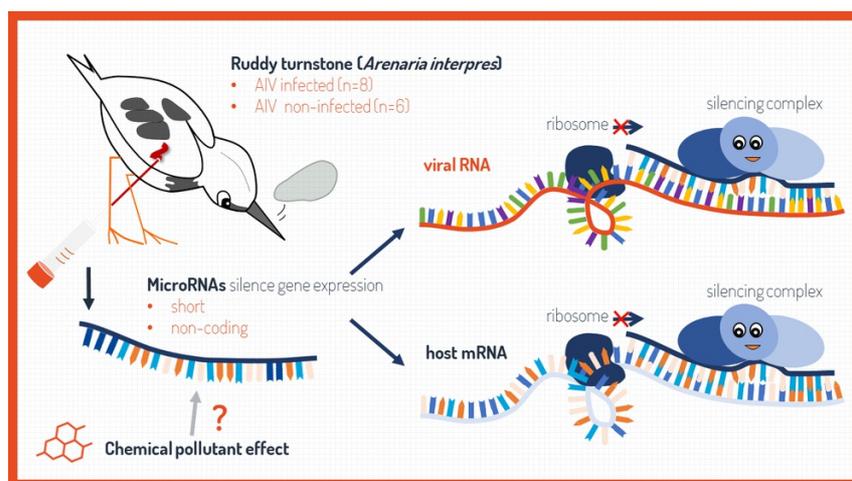
Wildlife habitats are increasingly polluted, resulting in exposures of wildlife to a variety of chemicals. Although chemical pollutant exposure has been linked to immunosuppression and disease outbreaks in various species, the exact mechanisms underlying the effects of chemicals on immune function are unclear.

Recently, microRNAs have been identified as post-transcriptional regulators of gene expression and key modulators of the immune system. MicroRNAs are short noncoding RNAs that bind to messenger RNA to prevent their translation into proteins. Changes in microRNA expression have been found after exposure to various chemicals and pathogens (e.g., avian influenza virus). The presence and stability of microRNAs in biological fluids, including serum, makes them promising biomarkers of immunomodulation.

In this study, we performed microRNA sequencing of serum samples from migratory shorebirds. The aim of this study is to elucidate the role of microRNAs in pollutant-induced immunomodulation by comparing serum microRNA profiles with (i) avian influenza (AIV) infection status and (ii) blood pollutant levels.

We identified four differentially expressed (DE) miRNAs in AIV-infected birds, all of which regulate immune pathways. One DE microRNA (miR-204/211) potentially targets the AIV genome. These findings might reflect an antiviral response, supporting the notion that serum microRNAs have potential as biomarkers for immunomodulation in avian wildlife.

Blood pollutant levels (per- and polyfluoroalkyl substances and heavy metals) and oxidative stress biomarkers are currently being quantified and their influence on microRNA expression will be assessed, to further elucidate the role of microRNAs in pollutant-induced immunomodulation. All results will be presented at the conference.



When: 2022-09-20, 10:40 - 11:00, Where: Aulan

## **Modeling risks and mitigation options for the Chronic Wasting Disease (CWD) in Scandinavia**

**Oskar Franklin**<sup>1</sup>, *Elena Moltchanova*<sup>2</sup>, *Andrey Krasovskiy*<sup>1</sup>, *Florian Kraxner*<sup>1</sup>

<sup>1</sup> International Institute for Applied Systems Analysis (IIASA)

<sup>2</sup> Statistics Consulting Unit, University of Canterbury, New Zealand

Because of the severe implications, its potential to spread and its persistence once established, the recent appearance of chronic wasting disease (CWD) in reindeers in Norway called for a drastic culling operation to prevent further spreading of the disease. To evaluate the risks and the effectiveness of alternative management (monitoring and culling) options we developed a model of CWD dynamics and management. The model includes stochastic population and spatial dynamics of the four relevant deer species in northern Sweden and Norway (reindeer, moose, roe deer, and red deer) and transmission of CWD via direct contacts and via the environment. The model was parameterized and calibrated based on CWD studies from USA, data from the Norwegian CWD cases, and deer population and vegetation data. The results suggest that to prevent an outbreak and the establishment of CWD it is necessary to cull all individuals, not only visibly sick ones, of an affected species in a relatively large area (30x30 km in our model) once a case is detected. Further, to prevent a slow buildup of CWD in the environment and eliminate the risk of outbreaks in the future it is necessary to expand this area of culling even further. Although the model has not yet been thoroughly validated due to scarcity of data, the results suggest that the drastic culling done in Norway was appropriate and necessary to prevent establishment of CWD and that further monitoring and potential culling is required to prevent outbreaks in the future.

When: 2022-09-20, 13:40 - 14:00, Where: Sal N

## **Monitoring highly pathogenic influenza (HPAI) and the role of citizen science**

**Caroline Bröjer**<sup>1</sup>, *Henrik Uhlhorn*<sup>1</sup>, *Siamak Zohari*<sup>2</sup>, *Malin Grant*<sup>3</sup>, *Elina Thorsson*<sup>1</sup>, *Gustav Averhed*<sup>1</sup>, *Karin Olofsson-Sannö*<sup>1</sup>, *Minerva Löwgren*<sup>1</sup>

<sup>1</sup> Dept. of Pathology & Wildlife Diseases, National Veterinary Institute, Uppsala Sweden

<sup>2</sup> Dept. of Microbiology, National Veterinary Institute, Uppsala Sweden

<sup>3</sup> Dept. of Disease Control & Epidemiology, National Veterinary Institute, Uppsala Sweden

In recent years several outbreaks with highly pathogenic avian influenza (HPAI) viruses have occurred among poultry and wild birds in Europe. However, the large number of outbreaks and mass mortality among wild birds, predominantly waterfowl and raptors, during the 2020-2021 influenza season is unprecedented. In Sweden, 128 out of 811 wild birds submitted to SVA tested positive for HPAI (H5N1, H5N4, H5N5 och H5N8) using Real-Time qPCR methods based on European Union Reference Laboratory (EURL) recommended methods and additional published protocols. Virus was detected in 24 different wild bird species, such as barnacle geese (*Branta leucopsis*), peregrine falcons (*Falco peregrinus*), eagle owls (*Bubo bubo*), common buzzards (*Buteo buteo*), mute swans (*Cygnus olor*), northern goshawks (*Accipiter gentilis*), Canada geese (*Branta canadensis*), whooper swans (*Cygnus cygnus*), and white-tailed eagles (*Haliaeetus albicilla*). In addition, one grey seal (*Halichoerus grypus*) and one red fox (*Vulpes vulpes*) tested positive for HPAI-H5N8 and H5N1, respectively.

Most of the tested wild birds were detected and reported by the general public. At most SVA received over 100 reports of dead or sick wild birds per week, compared to about 25 reports in the corresponding weeks during 2019. Reports were obtained by phone, e-mail, and a smart phone app. The information received provided insights into geographical distribution, number of birds at risk and was used to select birds for sampling as well as providing early warnings for poultry farms nearby. This constitutes a good example of the importance of citizen science when it comes to wildlife disease surveillance.

When: 2022-09-20, 11:20 - 11:40, Where: Sal N

## **New migratory habits in Swedish Greylag geese: a challenge for flyway management?**

**Camilla Olsson**<sup>1</sup>, *Lovisa Nilsson*<sup>2</sup>, *Johan Elmberg*<sup>1</sup>, *Johan Månsson*<sup>2</sup>, *Niklas Liljebäck*<sup>2</sup>

<sup>1</sup> Kristianstad University, Sweden

<sup>2</sup> Grimsö Wildlife Research Station, Swedish University of Agricultural Sciences, Riddarhyttan, Sweden

The growth of some European goose populations spurs initiatives to manage them at the flyway level. Success of such endeavors build on an appreciation of migration routes and temporal distribution. We describe movements over the annual cycle in 76 Greylag geese (*Anser anser*) fitted with GPS tracking devices at five sites in Sweden. Swedish Greylag geese still use a general SW-NE migration path. However, compared to previous knowledge we show that their wintering range has undergone a northward shift and a general reduction in migration distance, most pronounced in birds breeding in southernmost Sweden. The latter spent almost the entire annual cycle in Sweden and Denmark. The flyway of Greylag geese from more northern capture sites, though, still covers countries from Sweden to Spain, but only a fraction of the population now migrates to Spain. Instead, most of the annual cycle is spent in Sweden, Denmark, the Netherlands or Germany. Analyses based on the net squared displacement modelling framework show that Swedish Greylag geese now display 'a leapfrog migration pattern', radically different from 'the chain migration pattern' evident for the same population 35 years ago. The contrasting spatiotemporal distribution in geese of different geographical origin shows that management initiatives for European Greylag Geese must consider that different migration patterns occur within previously defined management units. As a consequence, coordination of management actions (monitoring, harvest quotas, reserves) needs to consider different spatial scales, from the regional to international, depending on the origin of the Greylag geese.

When: 2022-09-22, 09:40 - 10:20, Where: Aulan

## **Past experiences and future challenges: Research and the Conservation of Woodland Grouse in Europe**

**Ilse Storch<sup>1</sup>**

<sup>1</sup> Faculty of Environment and Natural Resources University of Freiburg

In the past 50 years, the wildlife sciences have experienced major technical and methodological progress. At the same time, there are positive trends in numerous wildlife species across Europe: beaver, wolf, brown bear, and lynx are making remarkable recoveries; others, such as wild boar, red deer and roe deer are expanding their range and continue to increase. Much of this, however, can be explained by effective legal protection, wildlife-friendly attitudes of an urbanized human population, and improved resource availability due to human land use and climate change. In fact, scientific research may have played a minor role in these wildlife success stories. I illustrate this thesis by reviewing the story of woodland grouse in Europe during the past 50 years. While scientific work focussing on conservation management of grouse has increased over the decades, successes in grouse conservation are rare. I present several case examples of conservation programmes for threatened woodland grouse populations across Europe, that indicate that we have not sufficiently understood limiting factors, and/or limiting factors act at large spatial and temporal scales that are unlikely to be reversed in local-scale conservation programmes. The challenges of woodland grouse conservation, especially at the edges of their global distribution ranges, lie in conflicting conservation objectives, increasing impacts of global warming and subsequent changes in ecosystem structure and functioning, which lead to changes in trophic interactions to the detriment of grouse.

## **Population density of wild boar (*Sus scrofa*) and farmland damage in south-western Poland - present status and future trends**

**Bogusław Bobek<sup>1</sup>**, *Jakub Furtek<sup>2</sup>*, *Dorota Merta<sup>1</sup>*, *Marta Wojciuch-Płoskonka<sup>2</sup>*

<sup>1</sup> Institute of Biology, Pedagogical University of Cracow, Podchorążych 2, 30-084 Kraków, Poland

<sup>2</sup> International Institute of Ecology Ltd., Żołnierska 31, 30-735 Kraków, Poland

The study area includes 10 game management units (GMU) throughout 16,581 km<sup>2</sup>. They cover 5,505 km<sup>2</sup> and 11,076 km<sup>2</sup> forest and farmland habitats, respectively. Using block count method, in January 2017 estimated wild boar density in the GMU ranged from 2.48 to 9.50 animals per one km<sup>2</sup> of forest. The population numbers of wild boar throughout the forest habitat was estimated at 32,431 animals i.e., 5.89 individuals per one km<sup>2</sup>. During 2016, the total wild boar damage in agricultural crops amounted to 4,530.5 hectares. In the GMU this value ranged from 127.6 to 845.0 hectares. Significant correlation ( $r = 0.787$ ,  $p = 0.00069$ ) was demonstrated between the population density and farmland area damaged by wild boar.

The mean percentage share of damaged crop area ranged from 40.1% (maize) to 1.9% of other crops. The mean amount of damage compensation per one hectare was EUR 395.6 and varied from EUR 173.8 (meadows) to EUR 987.8 (root crops). Over 60% of damaged crops area formed March – April and July – August – September clusters.

Because of African swine fever (ASF), hunters are obliged to reduce of wild boar number to 1,658 animals (0.1/ km<sup>2</sup>). The simulation of population number dynamic indicates that in 2021 there should be 24,000 animals in the study area. Wild boar play essential role in the functioning of the forest ecosystems therefore the present arbitrary wild boar depopulation criteria should be adjusted to take into account the statistical relationship between the ASF expansion rate and the population density.

When: 2022-09-20, 13:40 - 14:00, Where: Sal K

## **Population status of the strictly protected European wildcat (*Felis silvestris*) in western Hungary**

**Ágnes Gruber<sup>1, 2</sup>**, *József Lanszki<sup>1</sup>*

<sup>1</sup> Hungarian University of Agriculture and Life Sciences, Department of Nature Conservation, Kaposvár, Hungary

<sup>2</sup> Órség National Park Directorate, Óriszentpéter, Hungary

The European wildcat (*Felis silvestris*) is one of the most endangered European mammal species, strictly protected in Hungary. To explore the little-known population status of the wildcat population in western Hungary, we applied a combined field data collection. We surveyed the operational area of the Órség National Park Directorate (5 Natura 2000 sites and other areas, 2019-2021) in potential wildcat habitats in predominantly semi-natural forests. Simultaneously, we used 10–22 camera traps and a series of hair traps (lured sticks) parallel, most of which were at the site for at least a year. Distinguishing between wildcat and wildcat x domestic cat hybrids based on camera trap images is problematic. We examined 42 sites, of which we detected the presence of wildcats or hybrids at 20 sites. Out of 317 camera trap launches (12 thousand camera trap days), we detected the presence of wildcats at least once in 55 cases. The summarised number of wildcat appearances was 93 (0,78/100 camera trap days), and that of domestic cats was 231 (1.93/100 camera trap days). There were considerable differences between each study area. The mean time from odour baiting to the appearance (detection) of the first wildcat was 19 days. The wildcat and domestic cat are characterised by crepuscular and night activity, while the domestic cat showed partially daytime activity, especially during the winter period. We often detected wildcats in forest compartments near arable land with higher rodent abundances. The frequent presence of domestic cats increases the risk of introgression.

When: 2022-09-22, 14:20 - 14:40, Where: Sal K

## **Progress of the ENETWILD project: towards an integrated monitoring of wild mammals in Europe**

**Tomasz Podgórski**<sup>1, 2</sup>, *Joaquin Vicente*<sup>3</sup>, *ENETWILD Consortium*<sup>3</sup>

<sup>1</sup> Mammal Research Institute, Polish Academy of Sciences, Białowieża, Poland

<sup>2</sup> Department of Game Management and Wildlife Biology, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Czech Republic

<sup>3</sup> National Institute on Wildlife Research (IREC), University of Castilla-La Mancha and Consejo Superior de Investigaciones Científicas, Ciudad Real, Spain

Through the project carried out by the ENETWILD consortium ([www.enetwild.com](http://www.enetwild.com)), the European Food Safety Authority (EFSA) aims to improve European capacities to monitor wildlife populations. First, we developed standards for the collection and validation of wildlife data. The standards follow the criteria of: i) being flexible and robust allowing to filter data by quality to feed predictive models, ii) being compatible with existing biodiversity/disease data collection systems to ensure inter-operability. ENETWILD has created and promoted a data repository on abundance and distribution of various species of ungulates and carnivores. Existing data were collated, harmonized, and modelled to make an important progress in spatial distribution modelling of wildlife at European level. Guidelines for reliable abundance estimation of wild mammals and detailed protocols on field methods have been published. A network of data providers has been established and supported, including training on design, methods, field protocols and data analysis tools to estimate local density of populations. All these actions are planting the seed of a pan-European network of observation points for long-term, harmonized monitoring of wildlife abundance across Europe - the European Observatory of Wildlife ([www.wildlifeobservatory.org](http://www.wildlifeobservatory.org)). This initiative, launched in 2021, aims to i) help overcome existing data gaps and workflow bottlenecks of current nation- and European-wide frameworks for monitoring terrestrial mammal populations, ii) provide independent information on wildlife abundance and trends over time at European level. We consider this a milestone towards a trans-national, data-driven management of wildlife and wildlife-borne diseases having a potential to impact biodiversity, economy and human health.

