

35th European
Mustelid
Colloquium
24-27 September 2024
Cluj-Napoca, Romania

35th European Mustelid Colloquium
Book of Abstracts

European mink: ©ZooFanatic

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Welcome

We are delighted to welcome you all to the 35th European Mustelid Colloquium in Cluj-Napoca, Romania.

This is the first time the Colloquium has been held in Romania – the Organising Committee felt that it was important to bring the Colloquium back to eastern Europe and that Romania would be an excellent host country. This also provides an opportunity to highlight the latest conservation and research effort directed towards the recovery of the critically endangered European mink in Romania and elsewhere in Europe with extant populations. The opening session of the Colloquium focuses on the conservation of European mink.

We are looking forward to hearing more than 35 oral presentations and viewing more than 20 poster presentations, as well as meeting colleagues and friends during the conference. We hope you have an enjoyable time and find the Colloquium an excellent opportunity to meet colleagues old and new, share research, and explore opportunities for future research and collaboration.

The 35th European Mustelid Colloquium has been another collaborative effort, this time between British and Romanian colleagues from Vincent Wildlife Trust, Romanian Wilderness Society, Fauna & Flora and University of Agricultural Science and Veterinary Medicine of Cluj-Napoca.

We are very grateful to members of the Scientific Committee, who reviewed the submitted abstracts.

Steve Carter and Katherine McBride (Vincent Wildlife Trust, UK) on behalf of the Organising Committee.

We are also very grateful to the Colloquium's sponsor, Wildlife Management Consulting srl



Committees

Organising committee

- Steve Carter Vincent Wildlife Trust
- Katherine McBride Vincent Wildlife Trust
- Julia Bracewell Vincent Wildlife Trust
- Alexandra Duma Romanian Wilderness Society
- Alexandru Bulacu Romanian Wilderness Society
- Adrian Hagatis Romanian Wilderness Society
- Mihaela Faur Fauna & Flora
- Iain Trewby Fauna & Flora
- Andrei Mihalca University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Scientific committee

- Prof Margarida Santos-Reis University of Lisbon, Portugal
- Prof Tim Hofmeester Swedish University of Agricultural Sciences, Sweden
- Prof Izabela Wierzbowska Jagiellonian University, Poland
- Prof Robbie McDonald University of Exeter, UK
- Prof Andrei Mihalca University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania
- Dr Morten Elmeros Aarhus University, Denmark
- Dr Iain Trewby Fauna & Flora, Romania
- Dr Steve Carter Vincent Wildlife Trust, UK
- Dr Jenny MacPherson Vincent Wildlife Trust, UK
- Dr Patrick Wright Wright Wildlife Consultancy, France

Important information

The Colloquium — Regele Ferdinand Amphitheatre and Blue Amphitheatre

University of Agricultural Sciences and Veterinary Medicine (USAMV)

Calea Mănăştur 3-5, 400372, Cluj-Napoca, Romania

Registration

Please register on arrival at the conference — the registration desk will be in the entrance of the Regele Ferdinand Amphitheatre at USAMV.

Registration opening hours

Tuesday 24 September 16:00–17:00 and Wednesday 25 September 08:00–09:00

If you arrive later than 17:00 on Tuesday, someone from the poster session may be available to register you.

Colloquium Welcome Reception and Poster Session

17:00–19:00 Tuesday 24 September

Regele Ferdinand Amphitheatre at USAMV

If you are presenting a poster, please bring it to the registration desk in the Regele Ferdinand Amphitheatre between 16:00 - 17:00 and volunteers will be available to help you set up. Authors are asked to stand beside their posters during the poster session.

Field Trip — Turda Gorge

9:00–16:00 Thursday 26 September

The field trip to Turda Gorge is only available to those who booked onto it when registering. Transport to the field trip is provided by coach. Please meet outside the entrance of the Regele Ferdinand Amphitheatre at 09:00 on Thursday 26 September. We expect to return to the University at 16:00. Lunch will be provided. Please bring suitable footwear and clothing for the terrain and weather, drinking water and any extra snacks you may want during the day. Toilet facilities are available at Turda Gorge.

Important information

Colloquium Dinner and Raffle

19:00 Thursday 26 September
Biodiversity Building at USAMV

Please note the conference dinner is only available to those who booked it when they registered. Unfortunately it will not be possible to book onto the dinner at late notice or on the day.

*The raffle will be held during the Colloquium Dinner with a variety of fun prizes for winners to choose from. Tickets for the raffle will be available to purchase (from 1 Euro) throughout the conference until the dinner and the money raised will go towards the next Colloquium in the form of supporting student prizes or bursaries. **We would like to encourage delegates to bring a small contribution to the raffle prize table - items of a mustelid nature are particularly welcome!***

Student Prizes

We will be awarding prizes for the best student talk and best student poster at the end of the conference.

*The prize for the best student talk is in memory of Dr Aoibheann Gaughran, who tragically passed away at the end of 2021. Aoibheann researched the ranging behaviour of badgers in Ireland and had previously shared her work at the European Mustelid Colloquium. She was awarded the best student talk at the Colloquium in Lyon in 2017, and was later awarded her PhD at Trinity College Dublin in 2018. **We are honoured to award the best student talk in Aoibheann's memory.***

Photography Competition

New for 2024, we plan to hold a mustelid themed photography exhibition and competition. Information has already been shared about the competition, and entrants are invited to bring their photographs (10 x 8 inches, or in their original format to fit on A4 paper) to the conference for display.

Please bring your photograph with you to the registration desk, in a named envelope or with your name on the back.

Please tweet about the event — before, during and after the event! Use **#35EMC**

Keynote speaker biographies



Dr Mihai Marinov

Dr Marinov leads the Centre for the Study of Transborder and Emergent Diseases and Zoonoses, within the Department of Biodiversity Conservation and Sustainable Use of Natural Resources at the Danube Delta National Institute for Research and Development.

His main research interests are the ecology of birds, zoonoses involving birds and mammals in the Danube Delta, wildlife resources and implementation of the Natura 2000 Network in Romania. He is an expert in European mink in the Danube Delta Biosphere Reserve, one of the last remaining strongholds of the critically endangered European mink.



Professor Andrei Mihalca

Professor Mihalca is based at the Department of Parasitology and Parasitic Diseases at the University of Agricultural Sciences and Veterinary Medicine (USAMV) in Cluj-Napoca, Romania. He specialises in the ecology of vectors, including mustelids, and vector-borne diseases, wildlife diseases, tropical parasitology and conservation medicine. He has published more than 230 papers in international peer-reviewed journals and is currently the Chair for Guidelines at the Tropical Council for Companion Animal Parasites and the leader of Capacity Building in VectorNet.

Keynote speaker biographies



Professor Andrzej Zalewski

Professor Zalewski is Leader of the Ecophysiology and Behavioral Ecology Unit of The Mammal Research Institute, an independent scientific research unit of the Polish Academy of Sciences.

His main research fields include the ecology and conservation of carnivores, especially mustelids and their social systems, feeding habits, predator-prey relationships and population regulation. His current research projects focus on:

- 1** Space use and reproduction strategies in solitary carnivores (mainly medium-size mustelids);
- 2** The influence of introduced American mink on native fauna and its competition with native predators.

Professor Zalewski is the author of more than 100 scientific papers as well as books on American mink and Martens. He is also an Associate Editor of the international journal, *Acta Theriologica*.

Colloquium programme

Registration and Welcome Reception — Tuesday 24 September

Venue: Regele Ferdinand Amphitheatre, USAMV

16:00-17:00 Registration at Regele Ferdinand Amphitheatre, USAMV

17:00-19:00 Welcome Reception and Poster Session

Day 1 — Wednesday 25 September Venue: Regele Ferdinand Amphitheatre, USAMV

8:00-9:00 Registration

9:00 **Welcome**

SESSION I: European mink Session chair: Lauren Harrington

9:10	Keynote Lecture 1 Dr. Mihai Marinov Danube Delta National Institute for Research and Development Romania	The conservation status and conservation measures of the European Mink in the Danube Delta Biosphere Reserve, Romania
9:55	Asun Gómez	Assessing population reinforcement success in the critically endangered European mink in Spain
10:15	Madis Põdra	Low reproduction success of the critically endangered European mink in the wild in Spain — one more challenge for the species' conservation
10:35	COFFEE BREAK	
11:05	Remi Bodinier	New analytical approaches to studying the spatial ecology of the critically endangered European mink in France and implications for its conservation (Student talk)
11:25	Romain Beaubert and Sylvain Fagart	Underpasses on road infrastructures: a major action to reduce road collisions for the European mink, a critically endangered species
11:45	Andrea Marin Sierra	Behavioural clues from captive European mink: can their behaviour show us their welfare state? (Student talk)

SESSION 1 Lightning Talks

12:05	Kairi Kiik	The effect of early social and physical life factors in the stereotypic behaviour of captive male European mink <i>Mustela lutreola</i> — implications for reproductive success
12:10	Yoann Bressan	Knowledge for conservation: where to translocate European mink in France?
12:15	Patrick Wright	A journey towards restoring the European mink to the Romanian Carpathians
12:20	Kristel Nemvalts	Factors affecting female oestrus in European mink <i>ex situ</i> — implications for management
12:25	Lightning Talk Questions	
12:35-13:30	LUNCH	

SESSION 2: Conservation and Ecology Session chair: Morten Elmeros

13:30	Keynote Lecture 2 Prof. Andrei Mihalca University of Agricultural Sciences and Veterinary Medicine (USAMV)	Parasites of mustelids in Europe: what we know and what we don't
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Colloquium programme

Day 1 continued

SESSION 2: Conservation and Ecology Lightning Talks 1

14:15	Luis Miguel Rosalino	Influence of habitat edges on spatial and spatio-temporal occurrence patterns of mesocarnivores in a Eucalyptus plantation dominated landscape
14:20	Fred Slater	Otters and a new road
14:25	Aleksey Oleynikov	Spring seasonal activity peak in martens: possible causes of the phenomenon
14:30	Lightning Talk Questions	

SESSION 2: Conservation and Ecology Lightning Talks 2

14:40	Marcela Alvarenga	Museomics reveals the genetic architecture, evolution and adaptive potential of winter coat colour polymorphism in long-tailed weasels <i>Neogale frenata</i>
14:45	Kate McAney	Establishing a positive attitude to the recovery of the pine marten in Ireland, an arboreal carnivore in the least wooded country in Europe
14:50	Lightning Talk Questions	
15:00	COFFEE BREAK	
15:30	Keira Washtell	Territorial changes of a group-living carnivore in the wake of culling pressures
15:50	Rebecca Shaw	Unravelling historic demographic decline of the British European polecat population (Student talk)
16:10	Beatriz C. Afonso	Are you avoiding me? Effects of wild ungulates on mesocarnivores' activity patterns (Student talk)
16:30	Anna Wereszczuk	The last century of the Anthropocene has influenced body mass changes in mustelids in Europe and North America
16:50	Christelle Bellanger and Estelle Isere-Laoue	French strategy to control American mink populations, adaptations and results on mountain rivers
17:10	End and Closing Remarks	

Day 2 — Thursday 26 September

Field Trip to Turda Gorge and Conference Dinner with raffle

Colloquium programme

Day 3 — Friday 27 September

Venue: Blue Amphitheatre

SESSION 3: Research and Monitoring Methods Session chair: Steve Carter

9:00	Welcome	
9:10	Keynote Lecture 3 Prof. Andrzej Zalewski Mammal Research Institute, Polish Academy of Sciences	The American mink invasion in Europe: unwanted insights into the ecology of mustelids
9:55	Marco Granata	Comparing two camera-trap based methods for small mustelid monitoring in the Italian Alps (Student talk)
10:15	Andrin Dürst	Promotion of stoats <i>Mustela erminea</i> through regional biodiversity conservation projects and small structures in the agricultural landscape (Student talk)
10:35	COFFEE BREAK	
11:05	Samirah Blaauw	Live to fight an otter day: non-invasive conservation genetics of the European otter (Student talk)
11:25	Bastien Thomas and Anthony Le Guen	Using genetic methods to estimate density and genetic diversity in otter populations of the river Orne in Normandy (France)
11:45	Sirma A. Zidarova	A global problem: how can we monitor phantom species of mustelids? (Student talk)

SESSION 3: Lightning Talks 1

12:05	Santiago Palazón	The Western polecat recovery project in Catalonia, NE Spain
12:10	Badri Baral	A review of trends in and status of mustelid research in Nepal, Himalayas
12:15	Raluca-Ioana Nedelea	A rare case report of teeth decays in the European badger <i>Meles meles</i> (Student talk)
12:20	Lightning Talk Questions	
12:30	LUNCH	

SESSION 3: Research and Monitoring Methods Session chair: Sam Bremner-Harrison

13:30	Salvador Salvador Allue	The research and monitoring programme of the stoat and least weasel in Catalonia (Student talk)
13:50	Gonçalo Matias	Unveiling the FSC forest certification potential in safeguarding mammal populations (Student talk)

SESSION 3: Lightning Talks 2

14:10	Stephanie Johnstone	Creating a National Pine Marten Monitoring Programme in Britain
14:15	Nathan Chabaud	Using camera traps to survey mesocarnivores in deciduous forest over several seasons (Student talk)
14:20	Lightning Talk Questions	
14:30	COFFEE BREAK	
15:00	Andras Gubanyi	Complex research on polecat species in Hungary
15:20	Denise Karp	Mustelid detection dogs: a non-invasive tool to effectively monitor the presence of mustelids
15:40	Student presentation awards and closing remarks	

A close-up photograph of a European mink's face. The mink has dark brown fur with lighter, tan-colored patches around its eyes and on its muzzle. Its eyes are large, dark, and glossy. The nose is black and prominent. The mouth is slightly open, showing a pinkish-red interior. The background is a blurred, warm-toned surface, possibly wood or stone.

