

Interreg  
Vlaanderen-Nederland



Gefinancierd door  
de Europese Unie

Otter over de grens

# European Otter Conference

MARCH 12 & 13, 2026  
ANTWERP, BELGIUM



BOOK OF ABSTRACTS

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# Otterly Amazing: Non-invasive Conservation Genetics of the Eurasian Otter in Ireland.

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Monitoring biodiversity is essential when it comes to ecosystem restoration, protection, and conservation. Genetic sampling has become an integral part of wildlife conservation research, and can provide insight into the ecology and demographics of different species. In Ireland, the Lough Carra catchment (Co. Mayo) is a part of the EU LIFE Program and aims to restore and maintain the unique biodiversity found in the catchment area. Part of this effort to preserve the habitat and its species involves the non-invasive (genetic) monitoring of the Eurasian otter (*Lutra lutra*), which is protected under both Irish legislation and the UN under the European Habitats Directive (EHD). The obtained genetic information from these non-invasive samples can provide insight through relatedness, diet, population size, habitat requirements and threats to both the species and ecosystem. Spraints collected (n=395) at the catchment site were identified as otter (n=304) and sexed (n=276) using (probe-based) qPCR assays, as well as serving as a quality control step to determine which samples were suitable for genotyping (n=125). Microsatellite markers (n=5) are used to identify individual otters by means of genotyping, while metabarcoding was used to look at their diet. Additionally, hair-sampling and environmental DNA (eDNA) are being investigated in order to aid the National Parks and Wildlife Services (NPWS) in optimizing their current monitoring methods for the European otter.

# Overview of the distribution of the Eurasian Otter (*Lutra lutra*) in Bulgaria.

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The Eurasian otter (*Lutra lutra*) is widely distributed and strictly protected in Bulgaria, found in a variety of aquatic environments ranging from large river systems to micro-dams and fish farms, but few studies have investigated its range and habitat preference within the country. This study presents an overview of the species' current distribution, habitat use, threats and conservation challenges, as well as preliminary results from Species Distribution Modelling (SDM) based on observation and monitoring data.

Field observations confirm the presence of otters across most of the country's lowlands and low mountain regions up to ~1500m. Surveys indicate high dependence on artificial water bodies, such as micro-dams and fish farms, serving as important secondary habitats that support high population densities. Despite its strictly protected status, the Eurasian otter faces notable anthropogenic threats in Bulgaria. Unlike much of Europe where traffic accidents are often cited as the primary cause of excess mortality, some data from Bulgaria indicates that poaching around aquaculture facilities remains the leading cause (52%), followed by traffic and drowning in fishing gear. Understanding the distribution of the species through modelling and field observations can help identify and prioritize the conservation of critical corridors and high-risk areas and inform targeted conservation measures and action plans.

# Otters in the City – Opportunities and Challenges

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The resurgence of the Eurasian otter (*Lutra lutra*) across Europe is widely regarded as a conservation success. Yet urban areas often present significant barriers to dispersal and settlement. Despite this, the interaction between otters and cities remains poorly understood. Key questions include: To what extent do urban environments provide suitable habitat, and which factors determine successful establishment or passage? These issues are largely unexplored in Western Europe.

To address this knowledge gap, the Municipality of Breda initiated a study on otter presence and settlement potential in urban settings. The research combines a literature review with a survey targeting otter specialists in European cities where the species already occurs in urban areas. Insights from this survey will inform a reference framework for Breda's ecological ambitions and are summarized in this poster.

## Otters across urban borders

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The city of Breda is developing an ecological corridor that connects key aquatic and riparian habitats, enabling keystone species such as the Eurasian otter (*Lutra lutra*) to move safely through the urban landscape. This corridor links the Biesbosch wetlands with the Mark and Aa of Weerijns rivers and the historic singel system, forming a vital part of the Brabant Nature Network. The project integrates innovative design principles to enhance habitat quality and habitat structure complexity. Features include naturalized banks, submerged passages and strategically placed “stepping stones” for resting and foraging. These measures aim to overcome fragmentation caused by urban infrastructure and recreational pressure. The design applies zoning in time and space to balance ecological needs with human activities. The approach ensures seasonal and spatial differentiation, minimizing disturbance to wildlife while maintaining accessibility for people. By restoring ecological connectivity, the corridor supports biodiversity, improves water quality and creates a greener, more resilient city. The initiative demonstrates how urban planning and nature restoration focused on the otter can coexist, delivering benefits for both wildlife and residents.