When: 2022-09-20, 15:40 - 16:00, Where: Sal O1

## **Protective and license hunt as contested tools to balance the interests of Reindeer husbandry and Carnivore management.**

**Ildikó Asztalos Morell<sup>1</sup>**

<sup>1</sup> SLU, Department of Urban and Rural Development

The survival of carnivores has been threatened by decline in habitat and conflict with human systems with increasing nature exploitation. Their survival is protected by international law. To guaranty a favorable conservation status for carnivores is a tool to achieve balance between conflicting human and natural system interests. Semi-nomadic reindeer husbandry, based on the balance between human and natural systems, is under cumulative pressure from other human systems as well as nature and climate related threats, and is one of those conflicting systems. The state recommendation of 10% tolerance level, provides directives to estimate damages that reindeer husbandry is expected to endure from carnivores.

Protective and license hunt are two tools to obtain population control of carnivores and regulate the damages caused by carnivores to human systems. The former is a post-damage measure, while license hunt is a planned one. They are governed by different executive chains and economic regimes by authorities and are to be implemented so that the favorable conservation status of carnivores could be maintained. While the authoritative chain of carnivore protection is in place, there is a lack of comparable state assurance of how the 10 % tolerance level could be achieved and what a favorable conservation status of reindeer herds could be that is required for a viable reindeer husbandry. Protective and license hunt appear as such contested tools. This paper highlights negotiations between authorities and representatives of reindeer husbandry on conflicting perspectives on the implementation of hunt as means of population control of carnivores.

When: 2022-09-20, 16:00 - 16:20, Where: Sal O1

## **Public observations of elusive invasive alien species as a tool in IAS management**

**Fredrik Dahl**<sup>1, 2</sup>, *P-A Åhlén*<sup>2</sup>

<sup>1</sup> Swedish University of Agricultural Sciences

<sup>2</sup> Swedish Association for Hunting and Wildlife Management

The rapid spread of invasive alien species (IAS) is a major threat to biodiversity and ecosystem services worldwide. Early detection is crucial to prevent IAS from establishing, but difficult when abundance is low and risk of spread is high. IAS early-warning in many countries relies on the public reporting sightings of IAS. In Sweden most observations of the invasive raccoon dog are sent directly to the management project (since 2008), but lately the governmental agencies also receive reports which are immediately shared with the project. All reports, 600 - 1000 every year, are gathered in one common database. Our results show the importance of having an active media strategy; news today will be forgotten tomorrow. The project disseminates information and results intensively in both traditional and social media, creating a media buzz that results in more people reporting possible sightings. It is crucial to validate public reports. Many of the reports can be dismissed with a telephone call, others require more effort. This can include visiting the place, using game cameras, DNA or searching for tracks, in total summing up to the work of approximately one full time employee to manage the whole citizen science reporting system. Less than 5% of the public reports have historically been confirmed as raccoon dog, but these make up more than 50% of all the captured or culled animals. The citizen science public observation system in Sweden is thus very important and considered very effective, but at a significant cost.

When: 2022-09-20, 16:20 - 16:40, Where: Sal K

## **Recent developments in Finnish wolf population modelling**

Samu Mäntyniemi<sup>1</sup>, ***Inari Helle***<sup>1</sup>

<sup>1</sup> Natural Resources Institute Finland

In Finland, the wolf (*Canis lupus*) has recolonized many areas, which has resulted in conflicts between the wolf and humans. This has evoked an urgent need to provide reliable and transparent information on various wolf-related topics to different stakeholder groups. Here we present recent developments in modelling work concerning the Finnish wolf population. We focus on four separate modelling topics: i) the integration of different knowledge sources in annual population assessments, ii) an individual-based model, which forecasts the development of the population within one year, iii) the management strategy evaluation (MSE) modelling framework, which aims at modelling the links between the wolf and various relevant factors identified by different stakeholder groups, and iv) the population dynamics model, which is used to evaluate the demographic minimum viable population size and the favourable reference values based on this. All these approaches are based on Bayesian modelling.

When: 2022-09-22, 16:00 - 16:20, Where: Sal O1

## **Short-term behavioural responses during the hunting season: rock ptarmigan in Italy and Iceland**

**Farina Sooth<sup>1</sup>**, *Ilse Storch<sup>1</sup>*

<sup>1</sup> Chair of Wildlife Ecology and Management, Faculty of Environment and Natural Resources, University of Freiburg, D-79085 Freiburg, Germany

Hunting not only affects the dynamics and demographic structure of wildlife populations, but may also cause behavioural responses. Various predation avoidance behaviours in response to hunting have been shown in several game species; however, a basic understanding of the speed and duration of short-term behavioural changes of wildlife when confronted with humans is lacking.

To assess the timing of the behavioural response to hunting, I measured the FID (flight initiation distance) of rock ptarmigan *Lagopus muta* before, during and after the hunting season in two hunted and two unhunted areas in distinct parts of the species' range, Iceland and the Italian Alps. In both hunted areas I found a significant increase of FID when the hunting season started. The increase continued for ca. three weeks while the hunting season progressed. Towards the season's end, FID started to decrease; after the hunting season had ended, FIDs in hunted areas equaled the levels observed in the unhunted controls. While following the same trend, the difference between FID levels in the hunted and unhunted areas during the hunting period was more pronounced in Italy (FID up to 202% greater in hunted than unhunted area) than in Iceland (117%).

My results demonstrate fast adaptability of predation avoidance behaviour to changing threat levels, which allowed a strong short-term behavioural response of rock ptarmigan to hunting. The more pronounced response of rock ptarmigan to hunting in Italy as compared to Iceland might be caused by differences in the hunting regimes.

When: 2022-09-21, 14:00 - 14:20, Where: Sal K

## **Should we be concerned? Local people's appraisal of the presence of moose and other ungulates**

**Maria Johansson**<sup>1</sup>, *Sabrina Dresse*<sup>2, 3</sup>, *Annelie Sjölander-Lindqvist*<sup>4</sup>, *Camilla Sandström*<sup>2</sup>

<sup>1</sup> Lund University

<sup>2</sup> Umeå University

<sup>3</sup> Swedish University of Agricultural Sciences

<sup>4</sup> Gothenburg University

The densities of moose (*Alces alces*) and other ungulates such red deer (*Cervus elaphus*), fallow deer (*Dama dama*), roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), are debated among stakeholders representing different interests. The Swedish Moose Management System, a collaborative governance regime introduced 10 years ago was set up to represent different societal interests in that matter. However, the general public's view is rarely explicitly considered. This study aimed to investigate local people's appraisal of moose and other ungulates in northern and southern parts of Sweden. Based on psychological theory on human-environment interactions, a survey was developed and sent to representative samples of residents in four municipalities (total n=1111). Results reveal that the presence of ungulate species in general seem to be of no major concern to local people, ungulates evoke fairly positive emotions, and somewhat favourable attitudes are reported. It is concluded that the management system so far largely has been able to meet the needs of local people. However, experiences made for other species suggest that in times of changing populations, careful attention should be paid to local people's views.

When: 2022-09-21, 09:40 - 10:20, Where: Aulan

## **Social scientific perspectives on the understanding and management of conflicts between humans about wildlife**

**Juliette Young**<sup>1</sup>

<sup>1</sup> French National Institute for Agriculture, Food, and Environment (INRAE), France

Conflicts between people over wildlife and its management can be very acute, with negative impacts on livelihoods, relationships, wellbeing and conservation. There is much we can learn from social sciences both in the better understanding of conflicts in terms of who the actors are, what their values, attitudes, goals and positions are, and the context within which the conflicts occur, but also in testing out, evaluating and implementing approaches for the management of conflicts. In this talk, I will start with an overview of when and how social sciences can feed into conflict science, before outlining examples from a range of different contexts, including the return of wolves in Italy, a One Health approach in India to understand and address a zoonotic disease, controversies around reintroductions in Scotland, conflict transformation processes in France around pesticide use, and a community-based conservation programme around snow leopard conservation in the Himalayas. Approaches explored in these different contexts will include social network analysis, the community voice method, multi-criteria decision analysis, transformation labs, and narratives. I will end with a reflection on conflict transformation as a theoretical and practical approach that sees conflicts are a positive motor for change.

When: 2022-09-20, 11:40 - 12:00, Where: Sal N

## **Sotka project to revert the declining waterfowl populations - bringing together landowners, conservation workers and hunters**

**Heidi Krüger<sup>1</sup>**

<sup>1</sup> Ministry of Agriculture and Forestry, Finland

Many waterfowl populations breeding in Finland are currently in decline. The main reason behind this decline is considered to be habitat deterioration caused by eutrophication and overgrowth of wetlands, along with the continued spread of invasive alien predators, the American mink (*Neovison vison*) and the raccoon dog (*Nyctereutes procyonoides*).

Sotka project is part of the Helmi habitats restoration programme that aims to strengthen Finland's biodiversity. One of the main targets is to restore aquatic bird habitats, wetlands and coastal areas. While the governmental organisations will target their restoration at the Natura 2000 network special conservation areas (SPA) under the Birds Directive, the SOTKA project aims to engage private landowners and hunters to restore aquatic habitats for waterfowl.

The Sotka project is divided into subprojects including:

- 1) Creating good brood production habitats for dabbling ducks by restoring and building wetlands,
- 2) Securing safe nesting environments by removing invasive alien predators mink and raccoon dog,
- 3) Creating a network of resting areas for migrating waterfowl, and
- 4) Research and follow up on the efficiency of the actions.

Successful implementation of the project requires co-operation of governmental organisations, NGO's, landowners, hunters and researchers as well as a large funding base. The project was launched in 2020 with targets set until 2030. However, positive results of the work are expected within a shorter time span.

When: 2022-09-22, 10:40 - 11:00, Where: Aulan

## **Stakeholder perspectives on the prospect of lynx *Lynx lynx* reintroduction in Scotland**

**David Bavin**<sup>1</sup>, *Jenny MacPherson*<sup>1, 2</sup>, *Sarah Crowley*<sup>2</sup>, *Robbie A. McDonald*<sup>2</sup>

<sup>1</sup> Vincent Wildlife Trust, 3-4 Bronsil Courtyard, Eastnor, Ledbury, Herefordshire HR8 1EP UK

<sup>2</sup> Environment and Sustainability Institute, University of Exeter, Penryn Campus, Penryn TR10 9FE, UK

Conservation translocations are an increasingly frequent management practice employed by conservationists to reverse biodiversity declines. Large carnivore reintroductions can be emotive and contentious, partly because they present actual or perceived risks to the safety and livelihoods of people. Establishing only the ecological feasibility of such reintroductions is not sufficient, and is arguably subordinate to thoroughly exploring their social feasibility. In Britain, the Eurasian lynx *Lynx lynx* is the nearest prospect for reintroduction. We used Q-Methodology to explore stakeholder perceptions towards potential lynx reintroduction to Scotland. We revealed five Perspectives: Lynx for Change was supportive of lynx reintroduction, feeling that lynx could facilitate ecosystem restoration. Lynx for Economy was also supportive, anticipating economic benefits to local communities. No to Lynx was strongly opposed, perceiving that humans are fulfilling the roles of absent large carnivores. Scotland is not Ready supported the conversation but perceived prohibitive socio-ecological barriers. We are not Convinced were not satisfied that an adequate case for biodiversity gain had been made, but were open to further exploration of potential. There were strong areas of divergence over impacts on sheep farming and the degree to which the environment should be managed by people. There was consensus over lack of trust between stakeholder groups, primarily rooted in participants' experiences of previous wildlife reintroductions and contemporary management of recovering predators. However, there was also consensus that should lynx reintroduction continue to be explored, a participatory, cross-sectoral approach could approach these trust issues, address existing and emergent conflicts, and build knowledge collaboratively.

# The best defence is not being there: avoidance of larger carnivores is not driven by risk intensity.

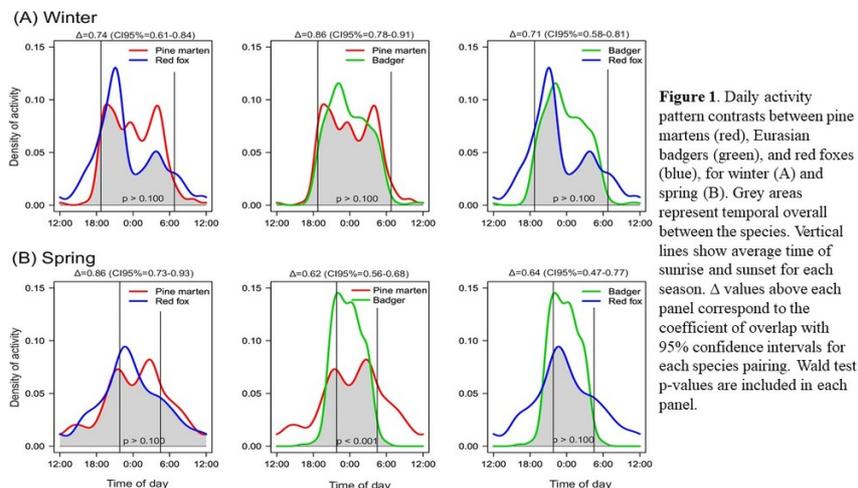
Cristian D Wagnershauser<sup>1</sup>, Karolina Zalewska<sup>1</sup>, Kenny Kortland<sup>2, 3</sup>, Xavier Lambin<sup>1</sup>

<sup>1</sup> School of Biological Sciences, University of Aberdeen, Aberdeen, UK

<sup>2</sup> Forestry and Land Scotland, Smithon, Inverness UK

<sup>3</sup> Cairngorms Connect, Achantoul, Aviemore, UK

Mid-ranking mammalian carnivores are involved in interactions with numerous species, including competition and instances of killing by higher ranking predators. Lethal interactions can directly influence species' demography, but together with competition they may also affect when and where individuals are active (i.e., non-lethal interactions). Body-size and trophic overlap are known predictors of the frequency of lethal interactions, yet their influence on non-lethal interactions remains uncertain. Through camera-trapping, we studied non-lethal interactions between a small mesocarnivore (pine marten), a potential killer and intense competitor (red fox) and a moderate competitor and unlikely killer (Eurasian badger). We determined overlap in their diel and spatial activity patterns in two seasons with contrasting resource availability. Additionally, we estimated the effect of larger carnivore detection rates on pine marten detections and compared time intervals between pine marten visits to baited stations in the absence and presence both larger carnivores. Our results are consistent with martens distributing their daily activity to maximise overlap with prey while minimising competition and risk of aggression spatially. Pine martens also responded to the immediate threat of larger carnivores irrespective of the threat they pose by taking 4–7 days longer to re-visit a station. Small-scale non-lethal interactions such as these may enable pine martens to coexist closely with two larger carnivores. Whether their population incurs a demographic cost through restricted access to resources remains uncertain. Risk-avoidance strategies could be harnessed to protect prey species of interest. However, our results suggest avoidance is short-lived and recurrent stimuli would be necessary.



