16TH INTERNATIONAL OTTER CONGRESS

24-28th February 2025, Lima, Peru

Book Of Abstracts

Contents

The Otter Specialist Group (OSG) is part of the Species Survival Commission (SSC) of the International Union for Conservation of Nature (IUCN) and has been leading global otter conservation since 1974

The aims of the IUCN SSC OSG, as set out by the IUCN, are to:

1. Provide leadership for the conservation of all otter species (Lutrinae).
2. Determine and review on a continuing basis the status and needs of otters, and promote the implementation of necessary research, conservation and management programmes by appropriate individuals, organisations and governments.
3. Make known the status and conservation needs of otters, promoting the wise management of otter species.

Every three to four years, the OSG organises an International Otter Congress (IOC), bringing together experienced and new researchers from all over the globe to update knowledge and create strategies to pave the way for the future of otter conservation.

Organisation

Organisation

Organising Committee

Joanna Alfaro, Margherita Bandini, Carlos Calvo Mac, Nicole Duplaix, Max Khoo de Yuan, Shawn Larson, Caroline Leuchtenberger, Anna Loy, Gonzalo Medina Vogel, Simon Rohner

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Program

Monday 24th of February

07:00–07:45	Official congress bus transfer from Miraflores to Universidad Científica del Sur (UCSUR)
07:45–08:45	Participant check-in at the Auditorium "Pabellón 0"
08:45–09:15	**Opening ceremony and welcome remarks** • *Nathaly Vargas* - Universidad Científica del Sur • *Nicole Duplaix and Anna Loy* - IUCN SSC OSG Co-Chairs
09:15–10:00	**Opening Lecture** Gonzalo Medina Vogel - Long standing otter research and conservation in Chile

((Pg 20-25)) Session 1 - Success Stories

Chair - Nicole Duplaix

10:00–10:30	**Invited Speaker:** Klaus Koepfli How genetics and genomics have enriched our understanding of otter biology and phylogeny
10:30–11:00	**coffee break & silent auction**
11:00–12:00	**poster session and silent auction**
12:00–12:15	*Vera de Ferran, Pablo César Hernández-Romero, Klaus-Peter Koepfli, Eduardo Eizirik* – The new otter *Lontra annectens* (Major, 1897): Cryptic Species and Speciation Processes in the Neotropical Otter (*Lontra longicaudis*) complex
12:15–12:30	*Daisuke Waku and Hiroshi Sasaki* - Phylogenetic relationships of otters lived/living in the Japanese archipelago
12:30–12:45	*Alejandro E. J. Valenzuela* - *Lontra felina* in Argentina. Discussion of its presence in the country
12:45–13:00	*Anna Loy* – Fall and rise of the Eurasian otter in Europe. When shared rules make the difference
13:00–14:30	**lunch**

Program

Monday
24th of February

((Pg 27-34)) Session 2 - *In-situ* and *Ex-situ* Conservation Planning and Action

Chairs - Shawn Larson and Tom Serfass

14:30-15:00	**Invited Speaker:** Tim F. Shickora From exhibition to conservation pillar - how the International Giant Otter Alliance makes the world's *ex-situ* population relevant to conservation
15:00-15:15	*Karin Schwartz* - The One Plan Approach for otter conservation: integrating *ex-situ* and *in-situ* conservation action
15:15-15:30	*Laura Rodríguez Medina* - Maintenance and management of neotropical otter under human care in Mexico
15:30-15:45	*Ng Wai Pak, Tee Thye Lim, Pazil Abdul Patah and Chee Yoong Woo* - The status and conservation effort of hairy-nosed otter in Malaysia
15:45-16:00	*Robert B. Wallace et al.* - Identifying spatial conservation priorities for the giant otter (*Pteronura brasiliensis*)
16:00-16:45	**coffee break & silent auction**
16:45-17:00	*Pablo César Hernández-Romero and David A. Prieto-Torres* - The new species *Lontra annectens* in the face of climate change in Mesoamerica
17:00-17:15	*Aleksei Oleinikov* - Conservation of otters in Kazakhstan
17:15-17:30	*Sanjan Thapa and Rajesh Sada, Nicole Duplaix* - Nepal Otter Conservation Action Plan: progress update
18:00-19:00	Official congress bus transfer from Universidad Científica del Sur (UCSUR) to Miraflores

Program

Tuesday 25th of February

08:00-08:45 Official congress bus transfer from Miraflores to Universidad Científica del Sur (UCSUR)

((Pg 36-43))Session 3 - Emerging Threats and Trade

Chair - Caroline Leuchtenberger

09:00-09:15	*Anna Roos and Katarina Loso* - Monitoring otters in Sweden over 50 years, with an update on PFASs in otters 1970-2020
09:15-09:30	*James L. Bodkin, Erin U. Foster, Shawn E. Larson* - How the maritime fur trade influenced our understanding of the biology and ecology of sea otters
09:30-09:45	*Osvaldo Eric Ramírez-Bravo, Martha Anahí Güizado-Rodríguez, Pablo Hernandez-Romero, Isaac Meza-Padilla, and Roxana Iveth Salas Picazo* - Assessing the illegal trade of otters in Mexico: insights from social media, seizure records, and expert perspectives
09:45-10:00	*Chloë Hawthorn, Emily O'Rourke and Elizabeth Chadwick* - Using Eurasian otters as sentinels of freshwater chemical pollution: insights from biomonitoring of PCBs and PFASs
10:00-10:15	*Caroline Leuchtenberger* - The impact of fires and drought on giant otters
10:15-11:00	**coffee break & silent auction**
11:00-12:15	**poster session and silent auction**
12:15-12:30	*Carlos Calvo-Mac, Macarena Barros-Lama, Gonzalo Medina-Vogel* - Pathogen Exposure in the southern river otter (*Lontra provocax*) and marine otter (*Lontra felina*) in Chile
12:30-12:45	*Greice Gonchoroski, Mariana M. Furtado, Lívia de A. Rodrigues, Gabriela R. Duarte, Thales Freitas, and Caroline Leuchtenberger* - Evidence of canine pathogens in giant otters (*Pteronura brasiliensis*): A study from the Pantanal wetlands, Brazil
12:45-13:00	*Adi Barocas, Alejandro Alarcón Pardo, Romina Camus, Claire Marr, David Macdonald* - Impacts of artisanal gold mining on giant otter populations and neotropical freshwater ecosystems