## Social-ecological suitability for Eurasian otters (*Lutra lutra*) in urban-dominated landscapes.

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The return of carnivores to areas where they were once driven to extinction provides an opportunity to examine how they interact with various anthropogenic factors and identify which ones most affect their distribution. However, there is still limited understanding of what drives Eurasian otter (*Lutra lutra*) habitat choices at a detailed level across a wide range of human-modified environments. The first part of this PhD project aims to conduct a systematic monitoring of the Eurasian otter in the city-state of Berlin and to assess habitat suitability. Relatedly, we are trying to understand the number of otters occurring in the city by using genetic analysis of the spraints. The IUCN Standard method is time-consuming, and often spraints are overlooked. In this study, we are using an abbreviated survey strategy, the survey underneath bridges - a method that could well suit the urban environment due to the wide and regular distribution of bridges. Afterwards, we will set a framework for determining otters' ecological and social network in urban-dominated landscapes. The whole PhD project consists of three work packages: (1) monitoring and assessment of otter's habitat suitability along a natural-to-urban gradient; (2) constructing a social-ecological network focusing on otters in Berlin and the analysis of its dynamics; and (3) exploration of future qualitative scenarios for otter conservation in Berlin.

## Genetic insights into the Eurasian river otter (*Lutra lutra*) populations in Fennoscandia.

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The Eurasian otter (*Lutra lutra*) is currently considered as Near Threatened at a global scale by the IUCN with the main threats being habitat degradation, pollution and reduced prey availability. While populations seem to be making a comeback in some regions, there remains a critical lack of knowledge on population size and genetic health in many regions including Fennoscandia.

To address this knowledge gap, we have collected samples from throughout the range in Fennoscandia and developed a small panel of highly informative single nucleotide polymorphism (SNPs) for ongoing population monitoring. With the original sequenced samples that span all of Fennoscandia, we used the SNPs to explore population and genetic health, including genetic diversity and signs of inbreeding, effective population size, and population structure which can indicate barriers to dispersal.

Long-term monitoring of Fennoscandian otter populations will focus on non-invasive sampling relying only on environmental spraint (fecal) sampling. Our findings, and ongoing monitoring facilitated by the SNP panel, will play a key role in guiding conservation strategies and ensuring the long-term viability of the Eurasian river otter in Fennoscandia.

## Reintroduction of the otter's 'little cousin', the European mink, in the Netherlands.

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The European mink (*Mustela lutreola*) is a semi-aquatic mustelid, which can be regarded as the 'little cousin' of the European otter (*Lutra lutra*). It is one of the most critically endangered mammals in Europe and it needs urgent conservation actions to ensure its survival. With the disappearance of the invasive American mink (*Neogale vison*) in the Netherlands, one of the European mink's primary threats has been eliminated here, creating an opportunity for its reintroduction. The European mink could also provide an ecological service by preying on invasive American crayfish. Over the past years the Dutch Mammal Society has explored a potential reintroduction through a feasibility study and a habitat suitability analysis. The Netherlands seems to have a considerable number of suitable areas for reintroduction, although their favorability varies depending on factors such as fragmentation and muskrat (*Ondatra zibethicus*) control efforts. Wetland areas in the north of the Netherlands, e.g. the Weerribben-Wieden, were generally identified as the most suitable for a reintroduction. Lowland peat areas in the west with high densities of American crayfish are also good options, although fragmentation and the high intensity of muskrat trapping present notable challenges here. A European mink working group has now been established to advance the development of a reintroduction plan. This plan will include the further ecological groundwork for the reintroduction, an extensive stakeholder analysis and the design of a breeding program. Contacts have been established with zoos, NGOs and land management organizations that have expressed keen interest in the plan.

# A brief history of otters in Europe: from many to *Lutra lutra*

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Today, *Lutra lutra*, or the Eurasian otter, is the only otter species to be found in the wild in Europe, having the largest range of any extant otter species. However, palaeontological evidence sheds a much more complex and diverse history of otters in Europe. A new morphological phylogenetic analysis —arguably the most complete such analysis for fossil otters to date — is presented to unravel the phylogenetic relationships of various fossil otter species that have been described from Europe. This presentation highlights the minute variations in otter dentition as key features to differentiate species, both extant and extinct. The present study highlights not only the past diversity of European otters at the species level, with certain fossil species showing stronger affinities with the Aonychini tribe of small-claw and clawless otters, and the Enhydrini tribe of sea otters, nowadays only known in Africa, Asia, and North America.