**Figure 1.** Daily activity pattern contrasts between pine martens (red), Eurasian badgers (green), and red foxes (blue), for winter (A) and spring (B). Grey areas represent temporal overlap between the species. Vertical lines show average time of sunrise and sunset for each season.  $\Delta$  values above each panel correspond to the coefficient of overlap with 95% confidence intervals for each species pairing. Wald test p-values are included in each panel.

When: 2022-09-21, 14:40 - 15:00, Where: Sal K

## **The Boarne Identity: Synthesizing the socio-legal status of wild boar in Europe**

**Erica von Essen**<sup>1</sup>, *Kieran O'Mahony*<sup>2</sup>

<sup>1</sup> Stockholm University

<sup>2</sup> Czech Academy of Sciences

As they move across national borders and symbolic boundaries, wild boars are made and unmade in ever-changing sociolegal landscapes. In practice, their rights and status, including the ethics and practices around their killing, are spatially contingent and determined by legal classification: whether they are classified as (1) under somebody's ownership; (2) belonging to no-one, or *res nullius*; (3) belonging to the state, or *res communis*; or (4) have escaped ownership, e.g. are *feral*. In addition, wild boar are labelled further through other logics that signify (un)belonging, such as native or non-native, invasive pest, or game. These may be applied consistently between countries, or else are territorialised and differ across borders. Synthesising an ERC project focusing on wild boar, hunting and veterinary knowledges in relation to the African Swine Fever emergency, we consider how the sociolegal statuses of the wild boar differ across six European countries, showing how wildlife governance is arranged through different modes of ordering. These logics include legal categorising, responsabilising 'the boar problem' across different actors, calculating and monitoring animals, controlling (through culling or enclosing space), and sanitizing human-animal relations. We draw on work from relational ethics and animal geography to introduce our findings and point to the ways animals can destabilise the orders that govern them.



When: 2022-09-20, 14:20 - 14:40, Where: Sal K

## **The diversity and activity patterns of medium and large mammal species in Gorce National Park, southern Poland**

**Ekaterina Rostovskaya**<sup>1</sup>, *Michał Strączyński*<sup>1</sup>, *Sayantani Basak*<sup>1</sup>, *Jan Loch*<sup>2</sup>, *Paweł Czarnota*<sup>2, 3</sup>, *Paweł Armatys*<sup>2</sup>, *Izabela A. Wierzbowska*<sup>1</sup>

<sup>1</sup> Institute of Environmental Sciences, Faculty of Biology, Jagiellonian University, 7 Gronostajowa str., 30-387 Krakow, Poland

<sup>2</sup> Scientific Laboratory of Gorce National Park, Poręba Wielka 590, 34-735 Niedźwiedź, Poland

<sup>3</sup> Department of Ecology and Environmental Protection, College of Natural Sciences, University of Rzeszów, 4 Zelwerowicza str., 35-601 Rzeszów, Poland

Non-invasive research methods such as camera trap monitoring are helpful to gather data on a wide array of species and to understand inter- and intraspecific interactions. We analysed the temporal use of the area by medium and large mammalian species over 24h period across the seasons. Recordings from camera traps were collected from 2017 to 2019 in 6 forest districts located in Gorce National Park. In total, 1173 recordings of 14 different wildlife taxa were analysed, from which only independent detections within more than 30 min interval were selected for further analysis. Among carnivores we detected brown bear (*Ursus arctos*), grey wolf (*Canis lupus*), Eurasian lynx (*Lynx lynx*), European badger (*Meles meles*), red fox (*Vulpes vulpes*), pine marten (*Martes martes*), whereas within ungulates we observed red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*). The annual average number of records was  $121.33 \pm 41.34$  (SE) with red deer being the most common, followed by lynx, red fox and badger. Lynx and grey wolf were mainly recorded in winter, with the activity peak during day and night hours, respectively. Red deer was detected throughout all seasons during day and night with exception of winter when it showed nocturnal activity. Red fox showed differences in diurnal and seasonal activity and was recorded mainly in spring day and winter night hours. The use of camera traps research revealed crucial facts on the activity pattern and temporal overlap of the species, in particular elusive and secretive ones.

## **The emerging role of fertility control in mitigating human-wildlife conflicts in Europe: an overview**

**Giovanna Massei<sup>1</sup>** , *Stephanie Boyles Griffin<sup>1</sup>*

<sup>1</sup> Botstiber Institute for Wildlife Fertility Control

Trends in human and wildlife population growth and in landscape development indicate that human-wildlife conflicts will escalate worldwide. This is particularly important for Europe, where both the density of the human population and that of some wildlife species are high and where the debate about how to mitigate these conflicts is often polarised. Lethal control, traditionally used to manage wildlife, can be ineffective in the long term, unfeasible, illegal or unacceptable for its environmental and animal welfare impact. For species like the wild boar, hunting as the main cause mortality has declined in parallel with a decreased trend in number of hunters. Non-lethal options such as fertility control are now advocated to manage human-wildlife conflicts. Most practical applications rely on injectable immunocontraceptive vaccines but oral contraceptives are also available for birds and small rodents. Several promising new approaches are currently being explored, including novel oral contraceptives, as well as methods to deliver these contraceptives to target species only. The first part of this presentation will summarise recent advances in research and development on fertility control as a tool to manage wildlife and feral animals. The second part of the talk will illustrate case studies where fertility control has been used to mitigate human-wildlife conflicts. The third part of the talk will highlight advantages and limitations of these methods, research gaps, applications and contexts for mitigating human-wildlife conflicts using fertility control.

When: 2022-09-21, 11:20 - 11:40, Where: Sal N

## **The influence of forest loss and fragmentation on European pine marten occupancy in Norway**

**Jennifer Angoh**<sup>1</sup>, *Morten Odden*<sup>1</sup>, *Neri Thorsen*<sup>2</sup>, *Tim Hofmeester*<sup>3</sup>, *John Odden*<sup>2</sup>, *John Linnell*<sup>1, 2</sup>, *Scott Brainerd*<sup>1</sup>

<sup>1</sup> Faculty of Applied Ecology, Agricultural Sciences and Biotechnology, Campus Evenstad, Inland Norway University of Applied Sciences, NO-2480 Koppang, Norway

<sup>2</sup> Norwegian Institute for Nature Research, NO-7485 Trondheim, Norway

<sup>3</sup> Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, SE-90736 Umeå, Sweden

Over the past decades anthropogenic activities, such as clear-cut logging, have modified and fragmented old-growth forests in Fennoscandia. These have subsequently impacted the space use and population densities of European pine martens (*Martes martes*) in this region. Nevertheless, remnant natural habitats and their surrounding altered land cover may provide suitable conditions for the latter species to persist. In this study, we investigated the influence of forest loss and habitat fragmentation, on pine marten occupancy. We used presence/absence data collected from 622 camera trap locations across Norway (2018-2021) in a Bayesian multi-scale occupancy model. At the landscape scale, we hypothesised that with decreasing forest cover, increasing proportion of clearcuts, and increasing total edge between forested and non-forested habitats, occupancy probability of pine martens decreases. At the habitat patch scale, we hypothesised that clearcuts and older forest (height of trees as proxy) influence site use by pine martens. We also determined if temperature, snow depth, seasons, and different types of camera trap placement influenced detection probability at the microsite scale. At the landscape scale, pine marten occupancy decreased with decreasing forest cover. However, at this scale, pine marten occupancy increased with the proportion of clearcuts. Total edge had no effect on occupancy probability. At the habitat patch scale, neither the proportion of clearcuts nor tree height influenced site use by pine martens. Increasing temperature and snow depth had a positive effect on detection probability. During the reproductive season and at locations with a camera trap facing boulders, detection probability was higher.

When: 2022-09-21, 10:40 - 11:00, Where: Sal N

## The timing of mountain hare (*Lepus timidus*) coat colour change in Norway is determined by elevation, latitude, and local climate

Allan Stokes<sup>1</sup>, Tim R. Hofmeester<sup>2</sup>, Neri H Thorsen<sup>3</sup>, John Odden<sup>3</sup>, Morten Odden, John Linnell<sup>1, 4</sup>, Simen Pedersen<sup>1</sup>

<sup>1</sup> Faculty of Applied Ecology, Agricultural Sciences and Biotechnology, Campus Evenstad, Inland Norway University of Applied Sciences, N-2480 Koppang, Norway

<sup>2</sup> Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, SE-90736 Umeå, Sweden

<sup>3</sup> Norwegian Institute for Nature Research, Sognsveien 68, Oslo NO-0855 Norway

<sup>4</sup> Norwegian Institute for Nature Research, PO Box 5685 Torgard, Trondheim NO-7485 Norway

Coat colour has a critical impact on fitness as predation risk may increase when a prey organism is mismatched against the background. In this study we investigate the impact of latitude, altitude and a gradient from continental to oceanic climate on moult timing in a native, winter-white herbivore, the mountain hare (*Lepus timidus*). Data collected between 2014 and 2019 by 678 camera traps deployed across a habitat gradient within Norway was used to create a Bayesian multinomial logistic regression model that quantifies the impact that latitude, altitude and climate zone has on autumn and spring moult timing. We hypothesised that hares that live in colder climates, such as those found at high elevation, high latitudes and in inland areas, would keep their winter coats for longer due to increased snow cover duration. Moult timing was modelled as the probability of hares being white, brown, or moulting at a given date. Preliminary results indicate that all three covariates have a significant impact on moult timing in both spring and autumn. Preliminary results indicate that hares that live 700 m.a.s.l. moult later in the spring and earlier in the autumn than hares live at sea level. Hares that live at 69° N moult later in the spring and earlier in the autumn than hares that live at 59° N. Surprisingly, climate zone results indicated that hares that live in inland regions moulted earlier in spring and later in autumn.



When: 2022-09-20, 13:20 - 13:40, Where: Sal N

## **Ticking off the ungulate box - the role of different ungulate species in the ecology of tick-borne pathogens**

**Nannet Fabri**<sup>1, 2</sup>, *Tim Hofmeester*<sup>1</sup>, *Hein Sprong*<sup>3</sup>, *Hans Heesterbeek*<sup>2</sup>, *Frauke Ecke*<sup>1</sup>, *Joris Cromsigt*<sup>1, 4, 5</sup>

<sup>1</sup> Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, Umeå, Sweden

<sup>2</sup> Department of Population Health Sciences, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

<sup>3</sup> Centre for Infectious Disease Control, National Institute for Public Health and the Environment, Bilthoven, The Netherlands

<sup>4</sup> Centre for African Conservation Ecology, Department of Zoology, Nelson Mandela University, Port Elizabeth, South Africa

<sup>5</sup> Copernicus Institute of Sustainable Development, Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands

Ungulates play a central role in the life cycle of *Ixodes ricinus*, an important vector of tick-borne pathogens in Europe. The composition of ungulate communities is changing across Europe, with species expanding their ranges and increasing in numbers. We identified the role of different ungulate species in the spread of *I. ricinus*-borne pathogens. Through a literature review, we investigated the relative importance of ungulates as a group, and of each ungulate species, in the transmission of *Anaplasma phagocytophilum*. Furthermore, we compared the contribution of each ungulate species to the number of (infected) ticks and the transmission of *A. phagocytophilum* and *Borrelia burgdorferi* s.l. through field studies, where we quantified tick burdens, relative ungulate densities, vegetation structure and (infected) tick density in the vegetation. These studies indicated that deer contributed more to the spread of tick-borne pathogens than wild boar, and fallow deer more than the other deer species. We then modelled how changing an ungulate community composition affects the circulation of pathogens, expressed as the  $R_0$ . An increase of fallow deer, and co-varying decrease of roe deer, increased the  $R_0$  of the zoonotic *A. phagocytophilum* ecotype 1, while it decreased for the non-zoonotic ecotype 2. The effects on *Borrelia afzelii* and *B. garinii* were smaller. Depending on the pathogen, different deer species may thus vary in their effect on the circulation of tick-borne pathogens. Overall, we conclude that ungulate management, as a tool to mitigate public health risk, should be adapted to the local vertebrate community and pathogen(s) of concern.

When: 2022-09-20, 15:20 - 15:40, Where: Sal K

## Timing and synchrony of birth in Eurasian lynx across Europe

**Jenny Mattisson**<sup>1</sup>, *John D.C. Linnell*<sup>1, 2</sup>, *Ole Anders*<sup>3</sup>, *Elisa Belotti*<sup>4, 5</sup>, *Christine Breitenmoser-Würsten*<sup>6</sup>, *Ludek Bufka*<sup>4</sup>, *Christian Fuxjäger*<sup>7</sup>, *Marco Heurich*<sup>2, 8, 9</sup>, *Gjorge Ivanov*<sup>10</sup>, *Włodzimierz Jędrzejewski*<sup>11, 12</sup>, *Radio Kont*<sup>13</sup>, *Rafał Kowalczyk*<sup>11</sup>, *Miha Krofel*<sup>14</sup>, *Dime Melovski*<sup>15, 16</sup>, *Deniz Mengüllüoğlu*<sup>17</sup>, *Tomma Lilli Middelhoff*<sup>3</sup>, *Anja Molinari-Jobin*<sup>18</sup>, *John Odden*<sup>19</sup>, *Jānis Ozoliņš*<sup>20</sup>, *Henryk Okarma*<sup>21</sup>, *Jens Persson*<sup>22</sup>, *Krzysztof Schmidt*<sup>11</sup>, *Kristina Vogt*<sup>6</sup>, *Fridolin Zimmermann*<sup>6</sup>, *Henrik Andrén*<sup>22</sup>

<sup>1</sup> Norwegian Institute for Nature Research, PO Box 5685 Torgarden, NO-7485 Trondheim, Norway

<sup>2</sup> Department of Forestry and Wildlife Management, Inland Norway University of Applied Sciences, Anne Evenstads vei 80, NO-2480 Koppang, Norway

<sup>3</sup> Harz National Park, Lindenallee 35, 38855 Wernigerode, Germany

<sup>4</sup> Department of Research and Nature Protection, Šumava National Park Administration, Sušická 399, CZ-34192 Kašperské Hory, Czech Republic

<sup>5</sup> Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Kamýcká 1176, CZ-16521 Prague, Czech Republic

<sup>6</sup> Foundation KORA, Talgut-Zentrum 5, 3063 Ittigen, Switzerland

<sup>7</sup> NP OÖ Kalkalpen GesmbH, 4591 Molln, Austria

<sup>8</sup> Chair of Wildlife Ecology and Management, Faculty of Environment and Natural Resources, University of Freiburg, Tennenbacher Straße 4, 79106 Freiburg, Germany

<sup>9</sup> Bavarian Forest National Park, Department of Visitor Management and National Park Monitoring, Freyungerstr. 2, 94481 Grafenau, Germany

<sup>10</sup> Geonatura, d.o.o. Fallerovo Šetalište 22, 10000 Zagreb, Croatia

<sup>11</sup> Mammal Research Institute, Polish Academy of Sciences, Stoczek 1, 17-230 Białowieża, Poland

<sup>12</sup> Centro de Ecología, Instituto Venezolano de Investigaciones Científicas (IVIC), Carretera Panamericana km 11, Caracas 1020-A, Venezuela

<sup>13</sup> Department of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, Liivi 2, 50409 Tartu, Estonia

<sup>14</sup> Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University of Ljubljana, Jamnikarjeva 101, SI-1000 Ljubljana, Slovenia

<sup>15</sup> Georg-August University Goettingen, Wildlife Sciences, Germany

<sup>16</sup> Macedonian Ecological Society, Skopje, Macedonia

<sup>17</sup> Ekoakademi Ekolojik Danışmanlık, 09400, 509 Sk. 3FA Kuşadası, Aydın, Turkey

<sup>18</sup> Progetto Lince Italia, Via Roma 43, 33018 Tarvisio, Italy

<sup>19</sup> Norwegian Institute for Nature Research, Sognsveien 68, NO-0855 Oslo, Norway

<sup>20</sup> Latvian State Forest Research Institute "Silava", Rigas str.111, Salaspils, LV-2169, Latvia

<sup>21</sup> Institute of Nature Conservation Polish Academy of Sciences, Mickiewicza 33, 31-120 Kraków, Poland

<sup>22</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, SE-739 93 Sweden

The ecology of reproductive timing and synchrony has been a topic of great interest in evolutionary ecology for decades. Lately, this topic has acquired new relevance in the face of climate change. However, there has been relatively little research on reproductive phenology in mammalian carnivores. The Eurasian lynx (*Lynx lynx*) distribution covers three of four main climate regions of the world, making it an ideal species to explore reproductive phenology. Here, we used data on multiple reproductive events from 169 lynx females, across Europe. Mean birth date was May 28<sup>th</sup>, but was ~10 days later in northern Europe than in central and southern Europe. Birth dates were synchronised across Europe, but more so in the north than in the south. Timing of birth were delayed by colder May temperatures. Whether kittens were born late or early did not affect kitten survival. We

argue that lynx give birth later when exposed to colder spring temperature and are more synchronized when the window of favourable conditions for raising kittens is shorter. This suggest that lynx are well adapted to different environmental conditions, from dry and warm climates to alpine, boreal and arctic climates, which should be favourable in times of climate change.