Colloquium Abstracts

European mink

The conservation status and conservation measures of the European mink in the Danube Delta Biosphere Reserve, Romania

Mihai Marinov^{1*}, V. Alexe¹, A. Dorosencu¹, L. Bolboacă¹, P. Pindic¹, A. Banescu¹, C. Anore¹, C. Trifanov¹, J.B. Kiss¹, V. Pocora¹, D. Maftai², A.D. Sándor³, A. D. Mihalca³, G. Chişamera⁴

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Keywords: *European mink; conservation; Danube Delta*

The European mink population in the Danube Delta experienced a range contraction, but also a decline in numbers in the mid-1960s due to large-scale habitat alterations, but also because of increased poaching. The species suffered a significant decline in numbers until the mid-2000s, when about 1,000 European mink were estimated. Population assessments were carried out almost continuously in the Danube Delta Biosphere Reserve from 2003 to 2024.

On the basis of these observations, a distribution map, the population size and conservation measures were established. Thus, a number of 1,470-2,320 individuals were estimated for the period 2019-2023. The overall conservation status of the species was assessed as Unfavourable – Bad. The main reasons were the habitat loss (ca. 13,500 hectares of suitable habitat were converted into agricultural areas); the decline in habitat quality of water banks (due to erosion caused by waves generated by Corsair-type boats with powerful engines); and climate change (desynchronisation of biological processes due to the delay of spring floods by about two-three months in the last five years). The intensity of pressures and threats to European mink were assessed and mapped and 14 measures were proposed to attain the species' favourable conservation status (in terms of populations size) and 16 measures to ensure habitat conservation. In the framework of a major conservation project, the breeding and feeding habitats for European mink have been restored through the construction of 33 platforms with a total area of 113,520m² and the construction of two channels with a total length of 10,497m, while general health status of mink populations was assessed against important diseases affecting the species.

Assessing population reinforcement success in the critically endangered European mink in Spain

Asun Gómez^{1*}, R. Godinho^{2,3}, J. Pinedo¹, D. Lacanal¹, J. López de Luzuriaga¹, J. Duran¹, L. Ruiz¹, I. Galdos¹, M. Pödra¹

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Keywords: *Spain; Mustela lutreola; Endangered species; Conservation translocation*

During the last decades, ex situ conservation and release of captive-born individuals into the wild have become a major element in applied conservation. While there is a large number of studies evaluating effectiveness of reintroductions, information about the success of population reinforcement for endangered species is rather scarce.

A small population of European mink *Mustela lutreola* persists in northern Spain in the Ebro river basin, although it is critically endangered today due to the invasion of the alien American mink *Neogale vison*. The alien mink species occupied nearly 400km of watercourses in this area after 2010, but was eradicated by 2016. As a consequence of the American mink invasion, a significant decline in the European mink population size was observed and reinforcement with captive-bred individuals was planned to facilitate its recovery.

Between 2018 and 2023, 89 European mink were released in the Najerilla river (La Rioja) and the wetlands of Salburua (Alava). Forty-nine mink were radio-tracked during the first three years to evaluate the adaptation of captive-bred mink in the wild. In addition, live-trapping was conducted annually for population monitoring in the two release sites and their surroundings. The released European mink appeared to adapt well to the wild and a positive trend in the population was observed. Furthermore, DNA samples taken from all released and live-trapped individuals confirmed that at least four of the released mink bred in the wild. We conclude that the population reinforcement of the critically endangered European mink may improve its conservation status, but removal of threats and systematic monitoring are both critical components of success.

Low reproduction success of the critically endangered European mink in the wild in Spain – one more challenge for the species' conservation

Madis Põdra^{1*}, J. Pinedo¹, D. Lacanal¹, A. Gómez¹

¹TRAGSATEC, Julian Camarillo 6B, 4A, Madrid, Spain *madis.podra@yahoo.es

Keywords: *Mustela lutreola*; endangered species; radio-tracking; La Rioja

The critically endangered European mink *Mustela lutreola* survives in small and fragmented areas of its historical range. Although the alien American mink *Neogale vison* is the main threat to the species, the small size of the remaining populations makes them susceptible to other threats.

In Spain, the American mink occupied near 400km of the European mink habitat in Ebro basin between 2010 and 2015 (in the provinces of Alava and La Rioja), seriously damaging the native species there. By 2016, it was removed successfully from the area. However, despite this, the European mink population showed no signs of natural recovery. The species' reproductive success was posed as a possible limiting factor to population growth and evaluated between 2021 and 2024 in La Rioja.

Ten female mink were radio-equipped at the beginning of the mating season, between March and early April, and radio-tracked during the next 3-4 months, searching for each individual daily. To estimate offspring presence and number, trail-cameras were installed in the areas where the litters were expected to be present. So far, two females have been found dead, five with kits, and three more continue to be radio-tracked and might whelp soon. The litters were often found in small streams and artificial canals, and consisted of one to two kits (approximately 2-2.5 months old) per female.

In conclusion, reproductive success in this area was lower to that previously described and therefore likely to negatively contribute to the natural recovery of the population. This study sheds light into European mink reproductive biology in the wild and its importance to *in situ* conservation management. Also, it is a valuable reference point for studies aiming to understand offspring behavioral development in the wild and *ex situ* in order to improve welfare and breeding success of captive-bred and translocated individuals.

New analytical approaches to studying the spatial ecology of the critically endangered European mink in France and implications for its conservation

Remi Bodinier^{1*}, R. Beaubert², Y. Bressan³, M. Dupuy¹, S. Fagart², C. Fournier-Chambrillon¹, E. Isère-Laoué¹, D. Jimenez⁴, I. Marchand², S. Aulagnier⁵, S. Devillard^{*6}, P. Fournier^{*1}

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Keywords: *Mustela lutreola*; home range; core area; models, conservation

The European mink *Mustela lutreola* is a critically endangered mustelid species of priority conservation. Improving our knowledge of the species ecology is one of the main key objectives establishing meaningful and highly needed conservation programmes all over the species range.

To set conservation strategies in France, we analysed radiotracking data of two studies carried out in the Landes de Gascogne region between 1996 and 1999 and in the Charente basin from 2020 to 2022 using recent analytical approaches. Data from 17 individuals in three types of environments were used to better understand the spatial ecology of the species.

Home ranges of European mink is often analysed using linear distances of riverbanks. The aim of our study was to identify a surface-based model of the home range which can fit the European mink specialisation for the aquatic environment. We tested different models based on probabilistic approach such as adaptative kernel or based on ecological data, especially to the distribution of wetlands in the landscape. Then, we investigated inter-individual variability of home-range size and shape, for each method. We tested the effects of biotic factors such as sex and age, and abiotic factors such as the period of the year to assess which one mostly trigger home range size and shape. For each method we also determined surfaces within home range of more intensive use, defined as core areas.

Results will provide tools for conserving the most requisite areas to be considered for the species. As part of the planned reintroductions in France, this study will also enable to determine the spatial characteristics of areas over which the released individuals could spread. In this way, the effectiveness of these reintroductions can be assessed and new indications can be given for improving subsequent ones.

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Underpasses on road infrastructures: a major action to reduce road collisions for the European mink, a critically endangered species

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Keywords: *Mustela lutreola*; road infrastructure; collision; underpasses; monitoring

Hydraulic structures unsuitable for the passage of semi-aquatic mammals and roads cutting across large marshes are a major obstacle to European mink's *Mustela lutreola* movement. By creating discontinuity in ecological corridors, they expose European mink to road collisions by forcing them to cross roads instead of walking along banks. Increase in traffic and low density of European mink populations, resulting in high mobility to find a partner, accentuate these risks by creating an excessive mortality rate. In France, road collisions are responsible for two-thirds of European mink carcasses found fortuitously. Reducing road mortality is therefore a priority action of European mink French conservation projects (National Action Plan, LIFE VISON, LIFE KANTAUERIBAI).

Both opportunistic and dedicated strategies complement each other to decrease this risk of mortality with the objective of achieving a large-scale efficiency. Thanks to the commitment of the French departments and, motorway and high-speed line concessionaires, about 400 underpasses have been secured for European mink over the last two decades, securing large-scale strategic areas for the species. In this way, we will present examples of projects carried out to create underpasses in alluvial valleys at a watershed scale.

Upgrading ecological continuity in marshland areas was considered to be technically difficult to fix because of the lengths to be secured and small level difference between road and water. However, an ambitious and innovative project has recently allowed to secure 800m of a deadly road in the Rochefort marshes in the Charente watershed. Technical realisations will be presented and thanks to their monitoring by camera trap, efficiency of underpasses have been confirmed with many contacts of European mink in dry culvert, very few days after field works, as well as many other marsh species.

Given the conservation status of the species, efforts must be continued, particularly in future translocation zones.

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Behavioural clues from captive European mink: can their behaviour show us their welfare state? [Student talk]

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Keywords: *European mink; behaviour; conservation program; environmental enrichment; animal welfare*

The study of animal behaviour is becoming increasingly important in conservation actions. For example, it can improve the success of conservation breeding programmes by enhancing ex-situ re-productive success, post-release survival and overall animal welfare. For critically endangered species, such as the European mink, incorporating behavioural studies is particularly important for ex-situ conservation actions since captivity often negatively impacts behavioural development. Individual differences in behaviour under experimental conditions (eg, novel object test) can determine both reproductive and reintroduction success in this species. However, basic knowledge about European mink individual behavioural differences in time budgets and how these are affected by the addition of welfare-improving environmental enrichment (EE) is unknown.

Therefore, we recorded the 24h behaviour of 27 adult European mink (16 females and 11 males) for at least four consecutive days outside the breeding season. Mink were individually housed in enclosures with a pool and riparian vegetation. Some of them (7 females and 7 males) also have EE (ie, hammocks, tubes, and stumps). Scan sampling was performed every 5 minutes to record the frequency of swim, play, stereotypies, etc. The mink's location within the enclosure, age, sex, and EE type were registered.

The European mink behaviour was characterised by discriminant analyses which showed the following associations: subadult males clustered with the performance of stereotypies and running; subadult females with swimming; and both adult males and females with feeding and inactivity. EE type was not associated with any specific behaviour. Mink used the different locations within their enclosures unevenly ($\chi^2_{14}=163.08$; $p<0.001$), significantly spending more time in the area closest to the keepers' corridor.

Our preliminary results show European mink's individual differences in time budget with sex and age in captivity. Further work will now investigate whether these reflect different welfare states and the potential implications for *ex-situ* and *in-situ* conservation efforts.

The effect of early social and physical life factors in the stereotypic behaviour of captive male European mink *Mustela lutreola* – implications for reproductive success

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Keywords: *stereotypy; separation; mating; sex-ratio*

The early physical and social environment can affect behavioural development. For example, early social isolation triggers the development of stereotypic behaviours (SBs) such as pacing, which have been associated with decreased male mating success in at least one mustelid species. This effect can be ameliorated by providing environmental enrichment, which reduces SBs in several carnivores. Despite implications for improving *ex situ* breeding success, this remains untested in the critically endangered European mink.

We hypothesised that adult male European mink conduct less SB if provided with extra enrichment from birth, and that their SBs are affected by litter parameters (litter size, sex-ratio, the time of separation from the mother and from the whole litter) and negatively correlate with mating success.

We studied the behaviour of 21 adult (1-3 years old) males (10 enriched, E; 11 extra enriched, EE) during the 2024 mating season, all provided with nest boxes, swimming water, enrichment items such as tubes and branches; EE mink could also access platforms and other hanging items where to climb or rest. Mink were observed via CCTV cameras and behaviour scanned every five minutes during their peak activity period (7pm-7am).

SB (%) was calculated out of total active observation. Litter parameters and mating history were obtained from the studbook, with 19/21 males having had at least one mating attempt. Preliminary results show that EE, litter sex-ratio or size did not affect SB or mating success. However, males separated earlier were significantly more likely to have higher levels of SBs as adults (mother: $F_{1,16}=4.93$, $p=0.04$; litter $F_{1,16}=6.56$, $p=0.02$). Further, males with higher SB levels were significantly less likely to successfully mate ($X^2=4.63$, $df=3$, $p=0.03$). These preliminary results indicate that European mink breeding programmes need to carefully consider weaning age, as it might affect the development of SB and mating success.