Program

Tuesday 25th of February

13:00–14:30 lunch

((Pg 45-50)) Session 4 - Conflicts and Coexistence

Chair - Gonzalo Medina Vogel

14:30–15:00	**Invited Speaker:** Silvio Marchini The rise of coexistence as a new paradigm in understanding and managing human-wildlife interactions
15:00–15:15	*Kerine Y. L. Leong and Max D. Y. Khoo* - Singapore's Urban Otters: from conservation success to management dilemma
15:15–15:30	*Caroline Leuchtenberger* - Ecotourism with giant otters in the Brazilian Pantanal
15:30–15:45	*María Camila Latorre-Cárdenas, Pablo César Hernández-Romero, Carla Gutiérrez-Rodríguez, and Luciana Porter-Bolland* - Evaluation of the human-otter conflict in central Veracruz, Mexico: recommendations for mitigation
15:45–16:15	coffee break & silent auction
16:15–16:30	*Samara Bezerra Almeida, Livia Rodrigues, Caroline Leuchtenberger* - Leveraging public policy for the conservation and monitoring of giant otters (*Pteronura brasiliensis*) in Cantão State Park, Tocantins, Brazil
16:30–16:45	*Roberto Dávila Orozco* - Study of the Neotropical otter *Lontra longicaudis* as a tool for sustainable wetland management
17:15–17:45	Official congress bus transfer from Universidad Científica del Sur (UCSUR) to Miraflores
19:30–21:00	**Youth Circle Mentor Mixer** (Hotel Las Palmas in Miraflores)

Program

Wednesday 26th of February

08:00-08:45 Official congress bus transfer from Miraflores to Universidad Científica del Sur (UCSUR)

((Pg 52-62))Session 5 – "How to": Advanced Techniques for Otter Monitoring and Research

Chairs: Joanna Alfaro and Carlos Calvo

09:00-09:30 **Invited Speaker:** Elizabeth Chadwick

Cardiff University Otter Project: thirty years of monitoring using otters found dead

09:30-09:45 *Simone Giovacchini, Pushpinder Sing Jamwal, Livia Chavko, Cecilia De Sanctis, Enrico Mirone, Mirko Di Febbraro and Anna Loy* - Eurasian otter connectivity analysis and range dynamic in central Italy

09:45-10:00 *Shawn Larson, Amy Olsen, George Esslinger, Dan Monson, Joe Eisaguirre and Joe Tomoleoni* - Current methods and challenges of monitoring sea otter population recovery

10:00-10:15 *Hiroshi Sasaki, Muhammad Iqbal Md Jamaluddin, Md Nor Shukor, Pazil Abdul-Patah, Daisuke Waku, Muhammad Abu Bakar Abdul-Latiff and Badrul Munir Md-Zain* - Habitat preferences of hairy-nosed otter in peninsular Malaysia

10:15-10:30 *Frederick Kistner, Assaf Ben-David, Sky Alibhai, and Zoe JeweLotte ll* - From Erlinge to AI: how novel technologies are revitalizing the ancient art of otter tracking

10:30-11:00 **coffee break & silent auction**

11:00-11:15 *Mariela García-Sánchez, Jose Pablo Huertas-Vásquez, and Manuel Santiago-Plata* - Activity patterns of *Lontra annectens* in two unique mesoamerican regions

11:15-11:30 *Tom Serfass, Bridget Amulike, Jan-Reed Smith, and Sadie Stevens* - Latrine use by spotted-necked otters: applications for improving survey efficiency and enhancing viewing opportunities at Rubondo Island National Park, Tanzania

11:30-11:45 *Hiroshi Sasaki, Takeshi Sekiguchi, Daisuke Waku, Md Nor Shukor, Pazil Abdul-Patah, Mohd Lokman Ilham-Norhakim, Muhammad Abu Bakar Abdul-Latiff and Badrul Munir Md-Zain* - The spread of hybridization between small-clawed and smooth-coated otters in peninsular Malaysia

Program

Wednesday 26th of February

11:45-12:00	*Jooseong Kim and Sungwon Hong* - Spraint density of the Eurasian otter (*Lutra lutra*) is an accurate indicator of its population status in urban areas
12:00-12:15	*Huerta-Santander Tamara, Hinojosa Iván A. and Pizarro Cristóbal* - Habitat use of the marine otter Lontra felina (Molina 78), in the locality of Colcura, Biobío Region, Chile
12:15-12:30	*Charlotte Stoffels, Sébastien Cambier, Tom Wirtz, Muriel Mercier-Bonin, Arno C. Gutleb and Jean-Nicolas Audinot* - High-end microscopy techniques to localize PFAs in tissues
12:30-14:30	**group photo & lunch**
14:30-15:30	**((Pg 75-78))Workshops and Round Table** (parallel sessions) • Necropsy Workshop - *run by Anna Roos, Simon Rohner Chloë Hawthorn and Elizabeth Chadwick* • eDNA Workshop - *run by Simone Giovacchini and Anna Loy* • Round Table with Peruvian government representatives - *run by Joanna Alfaro and Carlos Calvo*
15:30-16:00	**coffee break & silent auction**
16:00-17:30	*Workshops and Round Table continued*
18:00-19:00	Official congress bus transfer from Universidad Científica del Sur (UCSUR) to Miraflores

Program

Thursday 27th of February

08:00–08:45	Official congress bus transfer from Miraflores to Universidad Científica del Sur (UCSUR)

((Pg 64-66))Session 6 - Red and Green Status Assessment

Chair: Anna Loy

09:00–09:30	**Invited Speaker:** Magdalena Cygan Measuring Otter Recovery and Conservation Impact with the IUCN Green Status of Species
09:30–09:45	*Shawn Larson and Riley Pollom* - Sea otter, *Enhydra lutris*, conservation legacy and potential for recovery, the IUCN Green Status assessment
09:45–10:00	*Anna Loy, Pushpinder S. Jamwal and Syed A. Hussain* - The Green Status of the Eurasian otter
10:00–10:30	**silent auction closes!**
10:30–11:00	**coffee break**
11:00–13:00	*Nicole Duplaix, Anna Loy and Caroline Leuchtenberger* **Round Table: IUCN SSC Otter Specialist Group Strategic Plan 2026–2030**
13:00–14:30	**lunch**