When: 2022-09-22, 13:40 - 14:00, Where: Sal N

## **To hunt or not to hunt - effects of large carnivore hunting on attitudes towards the species and managing authorities**

**Sabrina Dressel<sup>1, 2</sup>**, *Göran Ericsson<sup>2</sup>*, *Camilla Sandström<sup>1</sup>*

<sup>1</sup> Department of Political Science, Umeå University, 901 87 Umeå, Sweden

<sup>2</sup> Department of Wildlife, Fish and Environmental Sciences, Swedish University of Agricultural Sciences, 901 83 Umeå, Sweden

Large carnivore management is a controversial topic across the globe. While large carnivores fill important roles in the ecosystem, their presence can create diverse costs for local stakeholders and lead to human-wildlife conflicts. One example of this is the return of wolves (*Canis lupus*) across several European countries in which they have been scarce or eradicated for decades. Responsible authorities are trying to find acceptable management strategies to decrease conflicts while maintaining viable populations. In this and other contexts, the possibility of allowing a regulated hunting season on wolves has been proposed as a potential pathway to increased public acceptance of the species. However, scientific evidence on this issue is lacking.

We used the 2021 license hunt of wolves in Sweden to design a quasi-experimental study to measure the potential effect of a regulated hunt on public attitudes towards the species and trust in managing authorities. At two points in time, we sent a survey to representative samples in four counties with a license hunt and three control counties. First before official decisions about a licence hunt were made (n = 5,470) and then shortly after the license hunt was carried out (n = 7,432). We used additional qualitative interviews with key actors in involved counties to enrich our understanding of how the license hunt was perceived. Our results indicate no clear effect of the license hunt on public attitudes towards the species and interviews revealed several process related aspects that influenced the perceived effectiveness and legitimacy of the hunt.

When: 2022-09-22, 15:40 - 16:00, Where: Sal N

## Top-down and bottom-up forces modulate patch utilization by two deer species in a disturbed temperate forest

Juan Ignacio Ramirez<sup>1</sup>, Lourens Poorter<sup>2</sup>, Patrick Jansen<sup>2</sup>, Matthias Siewert<sup>1</sup>, Jan den Ouden<sup>2</sup>, Johan Olofsson<sup>1</sup>

<sup>1</sup> Department of Ecology and Environmental Sciences, Umeå University, Umeå, Sweden.

<sup>2</sup> Department of Environmental Sciences, Wageningen University & Research, Wageningen, The Netherlands.

The Optimal Foraging Theory predicts that large herbivores seek to maximize their energetic gains by food intake while minimizing the costs associated to foraging, such as the energy required for exploiting resources, avoiding predators and competing for resources. However, it is poorly understood how the Optimal Foraging Theory regulates the decisions of two species belonging to the same guild and living in the same area. We aim to understand how top-down (i.e., patch quality & structure), bottom-up (hunting & distance to town) and the landscape matrix (forest edge & deer abundance) mediate patch utilization in a disturbed temperate forest by two deer species: *Capreolus capreolus* and *Cervus elaphus*. We also assess the implications of patch utilization by deer on forest regeneration composition. Our approach was to pair camera traps to vegetation sub-plots in ten anthropogenically disturbed forest sites in the Netherlands that widely ranged in deer abundance and running Structural Equation Models. Patch utilization was best explained by bottom-up forces and by the landscape abundance of deer, as predicted by the safety-in-numbers hypothesis. Top-down forces had little or no effect on deer patch utilization. Forces driving patch utilization differed between deer species. Higher patch utilization came with higher browsing intensity and a strong shift in species composition: from a mix of broadleaf and conifer species towards only conifers. Concluding that each deer species experiences and interacts strikingly differently with their surrounding landscape, highlighting the inherent complexity of the Optimal Foraging Theory.



When: 2022-09-22, 15:40 - 16:00, Where: Sal O1

## Transboundary movements of wild boars (*Sus scrofa*) in South-East Finland

**Mervi Kunnasranta**<sup>1, 2</sup>, *Elmo Miettinen*<sup>1, 3</sup>, *Markus Melin*<sup>1</sup>, *Katja Holmala*<sup>1</sup>, *Anna Meller*<sup>3</sup>, *Veli-Matti Väänänen*<sup>3</sup>, *Otso Huitu*<sup>1</sup>

<sup>1</sup> Natural Resources Institute Finland (Luke), Finland

<sup>2</sup> University of Eastern Finland, FI-80100, Joensuu, Finland

<sup>3</sup> University of Helsinki, FI-00014, Helsinki, Finland

The wild boar population of Finland (current estimate some 3 500 individuals) originates from individuals immigrated from Russia. Most of the current population lives in the southeast part of the country. The expanding and growing wild boar population may play role in the introduction, persistence and spread of African Swine Fever (ASF). To estimate the risk of potential transboundary spread of diseases, the movements and habitat use of adult wild boars (N=13) were studied from May 2020 to December 2021. The studied animals were captured by wooden box traps and fitted with GPS-collars on the Finnish side of the Finnish-Russian border. All studied individuals showed continuous transboundary movements, with the core areas of the home ranges being on the Russian side of the border zone. Total home ranges (MCP 90) of wild boars varied from 10 km<sup>2</sup> to 110 km<sup>2</sup> and the longest total distance travelled by a male from capture site was 15.5 km. Daytime locations were predominantly located in Russia, but most feeding excursions were made to Finland. Nocturnal movement patterns were highly associated with exploitation of available food resources, such as supplementary feeding sites and cornfields. During the winter, movements were shorter and mostly directed towards supplementary feeding locations. Our study shows that adult wild boars are relative sedentary, but the movement capacity of the species enables transboundary spread of diseases. Our preliminary results emphasize the importance of transboundary collaboration in the monitoring and management of common wild boar populations.



When: 2022-09-20, 11:40 - 12:00, Where: Aulan

## **Trends and pattern in train-wildlife accidents in Sweden**

**Karolina Jasinska**<sup>1</sup>, *Emma Håkansson*<sup>2</sup>, *Henrik Wahlman*<sup>2</sup>, *Mattias Olsson*<sup>2</sup>, *Andreas Seiler*

<sup>1</sup> Warsaw University of Life Sciences (SGGW)

<sup>2</sup> EnviroPlanning AB

Wildlife-vehicle collisions have become increasingly common and incidents with trains are no exception. In Sweden, train driver reports on accidents with wildlife are available since 2001. Although coverage is certainly not complete, the data is comprehensive and provides a unique possibility to identify factors that may be linked to the temporal and spatial pattern. With this knowledge, more effective and better targeted mitigation can be designed to reduce the impact on both animals and traffic.

During 2001 to 2020, over 67,000 incidents with wild ungulates, 14,500 accidents with semi-domestic rein deer, 6,500 cases with other wildlife and about 5,000 reports on accidents with domestic animals have been recorded along the 11,783 km railway network. Estimates in 2014 suggested that ungulates collisions only yield an annual societal costs of 1,5 MRD SEK.

While inter-annual variation is substantial, with clear seasonal differences, accidents in most species showed a steady upward trend over the years. We could relate changes in snow cover, increase in number of train engines and rail transport, changes in wildlife hunting statistics to large scale trends. Spatial pattern were linked to e.g., traffic volume, game bag, land cover and to rail characteristics such as signs for acoustic warnings and occurrence of safe crossing points. In our presentation, we present data and model results and discuss implications for developing mitigation strategies.

When: 2022-09-21, 13:40 - 14:00, Where: Sal K

## **Understanding polarized opinions on wolves: Life experiences, nature narratives and conflicting ethics -early notes from the field**

**Sofia Billebo**<sup>1</sup>

<sup>1</sup> Human Geography, Karlstad University.

Polarizing opinions of large carnivore recovery in Sweden, wolves in particular, has been an important theme in research as well as in public and political debate. The framing of the issue, as a divider between rural and urban population, has been supported as well as contrasted with big survey data. Qualitative research has shown that culture, identity and conflicting knowledge spheres also play a part in how opinions are formed. In this research, the conceptualization of space is stressed in order to understand how the human experiences, through life story interviews, can tell something about the various conditions people live within in diverse spatial setting in Sweden. The landscapes where the wolf has return, the rural, has also gone through vast changes over time. Yet, the same could be said about the other landscape, the urban. This spatial relationship have impact on people's life, belonging and how they see and value varied aspects of nature. Here, there is a potential in developing different conflicting environmental ethics. By addressing space we also enable an analysis of the interrelations between the rural and urban, as well as how the local is lived in a globalized world. The study aspires to understand these dynamics, which unfold between people and places, people and animals in the Swedish context in order to contribute to a constructive wildlife management strategy.

## Understanding the patterns of wildlife occurrence in Freiburg, Germany

Marufa Sultana<sup>1</sup>, Geva Peerenboom<sup>1</sup>, Marius Huber<sup>1</sup>, Nele Netzer<sup>1</sup>

<sup>1</sup> Wildlife Ecology and Management, Faculty of Environment and Natural Resources, University of Freiburg, Germany

Conceptual understandings of wildlife species status and distribution patterns in many European cities are not well developed. We aimed to understand mammal species occurrences and distribution patterns in the city of Freiburg, Germany. Specifically, we explored if mammal species diversity varies along a gradient of urbanisation. Further, we assessed how habitat connectivity influences different mammal species occurrence across urban areas. For this, we set up wildlife camera traps for one month at 23 locations distributed at a different urban gradient, collaborating with UWIN (Urban Wildlife Information Network; [urbanwildlifeinfo.org](http://urbanwildlifeinfo.org)). From the camera traps, we collected approximately 10700 images which provided 1570 records of 11 mammal species. The pattern of wildlife occurrences documented from our camera traps was consistent with the existing knowledge gathered at the citizen science platform 'wilde nachbarn'. The species observed were Brown rat, European badger, European hare, European hedgehog, Mouse sp, Red fox, Red squirrel, Roe deer, Stoat, Stone marten and Wild boar. Stone Marten was the most frequent and observed at 17 sites, whereas Stoat was the least frequent and detected only at one site. The overall observed number of mammal species was higher in lowly urban sites than highly urban sites. Our further assessment revealed that medium to large-sized mammal species diversity was higher in well-connected large green areas than in small, highly fragmented green habitat patches. It is consistent with the existing understanding that habitat connectivity in urban areas improve wildlife diversity in cities.



When: 2022-09-20, 16:20 - 16:40, Where: Sal O1

## **USING CITIZEN DATA IN A POPULATION MODEL TO ESTIMATE POPULATION SIZE OF MOOSE**

**Christer Kalen**<sup>1</sup>, *Henrik Andrén*<sup>2</sup>, *Johan Månsson*<sup>2</sup>, *Håkan Sand*<sup>2</sup>

<sup>1</sup> Swedish Environmental Protection Agency, SE - 106 48 Stockholm, Sweden.

<sup>2</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, SE - 739 93 Riddarhyttan, Sweden

Long-term and wide-ranging citizen science programs provide a unique opportunity to monitor wildlife populations and trends through time while encouraging stakeholder participation, engagement, and trust. Hunter observations is such a program that in Sweden is used on a regular basis to monitor population trends of moose. However, hunter observations are not reliable to determine actual population size. We developed a mechanistic moose population model that integrated citizen science data and used it at various geographical scales to estimate moose population size between 2012 and 2020. A sensitivity analysis, specifically performed for reproduction, adult sex ratio and calf sex ratio, showed that the population size were most sensitive for variation in reproduction. According to the result, Sweden had a total moose population of ~311 000 ( $\pm$  4%) individuals pre-hunt and ~228 000 ( $\pm$  4%) post-hunt in 2020. The post-hunt moose abundance has decreased nationwide from 0.72 to 0.61 moose per km<sup>2</sup> during the 2012 - 2020 period. The present post-hunt moose density was estimated to 0.39, 0.78, 0.84 and 0.54 per km<sup>2</sup> for the regions northernmost, northern, central and southern Sweden, respectively. The model can be used for strategic and operative management at various geographical scales and is publicly available. By integrating citizen data with a mechanistic population model a new low cost method of estimating population size and relevant population dynamics were established.

When: 2022-09-20, 15:40 - 16:00, Where: Sal N

## **Wild Boar regulating Fungal sporocarps in a Boreal Forest**

**Lars Hillström**<sup>1</sup>, *Antonio Carpio*<sup>2</sup>, *Marta Garcia Moreno*<sup>3</sup>, *Mikael Lönn*<sup>1</sup>, *Pelayo Acevedo*<sup>2</sup>, *Guillermo bueno*<sup>4</sup>

<sup>1</sup> Högskolan i Gävle

<sup>2</sup> Instituto de Investigación en Recursos Cinegéticos, IREC (UCLM-CSIC-JCCM), Ciudad Real, Spain.