Set in a palaeobiogeographical framework, the fossil record of European otters shows a history dating back more than twenty million years, as well as the shifting palaeogeography of mediterranean coastlines as a driver for an incredibly diverse fossil otter fauna in the Neogene and Quaternary Mediterranean realm.

# Sigma Plan – working with nature to keep Flanders safe from flooding

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The Sigma Plan aims to protect Flanders against flooding, restore the estuarine and riverine ecosystems and enhance the valley's climate resilience by providing more space for the Scheldt and its tributaries. To date, a total of 1,420 hectares of tidal and non-tidal wetlands have been restored. An additional 2,240 hectares is currently underway, and work on a further 1,700 hectares will begin in the near future. Most of the project areas are part of the Natura 2000 protected areas network.

Rare and unique is the fresh water tidal nature. By depoldering and creating flood control areas with reduced tides, habitat of typical species is restored, as well as the oxygen, silicium and sediment balance.

Areas that are not affected by the tides are turned into wetlands, where the focus is on habitat for great bittern, spotted crane, corncrake, black-tailed godwit, great crested newt, otter, beaver and so on.

Thanks to the ecosystem restoration and improved water quality, fish stocks start to recover and scientists are counting nowadays 83 species, including twait shad, river lamprey and European eel.

All these evolutions contributed to the return of the otter in the Scheldt estuary. Although there is again food and space for the otter, pollution - both historical and new - and habitat fragmentation are still a major concern. Because wetlands are less prone to pollution than tidal areas, they play a vital role in the otter's future. A future which is still unclear, as reproduction is uncertain and influx from nearby populations limited.

# How central Limburg is supporting the return of the Eurasian otter

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The natural recolonization of the Eurasian otter (*Lutra lutra*) in the south of the Netherlands has progressed slowly compared to other regions. Over the past 15 years, ARK Rewilding Nederland has supported and initiated several projects aimed at promoting the recovery of otter populations in this region. This poster illustrates four points in time along the journey of further expanding the otter population in central Limburg, the Netherlands.

First, suitable habitat and major barriers were mapped to identify where otters could thrive and which obstacles limited safe movement. This analysis provided a clear foundation for targeted conservation actions. Second, several priority bottlenecks were addressed by constructing fauna tunnels and installing ledges along culverts, enabling otters to cross infrastructure safely. Third, environmental DNA (eDNA) monitoring was introduced to detect otter presence. Finally, new research focuses on assessing the area's future potential and monitoring efforts are expanded by searching for spraints and placing wildlife cameras.

Together, these steps outline a continued commitment to strengthen otter populations in central Limburg, providing insights into what has been achieved and what is still needed to secure the species' future in the region.

# Distribution of the otter (*Lutra lutra*) and dynamics of its population in Ukraine at the beginning of the 21<sup>st</sup> Century.

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Previously, otters lived in Ukraine in the water bodies of forest, forest-steppe zones and the Carpathians. In the steppe zone in 1980–1985, they survived on the Dnieper, in the lower reaches of the Southern Bug, Dniester and Danube, as well as on the Siverskyi Donets. In 1987–1988, otters appeared in the south of the Zaporizhzhia region, and in 1990–1995, in many rivers of the Donbas. The construction of the Northern Crimean Canal (1957–1994) and the Kakhovka irrigation system (1967–1991) contributed to the expansion of the range, allowing otters to colonise remote water bodies. Regulation of the Dniester's flow led to the drying up of its delta and the formation of a south-western population.

Despite the deterioration of the hydrochemical characteristics of water bodies and the reduction in the diversity of ichthyofauna, the otter population is growing. In 2000, 8,735 otters were registered, in 2005 — 11,685, in 2010 — 12,232, in 2015 — 13,614, and in 2019 — 13,972. The main cause of mortality (n = 213) is the killing of animals by fish pond owners (75.59%), with only 12.71% killed by poachers. In the 20th century, the southern border of the otter's range reached the coast of the Azov and Black Seas. In 2010–2015, it penetrated the territory of the Crimean Peninsula through the North Crimean Canal, where it had been absent for several thousand years. The reason for the migration and growth of the otter population was the reduction in hunting pressure and the reduction in the duration of ice cover.