((Pg 68-74))Session 7 - Education, Communication and Networking

Chairs: Margherita Bandini and Arno Gutleb

14:30–15:00	**Invited Speaker:** Arno Gutleb 38 years of the IUCN SSC OSG Bulletin

Program

Thursday 27th of February

15:00–15:15	*Tom Serfass, Sadie Stevens, Jan-Reed Smith and Bridget Amulike* - Spotted-necked otters and Rubondo Island National Park, Tanzania: the process of developing an ecotourism flagship
15:15–15:30	*Alfredo Ñ. Claverie, Christopher B. Anderson, Luciana Riccialdelli and Alejandro E. J. Valenzuela* - Socio-ecological approach to research and conserve the Southern river otter (*Lontra provocax*) in Tierra del Fuego Archipelago
15:30–15:45	*Simone Giovacchini et al* – A 25 years best practice example of how citizen science and government organisations can collaborate with otter population monitoring
15:45–16:00	*Trevor McIntyre and Margherita Bandini* - The African Otter Network: conservation and education efforts and research outputs over the past decade
16:00–16:30	**coffee break**
16:45–17:00	*Lizzy Humphries, Jason Palmer, Margherita Bandini and Lauren Harrington* - Launching #ShareSavvy, the new Social Media Campaign
17:00–17:15	*Max Khoo and Simon Rohner* - **Introducing the Otter Youth Circle**
18:00–19:00	Official congress bus transfer from Universidad Científica del Sur (UCSUR) to Miraflores
20:00–22:00	**16th IOC Social Dinner** (Restaurant "La Candelaria")

Program

Friday
28th of February

08:00–08:45	Official congress bus transfer from Miraflores to Universidad Científica del Sur (UCSUR)
09:00–10:00	*Nicole Duplaix and Anna Loy* - The Otter Specialist Group: the first 50 years. What comes next?
10:00–10:30	*Caroline Leuchtenberger* – Outcomes from 3rd The Giant otter Workshop
10:30–11:00	**coffee break**
11:00–12:00	**poster session**
12:00–13:00	*Nicole Duplaix and Anna Loy* - **Final Recommendations and The World Otter Manifesto 2025**
13:00–14:00	Official congress bus transfer from Universidad Científica del Sur (UCSUR) to Miraflores

Posters

((Pg 79-84))
Monday 24th of February
11:00 - 12:00

João Henrique do Amaral Guerreiro, Gabriel Brutti, Livia A. Rodrigues and Caroline Leuchtenberger
Wildlife associated with giant otter (*Pteronura brasiliensis*) in Brazilian Pantanal

Caroline M. DeLong, Deirdre Yeater, Heather M. Manitzas Hill and David B. Hamilton
Manyotters1: a pilot study on long-term memory in otters using puzzle feeders

Mara Cecilia Llontop García Zapatero, Andrea Alosilla-Velazco Horna and Vanessa Milagros De La Cruz Yauri
The Secret Life of *Lontra felina*: nocturnal records and use of an artificial breakwater by the marine otter at Playa Valdivia in the district of Asia, Lima-Peru

Camila Diaz-Mancilla, Carlos Gonzales, Gonzalo Medina-Vogel and Carlos Calvo-Mac
Renal agenesis: necropsy findings in a southern river otter *(Lontra provocax)* from the Chiloé Archipelago, Southern Chile

Roberto Huanaco Pujaico, Romina Tapia Huaman and Karla Pozo Torres
Elaboration of a management and conditioning routine in giant otters for breeding under human care

Shogo Murao et al.
Identification of otter feeding habits and conflicts with paddy field stakeholders in Perak, Malaysia

Posters

((Pg 85-92))
Tuesday 25th of February
11:00 - 12:00

Patricio Méndez Moya
Survey of the Southern River Otter (*Lontra provocax*) in High Conservation Value Areas

Nicole Delgado-Parada, Gabriela Molina-Maldonado, Gonzalo Medina-Vogel and Carlos Calvo-Mac
Potential distribution of the huillín (*Lontra provocax*) in the middle and lower basin of the Chadmo river, X Region, Chile

Jose Pablo Huertas-Vásquez, Mariela García-Sánchez and Manuel Santiago-Plata
Exploring behavioral patterns of neotropical otters in communal latrines

Camila Diaz-Mancilla, Carlos González, Camilla Solari-Romkema, Beatriz Sotomayor, Nicole Delgado-Parada, Carla Soto, Carlos Calvo-Mac and Gonzalo Medina-Vogel
Necropsy findings: first record of rodent in southern river otter (*Lontra provocax*) diet and its link to rodenticides in Southern Chile

Marlene Thomas and Ursula Siebert
A flood of pictures – monitoring of Eurasian otters in Germany

Simon Rohner, Emily O'Rourke, Anna Roos, Sarah du Plessis, József Lanszki et al.
Too good to go – how otters found dead serve conservation legislation

Adriana B. Vallejos, Alejandro E. J. Valenzuela and Martín Kowalewski
Distribution and Habitat Use of the Neotropical Otter (*Lontra longicaudis*) in the Northwest of Corrientes Province, Argentina

Antonia Hennicke, Jana Klink, Dominik Nachtsheim and Ursula Siebert
Potential suitable habitats for the Eurasian otter *Lutra lutra* in Germany

Posters

((Pg 93-100))
Friday 28th of February
11:00 - 12:00

Gabriel Brutti, Caroline Leuchtenberger, Livia Rodrigues and Silvio Marchini
Giant otter's image in the context of the YouTube digital platform

Camilla Solari Romkema, Carlos Calvo-Mac, Andrés Ugarte and Gonzalo Medina-Vogel
Diet composition and ecological insights of sympatric populations of marine otter and american mink in the Valdivian coastal zone, Chile