<sup>3</sup> Faculty of Biological Sciences, Complutense University of Madrid, 28040, Madrid, Spain

<sup>4</sup> Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

Wild boar is a well-known ecosystem engineer, but a basic understanding of how the species affect key ecosystem organisms, such as soil fungi, that in turn are playing a fundamental role in most ecosystems, is lacking. We have investigated the effects of wild boar (presence and rooting intensity) on the abundance of fungal sporocarps and their functional guilds (symbiotic, saprotrophic and pathogenic). We selected eleven forested sites (400-500 x 150-200 meters) in central Sweden, six sites with, and five sites without the presence of wild boar. Within each forest, one transect (200 m long), and 5 plots (2 x 2 m each) for sites without wild boar, and 10 plots for sites with presence of boars (5 within and 5 plots outside wild boar disturbances), were used to determine the intensity of rooting and the abundance of sporocarps. We found that the presence of wild boar and intensity of rooting were associated with the abundance of sporocarps. Interestingly, this relationship varied depending on the fungal guild analyzed, with a negative correlation with symbiotic sporocarps and positive correlation with saprophytic sporocarps. Pathogenic fungi, in turn, were more abundant in undisturbed plots but located in areas with the presence of wild boar. Our results indicate that wild boar activities have the potential to regulate the abundance of fungal sporocarps, with different impact on different fungal guilds. Therefore, wild boar can have an up-to-now ignored effect on the plethora of key ecosystem functions driven by soil fungi in boreal forests.

When: 2022-09-21, 11:00 - 11:20, Where: Aulan

## **Wildlife disease surveillance in North Rhine-Westphalia, Germany - an interdisciplinary approach**

**Luisa Fischer<sup>1</sup>** , *Michael Petrak<sup>1</sup>*

<sup>1</sup> Wildlife Research Institute, State Agency for Nature, Environment and Consumer Protection North Rhine-Westphalia, Bonn, Germany

In North Rhine-Westphalia, hunters are encouraged to participate in wildlife research by sampling hunted and dead found game. All carcasses and samples of game and other wildlife species sent in are examined in four veterinary investigation offices. Reports on all examinations are continuously collected and reviewed by the Wildlife Health Institute, which covers the costs for the investigations carried out and manages communication and cooperation with other institutions. In addition to an annual report summarizing the results, the findings are published in scientific papers and regularly communicated to authorities, nature conservation agencies and other stakeholders.

The monitoring has revealed an increasing prevalence of tularemia in brown hares during the last decade (4.1-23.9 %). In addition to tularemia, the viral pathogen RHDV-2 causes regular mortality events in wild rabbits and hares. In wild boar, the number of seropositive individuals with a high rate of antibodies against Suid herpes virus-1 increased in the south of NRW. Papillomatosis, on the other hand, was rarely detected in wild boar. Canine distemper virus was identified as the main cause of death in raccoons and foxes. The potentially zoonotic parasite *Baylisascaris procyonis* was regularly detected and specific hazard information were given to hunters and the public. Emerging pathogens such as West Nile virus and Usutu virus as well as highly infectious pathogens such as avian influenza viruses were continuously monitored in wild birds.

In North Rhine-Westphalia, this cooperation helped to investigate wildlife diseases, advocate wildlife interests and to successfully initiate local intervention measures.

When: 2022-09-20, 11:20 - 11:40, Where: Aulan

## **Wildlife passages at roads and railways - crucial for wildlife landscape connectivity**

**J-O Helldin**<sup>1</sup>, *Manisha Bhardwaj*<sup>2</sup>, *Marcus Elfström*<sup>3</sup>, *Isak Holmberg*<sup>4</sup>, *Emma Håkansson*<sup>3</sup>, *Fabian Knufinke*<sup>5</sup>, *Mattias Olsson*<sup>3</sup>, *Andreas Seiler*<sup>6</sup>

<sup>1</sup> Swedish Biodiversity Centre, SLU, Sweden

<sup>2</sup> Wildlife Ecology & Management, Albert-Ludwigs-Universität Freiburg, Germany

<sup>3</sup> Enviroplanning AB, Sweden

<sup>4</sup> Dept. of Biology, Lund University, Sweden

<sup>5</sup> Institute of Wildlife Biology and Game Management, BOKU, Austria

<sup>6</sup> Dept. of Ecology, SLU, Sweden

Fenced roads and railways add to the barriers for wildlife movements, with potential impact on individual fitness, population demography, and genetic diversity. However, passage opportunities for wildlife can reduce the barrier effect. Such passage opportunities can be in the form of over- and underpasses or at-grade (fence openings), and they can be constructed specifically for wildlife or for any other reason but used by wildlife. Current ecological standards for the Swedish Transport Administration state that safe passage opportunities for larger wildlife should be provided at a maximum distance of 6 km along fenced and other larger roads and railways. We study to what degree these different types of passage opportunities provide the necessary landscape connectivity for wildlife, using simplified measures of effectiveness, such as frequency of use, success rate, and animal behavior. Given the large number of new constructions needed and the large investment costs, we particularly focus on comparing the function with cost drivers (size and particular wildlife adaptations) and on opportunities for combining wildlife passages with function for other purposes. In this presentation, we emphasize the crucial role that wildlife passages at roads and railways may play for large-scale landscape connectivity, and the importance that these measures are fitted into the larger management of wildlife populations and habitats.



When: 2022-09-21, 14:20 - 14:40, Where: Sal K

## **Wolf politics in Central and Eastern Europe - What is the impact of Europeanization?**

**Krzysztof Niedziałkowski**<sup>1, 2</sup>

<sup>1</sup> Institute of Philosophy and Sociology, Polish Academy of Sciences

<sup>2</sup> Mammal Research Institute, Polish Academy of Sciences

The range and numbers of wildlife are to a large extent dependent upon human management practices. This is particularly true in case of the wolf (*Canis lupus*), which in recent decades returned to various parts of Europe largely due to the protection introduced in the European conservation laws. However, this process was accompanied by social conflicts between groups supporting and opposing wolf conservation. In this paper, I analyse wolf policy and politics in three Central and Eastern European countries: Germany, Poland, and Belarus. Based on desk research and 40 semi-structured interviews, I identify policy paths, key events, and groups of social actors involved in decision-making. I also look at the impact of socio-political events on wolf governance in those countries, as well as the influence of the EU rules and discourses on national policy-making. I argue that these countries differ significantly with regard to the socio-political context of wolf governance, which translates into different approaches to wolf management, from constant wolf persecution in Belarus to strict protection in Poland and Germany. In all three analysed countries, the impact of the EU rules and policies was visible, but differed as to the importance to the national policy-making. In Belarus, European rules and policies strengthened conservation actors but did not influence wolf policy. In Poland, it strengthened existing policy path of wolf conservation, while in Germany it laid foundations for strict wolf protection that would be difficult to introduce otherwise.

When: 2022-09-20, 15:40 - 16:00, Where: Sal K

## **Wolf predation in a multi-prey system - development, validation and application of a DNA-based method to detect prey in wolf scats**

**Cecilia Di Bernardi**<sup>1, 2</sup>

<sup>1</sup> Department of Biology and Biotechnologies "Charles Darwin", University of Rome La Sapienza

<sup>2</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, SE-739 93 Riddarhyttan, Sweden

The investigation of prey composition in carnivore diet helps increasing our knowledge on carnivores' ecology and their role in affecting prey populations. Along with traditional approaches to study diet, an increasing number of molecular methods has been developed to detect prey DNA in carnivore scats. However, the use of DNA-based approaches to answer ecological questions is still lagging behind the methodological advances. Few studies have properly validated DNA-based approaches to measure prey species composition in scats and priority has usually been given to minimizing the rate of false positives, while sensitivity is rarely investigated, and false negatives may therefore be overlooked.

We developed a molecular method for prey species identification in wolf scats using multiple species-specific marker loci for 18 target species using a high-throughput Nanofluidic array technology. Through controlled feeding experiments with captive wolves, we validated the molecular method and observed a variation in method sensitivity among the six ungulate prey species provided to the wolves during the feeding trials. Additionally, the method sensitivity was favored by the use of multiple markers per species, and by the choice of a low threshold for the number of amplifying markers required to give a positive call. The subsequent application of the DNA-method to >2000 wolf scat samples from the Scandinavian wolf population aims at investigating wolf prey use and selection where multiple ungulate prey species occur and investigate whether predation pattern is affected by intrinsic factors (sex, social status and inbreeding of the wolves) and the availability of different prey species.

When: 2022-09-22, 16:20 - 16:40, Where: Sal N

## **Wolf predation on moose in Scandinavia - implications for hunting harvest**

**Håkan Sand**<sup>1</sup> , *Barbara Zimmermann*<sup>2</sup>, *Camilla Wikenros*<sup>1</sup>, *Ane Eriksen*<sup>2</sup>, *Petter Wabakken*<sup>2</sup>

<sup>1</sup> Grimsö Wildlife Research Station, Swedish University of Agricultural Sciences

<sup>2</sup> Faculty of Applied Ecology, Inland Norway University of Applied Sciences

Wolf effects on prey populations are mainly confined to the areas of territorial packs and pairs. One way of estimating the effect of wolf predation on the local moose population is to apply data on wolf kill rates, territory size, and moose density. We analyzed how different factors related to wolves and moose affected the variation in the predation rate (percentage of the moose population killed by wolves) among 19 wolf territories, and how this was related to the size of moose harvest rate at the territory level. Wolf predation rate on moose was not related to moose density, pack size or pack kill rate. Predation rate was most strongly related to the combined effect of territory size and moose density, which together make up the abundance of moose in the wolf territory. Predation rate constituted an average of 7 - 8% of the early summer moose population, ranging from 2 - 12% among wolf territories. Harvest rate was estimated to an average of 15 - 19%. Over an entire year, harvest rate was on average 2.4 - 3.5 times higher than wolf predation rate. Harvest rate was not related to the number of moose in the wolf territory nor to wolf predation rate, indicating that the effects of wolves and hunting were not compensatory. A comparison of the predation rate from wolves and bears on moose in Alaska with the mortality from harvest, wolves, and bears in Scandinavia suggests that moose populations in Scandinavia has lower annual mortality rate.

When: 2022-09-21, 13:20 - 15:00, Where: Sal N

## **Workshop: The do's and don'ts of using camera traps in wildlife management and the role of collaboration between researchers and managers**

**Tim Hofmeester**<sup>1</sup>, *Henrik Andrén*<sup>2</sup>, *Joris Cromsigt*<sup>1, 3</sup>, *Jonas Kindberg*<sup>1, 4</sup>, *John Linnell*<sup>4, 5</sup>, *John Odden*<sup>6</sup>

<sup>1</sup> Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, 90183 Umeå, Sweden

<sup>2</sup> Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences, 73091 Riddarhyttan, Sweden

<sup>3</sup> Centre for African Conservation Ecology, Department of Zoology, Nelson Mandela University, Port Elizabeth 6031, South Africa

<sup>4</sup> Norwegian Institute for Nature Research, PO Box 5685 Torgard, NO-7485 Trondheim, Norway

<sup>5</sup> Department of Forestry and Wildlife Management, Inland Norway University of Applied Sciences, Anne Evenstads vei 80, NO-2480 Koppang, Norway

<sup>6</sup> Norwegian Institute for Nature Research, Sognsveien 68, NO-0855 Oslo, Norway

Camera traps, cameras that are activated by a passive infrared trigger, have become increasingly popular over the last decades and are a great tool to monitor wildlife. However, clear protocols for how to use cameras in wildlife management are largely lacking. In this workshop, we want to focus on three main questions: 1) what species do we want to monitor using cameras and for what reasons, 2) what set-up should we use to monitor those species and how does this set-up vary with the type of monitoring question, and 3) how could we integrate this monitoring into wildlife management? The “we” in these questions are both wildlife researchers and managers and, in the workshop, we want to investigate if and how the answers to these questions vary for these two groups and promote collaboration between researchers and managers. To illustrate these questions, we will give several examples from the Scandcam project presented by both researchers and managers. Scandcam is a Scandinavian collaboration developing camera trap-based tools to monitor multi-species animal communities. Examples will include; use of camera traps to monitor lynx in Sweden and Norway, and use of cameras to monitor whole wildlife communities. Furthermore, we aim to bring together the knowledge of the participants to further the use of camera traps in wildlife management. We will do this by discussing the above questions and collecting ideas and knowledge from a range of participants. We welcome both researchers and wildlife managers to get a broad input into the workshop.

When: 2022-09-20, 13:20 - 15:00, Where: Sal O1

## **Workshop: Transdisciplinary research in wildlife management: Learning from different perspectives on collaboration across professions**

Fredrik Widemo<sup>1</sup>, *Bodil Elmhagen*<sup>2</sup>, **Anke Fischer**<sup>1</sup>, *Juliette Young*<sup>3</sup>

<sup>1</sup> Swedish University of Agricultural Sciences

<sup>2</sup> Swedish Association of Hunting and Wildlife Management

<sup>3</sup> INRAE, France

Transdisciplinary research involves collaboration between different professional groups, such as researchers, staff of governmental organisations and NGOs, and/or land managers, and is often seen as a useful approach that fosters understanding of complex situations and increases the real-world validity and applicability of research. However, bringing the expectations, perspectives and possibilities and interests of different actors together is often not easy.

In the first part of this workshop, we hear about experiences with transdisciplinary research in France, Finland and Sweden, and learn from the perspectives of different actors, including staff of governmental and non-governmental organisations. In the second part, we invite a discussion with all participants to identify factors that help or hinder research collaboration between professional groups, and share practical suggestions on how to further facilitate such collaboration. The workshop should be of interest to anyone working (or considering to work) in collaborative research, regardless of your professional background.

When: 2022-09-22, 13:20 - 15:00, Where: Sal O1

## **Workshop: Wild boar ecology, management, crop damages, and preventive measures. Experiences from other European countries**

**Petter Kjellander**<sup>1</sup> , *Tomasz Podgorski*<sup>2</sup>

<sup>1</sup> SLU, Dep of Ecology, Grimsö Wildlife Research Station, Sweden

<sup>2</sup> Czech University of Life Sciences Prague, CZ & Mammal Research Institute Polish Academy of Sciences Bialowieza, PL

Crop raiding by wild boar (WB) seem to be an unavoidable problem all over its range. In the still expanding Swedish WB population farmer losses increase rapidly and estimated annual costs due to WB damages in agriculture alone has passed €100 milj. per year. In many parts of Europe farmers, hunters and WB management has co-existed with for much longer time than in the Nordic countries. The aim with the workshop would thus be to summarize the experiences at the European level. -How do all involved cope with wild boar in the "old" WB countries? At what level do different interest groups cooperate around WB management? Are there compensation systems? How do the agricultural and management sector interact to minimize losses? How many WB is needed to kill to stabilize a local WB population, in different parts of Europe? What does the legislation allow in relation to who can do what, when and with what means? What are the experiences in terms of damage preventive actions? What can we see on the innovation front?

Given that we can gather a big enough group representing a number of countries, the final aim is to summarize the outcome from the workshop in a review article for *Wildlife Biology*.

## **Workshop: Wildlife disease**

**Anne-Marie Dalin**<sup>1</sup> , *Henrik Uhlhorn*<sup>2</sup>

<sup>1</sup> Department of Clinical Sciences, SLU Uppsala, Sweden

<sup>2</sup> National Veterinary Institute, Uppsala, Sweden

Globally, growing anthropogenic pressures and changing wildlife populations create increasing wildlife–livestock–human interfaces, facilitating cross-species transmission and emergence of pathogens into new host populations. Climate change with higher temperatures and shorter winters affects the distribution of vectors. In addition, changing population densities of wild animals, acting as vector hosts, also influence the spread of diseases. Conversely, disease is one of the driving factors behind the rise and decline of wildlife populations. This makes the surveillance and characterization of diseases in wildlife, a topic of immediate importance.