## Otters appear to have declined throughout Ireland amid increased pressures on water quality but remain ubiquitous.

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Governments must report on the conservation status of designated species. We assessed changes in the Eurasian otter (*Lutra lutra*) population throughout Ireland (the whole island) from the 1980s to the 2020s using four National Otter Surveys ( $n=6,060$  sites surveyed) and citizen science data ( $n=10,980$  species records). In 2023-24, otters were recorded at 65% [95% CI 62-68%] of sites in the Republic of Ireland (ROI) and 66% [58-74%] in Northern Ireland (NI). Rivers, lakes and coasts were included. Long-term trends in the population estimate indicated a decline of -24% to -27% (or -3% to -18% after correction for negative methodological biases). Short-term trends suggested -7% to +2% in ROI and -26% to -27% in NI. Otters have been recorded in 95% of hectads (10km squares), with no range reduction over time and remain widespread. They prefer large, fast-flowing rivers with rocky substrates, unmaintained banks, and riparian woodlands (trees and shrubs), positively associated with angling (likely due to salmonid prey availability) but negatively associated with peatlands. Eleven pressures were identified, notably site disturbance including agricultural pollution, siltation and water abstraction, which have increased over time. No single pressure threatens otters nationally, but cumulative effects on water quality and ecosystems likely contributed to the decline. Future research should account for potential methodological negative biases disaggregating detection from occupancy probability to more accurately capture the magnitude of any change while future surveys should adopt techniques less vulnerable to biases e.g. environmental DNA detection in water samples.

## Standardization of fauna passages for otters.

### Partners of the interreg project Otter across borders

The Netherlands and Belgium have very dense road networks contributing to the death of many wild animals. In Belgium the amount of road victims is estimated at 6 million individuals per year. In the Netherlands, traffic is the main cause of death for otters.

As otters follow river banks they often encounter obstacles such as bridges or culverts. Otters want to pass these obstacles by land and end up on the road, a deadly situation. These obstacles can be made passable in a safe and otter-friendly manner by installing faunapassages such as tunnels or ledges. In the Netherlands a lot of experience is available regarding these faunapassages for otters. In Belgium they are only just starting to install them.

The partners of the Interreg project 'Otter across borders' were determined to standardize the dimensions, materials and practices for faunapassages in order to speed up tendering and improve sustainability of the projects. Based on two workshops standards for ledges, fences, tunnels and cattle grids were developed. Technical drawings and texts for tendering (in Dutch) are available online to be used by road and waterway managers.

By providing these drawings and texts the offers received for tenders should be more comparable. The realized faunapassage should be effective, sustainable and economically beneficial. Standardizing materials and measurements facilitates maintenance as some basic materials can be immediately replaced during an annual inspection.

## The 'Meetnetten' project: monitoring otter in Flanders by volunteers.

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Commissioned by the Flemish government (Nature and Forest Agency, ANB), the 'Meetnetten' (Monitoring schemes) project maps species of European importance and policy relevance for Flanders. Natuurpunt Studie coordinates the volunteer fieldwork, while the Research Institute for Nature and Forest (INBO) is responsible for the data analysis. By monitoring species over the long term and counting them using standardized protocols, we can determine the extent to which species abundance is advancing or declining. A total of 428 species are monitored within the Meetnetten project, including the otter. Fieldwork for the Otter Monitoring Scheme began in 2020 and involved a total of 60 volunteers searching for signs of otter such as spraints and tracks within pre-defined search areas. Trail cameras were also utilized. Between 2020 and 2024, 93 surveys were conducted across four search areas in Flanders. Otter signs were found during four surveys in two of the search areas. Due to the low detection probability, the search for otter signs has been discontinued. From 2025 onwards, the otter will be monitored professionally using eDNA.

# How genetic structuring explains the national recovery of the Eurasian Otter.

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After a dramatic collapse in the 20th century that fragmented its once continuous distribution, the Eurasian otter (*Lutra lutra*) is now undergoing a remarkable natural recovery across France. Using non-invasive sampling and genotyping at 14 microsatellite loci, we analysed populations at the national scale and identified five to six genetic clusters. Their geographic organisation reflects the locations of modern refugia where remnant populations persisted through the species' demographic bottleneck, yet without exhibiting the severe genetic erosion typically expected after such declines.

Although the genetic structure is clear and spatially coherent, numerous admixed individuals reveal active contact zones and an increasing reconnection among formerly isolated lineages. Long-distance dispersal events and mixing across cluster boundaries underline the species' high mobility and emphasize the central role of hydrological connectivity in facilitating gene flow. This renewed admixture appears to reinforce genetic diversity and may contribute to the current recolonisation dynamics, in a pattern reminiscent of expansion processes observed in species with multiple genetic sources.