Maria Paula Coello Sarmiento, Stephanie Johnson-Padilla, Gonzalo Medina-Vogel, Carlos Olavarria and Carlos Calvo-Mac
Co-occurrence between marine otter (*Lontra felina*) and peruvian scallop aquaculture (*Argopecten purpuratus*)

Alexis Santibañez, Erwin M. Barría, Macarena Barros-Lama, Carlos Calvo-Mac, Cristina Coccia and Gonzalo Medina-Vogel
Presence and genetic characterization of canine parvovirus and distemper in domestic dogs and endemic and invasive mustelids in south-central Chile

Pablo César Hernández-Romero and Ximena Luna-García
Now there are two species, but what do we know about the otter *Lontra annectens* (Major, 1897): a review of the current knowledge and gaps to be addressed

Beatriz Sotomayor Illezca, Carla Soto Ampuero, Francisca Alvarez Soto and Gonzalo Medina-Vogel
Traffic mortalities of the southern river otter and road-passes

Alexis Santibañez, Erwin M. Barría, Macarena Barros-Lama, Carlos Calvo-Mac, Cristina Coccia and Gonzalo Medina-Vogel
Sanitary implications of the interspecific co-occurrence of a domestic and wild mammal assemblage from Central-Southern Chile

Sanjan Thapa, Dibuya Raj Dahal, Sujan Deshar, Ashish Kapali, Rajesh Sada
Threats to the smooth-coated otter in the Karnali River, Nepal

Opening Statement

The first 50 years of the Otter Specialist Group: what comes next?

Can you believe it? We have been working with otters for 50 years!

In 1974, all thirteen otter species (now fourteen!) were critically endangered, most close to extinction. How was this dire situation reversed, locally and globally? Is there one action or agreement that paved the way to recovery? I'll give you a hint. Placing all otter species on CITES Appendix I or II in 1978 was a good start, but assessing each species and developing conservation measures took many decades more.

Looking ahead, will threats, like climate change and habitat destruction, destroy our hard work and eradicate otters from our planet? Do we have the means to secure their future? This congress will provide some answers. I strongly believe that: Yes, we can and here's how we can do it.

Session 1

Success Stories

Chair - Nicole Duplaix

Oral Presentations

Opening Lecture

Long standing otter research and conservation in Chile. Applied science for evidence-based conservation

Authors

Gonzalo Medina-Vogel [1,2]

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Abstract

Before 1986, there were only sporadic data on *Lontra provocax* and *Lontra felina* from authors such as Sielfeld, Castilla, Cabello and collaborators in Chile.
In 1986 I began to investigate *L. provocax* and, in 1991, *L. felina,* guiding investigations to respond to the need for information by the State of Chile to develop conservation measurements, researching distribution of both species, developing of prospecting and sensing methods, evaluating their habitat. The first radio telemetry studies on the two species was carried out between 2000 and 2006, long before it was done on other species of aquatic mammals in Chile.
Results forced the State to include *L. provocax* in all Environmental Impact Studies in any river, lake or wetland intervention. The species recorded a decline of 10% of its original distribution since 1880. Between 2008 and 2010, the strong fragmentation and progressive isolation that *L. felina* populations suffered is determined - even in close proximity rocky shores, the populations are becoming isolated. This important data served to ensure that both *L. provocax* and *L. felina* are classified as "Endangered" by the IUCN.
Currently, the combination of information obtained since 1986 to today allows advanced studies to be carried out, researching the effects of disease, pollutants and invasive alien species, aquaculture and change in land use on the survival of these species. Recently, ~50% of overlap was determined between otter distribution and aquaculture, with interactions that in some cases end with the drowning of *L. provocax* within aquaculture installations. Furthermore, the projected increase in extension and intensity of aquaculture installations, timber, forestry industry, as well as hydropower will have a strong impact on the otter species present in the same area. The invasion by American mink (*Neogale vison*) and domestic animals (mainly dogs and cats) in *L. provocax* habitat results in higher probability of disease transmission (CPV and CDV).
There is no increase in distribution towards the north of *L. provocax* populations since the 90s (Medina 1996), which indicated that *L. provocax* is suffering a significant reduction in genetic diversity.
I strongly suggest that the species should be considered a priority by the IUCN, as it could drop to "Critically Endangered" in the near future. This presentation outlines how the work of the last decades has allowed us to understand the challenges these two species are facing, based on evidence and the participation of several undergraduate and graduate students, volunteers, as well interdisciplinary studies.

Oral Presentations

Invited Speaker

How genetics and genomics have enriched our understanding of otter biology and phylogeny

Authors

Klaus-Peter Koepfli [1]

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Abstract

Genetic methods have become an indispensable tool in understanding otter biology and informing effective conservation strategies. Genetic data can reveal past population bottlenecks, historical gene flow patterns, and the extent of isolation due to habitat fragmentation, all of which are critical for understanding vulnerability. Furthermore, genetic markers can be used to identify individuals and track their movements, providing valuable data on dispersal patterns, home range size, and social structure, as well as to determine relatedness among individuals, thereby providing crucial information for captive breeding and translocation programs.

My talk will provide an overview of the major advances in our understanding of otter biology, driven by the application of genetic and genomic data. I will detail how these technologies have illuminated otter phylogenetic history and taxonomy, as well as genetic diversity and population structure within species. Furthermore, recent analyses based on whole genome sequencing data are providing important insights into the adaptive potential and genetic health of otter populations. However, in-depth genetic analyses are still lacking for most otter species, requiring better efforts to coordinate biobanking of genetic samples as well as training of individuals in analytical methodologies, especially in native range countries.

As genomic technologies continue to advance, the power of genetics to inform otter conservation will only grow, enabling more precise and effective management strategies of both in situ and ex situ populations to ensure the long-term survival of otter species worldwide.

Oral Presentations

The new otter *Lontra annectens* (Major, 1897): cryptic species and speciation processes in the Neotropical otter (*Lontra longicaudis*) complex: morphological, ecological and genetic evidence.