The workshop aims at exploring the interface between wildlife biologists and veterinarians, to benefit from each other's expertise.

# Poster

## **Access patterns of ungulates to golf courses in the south of Spain. Effects of season, time and Covid-19 restrictions**

**Jesus Duarte**<sup>1, 2</sup>, *Diego Rodríguez*<sup>1</sup>, *Pablo J. Rubio*<sup>2</sup>, *Miguel A. Farfán*<sup>3</sup>

<sup>1</sup> Ofitecma Marbella SL, Av Ramón y Cajal 17, 29601 Marbella (Málaga, Spain)

<sup>2</sup> Wildlife Costa del Sol SL, Calle Málaga 28, 29110 Monda (Málaga, Spain)

<sup>3</sup> Departamento de Biología Animal, Universidad de Málaga, Campus de Teatinos, 29071 Málaga (Spain)

Between June 2020 and November 2021, camera trapping was used to monitor red deer (*Cervus elaphus*) and wild boar (*Sus scrofa*) entering a golf course in the south of Spain (Benahavís, Málaga province). These species are key contributors to damage in golf facilities in the study area. The numbers of ungulates, dates, and times of entry were recorded. The access patterns of both species were analysed, and the influences of season and time determined using a Poisson GLM. We also examined whether COVID-19 restrictions between October 2020 and May 2021 had affected access patterns. The sampling effort was equivalent to 1,370 camera-nights and captured images of 941 wild boar and 146 red deer. There was no valid model for red deer numbers entering the golf course during the study period, although they were more frequently observed during summer and autumn than winter and spring, and the time of entry showed a trimodal pattern (dawn, midday, and dusk). Wild boar access significantly differed between seasons (being more frequent in the summer and autumn) and the time of entry followed a bimodal pattern (dawn and dusk) with a peak occurring around nightfall. For both species, COVID-19 restrictions had no significant effect on the time of entry or the seasonality, despite there being no players and minimal staff numbers. Ungulates entered the golf course all the year round, regardless of the season, and human presence did not appear to act as a deterrent.

## **Agricultural damage following the recent expansion of wild boar in Finland - farmer perceptions and preconditions for coexistence?**

**Elmo Miettinen**<sup>1, 2</sup>, *Jani Pellikka*<sup>1</sup>, *Mervi Kunnasranta*<sup>1</sup>, *Otso Huitu*<sup>1</sup>

<sup>1</sup> Natural Resources Institute Finland (Luke), Finland

<sup>2</sup> University of Helsinki, Helsinki, Finland

Wild boar (*Sus scrofa*) numbers have recently increased in Northern Europe, including Finland. This induces both positive and negative human-wild boar interactions, manifesting, e.g., as hunting opportunities and damages to property. Experiences and associated feelings from encounters may shape attitudes towards animals and the need for population management. We studied whether attitude groups exist within farmers, and what factors explain the differences between such groups by means of theme interviews and survey data. We also made preliminary estimates of the economic value of wild boar damage in Eastern Finland. Our analysis revealed three attitude groups among farmers, representing different perspectives: "hunting resource group" (13% of respondents), "pest-of-concern group" (44%), and "unaware group" (43%). The perceived benefits received from wild boar presence, and their perceived population growth partly explained the division to groups. Surprisingly, only the level of experienced forestry damages differed between the groups, whereas no such effect was discernible in relation to agricultural damage. Estimates of the value of wild boar damage in Eastern Finland vary greatly from tens of thousands to hundreds of thousands of euros depending on how farmers choice to reply was assumed. The results indicate that both mitigating damages and promoting the presence of species may support the preconditions of coexistence. While the level of agricultural damages is thus far not substantial compared to that of other game animals in Finland, wild boar population growth, and undoubtedly increase in levels of damage, will facilitate the need to include wild boar in the national compensation scheme.

## **Bayesian approach for estimation of wild boar (*Sus scrofa*) population size in Finland**

**Leena Ruha** , *Mervi Kunnasranta*

In recent years, Finland has gained a permanent wild boar population, whose ancestors have roamed mostly from Russia. The spreading and increase of the population can be seen as harmful from the perspectives of the risks of damages and diseases. On the other hand, wild boar has also been seen as a new and prestigious game animal. Efforts have been made to limit the size and distribution of the population by hunting as effectively as possible, in particular to prevent the spreading risk of the African swine fever (ASF). For these reasons, Natural Recourses Institute Finland has been developing methods for estimation of the wild boar population size since 2017. The most current method is based on Bayesian state-space model that estimates yearly population sizes starting from year 2016. The model can be referred to as an integrated population model as it utilizes several sources of information including the road collisions and the data gathered from hunters including their estimates for the number of animals, the observations made and the number of hunted animals. Such data is combined with the prior information from literature about the breeding and mortality. In 2016-2020 the estimated population size at the end of the year has ranged between 2800 and 3400 individuals. In this presentation we show the new population estimates made in January 2022.

## Capture - new platform for image management and recognition

Andreas Seiler<sup>1</sup>, **Carolin Berndt**<sup>1</sup>, Peter Jäderkvist<sup>2</sup>, Jan Dalheimer<sup>2</sup>, Caroline Jansson<sup>2</sup>

<sup>1</sup> Grimsö Wildlife Research Station, Department of Ecology, SLU

<sup>2</sup> Sweco, Sweden

Automated camera traps are increasingly used in infrastructure projects, providing an attractive, non-invasive method to monitor wildlife. But managing the amount of imagery produced by a single camera requires substantial human resources. Also, camera traps inadvertently may capture people and infringe on personal data. This imposes a practical and a data safety issue to the monitoring of fauna mitigation measures. Practitioners and administrations thus need a tool to handle images in an efficient, safe and a legally complying way. Available image management platforms and desktop applications, however, did not hitherto satisfy the requirements of governmental agencies such as the Swedish Transport Administration (STA) has for data safety, archiving and privacy protection.

Together with the STA and the Norwegian Institute for Nature research (NINA), we developed a tailored, non-commercial, open-source, image platform that combines a half-automated management of metadata with automatic image recognition through artificial intelligence and automated depersonalization of potentially privacy-infringing images. The platform's modular structure enables new algorithms for image recognition and machine learning to be connected and thereby expand the area of use. Capture offers a centralized and secure way of managing and archiving monitoring data and research results. Capture is currently used to manage images and videos from monitoring studies on wildlife passages and experiments on animal deterrents, but it can be used in a much broader context.

We present Capture in a promotion video and invite interested users to test the platform.

## Creating a health monitoring program for the Saimaa ringed seal

**Marja Niemi**<sup>1</sup>, *Miina Auttila*<sup>2</sup>, *Vincent Biard*<sup>1</sup>, *Raisa Tiilikainen*<sup>2</sup>, *Marja Isomursu*<sup>3</sup>, *Mervi Kunnasranta*<sup>1, 4</sup>

<sup>1</sup> University of Eastern Finland, P.O.Box 111, FI-80101 Joensuu, Finland

<sup>2</sup> Metsähallitus, Parks & Wildlife Finland, Akselinkatu 8, FI-57130 Savonlinna, Finland

<sup>3</sup> Finnish Food Authority, Veterinary Bacteriology and Pathology Unit, Elektriikkatie 3, FI-90590 Oulu, Finland

<sup>4</sup> Luke, Natural Resources Institute Finland, Yliopistokatu 6 B, FI-80100 Joensuu, Finland

The Saimaa ringed seal (*Pusa hispida saimensis*) is an endangered subspecies found only in Lake Saimaa, Finland. Although the population of some 400 seals has recently grown due to various conservation measures, small population size and extremely low genetic diversity are still contributing to extinction risk in the changing climate. Traditionally, the focus of health monitoring has been on mortality investigations of by-caught and stranded carcasses in variable condition. Diseases and pathogens are known to cause significant population declines of many endangered species and epidemics driven by climate change have been documented in many wildlife populations. Therefore, in our ongoing Our Saimaa seal LIFE-project, we aim to develop more comprehensive custom-made procedures for health and animal welfare monitoring of the Saimaa ringed seal population. A major issue within the process is to document and assess the situation today and point out areas where improvements are needed. Updated and developed guidelines and best practices will be prepared with veterinarians and marine mammalogists. Finally, we aim to publish standardized health and welfare monitoring procedures for Saimaa ringed seals, which can be utilized by both national and local organizations as well as individuals working with population health monitoring, sample collection and animal handling.

## Crush at feeding sites - deer and moose with uninvited guests

Kaarina Kauhala<sup>1</sup> , **Marja Isomursu**<sup>2</sup>

<sup>1</sup> Natural Resources Institute Finland, Luke

<sup>2</sup> Finnish Food Authority, Animal Health Diagnostic Unit

In Finland, although supplemental feeding of e.g. white-tailed deer *Odocoileus virginianus* and roe deer *Capreolus capreolus* is common, little is known about the actual species composition of animals visiting feeding sites for deer. To clarify the issue, we monitored animals visiting 26 feeding sites in SW Finland using remote cameras from February 2020 to April 2021 (excluding summer months). The data consisted of > 43 000 photos of mammals and 245 photos of larger birds. Target species frequently visited the feeding sites, roe deer being the most common species. Also white-tailed deer and moose *Alces alces* commonly visited the sites, as well as some fallow deer *Dama dama*. The most common non-target species was the brown hare *Lepus europaeus* but also many carnivores, especially the red fox *Vulpes vulpes* and the raccoon dog *Nyctereutes procyonoides* were observed. Some badgers *Meles meles*, pine martens *Martes martes*, lynx *Lynx lynx* and grey wolves *Canis lupus* were also seen in the photos. The large numbers of intruders in the photos suggest that they benefit from supplemental feeding of deer. They also occurred in the photos together with ungulates. Co-existence of multiple species and increased direct and indirect contacts at feeding sites may facilitate the spread of pathogens. Therefore, it is important to allow for unwanted guests when planning supplemental feeding of deer. For instance, no food should be placed on the ground and more natural species-specific food should be offered at the feeding sites.

## Distribution, preservation and people's awareness about *Dama dama* on Rhodes, Greece

Elianna Natalie Alexandra Kantidenou<sup>1</sup>, Jane Morrell<sup>1, 2</sup>, Theodoros Ntallaris<sup>1, 2</sup>

<sup>1</sup> Swedish University of Agricultural Sciences

<sup>2</sup> Center of Reproductive Biology in Uppsala (CRU)

The only (and oldest) wild deer population in the Mediterranean is the fallow deer (*Dama dama*) found on the island of Rhodes. The population is endangered due to climatic factors, fires, agricultural activities, and tourism, among others. A better understanding about the species' biology by the local population would play a major role in conservation efforts. The purpose of this study was to map the level of knowledge about fallow deer among the inhabitants of Rhodes, to gain an understanding of what measures are required to protect the species and how measures for their survival could be carried out.

An anonymous questionnaire consisting of 15 questions was sent to vets and local inhabitants. A total of 117 responses were included in the statistical analysis. The results showed an association ( $p < 0.05$ ) between the age, gender and origin of the respondent and the level of knowledge about *Dama dama*. Older men, living in villages had greater knowledge about fallow deer biology than young women living in the city.

In summary, the study showed that people who have close contact with the fallow deer population also have a higher level of knowledge and a better understanding about the species biology. Educational programs about the species are needed to contribute to a better understanding about their biology by the local population to aid in conservation efforts.



## **Diversionsary Feeding as an Applied conservation tool, to reduce predation on ground nesting bird eggs, within a forest restoration landscape.**

**Jack Bamber**<sup>1</sup>, *Kenny Kortland*<sup>2</sup>, *Ana Payo-Payo*<sup>1</sup>, *Christopher Sutherland*<sup>3</sup>, *Xavier Lambin*<sup>1</sup>

<sup>1</sup> University of Aberdeen

<sup>2</sup> Forestry and Land Scotland

<sup>3</sup> University of St Andrews

Forest restoration in Scotland entails heavy culling of red and roe deer (*Cervidae*), to allow tree regeneration, whilst also providing, low-risk food in the form of carrion, exploited by meso-carnivores such as pine marten (*Martes martes*), badger (*Meles meles*), and red fox (*Vulpes vulpes*). This risk-free food may have positive survival benefits for meso-carnivores within restoration landscapes. It is not known whether this will have an impact on populations of iconic species of high conservation concern such as capercaillie (*Tetrao urogallus*). This project seeks to assess the usage of human-provided carrion and evaluate if modifying the provisioning of carrion subsidies can be used as a diversionsary food resource during the breeding season of ground-nesting birds, by altering the foraging behavior, to reduce additive predation pressure, with potential use as a strategy for positive conservation management.

This project takes advantage of non-invasive monitoring methods, via camera trapping to monitor ungulate carrion over winter, when present as a hunting bi-product, then again to monitor deliberately deployed ungulate carrion dumps during the spring breeding season. False nests (imitating capercaillie nests) are deployed to monitor alterations in nest predation alongside a control and test deployment of ungulate carrion across the landscape

Early research outputs show that this may be a valuable tool for nesting bird conservation, without the need for lethal predator control, reducing conservation conflict. As research continues, and understanding increases, more solid conclusions will be drawn.

## DNA-based monitoring of the Scandinavian wolverine population

**Alexander Kopatz**<sup>1</sup>, **Oddmund Kleven**<sup>1</sup>, **Henrik Brøseth**<sup>1</sup>, **Göran Spong**<sup>2</sup>, **Robert Ekblom**<sup>3</sup>, **Cyril Milleret**<sup>4</sup>, **Pierre Dupont**<sup>4</sup>, **Richard Bischof**<sup>4</sup>, **Jenny Mattisson**<sup>1</sup>, **Mari Tovmo**<sup>1</sup>, **Frode Holmstrøm**<sup>1</sup>, **Jan Arne Stokmo**<sup>1</sup>, **Øystein Flagstad**<sup>1</sup>, **Jonas Kindberg**<sup>1, 2</sup>

<sup>1</sup> Rovdata, Norwegian Institute for Nature Research, Trondheim, Norway

<sup>2</sup> Department of Wildlife, Fish and Environmental Studies, Swedish University of Agricultural Sciences, Umeå, Sweden

<sup>3</sup> Wildlife Analysis Unit, Swedish Environmental Protection Agency, Stockholm, Sweden

<sup>4</sup> Faculty of Environmental Sciences and Natural Resource Management, Norwegian University of Life Sciences, Ås, Norway

In Scandinavia, the wolverine (*Gulo gulo*) is inhabiting remote alpine areas and boreal forest, and in combination with its elusiveness, studying and monitoring of this species is notoriously challenging and elaborate. Thus, noninvasively collected material as well as tissue samples from legally harvested and age determined individuals are subject to DNA analysis. DNA-based monitoring of the wolverine has been implemented for two decades and nowadays, the whole Scandinavian population of Norway and Sweden is monitored using the same genetic markers. The results on individual identification of each sample are stored in the publicly accessible and common database Rovbase ([www.rovbase.no](http://www.rovbase.no) or [www.rovbase.se](http://www.rovbase.se)). Transparency of data and the possibility for the public to participate actively in the collection of samples has shown to be vital for an effective species management and wide acceptance of the results. As of today, more than 45,000 wolverine samples have been genotyped resulting in over 5,000 different individuals. Latest assessments on spatial capture-recapture modelling using data from 2021 estimated between 1,013 and 1,126 individuals in Scandinavia, corresponding with 358 to 418 individuals in Norway and 639 to 724 individuals in Sweden. On such a large scale, transnational collaboration provides the opportunity for a comprehensive monitoring of population size, distribution, and status. We present data on material and methods as well as results obtained during DNA-based monitoring of one of the most extensively surveyed wolverine populations in the world.