Crucially, no evidence of marked genetic depletion or reproductive impairment was detected, despite persistent anthropogenic pressures such as water pollution, habitat degradation and fluctuating prey availability. The French otter recovery thus represents a rare, large-scale example of natural recolonisation in a mammal, sustained by refugial persistence, restored connectivity and enhanced lineage mixing.

These results highlight the species' strong dispersal capacity and evolutionary resilience (traits shared with other recovering European carnivores) and stress the importance of maintaining functional freshwater habitats, sufficient food resources, and ecological corridors to support long-term gene flow within this expanding national population.

# Comparing Vision- and Olfaction-Based Methods for Detecting Otter Presence.

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Since 2017, *Artenspürhunde Schweiz* (Conservation Detection Dogs Switzerland) has been collaborating with *Pro Lutra* to optimise otter monitoring methods, including the use of specially trained conservation detection dogs. Our findings are based on eight years of experience from scientific studies involving six professionally trained and intensively deployed dogs, with two additional dogs currently in training.

The dog teams have demonstrated much higher detection probabilities compared to human observers in our studies: they detect up to six times more spraints along riverbank transects and require only half as many bridge checks compared to human surveyors to confirm otter presence within a grid square. For individual bridges, they reach a 100% detection probability.

These striking study results can only be replicated by other teams if their dog–handler units perform at the same level. To ensure this level of quality, an objective and standardised performance assessment is paramount — not only for the dogs but also for their handlers, who play a crucial role in overall effectiveness.

This poster presents key results from our studies and outlines the performance criteria necessary for reliable deployment of conservation detection dogs in otter monitoring.

# Conservation Status and Emerging Challenges for the Eurasian Otter (*Lutra lutra*) in Greece

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The Eurasian otter (*Lutra lutra*) is widely distributed across mainland Greece, occupying freshwater, brackish and coastal habitats, but occurs on only three Greek islands—Corfu, Lefkada and Euboea—where populations are small, isolated and fragmented. Greek freshwater systems are highly seasonal, with only ~6% of rivers exhibiting permanent flow, resulting in fragmented habitats and increased dependence on coastal and marine environments.

According to the most recent national assessment under the EU Habitats Directive (Article 17; 2019–2024), for which the authors carried out the national evaluation of the species' conservation status in Greece, the otter maintains a favourable status for range, population and habitat. However, the overall conservation status is classified as Unfavourable–Inadequate (U1) due to uncertain future prospects.

Although otter distribution remains broadly stable in mainland areas and major wetland complexes, environmental pressures are intensifying, particularly on islands and in southern Greece. Climate-driven impacts—prolonged droughts, declining river flows, extended summer water scarcity, extreme weather events and increasing water abstraction—pose a major threat to otter habitats. These pressures are most acute in small, vulnerable freshwater systems, including streams, isolated upland lakes, reservoirs, coastal freshwater ponds, coastal lagoons and river deltas. Additional pressures include habitat fragmentation and destruction, wetland pollution, dam construction and increasing road mortality. Island populations are particularly vulnerable due to their isolation and limited water resources.

This study provides an updated overview of otter conservation in Greece and ongoing research on insular populations in the Ionian and Aegean Seas. A new project on Lefkada, funded by the Ionian Environment Foundation, focuses on island population. Given Greece's position at the southern climatic limit of the species' range, these populations may serve as early indicators of climate-driven impacts on freshwater and coastal ecosystems.

## Otter in Willebroek

Submitted by the province of Antwerp

In 1959, the last otter in Willebroek died. Otters were extinct in Flanders until 2012, when an otter was filmed by a wildlife camera in Broek De Naeyer. Since then he appeared several times on camera. The otter came via the river Rupel. He chose Broek De Naeyer because of the abundance of puddles and streams, the quietness and enough places to hide himself.

The park rangers of the province of Antwerp took several measures to make the otter feel at home. The first measures were:

### **2 paths of 1 km who aren't accessible for public**

- dogs aren't allowed
- mountain bikers are prohibited in this domain

More recently they placed marker stones where animals leave their spraints and they constructed an otter beach to clean his fur. They placed 10 wildlife cameras and changed their location frequently, until they found good spots to film the otter. The videos aren't the only evidence of his presence. They also look for spraints and traces. All the information is shared with the otter network in the interreg project. The otter migrates between adjacent habitats that are separated by a dangerous road. That's why the municipality of Willebroek redesigned this road with fauna tunnels and tubes.

With this story of all our measures, we would like to inspire other conservators of natural environments to preserve otters. Our domain is only 1km<sup>2</sup>, but is successful because of the quietness, enough vegetation to rest and the lack of disturbance.