Authors

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Abstract

Cryptic species have been identified across a wide range of taxa, including well-studied groups like mammals. The Neotropical otter (*Lontra longicaudis*) represents a species complex with a broad distribution where various biogeographical (colonization history, watershed structures) and ecological factors (ecological niches) have likely influenced the diversification of the three recognized subspecies: *L. l. annectens* (Mexico, Central America, and western South America, west of the Andes), *L. l. enudris* (Amazon and Orinoco basins), and *L. l. longicaudis* (Paraná basin and other regions).
In this study, we evaluate how biogeographical and ecological processes have impacted the diversification of the Neotropical otter. We conducted integrative analyses to assess the presence of a species complex through various approaches, including geometric morphometrics, ecological niche modeling, phylogeography (mtDNA), and phylogenomics (nDNA).
The results reveal sufficient morphological, ecological, and genetic variation congruent with biogeographic events, supporting the hypothesis that the subspecies (*L. l. annectens*) should be considered a distinct species from the two South American subspecies. We propose naming this distinct lineage as Mesoamerican otter, based on its geographic range. These findings hold critical implications for establishing new research and conservation strategies for both the Neotropical and the Mesoamerican otter populations.

Oral Presentations

Phylogenetic relationships of otters lived/live in Japanese archipelago

Authors

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Abstract

The Japanese otter, historically native to the Japanese archipelago, is thought to have become extinct after the last confirmed sighting in 1979 in Kochi.
In 2017, however, a camera trap captured an otter on Tsushima Island, which is located between Kyushu and the Korean Peninsula, and spraints were also collected. We conducted tests on the otter spraints which were discovered on Tsushima in 2017, a whisker specimen from about 150 years ago (Fukuoka prefecture), and other historical samples (for example, taxonomic specimens).
We managed to determine the mitochondrial genome (mtgenome) sequence from the spraint, and performed shotgun sequencing to determined the mtgenome from multiple individuals. These mtgenome were conducted to phylogenetic analysis together with those of *Lutra lutra* and other species.
The results showed that the Tsushima sample formed a monophyletic group with South Korea and Sakhalin (Russia). In contrast, the whisker specimen (Fukuoka) formed a monophyletic group with Kochi individual and was found to be a sister group to *Lutra lutra*. In other words, it is highly likely that the otters that inhabited Kyushu (where Fukuoka is located) and Shikoku (where Kochi is located) belonged to a slightly different lineage from the extant *Lutra lutra*.
However, the otter found on Tsushima Island in 2017 - geographically close to Fukuoka Prefecture - is of the same lineage as the *Lutra lutra*. Until 2017, it was thought that otters did not inhabit Tsushima Island, but it is possible that the individual discovered in 2017 was a dispersing individual from possibly South Korea. The swimming ability of *Lutra lutra* may be higher than previously thought.

Oral Presentations

Lontra felina in Argentina. Discussion of its presence in the country.

Authors

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Abstract

The marine otter (*Lontra felina*) in Argentina was described for the Beagle Channel, Mitre Peninsula and Staten Island, in the eastern extreme of Tierra del Fuego Archipelago (TDF).
A re-evaluation of historical and present data, takes into consideration a new discussion about its actual presence in this area (therefore in Argentina). Historical records usually referred to "otters" in general, assigning the spraints found on the marine coast to *Lontra felina* and the ones found on the freshwater to *Lontra provocax*. However, currently in TDF it is known that *Lontra provocax* occupies both coastal and freshwater systems.
Except for one specimen collected in 1934 in Staten Island, the entirety "marine otter" (*Lontra felina*) records in museums correspond to individuals collected in the Chilean sector of TDF or are misclassified.
Since 2014, otter monitoring has been carried out in the area through search for signs and using camera traps. While the presence of *Lontra provocax* is stable in both coastal and freshwater systems, no *Lontra felina* was recorded. Moreover, a genetic research of otter spraint found in the area resulted in evidence of only *Lontra provocax*, exposing a possible mistake in historical texts when assigning spraint to species. Additionally, no *Lontra felina* was ever recorded by any researcher, manager or sailor since the mid-1990s.
Data shows that there are reasonable doubts that *Lontra felina* is currently found in Argentina, if ever it was present or common in the country.
Consequently, the current categorization for this species in Argentina is "Data Deficient".

Oral Presentations

The fall and rise of the Eurasian otter in Europe. When shared rules make the difference.

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Abstract

The Eurasian Otter (*Lutra lutra*) was once widespread throughout Europe, but it declined dramatically in the 1960s and 1970s, disappearing from most central and northern European countries.
Based on trends observed in Europe, although its range is wide and crossing three continents, in 2000 the species was classified as "Vulnerable" by the IUCN Red List. The main threats were listed as direct persecution for fur trade, water pollution, destruction of riparian vegetation corridors and poaching due to human-otter conflict (anglers and fishfarmers).
Following strict protection laws mandated by the European Union, the banning of harmful pollutants, the protection of riparian habitats and to awareness campaigns raised through 10 European Otter Workshops held every three years since 2004, the species is now recovering in many European countries. Accordingly, the species was downgraded to "Non Threatened" in 2004 and then to "Least Concern" in the most recent "European Mammal Assessment".
The recovery of otter populations has been and still is dependent on legal protection of the species and its habitat across EU countries, mainly through the Habitats Directive (43/92/EC) and the Water Framework Directive (60/2000/EC). Also, direct protection against trade is offered by CITES, where the Eurasian otter has been listed in Appendix 1 since 1976.
The process has also fostered by many projects focused on conflict mitigation funded by the EU through the LIFE programme, that funded 30 projects in 16 different EU countries.

Session 2

In-Situ and *Ex-Situ* Conservation Planning and Action

Chairs - Shawn Larson and Tom Serfass

Oral Presentations

Invited Speaker

From exhibition to conservation pillar - how the International Giant Otter Alliance makes the world's *ex-situ* population relevant to conservation

Authors

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Abstract

For a long time, giant otters (*Pteronura brasiliensis*) in zoos were a show species and a zoological rarity, especially in Europe and North America. In their natural range, they have been and continue to be under great pressure. Both *in-situ* and *ex-situ* populations face major challenges. The International Giant Otter Alliance (IGOA) was formed to address these challenges and to bring together the strengths and needs of *in-situ* and *ex-situ* conservation, research and science in a One Plan Approach.