Wolverine *Gulo gulo*. Photo: Kjetil Schjølberg, Rovdata.

## Evaluating Camera Traps as Ground Based Remote Sensing Networks Linking Snow and Wildlife

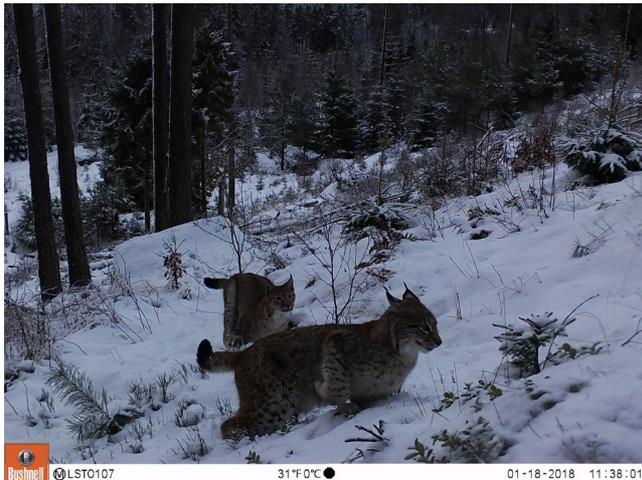
Catherine Breen<sup>1</sup>, John Odden<sup>2</sup>, Carrie Vuyovich<sup>3</sup>, Laura Prugh<sup>1</sup>

<sup>1</sup> University of Washington

<sup>2</sup> Norwegian Institute for Nature Research

<sup>3</sup> NASA Goddard Space Flight Center

Snow covers 31% of the Earth's land area seasonally each year. Satellite information provides large-scale observations of snow cover, but accuracy can be limited due to cloud cover and sparse ground truthing data. Remote camera networks deployed for wildlife applications represent a currently untapped source of snow cover observations to supplement satellite information and to validate regional snow cover maps. Using images from a network of 1000+ camera trap from the Norwegian Institute for Nature Research (NINA), we use snow cover extracted during Norway's meteorological winter season (September 1 to March 30) to validate and supplement satellite-based remote sensing. We compare snow cover classifications from the wildlife cameras in Norway with the Moderate Resolution Imaging Spectroradiometer (MODIS) snow cover product. When images approximately less than 50% snow were categorized as "no snow" and images with approximately greater than 50% snow were categorized as "snow," the cameras correlated with MODIS snow cover well (pseudo- $R^2 = 0.75$ ). We use the results to suggest a threshold for binary snow cover mapping for the boreal forests of Norway. The analyses facilitate remote sensing for snow, providing new tools and information for conservation applications.



## **Food choice of the red fox in a marshland during the period of maternal dependence of the cubs**

**Zsolt Bende**<sup>1</sup>, *Nikolett Nagyapáti*<sup>1</sup>, *Zsófia Lanszki*<sup>2</sup>, *Gabriella Lanszki-Széles*<sup>1</sup>, *József Lanszki*<sup>1</sup>

<sup>1</sup> Hungarian University of Agriculture and Life Sciences, Department of Nature Conservation, Kaposvár, Hungary

<sup>2</sup> University of Pécs, National Laboratory of Virology, Szentágotthai Research Centre, Hungary

To preserve vulnerable wetlands and their communities, essential to know factors influencing the predator-prey relationships. The red fox (*Vulpes vulpes*) has high importance in the predation aspect. During the period of dependence of the cubs on the mother, learning plays an important role in obtaining food after becoming independent. We hypothesized that compared to the diet of the adults, the composition of the food brought for the cubs is different, more varied, and the prey is larger. In an extensive marshland, the food choice depending on age group (cub and adult) and year (food supply) during three years, May was examined based on fox fecal samples collected around dens. Primarily important foods were small rodents (mainly *Microtus* species and *Arvicola amphibius*), secondary birds (mainly Anatidae), tertiary muskrat (*Ondatra zibethicus*), or arthropods over the years, age groups, and calculation methods. Cubs consumed a higher proportion of birds than adult foxes, and thus their "preys" were larger. The trophic niche breadth and the number of prey taxa consumed did not differ significantly between age groups. Foxes preferred *Microtus*, *Arvicola*, and *Rattus* species to eat, while omitting other small rodent and shrew species. In a dynamically changing, diverse wetland, the diet composition of the fox reflects the different sources each year, and the mother feeds the pups as varied as possible. The experience gained can provide a comparison to study the predation conditions of human-dominated areas and can also be used to conserve and manage populations and habitats.

## Habitat structure matters - Habitat selection of white-tailed deer and roe deer at two different spatial scales

Lukas Graf<sup>1</sup>, Juho Matala<sup>2</sup>, Juha Honkaniemi<sup>2</sup>, Jenni Poutanen<sup>2</sup>, Ari Nikula<sup>2</sup>

<sup>1</sup> University of Helsinki, Department of Forest Sciences

<sup>2</sup> Natural Resources Institute Finland (LUKE)

Introduced white-tailed deer (*Odocoileus virginianus*) and native roe deer (*Capreolus capreolus*) occur in sympatric ranges in southern Finland. In order to better estimate their impacts on ecosystems and plan the future management of these deer species, it is of high importance to understand what habitat types and -structures they prefer. Our aim in this study was to evaluate the preferences of habitat structure and resource availability of both species at different spatial scales in Finland.

We estimated 80 % probability summer home ranges and 50 % core areas of GPS collared white-tailed deer and roe deer between 2008 and 2011 using Kernel Density Estimation. Several landscape metrics for 19 habitat types were calculated from 31 white-tailed deer and 33 roe deer home ranges. The same metrics were calculated for randomly placed areas representing average area size for each species and sex.

We applied and ranked multiple sets of generalized linear mixed models for the different landscape metrics and species, using Akaike Information Criterion to select the most parsimonious models explaining habitat selection of roe deer and white-tailed deer.

Preference for habitat types and landscape structure differed between species as well as between home ranges and core areas. Agricultural land was the most favored habitat class in the summer home ranges of each species, while both species avoided higher patch densities of anthropogenic habitat classes. This study sheds new light into the habitat preferences of a non-native deer species in Finland in comparison to a natively occurring deer species.

## **LIFE BOREALWOLF develops tools for the human and wolf coexistence**

**Madeleine Nyman**<sup>1</sup>, *Mari Lyly*<sup>2</sup>, *Juha M Ahonen*<sup>3</sup>, *Iina Ala-Kurikka*<sup>1</sup>, *Lauri Kajander*<sup>4</sup>, *Harri-Pekka Pohjolainen*<sup>5</sup>

<sup>1</sup> The Natural Resources Institute Finland

<sup>2</sup> The Finnish Wildlife Agency

<sup>3</sup> Metsähallitus / Wildlife Services

<sup>4</sup> The Uusimaa District of the Finnish Association for Nature Conservation

<sup>5</sup> The Police Department in Eastern Finland

As the grey wolf has expanded its range in Europe during the past decades, the breeding populations with their territories have expanded further into human-dominated landscapes after an absence of over 100 years. In Finland, the coexistence of wolves and humans has not taken place without conflicts. During the last 10 years, the conflicts have evolved to a national institutional misfit of many dimensions that poses a considerable challenge to the Finnish wolf policy. Aims and methods of governance, routines of administration and approaches of wildlife research are currently incompatible with the cultures, wishes and lifestyles of civil society. This is concretised on the local wolf territory level as 1) strong demands for wolf hunting, 2) illegal killings of wolves, 3) notable fear of wolves, 4) unwillingness to share ungulate game with wolves and 4) mistrust of official wolf population estimates and management measures. The media presents the situation through polarised filters, further exacerbating these issues. The polarized views are also used as a tool for the political debate on all levels of society. The LIFE project BOREALWOLF (2019-2025) is set to mitigate the institutional misfit through a multitude of approaches simultaneously in all wolf areas. The project is a joint effort of the Natural Resource Institute, the Finnish Wildlife Agency, Metsähallitus / Wildlife Services, the Police Department in Eastern Finland and the . The main project objectives and tools developed, and preliminary results will be presented.

## Mapping hotspots of wildlife-vehicle accidents in Sweden

**Andreas Seiler** , *Emma Håkansson*<sup>1</sup>, *Henrik Wahlman*<sup>1</sup>, *Mattias Olsson*<sup>1</sup>

<sup>1</sup> EnviroPlanning AB

Wildlife-vehicle collisions (WVC) have been increasing in Sweden over decades despite numerous driver information campaigns, comprehensive road fencing and, more recently, the construction of wildlife crossing structures. Since 2010, car drivers are legally obliged to report any road incident with large mammals to the police who then contracts hunters to take care of the injured or dead animal. Over 70,000 accidents annually have been registered during the past years and concern is growing about the unbroken upward trend. One important step towards a greater awareness and more efficient mitigation is to visualize the spatial (and temporal) pattern in WVC and to identify areas where accidents are most likely to occur. In collaboration with the Transport Administration and the Council for wildlife accidents, we developed aggregated WVC maps for roads and railways that allow both citizens and planners to identify accident hotspots and risk-prone road sections. The maps summarize accident pattern over the most recent 5-year period and provide a means to evaluate the overall effect of mitigation measures. The maps are published online as pdf-images, but are also available as GIS-layers in full detail at the Swedish Transport Administration. The maps and their underlying statistics are intended to be part of the annual environmental report by the administration. We present the methodologies used to produce the maps and discuss their limitations and multiple use for communication, evaluation and research.

## Mapping the ranges of native and invasive beavers using eDNA

Terhi Iso-Touru<sup>1</sup>, Jonna Tabell<sup>1</sup>, Anneli Virta<sup>1</sup>, Kaarina Kauhala<sup>2</sup>, **Annika Herrero**<sup>1</sup>

<sup>1</sup> Natural Resources Institute Finland (Luke), Myllytie 1, 31600 Jokioinen, Finland

<sup>2</sup> Natural Resources Institute Finland (Luke), Itäinen Pitkätatu 4 A, 20520 Turku, Finland

Ranges of the native Eurasian beaver (*Castor fiber*) and the invasive North American beaver (*C. canadensis*) are approaching each other in Finland. Mapping the exact ranges of the two beaver species is essential for conservation of the native species and control of the invasive one. A non-invasive method was developed to identify beaver species: wood chips from foraging sites of beavers offer a source of environmental DNA. Citizens were thus asked to send wood chips from foraging sites of beavers especially from Lapland and other areas where the two beaver species may occur near each other.

Wood chips have remains of buccal cells containing DNA. In the laboratory, DNA was collected from the wood chips with the swabs. From the swabs, DNA was extracted using DNeasy blood & tissue kit (Qiagen). From the extracted DNA, approximately 840bp region of the mtDNA D-loop was amplified and species was identified based on the sequence.

The eDNA method revealed a formerly unknown area of sympatry of the two beaver species in SE Finland near the Russian border, where Eurasian beavers probably have wandered from Russia. Also, both species were found in some parts of Lapland. Eurasian beavers in W Lapland have crossed the border from Sweden. One case of Eurasian beaver was, however, found also in E Lapland. The origin of this case is unknown. The eDNA-method also confirmed observations of sympatric beavers in several rivers in SW Finland.

## microbial agents associated with infectious keratoconjunctivitis in swedish reindeer

Karin Wallin Philippot<sup>1, 2</sup>, Julia Bonevik<sup>1</sup>, Lena Ström<sup>1</sup>, Jenny Frössling<sup>1, 2</sup>, Charlotta Berg<sup>1</sup>, Jonas Wensman<sup>1, 2</sup>, Anna Omazic<sup>2</sup>, Ylva Persson<sup>1, 2</sup>

<sup>1</sup> Swedish University of Agricultural Sciences

<sup>2</sup> National Veterinary Institute

Infectious keratoconjunctivitis (IKC) is a multi-factorial, transmissible and severe ocular disease that affects ruminants worldwide. Both isolated cases and outbreaks occur in reindeer, mainly during the colder period of the year. Previous studies indicate that cervid herpesvirus 2 (CvHV2) works as a primary causative agent. In addition, the bacterium *Chlamydia pecorum* was previously isolated during an outbreak of IKC in 2016, but its role in developing of IKC remains unclear. Many different secondary bacteria have been isolated from reindeer with IKC which all may play a role in the progression of disease.

The objective was to study the presence of potential pathogens in samples from reindeer in Sweden with and without clinical signs of IKC and examine which possible secondary bacterial ocular infections followed the suspected primary pathogens CvHV2 and *Chlamydiaceae*.

Conjunctival eye swabs were collected from reindeer with (n=170) and without (n=30) clinical signs of IKC, sent to the National Veterinary Institute in Sweden (SVA), and analyzed for the presence of CvHV2 and *Chlamydiaceae* with real-time PCR. In addition, routine general aerobic bacteriological culturing was performed.

In this study we hypothesized that CvHV2 and *Chlamydiaceae* act as primary pathogens of IKC in reindeer. Preliminary results support CvHV2 to be the primary cause since it was only isolated in reindeer with clinical signs, which was not the case for *Chlamydiaceae*. In addition, secondary bacterial infections seem to differ depending on previous findings of CvHV2 or *Chlamydiaceae*, which could improve our understanding of the pathogenesis and risk factors for the disease.

## Preventing wolf depredation on livestock facilitates the coexistence of humans and wolves in Finland

Mari Lyly<sup>1</sup>, Mikael Luoma<sup>1</sup>, Jaakko Alalantela<sup>1</sup>, Mari Tikkinen<sup>1</sup>

<sup>1</sup> Finnish Wildlife Agency

The wolf (*Canis lupus*) population in Finland has increased during the 21<sup>st</sup> century, expanding its range. This has caused increasing damages on livestock, especially on sheep (annual compensations 30 000–100 000 euros). The LIFE BOREALWOLF project aims to reduce damages during 2019–2025 with a wide range of methods. The key approach is to collaborate face-to-face with livestock owners and help them to execute the most suitable and appropriately dimensioned preventive measures in each farm. Personal contact is considered important, especially when damages occur, to give livestock owners sufficient support.

LIFE BOREALWOLF has acquired several types of light and sound deterrents for complementing protective structures and for acute situations, where large carnivores have visited a farm or caused damage. To monitor the functioning of these devices, transmitting trail cameras are used in many farms. According to a survey, cameras are a very popular tool, helping farmers to monitor the well-being of animals in real-time and to detect the possible presence of large carnivores. The project also tests GPS-collars on sheep in semi-natural biotopes. Experience from 2021 produced positive feedback: collars help to identify deviant movement patterns of sheep and alert farmers to check on the animals.

Predator fences are usually the most effective way of preventing depredation. LIFE BOREALWOLF offers farmers free electric fences (50 km delivered so far). From 2022 onwards, it will also seek effective methods to facilitate fence maintenance via limiting vegetation growth. Maintenance is often laborious and typically considered the biggest drawback of using electric fences.