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Keywords: *European mink; Mustela lutreola; conservation; translocation; France*

The European mink *Mustela lutreola* is the most endangered mustelid in Europe. France has a major responsibility for its conservation as it has one of the last free-ranging native but still decreasing populations. One of the main priority actions of the 3rd National Action Plan (NAP) for European mink (2021-2031) is the definition and implementation of a translocation strategy of individuals born in French breeding centres since 2019. In order to maximise the chances of success of these translocations, a good knowledge is needed to identify the best places to release individuals and how to implement them technically.

Firstly, we deployed a large-scale monitoring program between 2016 and 2024 to identify the current active population nuclei of European mink. In parallel we implemented a monitoring and fighting programme of the American mink *Neogale vison*. This information allows us to choose the best area to welcome a viable translocated European mink population. Then, the methodology for translocation sites' selection was built with the help of the members of the 3rd NAP's Scientific Council. Based on international experiences of translocation programmes, on the knowledge on European mink's ecology and its environmental needs, we defined criteria to choose the translocation area. Crossing these criteria with the local knowledge, we found precise release sites to install acclimatisation enclosures.

All this knowledge was collected with the involvement of many partners: the international experts of countries that have already translocated European mink and other species; the animators of the LIFE VISON 2017-2023 (LPO, GREGE, Conseil Départemental 17); the network of structures carrying out European mink surveys and American mink monitoring; and the animators of the Natura 2000 sites. Thank you to all of them. Now the next step is to carry on the preparation of operations and release our first European mink in 2025!

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Keywords: *European mink; freshwater ecosystems; feasibility study; landscape modelling; habitat restoration; field survey*

The European mink *Mustela lutreola*, is critically endangered and one of the most threatened mammals in Europe, where it is now only found in a fraction of its former range. Our project is assessing the feasibility of restoring this species beyond its last Romanian stronghold in the Danube Delta to the southern Carpathians. The outputs from this project will inform the focus of future projects on either reintroducing or reinforcing the species and managing the habitat to support a viable population.

From published information and expert opinion, we identified eight landscape variables, which were scored based on their expected impact on European mink movement and their habitat preferences. This helped us to assess the habitat available for European mink and its levels of connectivity at a broad scale within Romania, the Carpathians and the focal area where it is possible that a small population could still be present. Understanding that success depends on real-world conditions, two sites were identified for field surveys where we evaluated on-site habitat suitability. We then conducted targeted surveys at two locations using camera traps and live traps to assess species presence. Despite exhaustive efforts, we did not find any evidence of mink presence, either European or the non-native and invasive American mink *Neogale vison*. We also collected faecal and water samples for DNA and eDNA analysis, complementing traditional survey methods.

In summary, our project highlights the importance of adopting a holistic approach that combines landscape modelling with fieldwork and some of the challenges in ensuring the long-term survival of the European mink and the ecosystems it inhabits.

Factors affecting female oestrus in European mink *ex situ* – implications for management

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Keywords: *oestrus; cytology; European mink; captive breeding*

The conservation of the critically endangered European mink *Mustela lutreola* is highly dependent on its captive breeding. Identifying the correct time for mating is crucial, as female mink oestrus might last only a few days. As a seasonal breeding species, mink female oestrus is triggered by photoperiod, and might be also influenced by other seasonal factors such as temperature, as well as body condition, age, and parity. Further, external stressors can impact onset of oestrus and affect reproductive success.

This work aims to investigate whether these factors influence oestrus in 53 captive-born female European mink at Tallinn Zoo (Estonia) during the 2018-2022 breeding seasons. Oestrus was monitored using vaginal cytologies, with samples collected every 1-4 days between March and May. Females were considered to have reached oestrus (oestrus onset) when 75% of cornified cells were present. Oestrus onset (OO) and time to onset was studied in relation to average daily temperature as well as age, body weight, and parity.

Results showed that OO chances increase as days get warmer during the breeding season ($F_{1,190.2}=178.2$, $p<0.001$), and that lighter and heavier females are less likely to reach OO ($F_{1,127.5}=48.11$, $p<0.001$). Neither age, nor parity affected OO. However, females older than three years took longer to reach OO ($F_{6,111.9}=6.53$, $p<0.001$). While year did not appear to affect OO, in years with external disruptions OO was half as synchronised as in other years, as evidenced by differences in standard deviations.

Ongoing analyses aim to replicate these results with data from additional European mink facilities, and assess effects of yearly variations in temperature on female reproductive success to anticipate effects of climate change on wild population recovery.

Colloquium Abstracts

Conservation and Ecology



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Keywords: *parasites; parasite dynamics; mustelids; nematodes*

Despite the ubiquity and diversity of this group of carnivores, surprisingly little research has been done on the parasites of mustelids in contrast to other groups of carnivores in Europe such as felids and canids. This results in serious knowledge gaps on the true diversity of parasites of mustelids, mainly in less accessible species.

Similarly, the dynamics of these parasites is not known, neither the possibly complex interactions with other native or invasive carnivore hosts. Invasive parasites also seem to affect native mustelids, but their impact on these hosts has been rarely been assessed. Parasite dynamics may be affected by the complex environmental and anthropological changes, such as climate and land-use change as well as urbanisation.

Last but not least, parasite prevalence and abundance can be used as a measure for host abundance. The presentation will be focused on several case-studies, with particular focus on nematodes. Lungworms of mustelids have been studied in more detail recently, but the data on their true diversity, full host spectrum and geographical distribution of these parasites remains unknown. Native or vector-borne nematodes such as *Dirofilaria immitis* or *Thelazia callipaeda* affect mustelids and might have an impact on their health or even conservation. Conversely, other parasites, such as the host-specific chewing lice, might require conservation measures together with their co-endangered hosts.

Influence of habitat edges on spatial and spatio-temporal occurrence patterns of mesocarnivores in a Eucalyptus plantation dominated landscape

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Keywords: *Carnivora; edge effects; Mediterranean context; camera-trapping; time use; occupancy*

Human population growth leads to drastic changes in landscape structure that often result in fragmentation. Fragmentation modifies the landscape and divides it into smaller habitat patches, creating habitat edges. These can affect the distribution and abundance of species and influence interspecific interactions. By comparing edges with habitat interiors, we intend to study how or if habitat edges influence mesocarnivores': i) activity patterns, ii) co-occurrence in time, and iii) occupancy.

We used a camera-trapping approach to monitor the mesocarnivore community in two Eucalyptus plantations interspersed with patches of natural habitats, producing a landscape rich in habitat edges. A total of 18 camera traps were placed in each study site, half on habitat edges and half in the interior habitat. We found a higher overlap of the mesocarnivores activity patterns in interior habitat than in habitat edges and a consistent positive effect for edge density on occupancy at both species and community-level.

This study helped to demonstrate that habitat edges contribute to shape mesocarnivores' spatial and temporal behaviour. While spatially all species are positively affected by edges, as they may provide alternative or increase availability of resources, or act as travel corridors, to minimise interspecific interactions in edges, species activity overlap is greater within interior habitats than in edge habitats.

Our findings support the design of better management measures in human-altered ecosystems, such as agricultural areas and forestry plantations, to ensure biodiversity conservation while maintaining economic profitability.

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Keywords: *otter; amphibians; roads*

The river Wye was once one of Wales's cleanest rivers but now suffers the depredations of domestic and agricultural pollution and a concomitant loss of biodiversity. Its once strong otter population has seemed, in the last few decades, to be recovering almost complete loss due largely to pesticides, to a position of relative strength. More recent studies, however, have found that it is no longer as abundant as it once was.

Otters have always seemed to use the Wye as a main highway, diverting into its hinterland as conditions and season demand. Long-term studies have found evidence that otters search out isolated pools and ponds during the spring, particularly so now that food such as eels and crayfish are no longer readily available, and spend more time in nearby reed beds and boggy areas, apparently sometimes breeding there.

The old A470 main north to south road through mid-Wales ran almost parallel to the Wye for some eight kilometres, to be replaced, about a decade ago, by a larger, straighter, faster road with numerous underpasses. Prior to the new road, wildlife road casualties were frequent including otters, but the new road, over the last decade, has had no recorded otter road casualties. The underpasses, from spraint surveys, however, show regular otter use. This has helped quantify the seasonal movement of the animals and has helped verify that usage, and by implication animal abundance, has changed since the road was built. On adjacent sections of the unimproved old A470, otters have continued to be killed, mainly when crossing from nearby bogs and swamps.

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Keywords: *Guloninae species; 'pseudomating season'; seasonal activity; obligate embryonic diapause*

The phenomenon termed 'pseudomating season' was first described for the sable *Martes zibellina* by P.A. Manteifel (1934). The term originated from the erroneous belief that sables mate in February-March. During this period, both in the wild and in captivity, high activity levels were observed among these animals, males sables pursued the females and engaged in false mating. Similar observations were later made for the pine marten *M. martes* and the stone marten *M. foina* in the northern Palearctic region. Our research, conducted using camera traps in Northeast Asia, demonstrated a comparable seasonal activity peak (March-April) for the yellow-throated marten *M. flavigula* (Oleynikov *et al.*, 2023). All these species not only belong to the same family but also exhibit a common trait: obligate embryonic diapause.

Not all data confirm high activity levels in February-March (Zalewski, 2000) – field observations suggest that this phenomenon may not occur annually and is more pronounced at higher latitudes. Therefore, there is a clear need for further, more extensive research into this phenomenon using modern methods and techniques, including studies on other *Guloninae* species (such as North American species). To explain the phenomenon, we propose the following preliminary hypotheses:

- 1 After a harsh winter, as the snow melts and crust forms and air temperatures rise, martens replenish the energy resources depleted over the winter.
- 2 High activity and interactions between sexes represent an evolutionary rudiment of the mating season from a time before diapause was present.
- 3 The phenomenon is associated with changes in hormonal status and subsequent embryo implantation following diapause, which occurs during this period. Additionally, spermatogenesis activation begins in males.

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Museomics reveals the genetic architecture, evolution and adaptive potential of winter coat colour polymorphism in long-tailed weasels *Neogale frenata*

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Keywords: *seasonal coat color change; natural history collections; evolutionary biology; adaptation genomics*

The long-tailed weasel (*Neogale frenata*) is one of three *Mustelidae* species that undergo seasonal color change from summer-brown to winter-white coats. This adaptation enables camouflage throughout the year in regions seasonally covered with snow. Reductions in snow cover duration and extent caused by climate change are predicted to progressively disrupt crypsis of winter-white individuals by increasing colour mismatches with the background and, consequently, predation pressure.

Under this scenario, genetic variation for winter-brown coats is predicted to play an important role in fostering adaptive responses in populations that are declining due to mismatch. It is therefore crucial to understand the genetic basis, origin, and evolutionary history of standing genetic variation for seasonal camouflage within this species. Here, we produced whole-genome and targeted enrichment sequencing data for long-tailed weasel specimens from natural history collections, spanning two winter coat color transition regions within the Western and Eastern United States. We used these data to investigate the genetic architecture and adaptive potential of winter coat colour polymorphism.

Genome-wide association scans indicates that the same gene underlies the white-brown winter polymorphism in both transition zones, but detailed inspection of the genomic region revealed independent candidate amino acid mutations in the Western and Eastern populations. We further explore the evolutionary history of the gene within long-tailed weasel populations and across closely related species, to dissect the origin of the adaptive variants and the processes underlying persistence of this adaptive variation through time.

Our findings illuminate the mechanisms involved in the evolution of this remarkable adaptation in the long-tailed weasel, and provide key insights about the potentially alternative pathways underlying the recurrent evolution of this adaptive trait. Ultimately, this work underscores the value of long-tailed weasels for investigating climate change adaptation through landscape genomics.

Establishing a positive attitude to the recovery of the pine marten in Ireland, an arboreal carnivore in the least wooded country in Europe

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Keywords: *Martes martes*; population recovery; conflict management

In Ireland the pine marten *Martes martes* was at risk of extinction in the 1970s because of the loss of suitable woodland habitat, being trapped for its fur and general persecution. The introduction of legal protection, a ban on the use of strychnine as a poison and the expansion of coniferous plantations have aided its slow recovery. The most recent distribution survey revealed it is now widespread throughout the island, being recorded in all 32 counties on the island (Lawton *et al.*, 2020).

This recovery is not, however, being viewed as a positive biodiversity story by everyone. Concern arose from within the game shooting sector because of predation by pine martens of pheasants being reared in pens. Due to a lack of natal denning sites in trees, female martens are increasingly using occupied human habitations in which to give birth and rear their kits, resulting in complaints about noise and smell. There has also been unsubstantiated media reporting regarding risks to livestock from pine martens.

Vincent Wildlife Trust is working with a range of partners to find solutions to mitigate the evidence-based problems posed by the recovery of the species. This paper describes the actions taken, which includes updating leaflets with advice for householders and game clubs, organising symposia to bring together stakeholders to share experience and concerns, creating a dedicated website (www.pinemarten.ie) and working with a game club to develop a pine marten-proof pheasant pen.