Today, the *ex-situ* population, spread across four continents, is an important component of giant otter conservation in many ways. Animals living in a reintroduction project in Iberá National Park, Argentina, come from the coordinated captive breeding programmes of the European Association of Zoos and Aquaria (EAZA) and the North American Association of Zoos and Aquariums (AZA). The species is yet considered extinct in the country. Animal husbandry expertise is used in the rearing of wild born but abandoned cubs or confiscated animals.

If these animals cannot be released back into the wild in their area of origin, zoos provide a refuge. Those animals play an important role as founder animals, genetically enriching the *ex-situ* population. This ensures a healthy zoo population and the endurance of the source population for reintroductions.

IGOA's open international workshops are supported by the zoo community with funding, manpower and expertise. In urgent cases, the network can also provide the necessary funds in an uncomplicated manner, for example to finance translocations in the event of human-wildlife conflicts.

Moreover, the presence of giant otters in zoos has several, indirect valuable impacts on species conservation. Firstly, it raises awareness of the threat to the species and its ecosystem. Secondly, it raises funds for NGOs. And, more generally, it raises awareness of the existence of this fascinating species, which is largely unknown to the general public outside South America.

Oral Presentations

The One Plan Approach for otter conservation: integrating *ex-situ* and *in-situ* conservation action

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Abstract

The earth is facing a triple planetary crisis with climate change, pollution, and biodiversity loss heading up the list of impacts threatening the very existence of all living species.
The 2023 IUCN Red List assessment shows that seven of the fourteen otter species are listed as "Endangered" or "Vulnerable". Another five are "Near Threatened" and all populations of thirteen species are declining or presumed declining. Only the North American river otter (*Lontra canadensis*) is "Least Concern", thanks to reintroduction programs, with a stable population.
Effective conservation and, inevitably, species recovery, require that a diversity of management actions be considered and tested using a cross-disciplinary and multi-institutional approach. *Ex-situ* institutions (zoos, aquariums, rescue-rehabilitation facilities) have evolved from menageries to organizations with high standards of animal health and welfare, as well as focusing on a conservation mission at the international, regional, and local levels.
To mitigate the extinction risk of wild otter populations, it is critical to utilize all available tools and resources, combining *ex-situ* and *in-situ* conservation efforts in close collaboration with local and Indigenous communities for a One Plan Approach to otter conservation.
There are diverse conservation roles for ex situ institutions that include responsible genetic and demographic management to maintain insurance populations, act as sources for reintroduction/release, head-start, or rescue/rehabilitation/release programs, research (e.g., on biology, genetics, reproductive physiology, behavior, develop techniques for monitoring in the wild, etc.), with exhibition and conservation education opportunities to spread awareness. Zoo and aquarium staff contribute their skills to field conservation and research programs, monitoring for recovery programs, conservation action planning, capacity building, establishing partnerships with governments and local and Indigenous communities within natural otter ranges, and participation in IUCN SSC Specialist Groups including the Otter Specialist Group.
Only through this One Plan Approach will the future be ensured for otter species in their natural habitats.

Oral Presentations

Maintenance and management of the Neotropical otter under human care in Mexico

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Abstract

In Mexico, there are successful zoological projects in the conservation of wildlife under human care that have contributed to the protection and recovery of species in danger of extinction or in some degree of threat, such as the Mexican Gray Wolf (*Canis lupus bayleyi*) and the Scarlet Macaw (*Ara macao*). To achieve these results, it is essential to generate and disseminate the information obtained within these institutions. This work addresses the neonatal care of the Neotropical otter (*Lontra longicaudis*) in Mexico, which has been poorly documented and constitutes the majority of the reports we face when working in zoos and aquariums that receive wild animals for rehabilitation. This stage is critical to determine whether an animal survives. In Mexico, the birth of 3 pups was recorded in the facilities of Acuario Michin.

For the maintenance of *ex-situ* individuals of this species, the centers must have facilities that provide sufficient space for reproduction, swimming, handling or isolation/quarantine of the animals. The enclosure must be designed to meet the physical, social, behavioral and psychological needs of the species.

Diet formulation criteria must respond to nutritional needs, feeding ecology, feeding patterns and behaviors, as well as individual background.

Veterinary services are a vital component of optimal animal care practices. Hematological studies and preventive medicine programs are necessary to assess the health status of otters. Having this clinical information is essential to establish methodologies and base data for the management and care of otters in captivity, as well as generating information that allows creating a knowledge base applied to wild populations

Oral Presentations

The current status and conservation efforts of the hairy-nosed otter (*Lutra sumatrana*) in Malaysia

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Abstract

The hairy-nosed otter (HNO; *Lutra sumatrana*) is classified as "Endangered" both globally by the IUCN Red List and nationally in Malaysia.
However, conservation efforts and research on this species remain limited across Southeast Asia. In Malaysia, our knowledge of its distribution is largely based on opportunistic sightings and by-catch data from camera trap studies. The lack of ecological research of HNO, combined with wetland habitat fragmentation, raises concerns about threats to its population, including roadkill.
The Malaysia Otter Network (MON) was established in 2020 as a coalition among government agencies, NGOs and conservationists advocating for research and conservation of Malaysia's three threatened otter species. MON has partnered with various organisations to initiate conservation projects for HNO. At the West Coast of Peninsular Malaysia, the mangrove forests and the North Selangor Peat Swamp Forest were surveyed to assess the spatial distribution of three species of otters and confirmed the presence of HNO near the peat swamp using spraint samples. This project also developed species-specific DNA primers to identify this rare species. Camera traps were deployed to monitor the HNO population in both Pahang and Sabah, alongside two other novel projects. At the East Coast of Peninsular Malaysia, the HNO has been detected through both camera trap records and roadkill incidents at the South-East Pahang Peat Swamp Forest.
Positioning HNO as an ambassador species is a key strategy to enhance conservation efforts and garner public support for protecting its natural peatland habitat. In Sabah, surveys in the Deramakot Landscape, targeting the flat-headed cat (*Prionailurus planiceps*) indicated habitat overlap with HNO, suggesting shared hunting grounds associated with local water bodies. Observations included HNO preying on Tilapia (Cichlidae) and spraint deposition within the survey area. However, further structured research is essential to better understand its ecological range, resource dependencies, and unidentified threats to its survival.