## Raptors under fire - recent shooting injuries in Finnish eagles and hawks (Accipitridae)

Marja Isomursu<sup>1</sup>

<sup>1</sup> Finnish Food Authority

Eagles and hawks are protected species that have historically suffered from human persecution since they have been perceived as threats to small game. The Finnish Food Authority conducts national wildlife disease surveillance, including raptor species. During the last decade (2011-2021), 725 eagles and hawks (395 white-tailed eagles *Haliaeetus albicilla*, 181 northern goshawks *Accipiter gentilis*, 67 golden eagles *Aquila chrysaetos*, 57 sparrowhawks *Accipiter nisus*, 9 European honey buzzards *Pernis apivorus*, 7 common buzzards *Buteo buteo*, 6 rough-legged buzzards *Buteo lagopus*, and 3 harriers *Circus* sp.) have been examined for cause of death and disease. Typical shooting injuries were recognised during routine necropsy, and x-ray photography to reveal remnants of ammunition was used as adjunct. In total, 28 individuals (3.9%) had shooting injuries, 18 of which were immediately lethal and 10 crippling injuries. X-ray images were useful in finding shotgun pellets but did not show specific findings when a bullet had pierced the body intact. When looking at the four most commonly examined species, the golden eagle had the highest rate of shooting injuries (10.5% of all cases). Regionally, the highest proportion of shot birds was found in the middle of the country, in provinces of Kainuu (11.8%) and Northern Ostrobothnia (10.9%). Almost half of the cases (46%) had occurred during September-December. Cases have occurred in a steady rate during the decade, with 2-3 cases annually. Eagles and hawks continue to be targets of illegal shooting, and the pressure seems to be particularly high on the golden eagle.

## Sampling of French cervid populations for genetic analysis of susceptibility towards chronic wasting disease

Anne Van De Wiele<sup>1</sup>, Maryline Pellerin<sup>1</sup>, Christine Saint-Andrieux<sup>1</sup>, Aurélie Barboiron<sup>1</sup>, **Emma Meloni**<sup>1</sup>, Katayoun Moazami-Goudarzi<sup>2</sup>, Johann Laubier<sup>2</sup>, Sandrine Floriot<sup>2</sup>, Léo de Tauzia<sup>2</sup>, Jean-Luc Vilotte<sup>2</sup>, Olivier Andreoletti<sup>3</sup>

<sup>1</sup> French Biodiversity Agency (OFB) - Research and Scientific Support Department

<sup>2</sup> University of Paris-Saclay - National Research Institute for Agriculture, Food and Environment (INRAE) - AgroParisTech - GABI

<sup>3</sup> UMR INRAE ENVT 1225-IHAP - National Veterinary School of Toulouse

Chronic wasting disease (CWD), known since 1967 in North America, appeared in 2016 in North Europe, affecting different species of deer such as reindeer or elk. CWD is a highly transmissible prion disease that might weaken the European cervid populations.

Genetic susceptibility towards prion diseases is mostly determined by the prion protein gene sequence as exemplified in humans, cattle and sheep. We started to investigate for the first time the polymorphism of this gene in French red deer and roe deer populations, as part of the ANR EU-CWD project (2021-2025).

A national sampling of red deer and roe deer populations was carried out during the 2020-2021 and 2021-2022 winters, with the collaboration of 32 departmental hunting federations, as well as 6 study areas of French Biodiversity Agency (Figure 1). This monitoring was based on the origins and geographical locations of these wild animals in France. Muscle samples were taken from the cervid, preserved in alcohol before DNA extraction and *Prnp* coding sequence analysis. Currently 248 samples have been analyzed and no new allele observed. These data confirmed the already highlighted surprising *Prnp* roe deer genetic homogeneity.

A total of 1100 samples will be sequenced, and should provide us a detailed analysis of the range of cervid *Prnp* polymorphisms (including their geographic distribution) present in French red and roe deer populations. The aim of this study is to map the *Prnp* genetic distribution of French cervids and to estimate their susceptibility towards CWD.

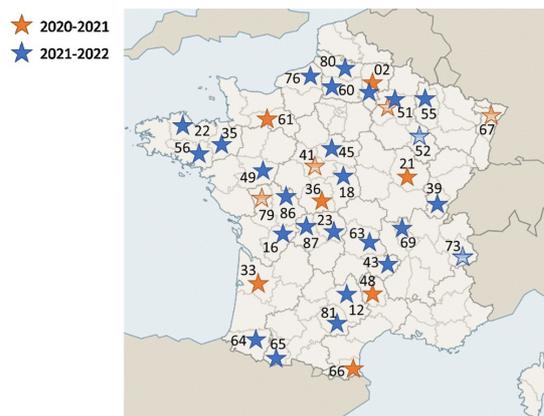


Figure 1: Sampling of the French cervid populations for Chronic wasting disease genetic susceptibility analysis. Orange stars: sampling on 2020-2021. Blue stars: sampling on 2021-2022. Hatched stars: study areas of the French Biodiversity Agency (OFB).

## **Spatial effort and density in Swedish population monitoring of the brown bear**

**Martin Sköld<sup>1</sup>**

<sup>1</sup> The Swedish Museum of Natural History

The Swedish brown bear population is monitored using capture-recapture methods based on genetic identification of scat samples collected by volunteers. We present tools for visualising spatial measures of sampling effort and population density, and consider their implications for the estimation of abundance.

## **Spatiotemporal overlap and risk of *Mycobacterium bovis* infection between three woodland mammal species**

**William Justus<sup>1</sup>**, *Owain Barton<sup>1</sup>, Amy Gresham<sup>1</sup>, Shannon Graeme<sup>1</sup>*

<sup>1</sup> Bangor University

*Mycobacterium bovis* (*M. bovis*) is the causative agent in bovine tuberculosis, a global disease that poses a risk to cattle, humans, and wildlife. In Europe, Eurasian badgers (*Meles meles*), fallow deer (*Dama dama*), and red foxes (*Vulpes vulpes*) have been identified as important maintenance or spillover hosts of *M. bovis*. Interactions between these species in the wild may be contributing to the spread of disease, but the degree of contact between them is poorly understood. The Elwy Valley in North Wales is a patchwork landscape of agricultural fields, villages, and woodlands. The area has had relatively low levels of *M. bovis*, despite having populations of badgers, foxes, and fallow deer that are often in close proximity to cattle farms. However, it's possible that an *M. bovis* maintenance population could be established among wildlife in the area should a breakout ever occur among cattle. We placed 40 camera traps across woodlands in the Elwy Valley for over two years (2019-2021) to determine the daily activity patterns and habitat occupancy of these species. Using preliminary data to narrow our search, we also carried out transect surveys to locate badger setts and fox dens in high-use areas and placed cameras around any discovered den or sett sites. We analyzed our results to assess the degree of spatiotemporal overlap between species. These data will ultimately be used to construct a model of disease transmission to predict the potential risk of *M. bovis* outbreak in a wildlife community.

## **Stressed as a hare? Non-lethal impacts of hunting on mountain hares**

**Simen Pedersen**<sup>1</sup>, *Tomasz M Ciesielski*<sup>2</sup>, *Clare Stawski*<sup>2</sup>, *Hans C Pedersen*<sup>3</sup>

<sup>1</sup> Inland Norway University of Applied Sciences, Faculty of Applied Ecology, Agricultural Sciences and Biotechnology, Department of Forestry and Wildlife Management

<sup>2</sup> Norwegian University of Science and Technology, Faculty of Natural Sciences, Department of Biology

<sup>3</sup> Norwegian Institute for Nature Research

Direct effects of hunting on wildlife populations is thoroughly studied, however, due to an increased focus on animal welfare, there is a rising concern of negative non-lethal effects of hunting on individuals. In order to carry out ethical, humane hunting practices, and for the cultural heritage of hunting to prevail, we need to ensure that hunting is carried out with minimum stress to the hunted individuals. In several European countries, including Fennoscandia, mountain hares (*Lepus timidus*) are hunted using hounds. The hound will chase the hare for varying duration, as the hunters attempt to shoot it when it passes by. Alternative ways of hunting hares are by walk-up hunting using a rifle at longer distances or shooting the hare as it flushes using a shotgun. In this study we investigate the non-lethal impacts of hunting on mountain hare through levels of various stress hormones. We utilize two approaches; 1) Comparing blood stress hormone levels of individual hares shot using hounds, versus hares shot not using hounds. 2) Comparing fecal stress hormone levels in local hare populations before and after hunting events using hounds. Hares were sampled during the normal hunting season from September to March of 2020/21 and 2021/22. Lab analysis is to be carried out in August-September 2022.

## Validation of acceleration loggers for quantifying reindeer behaviour

Heidi Rautiainen<sup>1</sup>, Moudud Alam<sup>2</sup>, Paul G. Blackwell<sup>3</sup>, **Anna Skarin**<sup>1</sup>

<sup>1</sup> Department of Animal Nutrition and Management, Swedish University of Agricultural Sciences

<sup>2</sup> School of Information and Engineering, Dalarna University

<sup>3</sup> School of Mathematics & Statistics, University of Sheffield

Animals in the circumpolar north have adapted to the arctic and subarctic winter when forage resources are scarce. In Sami reindeer husbandry, herders rely on reindeers' adaptations to utilize lichens as an energy source in winter. However, due to competing land use and climate change, supplementary feeding has become more common. Warm and wet weather in winter increase ground icing restricting the access to lichens. Supplementary feeding might be beneficial in the short term, but might risk the reindeers' future ability to search for lichens. In this study, our aim was to calibrate and validate a method of automated classification of reindeer fine-scale grazing behaviour when they dig for lichens. We fitted 19 tri-axial accelerometers to quantify behaviour of reindeer and used video recordings to generate a labelled data set. We developed an ethogram classifying 17 behaviours of reindeer with the main categories grazing, browsing, lying, standing and movement. We used 1) random forests 2) support vector machines and 3) hidden Markov models to find the best model to classify acceleration data into our behavioural categories. We were able to develop and validate a method to classify reindeer fine-scale foraging and movement behaviour. Features of inactivity, such as lying and standing, were more difficult to discriminate. To our knowledge Rangifer fine-scale behaviour have not been defined with such detail before. Apart from evaluation of how supplementary feeding affects reindeer grazing behaviour in our ongoing study, our results will enable a wide range of studies to assess reindeer fine-scale resource use.

## White-tailed deer population size estimation in Finland

**Sami Aikio**<sup>1</sup>, *Tuomas Kukko*<sup>1</sup>, *Jyrki Pusenius*<sup>1</sup>

<sup>1</sup> Natural Resources Institute Finland

White-tailed deer (*Odocoileus virginianus*) was introduced in Finland in the 1930's and its population has since increased to c. 125 000 individuals (post-harvest), making it the most important game animal in SW-Finland. Annual hunting bag is decided based on population size estimates that are obtained with a bayesian model of white-tailed deer population dynamics and various indices of population size, productivity and mortality. The data includes harvest numbers since 1960, with sex and age group known since 2000, when the hunters also started reporting local post-harvest population estimates. Collisions between deer and vehicles provide an important index of population size, but data before 2017 are compromised by incomplete reporting and unreliable identification of small cervids (mainly white-tailed deer and roe deer). Lynx population size is included in the model as an index of predation mortality. The reporting of deer sightings during the hunt started in 2021, providing data for the estimation of calf production. The model is used for calculating posterior distributions of population size, sex and age so that the correspondence between the model and the various data as good as possible. Population size is first estimated for the whole country and then allocated to local administrative levels based on the relative size of remaining population in hunters' reports. The model has seen annual improvement since its first implementation in 2016. A major forthcoming change is to model each moose management area separately to account for local variation in processes like calf production and traffic collision risk.

## **Wild boar habitat selection in southern Sweden**

**Evelina Augustsson<sup>1</sup>**

<sup>1</sup> SLU

In Sweden, the wild boar population has increased rapidly since the reintroduction in the 1970s, through escapes from enclosures. The current population size is estimated to > 300,000 animals and the annual hunting bag is > 150,000 animals in 2020. This rise in population size has caused severe damages in agriculture and will potentially cause major problems for the Swedish pig industry if African swine fever (ASF) would spread among the wild boar. Current management action plans aiming to control or handle these challenges require basic knowledge about wild boar habitat selection to be realistic. However, such basic information is still not very well examined at northern latitudes. This study on wild boar habitat selection in Sweden is thus based on 102 GPS collared animals, marked between 2004-2021 throughout southern Sweden. It is a first attempt to investigate wild boar habitat selection in relation to available habitats in a Nordic environment. We use a two-step resource selection function controlling for day or night locations, latitude, hunting bag and human population and our results will be reported and discussed accordingly.

## **“Landscape of stress” for sheep owners in the Swedish wolf region**

**Anders Flykt**<sup>1</sup>, *Ann Eklund*<sup>2</sup>, *Jens Frank*<sup>3</sup>, *Maria Johansson*<sup>2</sup>

<sup>1</sup> Mid Sweden University

<sup>2</sup> Lund University

<sup>3</sup> SLU Grimsö Wildlife Research Station

The presence of predators in an ecosystem will influence prey animal behaviour, and in a similar way may impact the well-being of people who perceive predators as a risk. Re-analysing previously collected materials from interviews with sheep owners within the Swedish wolf range, we were able to abstract statements of stress responses from three psychological domains; cognitive, behavioural and physiological. Cognitive responses to carnivore presence is exemplified by allocation of attentional resources, whereas behavioural responses are often shown as taken actions to prevent attacks on sheep, and physiological responses as for instance belly aches, sleeplessness, or headache. A division of stress responses into these domains could result in a more nuanced understanding of the stress that the presence of large carnivores cause among sheep owners, and could facilitate the understanding of how large carnivores may affect the total life situation of the sheep owner.

## **„Smart Trapping“- Comparison of different trap surveillance- and electronic trigger methods**

**André Fetzer<sup>1</sup>** , *Johannes Lang<sup>1</sup>*, *Katharina Mareike Westhoff<sup>1</sup>*, *Prof. Dr. Michael Lierz<sup>1</sup>*

<sup>1</sup> Justus-Liebig-University Giessen, Clinic for Birds, Reptiles, Amphibians und Fish, Working Group for Wildlife Research

In wildlife research and management, it is often necessary to carry out selective capture events for specific individuals. In addition, present events, like the spread of African swine fever, have required actions to reduce wild boar (*Sus scrofa*) numbers to a minimum. Trapping wild boar can be an essential tool for their management. Within an animal welfare research project for wild boar trapping in Hesse/Germany, it was possible to test and gain experience with different surveillance and electronic trigger systems for remote trapping. However, these methods could be used for any selective trapping attempt.

This study evaluates the advantages and disadvantages of wireless trail cameras, LTE surveillance video cameras and the use . The practicability and cost effectiveness of the different solutions are discussed. Mobile routers are capable to create Wi-Fi networks at remote trapping sites and create a wide variety of possibilities for surveillance. In addition, several application possibilities for GSM-relays and remote triggers to close trap gates are presented, and reliable combinations of different devices on the ground are shown. Especially a novel system for remote trapping is presented. The costs and benefits of those units are compared to conventional methods such as automatic triggers and manual cord triggers.

Modern technic cannot replace expert knowledge for capturing wildlife, but it can simplify the operational process. Furthermore, it can also help to improve animal welfare. Some of the presented technical devices are cost-effective options not only to support conventional methods but also to replace them.