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Territorial changes of a group-living carnivore in the wake of culling pressures

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Keywords: *social perturbation; bait-mark; territory; culling; badger*

In high densities, European badgers form large social groups (typically 3-10 individuals) occupying territories which they defend against neighbouring badgers. They mark their territorial boundaries with communal latrines, which signal their presence to adjacent groups. Since the 1970s, researchers have used 'bait-marking' to identify badger social group territories. The technique involves feeding peanut/syrup bait mixed with different coloured, indigestible, plastic beads (bait-markers) to known social groups. The beads pass through the digestive system of the badgers and are detected in latrines, thus enabling delineation of territorial boundaries.

Wild badgers are vectors for transmission of bovine tuberculosis to cattle, and industry-led culls have been utilised in an attempt to reduce TB infection. Bait-marking has helped to characterise inter-group interactions and inform models of disease transmission. Here we assess whether badger social group territories have been impacted by adjacent badger culling, by analysing bait-marking data collected during a long-term study of a high-density badger population. The study site, located in the southwest of England comprises woodland and farmland covering approximately 7km².

Using bait-marking data collected annually in spring between 2007 and 2023 badger social group territories were visualised as 95% minimum convex polygons (MCPs) in ArcGIS. From 2007 to 2018 the population was undisturbed, while between 2019 - 2023 badger culling took place outside, but within the vicinity, of the study area. Mixed effects modelling revealed both social group territory area and territorial overlap significantly increased in the years of culling. Average social group territory size increased by 20% and percentage overlap increased on average by 44%. This research expands our scientific knowledge of badger social perturbation by creating a base level understanding of spatial change pre and during culling induced reductions, against which future post cull population recovery data can be compared.

Unravelling historic demographic decline of the British European polecat population [Student talk]

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Keywords: *European polecat, introgression, demographic decline, range expansion*

The European polecat has a widespread distribution across much of mainland Europe but is documented to be declining within these ranges¹. Direct persecution led to a severe demographic decline in the British polecat population in the 19th century, however unlike European mainland populations, it is now recovering and increasing in numbers across much of its former range. Protective policies as well as introgression events between polecats and feral domestic ferret are thought to have aided the polecat's revival in Britain. Although weakly deleterious mutations are expected to accumulate in the genome of populations undergoing severe demographic decline, the genomic and conservation implications of such have not been investigated in the European polecat.

Here we carry out population-level whole genome sequencing of 65 Welsh, English and mainland European polecats². Welsh polecats appear genetically distinct and the population has a significantly lower genetic diversity compared to European mainland polecats. We reconstructed the demographic history of the British polecat to quantify the size of the bottleneck. We confirmed the drastic decline of polecat numbers, with a severe genetic bottleneck 40 generations ago. This study determines that the health of the British polecat population could be due to admixture events, but also that the Welsh polecat serves as a distinct genetic population, which could be crucial for the overall conservation of European polecats.

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Are you avoiding me? Effects of wild ungulates on mesocarnivores' activity patterns [Student talk]

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Keywords: *European badger; stone marten; temporal co-occurrence; Portugal*

Wild ungulates have been increasing in the past few decades, particularly in Europe. Land abandonment, among other factors, has fostered the natural expansion of roe deer, red deer and wild boar. They are considered ecosystem engineers since they can modify habitat features such as vegetation structure and soil composition, with potential consequences for the whole ecosystem. Such alterations may induce changes in the spatial and temporal patterns of other wildlife species occurrence.

While some studies have demonstrated the negative impacts of wild ungulates on small mammals, few have focused on their effects on mesocarnivores. To fill this gap, this study aims to 1) understand the effects of wild ungulates' presence on mesocarnivores activity patterns and 2) how environmental factors (anthropogenic disturbance, habitat diversity and composition) shape the temporal overlap between each species pairwise at a large scale.

This study was conducted in continental Portugal and we used the most common mesocarnivore species as models: red fox, stone marten, and European badger. We used a total of 578 cameras between 2020 and 2024, in 24 different study areas, across the whole country. We calculated the coefficient of overlap between each species pairwise per area and used a GLM approach to model the effect of each environmental factor on temporal overlap.

Our results show a mismatch in activity patterns between wild ungulates and mesocarnivores, especially when anthropogenic disturbance is high, while habitat diversity tends to increase the temporal overlap in species occurrence. Human disturbance causes both mesocarnivores and wild ungulates to change their activity patterns to avoid human contact, with different activity peaks. Areas with higher habitat diversity showed greater temporal co-occurrence, probably due to uneven distribution of resources. By promoting habitat heterogeneity, we can promote the coexistence of wild ungulates and mesocarnivores in the context of natural expansion and rewilding initiatives.

The last century of the Anthropocene has influenced body mass changes in mustelids in Europe and North America

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Keywords: *climate change; body mass; mustelids*

Human-induced climatic and environmental changes trigger behavioural responses and morphological changes that facilitate adaptation to changing conditions. One of these traits is body size, which plays a significant role in numerous aspects of animal life and population dynamics. For instance, it affects reproductive success and survival across varying biotic and abiotic conditions. The body mass of many species decreases with latitude, which also suggests a reduction in size with climate warming. However, mustelids are not subject to this rule, and their body mass appears to change inversely and depend on complex factors.

To explain this phenomenon, we designed a comprehensive analysis of body mass changes conducted on seven mustelid species, including the pine marten *Martes martes*, stone marten *M. foina*, American marten *M. americana*, polecat *Mustela putorius*, stoat *M. erminea*, weasel *M. nivalis* and American mink *Neogale vison* across two continents over the past century.

The body mass of different species exhibits varying degrees of increase, which is a dependent function of latitude and the velocity of climate change. This highlights the importance of considering different responses of species when studying animal adaptation to climate and environmental change.

French strategy to control American mink populations, adaptations and results on mountain rivers

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Keywords: *American mink; Neogale vison; conservation; control strategy; France*

American mink *Neogale vison* is one of the principal factors of the western European Mink *Mustela lutreola* population regression. In France, its expansion since the middle of the 20th century has led to three feral populations, one in Brittany, and two in the southwest. The southwest feral population is overlapping a part of the relict area of the European mink until the Spanish border. In order to protect the last western European mink nuclei, a control and fighting strategy has been led since 2015 by the French National Action Plan.

This strategy uses the very specific and effective 'mink raft' method based on monitoring of footprint rafts, then targeted with live-traps when prints are regularly detected. Priority intervention zones have been defined, essentially on colonisation fronts that directly threaten European mink relict nuclei. Currently, more than 700 mink rafts are deployed to implement this strategy and some local adaptations are needed to keep them efficient.

On the Nive and Nivelle rivers, priority zone for limiting emigration to Spain, adaptations to torrential mountain rivers were tested to avoid too much loss of material while keeping trapping possibilities. In this area, a multi-partner intensive control project has been underway since 2018. Approximately 250 rafts have been deployed along almost 300km of river, and 154 American mink were removed between February 2019 and March 2023. A drastic reduction in both number of captures and rafts visited has been observed over time, suggesting a significant decrease in the density of local American mink's population. An eradication on the upper parts of the rivers is suspected. These results corroborate that, despite local adaptations, this method can be deployed intensively in those fluctuating rivers and allows effective control and even possible local eradication of the species.

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Colloquium Abstracts

Research and Monitoring Methods



The American mink invasion in Europe: unwanted insights into the ecology of mustelids

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Keywords: *non-native species; American mink; adaptation; density dynamics*

The ongoing introduction of non-native species often poses a tremendous threat to ecological systems. At the same time, these introductions are unwanted ecological experiments, which may provide important insights into species adaptation, their interactions within a community, and other ecological processes. Studies of introduced species allow for these processes to be observed in real time and their rate measured directly in often replicated experiments due to multiple introductions.

I will explore the history of the American mink introduction in Europe, emphasising the process of their adaptation to new conditions over time and describe factors that have affected mink density dynamics during its expansion. I aim to show the link between morphological adaptation and mink's effect on prey abundance, the risk of pathogen infection in this predator, as well as the response of prey to an increase in predation risk.

Finally, I will discuss the competitive interactions with native and non-native mustelids, acknowledging the inherent uncertainty in disentangling the impact of non-native species from that of other temporally-varying factors.

Comparing two camera-trap based methods for small mustelid monitoring in the Italian Alps [Student talk]

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Keywords: *weasel; stoat; Mustela; camera-trapping; monitoring*

Small mustelids are increasingly recognised as species requiring conservation attention. In Italy, only three papers were dedicated to least weasels *Mustela nivalis* and stoats *Mustela erminea* over the last three decades. In the past, small mustelids were primarily studied using live trapping methods, while today non-invasive techniques are often preferred.

With this study, we compared two camera-based methods to identify the most effective method to study the occurrence of small mustelids in the Italian Alps. From June to October 2023, after superimposing a 700x700m grid on our study area (Maritime Alps Natural Park, NW Italy), we surveyed 36 cells over three separate 45-day sessions. In each cell, we employed 1) an 'Alpine *Mustela*', a foldable PVC box containing a camera trap and a PVC tube (9cm Ø), and 2) an external trail camera, positioned around 30cm above the ground. All devices were located at least 150m from the others, and salmon oil was used as bait in half of the cells. Over 150 survey days, we recorded 73 videos of stoats and 9 videos of weasels.

To compare the methods, we used a single-season Bayesian occupancy model. The detection probability of stoats was higher with unbaited *Mustelas* and baited external cameras. Due to the limited number of detections, we couldn't conduct the same analysis for weasels. Moreover, bait use positively affected the number of non-target videos. In this study, unbaited *Mustelas* and baited external cameras demonstrated reliable performance in detecting stoats. However, with the *Mustela* accomplishing slightly better results with much fewer non-target videos, it emerged as the preferred choice for long-term stoat monitoring. However, given the limitation of our small sample size, these findings warrant further investigation in the Alpine environment.

Promotion of stoats *Mustela erminea* through regional biodiversity conservation projects and small structures in the agricultural landscape

[Student talk]

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Keywords: *camera traps; detection dogs; stoat; small structures; conservation*

Installing small structures such as branch and stone piles in agricultural landscapes is encouraged by conservation experts to improve habitat conditions for biodiversity, in particular reptiles and small mammals. Although stoats *Mustela erminea* and weasels *Mustela nivalis* have been identified as the main target species when installing small structures within regional biodiversity conservation (RBC) projects, no study has quantitatively examined the effect of this measure on mustelids.

To move from expert-based to evidence-based recommendations, we employed camera trap boxes and scat detection dogs to monitor stoats and weasels within 14 RBC projects and 14 paired pseudo-control regions located in Swiss farmland. Our objective was to investigate how small structures and other landscape elements influence the presence of these mustelids.

While 281 sites with and 139 sites without small structures were sampled, mustelid presence was detected only in 26 sites, all with small structures, demonstrating an overall positive effect of RBC projects on stoat populations, but not on weasel populations (only one weasel was recorded). Furthermore, results indicate that stoat occurrence was higher on stone compared to branch piles, and was positively affected by small structures density but negatively affected by forest cover in the surroundings.

Findings provide evidence for the effectiveness of RBC projects in promoting farmland biodiversity and provides practical recommendations for the installation of small structures.

Live to fight an otter day: non-invasive conservation genetics of the European otter [Student talk]

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Keywords: *conservation genetics; non-invasive sampling; otter; mustelid monitoring*

Biodiversity is an important indicator of ecosystem health, underpinned by species richness and diversity. Conservation and management of endangered species such as the European otter is therefore particularly important to preserve biodiversity. The European otter *Lutra lutra* and its habitat are protected by the UN under the European Habitats Directive (EHD) throughout Europe. In Lough Carra, County Mayo, the EU LIFE programme currently underway aims to restore and maintain the unique biodiversity that the catchment area and marl lake offer. This includes protecting the local population of the (native) European otter, as well as the management of the (invasive) American mink, amongst others.

Genetic information can provide valuable insight into the ecology and demographics of the otter population in Lough Carra by means of determining population size, relatedness, habitat requirements and diet. Non-invasively collected samples have become increasingly more important for generating the necessary genetic information on cryptic species such as the otter in lieu of more invasive sample types such as blood or tissue. However, carnivores – and the otter in particular – still pose a challenge when it comes to obtaining good quality DNA from non-invasive samples. This means that there is an urgent need for a non-invasive monitoring method that ensures a high yield and sufficient quality DNA for population genetic analysis of otters.

Different methods for obtaining non-invasive samples such as hair, faeces and even eDNA (water) are currently being tested in the catchment area. The resulting genetic information will aid conservation efforts underway in the catchment area and can better inform management plans for the National Parks and Wildlife Service (NPWS) in order to improve Irish otter population estimates and mink management plans. Not only that, but genetic information resulting from this project can help with establishing a standardised method to survey otters (and other mustelids) across Europe.

Using genetic methods to estimate density and genetic diversity in otter populations of the river Orne in Normandy, France

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Keywords: *Eurasian otter; genetic; density; conservation*

Considered as a harmful species for the major part of the 20th century, the Eurasian otter *Lutra lutra* has widely regressed in France during that period, especially in Normandy where it has almost disappeared. Since it was granted protected species status in 1981, populations have recovered several areas from those where the species was still present. In Normandy, we consider the river Orne as the historic bastion for Otter from which other rivers have been colonised in that region in the last 20 years.