Oral Presentations

Identifying spatial conservation priorities for the giant otter (*Pteronura brasiliensis*)

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Abstract

The giant otter (*Pteronura brasiliensis*) is a charismatic, South American, social carnivore and the largest otter species in the world. Historically, giant otters were almost extirpated due to the wildlife skin trade and are currently considered as "Endangered".

Using the Range Wide Priority Setting methodology, we (a group of 33 giant otter experts) updated the species' historical range (9,021,590 km2), modelled an adjusted and more conservative aquatic historical range of 2,813,539 km2, systematised 3,874 giant otter distribution points across the all range, and identified geographic areas for which there was expert knowledge (63%), including sites areas where giant otters no longer occur (19%), and geographic regions where giant otters presence is uncertain due to a lack of expert knowledge (37%).

To prioritize conservation actions into the future and identify existing giant otter population strongholds, we used expert knowledge to identify 22 of the most important areas for the conservation of the species (i.e., Giant Otter Priority Conservation Units [GOPCUs]) that cover 29% of the historical range, and range in size from 1,367 km2 to 829,152 km2.

In general, GOPCUs were relatively large and approximately 35% of the total GOPCUs are already designated as protected areas. Using the Range Wide Priority Setting results, we make a series of recommendations for the long-term conservation of this iconic aquatic species.

Oral Presentations

The new species *Lontra annectens* in the face of climate change in Mesoamerica

Authors

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Abstract

Climate change is an event that will impact global biodiversity in the coming years.
In particular, shifts in rainfall patterns are expected to affect aquatic and semi-aquatic species, such as otters. Otters occupy a narrow semi-aquatic ecotone, making them highly vulnerable to changes in their habitat and heavily dependent on prey availability, which, in turn, relies on water availability.
Ecological niche models allow us to infer how the optimal environmental conditions for species might shift under various climate change scenarios. The objective of this study was to evaluate the potential impact of climate change on the distribution of the Mesoamerican otter across its range.
We developed ecological niche models using the MaxEnt model in R software under two future scenarios—40 and 70 years ahead—while considering the assumptions of dispersal and non-dispersal capabilities of the species. We found that the otter's current distribution spans 875,500 km², with 39.82% of this area experiencing habitat loss and 41.69% classified as degraded areas with moderate-to-high human impact.
Under the 2040 dispersal scenario, the distribution could increase to 923,252 km² and decrease to 759,980 km² without dispersal. For the 2070 scenario, the area could reach 786,784 km² with dispersal, and 569,384 km² without. This reflects a projected change in distribution for 2040 of +5.45% (with dispersal) and -13.20% (without dispersal). The projected losses for 2070 are -10.13% (with dispersal) and -34.97% (without dispersal).
This information allows us to identify climatically stable areas (63.02% of the current distribution) where the species could potentially persist in the future, as well as priority areas where the species might disappear under these climate change scenarios. Therefore, it is essential to prioritize the establishment of new protected natural areas in climatically stable sites and to strengthen conservation efforts to ensure the species' long-term survival.

Oral Presentations

Conservation of otters in Kazakhstan

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Abstract

Two subspecies of *Lutra lutra* inhabit the basins of two transboundary rivers in the Republic of Kazakhstan.
The northern subspecies *L. l. lutra* is found in the northeastern part of the country (Irtysh River basin), while *L. l. seistanica* inhabits the southeastern regions (Illi River basin). Field research in 2022-2023 at four sites in the basins of two rivers showed the disappearance of the otter from the Irtysh River section in the Pavlodar region and its isolated occurrence on the Ili River. The situation has visibly worsened in recent decades.
The main threats to otters in the region include water use, flow regulation and water pollution. This study highlights the urgent need to conserve and restore otter habitats in Kazakhstan. Although *L. l. lutra* is classified as part of the game fauna in Kazakhstan, its local distribution and decreasing range trend suggest a need to re-evaluate its status.
It is recommended that *L. l. lutra* be included in the Red Book of the Republic of Kazakhstan alongside *L. l. seistanica*.
Despite successful recoveries in parts of Europe, Central Asian countries including Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan, are experiencing alarming declines in otter populations. The lack of information and scarce interest in the species call for increased conservation focus. The region should be considered an area of increased concern due to its critical status.
This research highlights the significant threats facing otter populations in Kazakhstan and the importance of dedicated conservation efforts. Immediate action is required to mitigate habitat degradation and ensure the survival of this subspecies. The study calls for a reassessment of the species' conservation status and enhanced measures to protect and restore freshwater habitats.

Oral Presentations

Nepal otter Conservation Action Plan: progress update

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Abstract

Three species of otter are found in Nepal, both outside and inside protected areas. All three species are under greater threat from anthropogenic pressure such as overfishing, destructive fishing, overarching exploitation of river aggregates, linear infrastructure development along the river banks and river drying by hydropower dams and plants during the dry and breeding seasons.
Despite the obvious threats, the Government of Nepal has yet to prioritize the conservation of these species. The lack of a conservation strategy for the long-term protection of otters in the country has been an issue for local environmental groups and otter researchers.
The 10th of March, 2024 the Department of National Parks and Wildlife Conservation (DNPWC) approved the preparation and drafting of Nepal Otter Conservation Action Plan (NOCAP). A technical committee led by Ecologists from the DNPWC was formed, and a hearing was carried out, involving the communities in the ground regarding the scenario and issues on otter occurrence and threats to their habitat.
Altogether, 13 sites were selected for the community consultation between March and June 2024. An online discussion with the Himalayan Otter Network members was conducted to verify and agree on the assessed threats and appropriate strategies to be adopted. A first draft of the action plan is under preparation and two national level workshops have been organised for March/May and October/November 2025. A review committee will analyse the draft and, based on the comments and suggestions from the review committee as well as feedback from the workshop, the draft will be revised and submitted to the technical committee for final approval. Once approved, 500 copies of the action plan will be designed and published, endorsed by the Government of Nepal.