Despite these recolonisations since the early 2000s until 2015, otter seems to have disappeared from many of these rivers. Faced with the fragility of populations threatened by other factors such as road collisions and accidental trapping during regulation operations targeting exotic rodents, it seemed essential to study viability of Norman populations, and more precisely, population density and genetic variability in this recolonisation region.

We conducted a genetic study to assess the minimal number of otters and genetic variability in the middle and downstream of the river Orne. In total, 150 fresh spraints (estimated to be produced less than 72h before sampling) have been collected in 48 different stations stretching over 130km of the main river and its tributaries. Moreover, other information could have been known, such as the gender of individuals and kinship relationships. Afterwards, spraints were sent to Antagene laboratory for genetic analysis.

At this time, spraints are still being analysed by the laboratory. For this reason, final results will be communicated later during the symposium.

A global problem: how can we monitor phantom species of mustelids?

[Student talk]

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Keywords: *Vormela peregusna*; *Mustela eversmanii*; monitoring; food supply; rodents abundance

The marbled polecat *Vormela peregusna* G., 1770 and the steppe polecat *Mustela eversmanii* L., 1827 are among the most threatened and accordingly protected species of *Mustelidae* family in Europe. Their vulnerability is additionally increased by climate change as predictable models evidence for reduction of their suitable habitats and their food resources in future. Being obligate carnivores, they are expected to be quite sensitive to the abundance of their optimal prey, which, in decline, is considered one of the threats to their populations. Nevertheless, both mustelids still aren't subject to successful and effective monitoring due to some of their specific biological and behavioral features. Former efforts evidence that collection of quantitative data required for tracing population tendencies in time is practically impossible.

We present our experience with monitoring these mustelid species in Bulgaria as an example. Besides, we developed and successfully tested a methodology for assessment and monitoring of the primary food resources of *V. peregusna* and *M. eversmanii* based on a simple transect method. The obtained results suggest that in the western part of its range the distribution and abundance of the marbled polecat may not be as reliant on those of *Spermophilus citellus* as traditionally assumed. Great number of *Nannospalax leucodon* and *Microtus* sp. may also provide sufficient food supply to maintain a stable population of this predator.

A number of studies indicate that the populations of the open habitats' rodents that are important food supply for *V. peregusna* and *M. eversmanii* are declining due to climate change and anthropogenic impact. Therefore, we claim that opportune monitoring and conservation of these rodent species are of prime importance for successful long-term management of polecats' populations. Thus, being simple, inexpensive, non-invasive, and easy-to-use, the proposed methodology is suitable for conservation purposes and national or regional monitoring of the two mustelids.

Acknowledgements

Part of the data collection, summarisation and analysis of available information, as well as participation in the 35th European Mustelid Colloquium, were supported by the National Science Program 'Environmental Protection and Reduction of Risks of Adverse Events and Natural Disasters', approved by the Resolution of the Council of Ministers № 577/17.08.2018 and supported by the Ministry of Education and Science (MES) of Bulgaria (Agreement № Д01-279/03.12.2021). The authors are grateful to all colleagues and non-experts who contributed to the collection of data on the distribution of the species in Bulgaria.

The Western polecat recovery project in Catalonia, NE Spain

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Keywords: *Mustela putorius*; captive breeding; camera trapping

Although the western polecat *Mustela putorius* is not considered globally threatened, the species has suffered severe declines in large parts of Europe. Given the severity of its decline in Catalonia (NE Spain), the polecat was listed as 'Endangered of Extinction' in 2022, and we started a captive breeding programme with four males and five female polecats from central France, northern and central Spain, in two Catalan wildlife centres (El Pont de Suert and Santa Maria de Merlès). Within three years (2021-2023) 17 litters have been produced, with the result of 42 kits.

In parallel, a release program in the wild for the polecats born in captivity has been initiated in two areas: Empordà (NE Catalonia), where a native population of polecats is still found, and Segrià (W Catalonia), where a new population is being founded to become a genetic reservoir. All the polecats were released with microchips. In the first year, (2022) 13 young polecats were released with a model of collar previously used in European mink *Mustela lutreola* that caused injuries in the polecats' necks; in the second year (2023), 12 young polecats were released with no collars, and the tracking was carried out by means of camera trapping exclusively, and animals were tagged with a barcode on the tail. In 2024 we are expecting to release the new born polecats, with GPSs attached to tailor-made collars designed to avoid injuries.

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Keywords: *distribution, Himalayas, mustelids, and Protected Area*

Nepal is Home to 212 Wild Mammals of which 13 species are mustelids. Knowledge about biodiversity remains inadequate and plagued by the Linnean and Wallacean shortfalls. Overall mustelid studies in Nepal are at the state of infancy. Scientific studies primarily focusing on any species is lacking. Chronicled records on mustelids are based on observational data, and only sketchy information is known about the mustelid distribution in the Himalayas in its range. Allied to this, there are a few shreds of mustelid occurrence in Nepal and paucity of distribution data and conservation efforts for the species.

A total of 14 publication recorded 21 authenticated observational record localities of four species of Mustelinae: mountain weasels, yellow bellied weasel, Siberian weasel, Steppe polecat presence, six publications recorded six distributional records of large toothed ferret badger, one publication recorded one distributional record of stone marten and four publications recorded yellow throated martens from 22 districts (during 2013-2020), two publications report on four distributional records of honey badger from its range in the country.

Concomitantly, a total of 33 scientific publications on otters of Nepal; (nine authenticated report on the distribution and habitat of smooth coated otter, three on Eurasian otter, two reports on legal trade, one on threats, four on outreach and capacity enhancement, four dissertations, four review paper and five reports on cross cutting of otter and their habitat) and 16 technical reports (proceedings, book chapter, action plan, book) have been reported from the library of Himalayan Otter Network. Few localities with unverified evidences report on availability of mustelids in the country.

Of 20 protected areas of Nepal, there are a published record of ten species belonging to five sub family species of mustelids (*Guloninae*, *Helictidinae*, *Lutrinae*, *Mellivorinae* and *Mustelinae*) from fourteen Protected Areas: namely Annapurna Conservation Area, Api Nampa Conservation Area, Banke National Park, Bardiya National Park, Chitwan National Park, Dhorpatan Hunting Reserve, Gauri Shanker Conservation Area, Langtang National Park, Makalu Barun National Park, Manaslu Conservation Area, Parsa National Park, Sagarmatha National Park, Shivapuri Nagarjun National Park, and Shuklaphanta National Park.

The present works attempts to provides discussion on the previous records from the country, emphasising the need for field assessments, accurate biogeographical interpretations and subsequent conservation strategies to address such data gaps and present a more realistic picture of mustelid distribution in the country.

A rare case report of teeth decays in the European badger *Meles meles*

[Student talk]

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Keywords: *carnivores; teeth; caries; badgers*

Dental pathologies in badgers are a subject for which studies are warranted. Teeth caries have a multifactorial dental pathology. Factors involved are bacteria, diet, oral hygiene and local conditions. One of the determining factors in their aetiology is processed food. Bacterial factors involved in the apparition of teeth decays are saccharolytic acid-producing bacteria, usually *Streptococcus mutans* and *S. sanguis*. The structure of the enamel, local pH, and oral hygiene play a significant role in the appearance of the teeth decays. Tooth decay in carnivores is rarely found in dogs and even less in other species.

This study aimed to investigate the dental findings in European badgers *Meles meles* from Transylvania, Romania. This is a subject that has not been extensively explored yet. Fifteen skulls of road-killed badgers were post-mortem clinically and radiologically examined. The permanent dentition in badgers has 36 teeth. Five skulls presented an angulation of the second mandibular molar's central axis compared to the first one. Three of the five individuals had an angulation that positioned the second molar's mesial vestibular ridge below the first one's cemento-enamel limit. This angulation favours the accumulation of food and fermentation of the food scraps, inducing a local acid PH and creating conditions for developing dental caries. In this context, one skull presented bilateral teeth decays between the mandibular molars. The first molars presented on the distal side of the crowns simple caries. The second molars, on the mesial sides of the crowns presented complicated with periapical pathology.

This study reports teeth decays in *Meles meles*, and opens new perspectives on dental pathologies in badgers.

The research and monitoring programme of the stoat and least weasel in Catalonia [student talk]

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Keywords: *stoat; least weasel; monitoring; conservation*

Stoats *Mustela erminea* and least weasels *Mustela nivalis* play important roles in ecosystems, mainly as controllers of small mammal populations, but also as sentinel species of global change. The small size, rapid movements, demographic fluctuations, and low densities of these small mustelids make their detection in the field difficult, historically hindering the study and monitoring of their populations. Thanks to the development of new detection techniques, ecological research and long-term monitoring programmes for the stoat and least weasel have been initiated in Catalonia (NE Spain), where both species are classified as Vulnerable.

In Catalonia, stoats are found only at high altitude and are thought to be in decline due to changes induced by global warming. Using enclosed and external cameras in combination with citizen science, we are gathering data on the distribution of stoats and other small mammals found at high altitude, revealing the potential of these species as indicators of the progress of climate change in the mountains.

The least weasel is a ubiquitous species in Catalonia, yet currently rare everywhere. This hinders the development of a monitoring network based on camera trapping, although successful tests have been carried out using *Mustela* enclosed camera traps. Hence, citizen science has proven to be the best source of data for monitoring the species, complemented by opportunistic captures recorded by external cameras.

Unveiling the FSC forest certification potential in safeguarding mammal populations [Student talk]

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Keywords: *Forest certification; Forest Stewardship Council; mammal conservation; Eucalyptus plantations*

Forestry is responsible for 26% of global forest loss. In response to increasing global deforestation, the Forest Stewardship Council (FSC) was established in 1993 to promote responsible management of forest systems. In Portugal, half of the FSC-certified area is homogeneous eucalyptus plantations (EPs; approximately 308,000 ha). These plantations limit the diversity and abundance of vertebrates in general, mainly due to limited food resources and shelter.

Remarkably, no study has investigated how mammal communities inhabiting EPs respond to sustainable forest management under the FSC scheme. Therefore, to investigate the effect of the FSC management scheme on mammals in EPs, we used a multi-regional, multi-species occupancy model to document mammal response to three types of forest management – FSC (n=3), non-FSC (n=2) and protected area (PA; n=2). We deployed 20 camera traps at each study site for 60 consecutive days during the wet and dry seasons.

Mean occupancy was highest in PA (0.50, 0.37-0.63), lower in FSC (0.40, 0.30-0.52), and lowest in nonFSC (0.37, 0.25-0.53). Four out of 10 species-area pairs had occupancy rates that were higher in the PA, mainly forest species such as the stone marten. Species-specific mean occupancy was similar between FSC and non-FSC, although the European badger, roe deer, common genet and Iberian rabbit were more common in non-FSC.

Our results showed that species with forest habits (eg, stone marten and European badger) were more abundant in PAs and nonFSC, highlighting that FSC management criteria may be inappropriate for these species. The non-FSC areas are managed by multiple owners and show heterogeneity between patches in terms of understory vegetation (with dense shrub patches), providing shelter and refuge for these species. We show that more research is needed to improve forestry practices in certified EPs to ensure that they meet sustainable production criteria and biodiversity conservation.

Creating a National Pine Marten Monitoring Programme in Britain

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Keywords: *pine marten; citizen science; monitoring*

Pine martens, *Martes martes*, are wide-ranging mesocarnivores that require vast tracks of suitable habitat to establish robust populations. The species is best managed at the landscape scale across county and country borders and so conservation and land managers require knowledge of the species range and status to prioritise limited resources so that activities can maximise positive impact.

Through the Martens on the Move project, Vincent Wildlife Trust (VWT) is creating a National Pine Marten Monitoring Scheme with professional and volunteer pine marten enthusiasts contributing data from across Britain. Advances in the use of technology for wildlife monitoring have enabled the non-invasive monitoring of den boxes to become an engaging citizen scientist activity, allowing us to dramatically expand the pool of participants.

Data gathered from across the three nations of England, Scotland and Wales is being collected and collated using an ArcGIS based data recording system with contributors interfacing with the Esri Survey123 app.

Using camera traps to survey mesocarnivores in deciduous forest over several seasons [student talk]

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Keywords: *mesocarnivores; camera trap; interspecific interactions; forest; occupancy*

The use of camera-traps in wildlife monitoring has increased sharply over the last twenty years or so in line with technological advances (Burton *et al.*, 2015). These non-invasive tools have various applications, such as estimating species richness, population density and interspecific interactions through the analysis of multi-species activity and occupancy patterns (Sollman, 2018).

Our main objective was to study the evolution of fisher *Pekania pennanti* occupancy over the seasons and to test the hypothesis of fisher avoidance by American marten *Martes americana*. We deployed 50 monitoring stations during two field campaigns running from mid-October to the end of April between 2020 and 2022, in the temperate forest of Quebec (Canada). One camera was installed per station, which were baited and lured. Stations were regularly re-baited, and re-lured if necessary. Photographic data were processed using Timelapse 2 software (Greenberg, 2020).

Numerous mesocarnivore species were detected and identified, including fisher, American marten, ermine *Mustela erminea*, lynx *Lynx canadensis*, fox *Vulpes vulpes*, and canids *Canis lupus*, *Canis latrans*. Our preliminary results show a greater occupation of sites by fisher in winter (season with snow) than in autumn (snow-free season), as well as an apparent lack of avoidance by marten of sites occupied by fisher.

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Complex research on polecat species in Hungary

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Keywords: *polecat; hybridisation; rodenticide residues; wildlife cameras; radio telemetry*

In 2015, the rise in hamster populations led to a notable increase in polecat numbers, providing a unique opportunity for study in Hungary. A comprehensive research project has started on polecat species, focusing on several conservation-relevant issues. These included hybridisation between the steppe polecat *Mustela eversmanii* and the European polecat *M. putorius*, as well as the detection of coumarin-type rodenticide residues.

Significant insights into the previously little-known life history of the polecat were gathered using wildlife cameras. Although telemetric monitoring was attempted, it produced only limited results due to methodological shortcomings. Our current plans include revitalising this research objective using the latest technological advances. A novel automated radio telemetry tracking system has been developed with the purpose of helping biological research and is currently being customised to enable the monitoring of polecats. It facilitates a combination of established radio telemetry technologies with new innovations. The system is designed for high positional tracking accuracy and makes the observation of over a dozen specimen simultaneously possible. One of its key advantages over other systems is the compact formfactor and energy efficiency of the transmitters. The transmitters vary in weight and have a potential lifetime of up to multiple years thanks to the device's remote activation feature.

Utilising this radio telemetry technology, opens new ways to monitor the movement and behaviour of animals and holds great potential in aiding the research of polecats.

Mustelid detection dogs: a non-invasive tool to effectively monitor the presence of mustelids

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Keywords: *detection dogs, monitoring, Lutra lutra, Mustela erminea, Mustela putorius*

Detection dogs are increasingly used to help researchers during data collection. Many mustelid species are notoriously difficult to detect and monitor (Jachowski *et al.* 2024). However, their scats provide us with a multitude of information used for monitoring and conservation (Wasser *et al.* 2004). Our data on otter spraint detection showed that accurately trained detection dogs are able to find up to 6x more samples compared to human searchers (Karp *et al.* 2022). This leads to an extended as well as more balanced dataset, as hard to detect samples are not being overlooked (Karp *et al.* 2022).

The training of stoat scat detection dogs has allowed us to collect data on the occupation of small structures (stone and branch piles) in the Swiss agricultural landscape and simultaneously collect data on stoat scent-marking behaviour (Egloff *et al.* in preparation).

Using the knowledge gained from previous work we plan to combine camera traps and detection dogs in the best possible way to maximise the probability of detection for weasel, stoat and polecat and formulate best practice protocols including training, performance assessment and search methodology for the detection dog method (Karp 2024, Karp & Andrist 2024). Another goal is to provide insights into how long different scats can persist in the environment and thus remain available for detection. This will shed light on the timespan a single survey can cover.

Colloquium Posters



A short history of American mink (*Neogale vison*) in Romania and Republic of Moldova

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Keywords: *American mink; Neogale vison; distribution; invasive species; occurrence*

The development of fur animals was closely tied to market demand for furs. During the socialist period, Romania's fur industry experienced significant growth. At that time, there were 13 mink farms in the country. While most of these farms are now closed, two newly built mink farms continue to operate in Romania after 2010. Additionally, two mink farms were established in the Republic of Moldova during the same period.

Contrastingly, the current population of American mink on fur farms in Romania significantly surpasses that during the socialist era. In the 1980s, the highest national production reached 40,000 American mink heads. However, in 2018, the two Dutch-owned companies amassed a total of 238,085 mink heads, and by 2020, this number decreased to 151,000.

Due to accidental escapes and intentional releases, the American mink is currently the most widespread, potentially invasive mammal in Europe. Introduced for fur farming in the 1920s, it later established itself in the wild after escaping captivity or being illegally released. As a feral species, the American mink poses a threat to native wildlife and biodiversity.

The potential risk of accidental introduction into the natural environment in Romania and the Republic of Moldova remains, given that Brașov County hosts two mink breeding units for fur. These units collectively house over 151,000 individuals.

The evaluation and monitoring of mink farm areas in the past and present is an important starting point to identify potential populations of American mink that have reached the wild environment in Romania and the Republic of Moldova. Fur farms are the main source of spread of the American mink on the territories of Romania and the Republic of Moldova. The accidental escape from the farm in Feldioara in September 2015 is a precedent.

Choosing a bait station for pine marten bib image capture: comparing the Giggler (was Jiggler) and T Sniffer [student poster]

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Keywords: *Pine marten; bib; bait station; Giggler; T Sniffer*

This study compares two bait stations to see if one outperforms the other at capturing clear bib patterns on trail cameras so that individuals can consistently be identified. Capture-recapture analysis can then be used to establish minimum population size. It also contrasts using the video setting with the multi-shot setting on the trail cameras to see which achieves the clearest images.

Currently, two bait station devices – the Jiggler and T Sniffer – used by pine marten ecologists are paired with trail cameras to capture images of pine marten bibs by encouraging them to reach up towards bait. Due to welfare concerns over the metal mesh on the Jiggler and its potential to harm martens, a modified version called a Giggler is being used in this study.

Over the summer of 2024 six of each type of bait station will be distributed in pairs across various locations with known populations of pine martens in the Tweed Valley for one month, and then further west in Dumfries and Galloway for another month. Half of the trail cameras will be set to video and half to multi-shot image capture. The bait will be a mix of peanut butter and sardines, with a smear of fish sauce externally to ensure a far-reaching aroma.

The resulting data will be analysed and a comparison made on the ability of individuals to be identified at each device and trail camera setting.

Time partitioning in mesocarnivore communities from South Namibia: Insights into honey badger competitive abilities

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Keywords: *honey badger; African wildcat; genet; reddish mongoose; mesocarnivores*

As is well known, small carnivores are subject to increased competitive pressure among all other carnivores (Hunter and Caro, 2008). In fact, in order to prevent the dominant carnivore (Smith *et al.*, 2023) from killing them (Palomares and Caro, 1999; Donadio and Buskirk, 2006), they implement several strategies to reduce their competition.

The mechanism used in this regard is partitioning, which, depending on the plasticity of the species, can occur along a temporal, spatial, or trophic axis (Monterroso *et al.*, 2014) emphasising that any lack of clear temporal avoidance does not imply a lack of competition or risk (Smith *et al.*, 2023).

As interspecific competition is crucial to understanding carnivore coexistence and their ability to access limited resources, we decided to study the mesocarnivore community within Canyon Nature Park, southern Namibia, focusing our results on the interaction of honey badger *Mellivora capensis* with African wildcat *Felis lybica*, genet *Genetta genetta* and reddish mongoose *Herpestes sanguineus*.

Preliminary results showed partial overlap in activity rhythms between the honey badger and the wildcat, little overlap with the common genet and no overlap with the activity rhythms of the reddish mongoose. The analyses thus seem to emphasise a temporal avoidance propensity on the part of these species, with peaks of activity concentrated at different times of the night (wildcat vs. honey badger and common genet vs. honey badger).

This study, however, should be regarded as a preliminary investigation of the temporal interactions among mesocarnivores in the Fish River Canyon, and therefore some caution is advised regarding the interpretation of the data obtained. In fact, the relationships among the species examined could also be influenced by other aspects, which were not considered in this study.

Mustelidae community in riparian habitats of rural lowlands

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Keywords: *mustelids; riparian habitats; camera-trap; monitoring; Lutra lutra*

Riparian habitats play an important role as corridors for mustelids, especially in cultivated areas, maintaining biological connections and landscape connectivity. In Italy the knowledge of the distribution of mustelids is poor for most species. We aimed to assess riparian mustelids along Liri river, an area recently re-colonised by Eurasian otters *Lutra lutra* in Central Italy. Secondly, we aimed at updating the current distribution of otter along the river catchment.

The study area was an 80 km-stretch of Liri river crossing a cultivated plain, with fragmented riparian woods. We deployed camera-traps in 14 different sampling sites selected based upon land use, vegetation cover, distance from roads, and accessibility. We also checked the same sites looking for otter signs adopting transect lines.

We detected five mustelids with camera-traps. European badger *Meles meles* and *Martes* spp. had the highest TRs (respectively, 3.4 and 2.9), and we speculate they are the most abundant mustelids in the study area. Weasel *Mustela nivalis* was detected for the first time in the study area with a moderate TR (0.7). Stone marten *Martes foina* and Pine marten *Martes martes* were correctly identified in few circumstances (respective TRs: 0.4, and 0.3). As expected by literature, we obtained very low TR for otters (0.2). We explored the relationship between species TRs with the same 3 environmental variables used for site selection. However, no significant pattern was found. Furthermore, even though the otter was recorded by two camera-traps only, transect lines confirmed its widespread occurrence along Liri river.

This study provides fundamental field observations relevant to update the distribution of middle and small elusive mustelids, valuable for conservation strategies. The presence of mustelids might be affected by other environmental factors in fragmented farm landscapes, such as linear hedges and drainage culverts.

Spatial distribution and niche comparison of *Mustela* species in northwestern Italy [student poster]

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Keywords: *weasel*; *stoat*; *polecat*; ENMs

Northwestern Italy hosts three weasel species: least weasel *Mustela nivalis*, stoat *Mustela erminea*, and Western polecat *Mustela putorius*. The stoat inhabits the Alpine region, the Western polecat the lowlands, while the least weasel is considered more ubiquitous. Due to their elusiveness, little is known about their current distribution and ecological niche characteristics. Therefore, after collecting *Mustela* species records and environmental predictors, we fitted Ecological Niche Models (ENMs) to investigate their distribution and compare their ecological niches.

Data were downloaded from open-source databases (eg, iNaturalist) and requested from regional services, parks and museums. We collected a total of 337 (stoats), 149 (least weasels), and 129 (polecats) recent records (2000-2023). Based on their ecology and after checking for collinearity, we selected 2 topographic, 7 bioclimatic, and 11 land-use variables. Overall, ENMs achieved fair-to-good predictive performances: *M. erminea* (AUC \pm SD = 0.873 ± 0.022); *M. nivalis* (0.743 ± 0.023); *M. putorius* 0.742 ± 0.03).

Stoat habitat suitability increased with slope and with distance from forests. For the least weasel, vineyards and fruit trees had the most important effect, along with rice fields and heterogeneous agricultural areas, habitat suitability increased as the distance from those areas increased. Habitat suitability for Western polecats was molded by rice fields, coniferous forests, and mean temperature in the wettest quarter. Niche overlap analyses reported a slight niche similarity between least weasels and western polecats (Schoener's D = 0.37). The significant niche overlap between least weasels and polecats suggests other factors mitigating their competition.

Importantly, all three ENMs reveal potential threats to the species, with climate change posing a significant risk to stoats due to their Alpine link, and land-use change, specifically intensive agriculture, threatening least weasels and Western polecats.

Towards the conservation of mustelids in Bucharest – a case study on the species that reside in the city

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Keywords: *fauna of Bucharest; conservation status; The Red List IUCN; wildlife conservation*

Mustelids are a group of small predatory mammals that are primarily active at night in Europe. After the fall of the communist regime in Bucharest, many projects in the city were abandoned, creating new habitats for wildlife. Among the habitats discovered, we encountered the stone marten *Martes foina*, pine marten *Martes martes*, European otter *Lutra lutra*, and the weasel *Mustela nivalis* distributed alongside the meadows and rivers that wind their way through the city. We also found the European badger *Meles meles* in the forest in the northern part of Bucharest.

Our study aims to focus more on this sensible group of predators and better understand how the areas are interconnected, resulting in wider and broader habitat and migratory passages and how we can intervene to protect their habitat. The NGO focuses on finding ‘the green oasis’ in the city and protecting them while facilitating the population’s access to green spaces. Hence, our work will focus on the following areas: Văcărești Natural Park, Petricani Meadow, Saulei Valley, Dobroiești Reedbeds, a segment of the Dâmbovița River and Băneasa Forest and the population of mustelids from within this areas.

The mustelids play a crucial role in controlling the rodent population and preventing the spread of diseases in urban areas like Bucharest.

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Conservation measures for the critically endangered European mink *Mustela lutreola* as part of the LIFE KANTAUERIBAI project

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Keywords: *conservation; detection; France; Mustela lutreola; road kill*

LIFE KANTAUERIBAI is a cross-border project coordinated by GAN-NIK (Gestión Ambiental de Navarra) and involving 13 Spanish and French partners. The main objective of this project is to improve the conservation status of species and habitats linked to the fluvial ecosystem of rivers and tributaries flowing into the Bay of Biscay (15 Natura 2000 sites in 5 watershed). Among the target species, the critically endangered European mink *Mustela lutreola* has an important place.

In France, its first objective is to localise potential relict nuclei of the species, using combinations of different indirect detection methods (footprint and hairtrap tunnels, hairtrap tube, 'lutroscope' boxes and camera traps). In May 2024, 18 two-week detection surveys were carried out in two Natura 2000 sites. At the same time, 43 fixed stations have been installed in the three French sites of the project (Nive, Nivelle and Barthes de l'Adour) and will be left in place for at least six months. For the moment, the presence of European mink has not yet been reaffirmed (last data in 2021).

The creation of wildlife underpasses in hydraulic bridges to restore corridors and limit road collisions is also one of its priority actions. For this, all hydraulic structures crossing a watercourse or wetland were mapped and then ranked according to their risk of collision, in order to classify the priority bridges to be upgraded. A total of 4,465 structures have been mapped, and of the 58 presenting a high risk of collision, 11 had priority. Three structures, on a same travel corridor, have already been upgraded with specific underpasses, and three other improvements are already planned.

LIFE KANTAUERIBAI therefore will have an important role for the conservation of the European mink in this border area, and make a significant contribution to the actual French action plan for the species.

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Mustelids as hosts of the parasite *Toxoplasma gondii* in Denmark

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Keywords: *Martes*, *Mustela*, *Meles*, *Lutra*, zoonosis

Denmark is home to seven native mustelid species. The current knowledge on their exposure to pathogens is limited. Statens Serum Institut (SSI) and the University of Aarhus (AU) aim to elucidate the exposure of mustelids to selected pathogens. The zoonotic protozoan parasite *Toxoplasma gondii* can infect most warm-blooded species, but felids is the only known definitive host. High seroprevalence estimates as well as cases of clinical toxoplasmosis have been described in mustelids elsewhere, as well as in other wildlife and in domestic cats in Denmark. Here we present preliminary findings of *T. gondii* in mustelids collected in Denmark.

Carcasses of stoat, weasel, polecat, stone marten, pine marten, otter and badger were collected by a network of volunteers, sampled by AU and analysed by SSI. Blood samples were centrifuged and the supernatant was analysed for antibodies against *T. gondii* with a commercial ELISA kit. Small samples from the apex of the hearts were submitted to DNA extraction on an automated platform. The DNA samples were then analysed by real-time PCR for *T. gondii* DNA. A total of 90 blood samples and 71 of the heart samples have been analysed so far.

Antibodies against *T. gondii* were detected in 65 of the 90 analysed blood samples (72%; 95% confidence interval 62%-80%). Seropositive animals were found within all seven species. *Toxoplasma gondii* DNA was detected in nine of the 71 analysed heart apex samples (13%; 95% confidence interval 7%-22%) with Ct-values ranging from 27 to 39.

Radiotracking the critically endangered European mink *Mustela lutreola*: feedback on the fitting of collars and intraperitoneal transmitters

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Keywords: *radio-collar; injuries; Mustela lutreola; intraperitoneal transmitters; VHF radiotracking*

Several radiotracking studies of the spatial ecology of native European mink *Mustela lutreola* have been carried out in France and Spain over the last 25 years in order to better target conservation measures. Similarly, translocated European mink in Spain, Germany or Estonia have been radiotracked in order to monitor their behavior and adaptation to the environment. However, both morphology and ecology of the species make it difficult to radio tag as it has similar head and neck circumference and because of its semi-aquatic and frequently subterranean behavior patterns.

Feedback from 34 installations of external transmitters on European mink and polecats *Mustela putorius* has shown that all types of collars or harnesses used caused serious neck injuries on more than 50% of the individuals, sometimes fatal. Severe emaciation was also observed in one female and one mink drowned when its collar got stuck in the rocks. Such ethically unacceptable problems have also been observed on American mink *Neogale vison* and invasive Northern raccoon *Procyon lotor* fitted with radio-collars.

Conversely, feedback from over 70 European mink and polecat intraperitoneal transmitters implantations or re-implantations has revealed minor problems on only four occasions. Once placed, intraperitoneal transmitters do not distort the animal's conformation and their volume in the abdomen is fairly close to the size of faeces. Monitoring carried out on females during the breeding season confirms that the materials were harmless to reproduction. In addition, several individuals were recaptured several years after the transmitter was fitted, up to 4.5 years for one female, showing the absence of long-term impact.

With up to eight months monitoring periods – similar to radio-collars – at present, intra-peritoneal transmitters appear to be the best solution for radiotracking European mink with reference to animal welfare. Zschille *et al.* also recommend implanted transmitters for long-term telemetry studies on American mink.

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Keywords: *European mink; American mink; distribution*

We are currently tasked with updating the IUCN Red List status assessment for the European mink. There is little doubt that ‘Critically Endangered’ is the correct status for the species but it is not only the highly fragmented distribution and the small populations that are alarmingly – it is also the lack of the robust up-to-date information. Even the largest remaining populations lack precise population estimates; records from across European (Western) Russia, previously considered the most extensive part of the current range of the species, are sparse. Here we present what is currently known of European mink range and population size – our aim is to reveal gaps in our knowledge, to highlight the enormity of the threat of American mink across Europe, and to encourage joined-up planning and action to save this threatened species before it is too late.

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Maximise efficiency and precision when monitoring Eurasian otters *Lutra lutra* by considering survey method and habitat features

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Keywords: *Lutra lutra*; detection dogs; citizen science; ecomorphology; monitoring

As an elusive species, the distribution of the Eurasian otter *Lutra lutra* is recorded through indirect indices. In Europe, otters are typically surveyed by walking along 600m sections (transects) of water bodies within 5x5km squares, where bridges and banks are searched for spraint and footprints. The surveys are conducted by experts, volunteers or, more recently, with the help of professionally trained detection dogs.

However, it is not known how these survey methods differ in terms of spraint detection probability and how the ecomorphology of a water body affects the probability of detection. These questions are likely to be relevant for future otter surveys in Switzerland and Europe. We investigated these questions by conducting transect and bridge surveys where volunteers, experts and detection dogs each searched 600m transects on the same day. The probability of detection was then compared for individual finds and for the entire transect, taking into account the ecomorphology at the location of the find. We also recorded the distance at which otters deposited spraint.

Detection dogs found the most spraints and correctly identified the most transects as occupied. The detection probability for volunteers and experts did not differ significantly, but it was significantly lower than that of detection dogs. All methods had a higher detection probability in near-natural water sections. Otters marked preferentially and at shorter distances in near-natural environments. Therefore, priority should be given to near-natural sections when searching transects.

With this work, we lay the foundation for habitat-specific otter surveys aiming to increase efficiency as well as precision. An alternative possibility is to search bridges, which is faster and less disruptive. How many suitable bridges are needed to determine the presence of otters without searching transects is still unclear and requires further investigation.

Habitat studies and detection methods of the Eurasian otter *Lutra lutra* in Southwestern Leipzig

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Keywords: *Eurasian otter; habitat preferences; detection methods; occupancy model*

The Eurasian otter *Lutra lutra* is a protected species in Europe, requiring continuous research on its distribution and habitat preferences to develop effective conservation measures and integrate them into restoration projects. This study investigates the presence of otters across 15 water body locations in southwestern Leipzig, distributed in eight different districts of the county.

The objective of this study is to determine the habitat use of the Eurasian otter using camera traps, transect surveys with detection dogs, and bridge survey methods. It aims to compare detection methods and develop an occupancy model to estimate detection probability and occupancy of otters at each site.

At each of the 15 sites, camera traps were deployed for an average of 27.8 days to document otter movements. Additionally, standardised transect surveys (3x200m) with a detection dog were conducted, and bridge areas were searched for otter spraints. Habitat and structural parameters of the water body, along the shore and in the surrounding area were recorded, along with potential threats to the otter in the environment.

Otters were detected at five sites using camera traps, at 13 sites on at least one of the transects, and at seven sites using the bridge survey method. Habitat parameters were used as covariates to calculate occupancy probability using an occupancy model. Results indicated that the detection probability of the camera traps was influenced by several parameters, whereas the detection probability with the detection dog was almost unaffected by these parameters.

The combination of various detection methods provides a reliable means of assessing otter presence. The transect survey with a detection dog proved to be the most successful detection method. The results offer crucial insights into the habitat use of the Eurasian otter, which are essential for future conservation efforts. The poster will present the factors influencing detection probability. Additionally, occupancy probabilities will be shown in relation to various environmental parameters and their implementation options for conservation.

Is environmental DNA efficient for large-scale monitoring of Western polecat *Mustela putorius*?

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Keywords: *environmental DNA; western polecat; monitoring; genetic primers*

The western polecat *Mustela putorius* is a mesocarnivore with an elusive nature, typically found in riparian habitats and freshwater ecosystems. This solitary mammal is known to inhabit low density populations, making its presence rare and difficult to monitor. In fact, polecat distribution is mostly surveyed with a passive monitoring relying on mortality data obtained from roadkill carcasses. The species is listed in Annex V of the European Habitat Directive 92/43/EEC, obliging EU State Members to report on its distribution and conservation status every six years.

In this study, we evaluated the use of environmental DNA (eDNA) as a method for detecting *M. putorius*. A species-specific amplicon of 130 base pairs was developed for the first time from the CytB (mtDNA) gene and validated through in silico, in vitro, and in situ steps. The assay was tested at 31 freshwater sampling sites in Central Italy, with sampling replicated in 2021 and 2022. Water samples were collected and processed, with DNA extracted and amplified using quantitative PCR (qPCR).

eDNA of the European polecat was detected at 6.5% of the sampled sites (n=2), revealing new locations for the species. Our results demonstrate the potential of eDNA as a sensitive method for detecting this elusive species at a larger scale. While the detection rate for the polecat was lower compared to other semi-aquatic mammals like the otter, the development and testing of our primers have shown high-quality results, reaching a 4 out of 5 level according to standardised classifications. Further improvements, such as increased replicates, consideration of seasonal variations, and environmental factors, are recommended to enhance detection probability. However, our qPCR assay specifically designed for *M. putorius* is now available for routine eDNA species monitoring on a larger scale.

National Polecat Survey 2024-2025: continued recovery of the polecat in Britain?

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Keywords: *Mustela putorius*; citizen science; monitoring

Once common and widespread, the European polecat *Mustela putorius* is a native carnivore to Britain with a long history of human conflict, which resulted in near extinction and confinement of the species to an area of mid-Wales and the Welsh-English border counties. Thanks to a number of factors, including legal protection, the Welsh and English polecat population has been making a comeback since the mid-20th Century.

Vincent Wildlife Trust (VWT) has been monitoring the polecat's recovery with nationwide citizen science surveys spanning Wales, England and Scotland every 10 years since the 1990s. The surveys have demonstrated a gradual range expansion out of Wales to the east, south and north. However, with range expansion comes threats from areas of increased human population density, and hybridisation with feral domestic ferrets *Mustela furo*.

We aim to gather up-to-date distribution data for polecats, to inform future conservation action, through our current National Polecat Survey, running from 2024 until the end of 2025. The project utilises effective communications to engage citizen scientists to record polecat sightings, and presents an opportunity to involve citizen scientists in collecting hair and whisker samples from deceased polecats, for future genetics and dietary research.

To be there or not to be there — that's still the question. The ongoing search for a tiny mysterious predator, the common weasel *Mustela nivalis vulgaris*

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Keywords: *Mustela nivalis vulgaris*, *Mostela*, *detection*

Small mustelids play an important role in ecosystems as specialist predators of rodents. However, due to their small size and elusive behaviour, observing small mustelids is difficult and our knowledge about their population dynamics still limited to inferences based on tracks and signs. The development of enclosed camera-trap systems to study small mustelids in a non-invasive way has changed these conditions and long-term study of the animals is now a possibility.

Since August 2022, we have been conducting a study on the spatial activity of common weasel *Mustela nivalis vulgaris* at the Middachten Estate, a 50ha floodplain area in the Central East part of the Netherlands. This study had two specific aims: 1) to test if we could identify individual weasels to allow density estimation using capture-mark-recapture methods and 2) to study how the spatial occurrence of weasels in the area changed across the seasons. We placed 16 Mostelas – an enclosed camera-trap system – in linear landscape features on average 275m apart and checked and baited the Mostelas with salmon oil every two weeks. Up to Spring 2024, we obtained more than 600 weasel observations over a period of almost two years.

Preliminary analyses show an increase in observations in late summer/autumn and we have been able to identify at least eight individuals. Our initial results confirm earlier studies showing that detection probabilities of weasels in Mostelas are highest at the end of summer/beginning of autumn. Furthermore, we confirmed the idea that common weasels can be identified from their spot patterns. We are planning to conduct capture-mark-recapture analyses on these data as well as dynamic occupancy models to study how the spatial occurrence and density of weasels changed over time.

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Keywords: *pine marten; engagement; habitat enhancement; landscape-scale recovery*

The restoration of quality habitat will continue to play a key role in the recovery of biodiversity in the British Isles. As work to restore nature across the whole landscape is recognised as being necessary to accomplish effective habitat improvements, new approaches are needed to make the case for landscape-scale recovery and to engage and empower people to make effective change.

As a recovering predator that requires hundreds of hectares of quality habitat, particularly woodland, the pine marten is an ambassador species for landscape-scale recovery in Britain. The development of three 'Pine Marten Havens', publicly-accessible information and habitat-enhancement sites, is presented here as a case study in approaching carnivore conservation through the lens of community and multi-stakeholder engagement.

These sites, located across Britain in ancient woodland, commercial forestry and mixed agricultural-use landscapes respectively, will showcase habitat enhancement works that benefit both pine martens and the diverse prey and plant base required to support them. The areas around Haven sites will be enhanced by increasing structural and floristic diversity, particularly through the planting of native edible fruiting species and installing artificial den boxes. Wildlife hides and interpretation trails will provide visitors with information about pine martens and the wider ecosystems that support them.

Actively engaging communities and stakeholders in sites that demonstrate how woodland areas can be diversified and connected to benefit wildlife is an important part of creating the best possible conditions for the success of pine martens in the long term. As habitat quality improves across landscapes, populations can thrive and reach their natural carrying capacity.

Competitive overlap between sable *Martes zibellina* and yellow-throated marten *Martes Charronia flavigula*

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Keywords: *sable; yellow-throated marten; ecological niches; interspecific competition*

The sable *Martes zibellina* and the yellow-throated marten *Martes Charronia flavigula* share a common evolutionary history and are classified within the same genus, *Martes*. However, their relatedness remains debated. The distribution range of the sable predominantly encompasses the boreal forests of the Northeastern Palearctic, while the yellow-throated marten inhabits the subtropical forests of Southeast Asia.

In the mixed coniferous-broadleaf forests of Northeastern Asia, the southern sable's range and the northern yellow-throated marten's range overlap across approximately 28 million hectares. Given their body sizes differ by a factor of 2-3, and both are semi-arboreal with a similar diet, they are expected to exhibit high interspecific competition and ecological niche overlap. Documented cases of direct antagonism corroborate this. However, competitive exclusion does not apply, as they have coexisted over an extended period, indicating effective niche differentiation mechanisms that reduce interspecific competition.

Both species inhabit forested habitats, preferring mountainous mixed forests, although their spatial distribution patterns vary. The yellow-throated marten predominantly exhibits diurnal activity, while the sable is primarily polyphasic. They are mainly carnivorous, with a significant seasonal proportion of plant-based foods. The larger body size and complex social organisation of the yellow-throated marten enable it to procure relatively larger prey, whereas the sable's diet primarily consists of murine rodents. Yellow-throated martens are more adapted to hunting in tree canopies and hollows, where they spend considerable time.

Species-specific preferences in spatial distribution also exist. Spatial distribution modeling data indicate different preferences, including varying tolerance to snow depth. Additionally, their tolerance for minimal temperatures during the coldest month and maximal temperatures during the warmest month differs. Yellow-throated martens prefer valleys of large rivers and adjacent slopes, whereas sables avoid them.

Thus, the ecological characteristics of these closely related species, shaped partly through coexistence in the sympatric zone, mitigate interspecific competition and allow them to occupy similar ecological niches.

Small mustelids in peril: investigating detection, abundance and ecology in the Netherlands [Student Poster]

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Keywords: *Mustela*; conservation; monitoring; camera trapping; telemetry

Small mustelids of the *Mustela* genus within the *Mustelidae* family are widespread across the northern hemisphere and parts of the southern hemisphere. In recent years, they have become an increasing conservation concern due to suggested declining populations.

The three small mustelid species that occur in the Netherlands – the European polecat *Mustela putorius*, stoat *Mustela erminea*, and common weasel *Mustela nivalis* – have been suggested to be declining in either range or population numbers across their European range. In the Netherlands, the conservation status of the European polecat and stoat has been listed as ‘vulnerable’ and the common weasel as ‘near threatened’ on the national red list, following IUCN standards.

With rising conservation concerns, there is need for more research on small mustelids occurring in the Netherlands to estimate population distribution and size, and to effectively apply conservation methods. Hence, our project focuses on four different topics which will hopefully prove useful in the protection of these three illusive species.

Our study takes place in areas in the north of the Netherlands, consisting of Natura2000 nature reserves and meadow-bird conservation habitat. First, we tested three different camera-trapping methods to examine which method most efficiently detected the different species. The results of this study will be applied in camera grids in three consecutive years to estimate abundance of the different species. Concurrently, we aim to track stoats with GPS-collars during the camera grid study period to study habitat use and link this to prey and predator abundance and landscape characteristics. Finally, we plan to combine all data to create species distribution models for all three species for the whole of the Netherlands to mark so called ‘small mustelid hotspots’. These models will be compared with national observation models and supplemented with abundance estimates to estimate current number of small mustelids in the Netherlands.

Mitogenomic diversity of the extant population of critically endangered European mink *Mustela lutreola* L., 1761 in the Danube Delta

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Keywords: *conservation genetics; European mink; mitogenome; mtDNA; Mustela lutreola*

This study investigates the mitogenomic diversity of the critically endangered European mink *Mustela lutreola* in the Danube Delta, Romania. DNA samples were obtained from soft tissues and hair bulbs, and genotyped using the genotyping-by-sequencing method. Sequencing was performed on the Illumina MiSeq PE-250 platform. After sequencing, raw reads were processed using Cutadapt and FastQC to ensure high-quality data. Clean reads were then assembled and mapped to the reference mitochondrial genome of the European mink (GenBank Accession No. MW148603).

An equal importance approach was taken for each partition within the complete mitogenome. To identify variable sites, sequences were aligned using Clustal Omega. Genetic diversity within the mitogenome was evaluated based on nucleotide diversity (π), haplotype diversity (h), and the effective number of haplotypes (N_e), considering alignment gaps and segregating sites. The results were compared with those from other European mink populations in Russia, Germany (captive breeding herd), and the French-Spanish region, and discussed in the context of previous genetic studies on the Romanian population.

The study's findings provide important insights into the genetic diversity of the Danube Delta population and form the basis for conservation recommendations. These recommendations aim to enhance conservation efforts and ensure the survival of this critically endangered species.

Molecular and phenotypic discrimination between steppe polecats *M. eversmannii* and European polecats *Mustela putorius* in their Austrian overlap range

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Keywords: *Mustela eversmannii*; *Mustela putorius*; microsatellites; mtDNA; phenotype

Steppe polecats *Mustela eversmannii* are considered declining at least in parts of Europe and are under EU-wide protection. In Austria they are listed in the Annexes II and IV of the 'Flora-Fauna-Habitat Directive'. Their eastern Austrian range overlaps with the range of European Polecats *M. putorius*, with regional syntopic occurrences being confirmed. Typical external phenotypes of either species are clearly different and distinguishable, but several individuals display unclear/intermediate external phenotype, which may indicate hybrids.

We used mitochondrial d-loop sequences and multilocus microsatellite genotyping to

- 1 investigate gene pool differences between the two species, particularly to evaluate the feasibility of non-invasive genetic species assignment;
- 2 estimate the level of potential introgressive hybridisation; and
- 3 to work out a key for discriminating the two species from their external phenotype.

The latter aim was particularly to provide an simple and practical tool for species identification for practical protection and conservation, eg, measures for hunters that use live traps for polecats. Based on 198 European polecats and steppe polecats examined from eastern Austria and polecats from parapatric and allopatric regions, the d-loop sequences did not serve for species distinction as steppe polecat sequences were shared by and nested phylogenetically within those of European polecats, which may indicate mitochondrial capture by European polecats. Microsatellite genotyping, however, enabled unequivocal species distinction in agreement with skull characteristics and identified occasional hybridisation. Based on our individual microsatellite genotypes, we developed a simple key for external species diagnosis as obtained from a few fur characteristics that could be applied to live animals in the field (eg, trapping/camera trapping).

Remote monitoring of live traps: Improving animal welfare by reducing the animals' time in the trap

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Keywords: *Mustela eversmannii*; *Mustela putorius*; microsatellites; mtDNA; phenotype

Live trapping of predatory mammals is used worldwide for a variety of purposes, including hunting, conservation, and research. In this context, animal welfare is increasingly being discussed. One focus is on the time the animal spends in the trap. Electronic trap monitoring systems (trap alarms), if reliable, should help to reduce this time. Since there has been no evaluation of the reliability of available systems and potential time reduction of the animal in the trap, this study was performed.

Four systems were tested during the hunting seasons from 2022 to 2024. The study focuses on the operational reliability of the trap alarms and the time the animals spend in the trap. During the first half of the study, trap operators were not able to view the trap alarm data or messages (simulating non-electronically monitored traps (TG0)), while during the second half of the study, the trap alarm data and messaging service were available to them (TG1). We report preliminary results as of September 2024.

All systems with proper installation and reception reported trigger events correctly. One system was excluded from the study after five months due to multiple server failures and the company's unavailability. Another system experienced one-time reporting delays, which were immediately pointed out by the company. Over all systems, the time the animals spend in the trap was 9.18 ± 6.61 h for TG0 (n = 125) and 6.61 ± 5.25 h for TG1 (n = 131).

Three of the four systems appear to be reliable trap monitoring systems. The better user-friendliness of the established systems counteracts operating errors. Quick response to triggering events can significantly reduce the time animals spend in the trap. Therefore, electronical trap alarms are highly recommended to improve animal welfare during life trapping.

An innovative automated radio telemetry system for real-time animal tracking

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Keywords: *radio telemetry; automated radio-tracking; habitat use monitoring*

A novel automated radio telemetry tracking system has been developed with the purpose of aiding biological research. It facilitates a combination of established radio telemetry technologies with new innovations. It makes tracking the positions of dozens of animals simultaneously possible with high accuracy and low energy cost relative to other solutions such as GPS-based tracking devices. First and foremost, the system is designed for the study of species with small to medium home ranges. Optionally, sensors (eg, temperature, light, humidity) can be installed on the transmitters, which allow for the monitoring of auxiliary data.

The system's transmitters vary in weight, ranging from 0.25 grams to double-digit grams. They are reusable and their batteries can be easily replaced in field conditions. Additionally, we have developed transmitters with a tissue-friendly coating that can be implanted in the body cavities of animals. In each case, the transmitters operate according to a specific program designed based on the research project's objectives. As a result of recent advancements, the transmitters can be activated/deactivated remotely from long distances, leading to a substantial enhancement in battery life and a standby period of multiple years. This innovation allows for new ways to conduct research on a wide variety of animal species, such as the steppe polecat *Mustela eversmanii*.

In the field of conservation biology, this system allows researchers to determine not only the species' habitat preference, but also how they utilise the different habitats. Additionally, by analysing changes in habitat use in response to habitat alterations, researchers can better predict how species might react to environmental shifts, such as habitat degradation due to human activities.

Advancing American mink eradication in England: successes, innovations, and implications for Europe

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Keywords: *invasive species control; American mink (Neogale vison); eradication; collaboration*

Invasive American mink *Neogale vison* (formerly *Neovison vison*) – hereafter ‘mink’ – pose a critical threat to native wildlife across England, especially water voles *Arvicola amphibius* and ground-nesting birds. Effective mink control is essential for biodiversity conservation but is costly and time intensive. We highlight the successful mink eradication efforts by the Waterlife Recovery Trust (WRT) in East Anglia in England and introduce the innovative Mink Mapper app, demonstrating potential benefits for broader European conservation efforts.

The WRT’s comprehensive trapping programme in East Anglia has eradicated mink from an area of over 10,000km². The programme involves the use of electronically-monitored ‘smart’ cage traps and anal gland scent lure. The work is supported by volunteers, local stakeholders and conservation organisations. This coordinated approach led to the extinction of mink in five years and a rapid recovery of water voles and other vulnerable mink prey species.

The WRT mink eradication operation has now been rolled out across 25% of England and serves as a model for similar initiatives across Britain and potentially in other European countries struggling with American mink populations. The combination of community engagement and technological innovation yields cost-effective, humane, targeted eradication within a relatively short period of time.

Another initiative is the Mink Mapper app, a digital tool designed to bring projects together to begin nationwide co-ordination of mink control projects to capitalise on individual project effort. The app highlights not only where effective mink control is being undertaken, but crucially, geographical gaps in control which could serve as hotspots within which mink continue to breed and replenish numbers.

This poster highlights the progress made in England on mink eradication and outlines how these practices can be adapted and implemented to benefit conservation efforts across Europe.

References

<https://minkmapp.uk/>

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Detection of lungworms *Metastrongylidae* in suckling pups of *Mustela putorius* — Is vertical transmission to the pups possible?

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Keywords: *polecat, lungworm, detection*

The polecat lives with a large number of parasites which are not pathogenic if the immune system is intact and often even parasitise completely asymptotically in the organism. However, infections with species-specific parasites such as *Troglotrema acutum* or *Skrjabingylus nasicola*, which live in the paranasal and frontal sinuses, and infections with lungworms (*Crenosoma*, *Aelorostrongylus* and *Angiostrongylus* species) can be problematic.

Although lungworms generally require at least one intermediate host in their development and have a prepatent period (period between infection and the possibility of detection, eg, in faeces) of no less than 21 days, infections with them in polecats *Mustela putorius* have already been detected during the suckling phase (1st to 5th week), when no solid food (eg, snails or other infected intermediate hosts) is ingested. The detection of lungworms can therefore not be explained by the previously known transmission route. Is vertical transmission to puppies possible?