Session 3

Emerging Threats and Trade

Chair - Caroline Leuchtenberger

Oral Presentations

Monitoring otters in Sweden over 50 years with an update on PFAS in otters 1970-2020

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Abstract

The Swedish Museum of Natural History has a long tradition on monitoring top predators such as otters, seals and white-tailed eagles.
All species showed a dramatic decline after 1950s up through 1980s. However, after the bans of the environmental contaminants PCB and DDT all species started to increasing numbers. In 1972 a game law came into force, listing otter as a species that if found dead should be reported and sent to the authorities. The numbers of dead otters reported from different areas indicate population status and distribution.
Between 1970 and 2024, almost 3000 otters were sent to the authorities, 59% since the millennium. Most were killed in traffic accidents (at least 82%) or drowned in fishing gear (8%). During necropsies samples are taken for a number of different studies on pathology, diet and analyses of environmental contaminants.
We reported high frequencies of cysts on the deference ducts, ca 72%, in 2013. Between 2004 and 2024 the frequency of cysts shows a stable trend (56-88% yearly, n=1063). Although uncommon, kidney stones were found, mostly in adults, and they resulted twice as common among males (10,6%, n=719) compared to females (5.0%, n=438).
PFAS are a large group of environmental chemicals ("forever chemicals") with a wide range of applications. It has previously been shown that otters in Sweden can have extremely high concentrations of these chemicals, even though they are not directly produced in the country. Time trends from 1970-2011 showed a dramatic increase in concentrations in otters. Since then, we laid "a net of otters" over Sweden, to find hot spots of contaminated areas. The concentrations vary a lot. The time trend up to 2020 shows that concentrations of several PFAS have stabilized, but no clear decreases are seen despite the fact that several of these chemicals were banned in 2009.

Oral Presentations

How the maritime fur trade influenced our understanding of the biology and ecology of sea otters

Authors

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Abstract

The maritime fur trade extended for more than two centuries across the North Pacific, resulting in the extirpation of sea otters across nearly their entire range. International protection, remoteness, and rarity left 11 small, isolated colonies scattered mostly across their northern habitats early in the 20th century.

As remnant populations increased, reintroduction efforts established additional populations along the west coast of North America, from southeast Alaska to southern California, as the 20th century ended. The juxtaposition of nearly two dozen independent sea otter populations, vast areas of adjacent unoccupied habitat, and an abundance of their preferred prey, set the stage for two unintended large-scale experiments.

The first explicitly used the presence and absence of sea otters to document the effects of sea otter foraging on the structure and function of near shore rocky reef ecosystems. This body of work resulted in what came to be known as the otter/urchin/kelp trophic cascade and the designation of "keystone predator" to the sea otter.

The second experiment, largely unrecognized at the time, consisted of wide-ranging studies to document the biology and natural history of sea otters. These tended to be descriptive in nature, estimating various life history and behaviour attributes, usually within a single population. Results of the second experiment revealed large differences among populations in many of the attributes under study, e.g. age-specific survival and reproductive rates, and time budgets. These two experimental opportunities resulting from the maritime fur trade provide the foundation for a new book, Sea Otter Conservation II: Near shore Ecosystem Restoration.

In this presentation we will synthesize the results to date of these experiments as new habitats become occupied and as food and space become limiting resources for the sea otter, and as we explore the potential for additional reintroductions to facilitate restoration of habitats where sea otters remain absent.

Oral Presentations

Assessing the illegal trade of otters in Mexico: insights from social media, seizure records and expert perspectives

Authors

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Abstract

Wildlife trade poses a major threat to biodiversity, especially in megadiverse regions like Latin America, where research and policy action remain limited.
In Mexico, wildlife trade is prevalent through various channels, yet detailed information on species-specific impacts remains scarce. This study explores whether otter species in Mexico are subject to illegal trade, drawing from diverse data sources: social media monitoring, seizure records, expert interviews and news reports.
From January to December 2019, we monitored social media groups in Estado de México, Guerrero, Jalisco and Oaxaca, identifying 175 posts listing 90 species for sale, including 202 individual mammals from 39 species. We also analyzed wildlife seizure records from 2000–2020 provided by PROFEPA in northern and southern Mexican regions. These records documented 473 species, including 110 mammal species, with detailed information on seizure dates, specimen types (live animals, products), and conditions. Additionally, interviews with otter experts revealed 19 inquiries about otter purchases, and news reports noted two cases of otters marketed as pets and one attempted sale.
Our findings suggest otters are not the primary targets in Mexico's wildlife trade, with larger species such as big cats and macaws being more desirable, likely due to cultural factors. However, there is evidence of small-scale, localized otter trade that may escape detection and regulation. This underscores the need for more localized research and monitoring efforts to better understand the nuances of the trade and its ecological impacts on otter populations and other vulnerable species across Mexico. Enhanced research and targeted action will be crucial to addressing the complexities of the illegal wildlife trade in Mexico and to informing effective conservation strategies.

Oral Presentations

Using Eurasian otters as sentinels of freshwater chemical pollution: insights from biomonitoring of PCBs and PFASs

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Abstract

Freshwater ecosystems are facing increasing pressure from chemical pollution, threatening biodiversity and ecosystem services. Protecting these vital ecosystems requires comprehensive management, stringent regulatory frameworks and effective monitoring. While water analysis can quantify contaminant concentrations, it fails to provide information on bioavailability or accumulation in biota. Biomonitoring - measuring contaminants in animal tissues - provides critical data on exposure and risks to ecosystems and human health. Otters found dead can act as sentinels, providing insights into spatial and temporal contaminant trends and policy effectiveness.

This presentation demonstrates how long-term biobanking can reveal temporal changes in contaminant concentrations, and how shorter-term studies can be used to assess spatial variation and associations with health indicators, using two groups of chemicals.

Polychlorinated biphenyls (PCBs), used extensively until the 1970s, have left an enduring contamination legacy. The Cardiff University Otter Project's 27-year dataset (1992-2019) shows PCB concentrations in otters from Wales declined until 2009, but have risen since 2010, with higher levels in otters from coastal areas suggesting remobilisation from riverine and marine sediment sinks is now a major driver. Some otters had toxicologically significant concentrations, indicating potential health impacts.

Per- and polyfluoroalkyl substances (PFASs) were studied in otters from 2007-09. Findings revealed higher concentrations near wastewater treatment plants and arable areas. We also found an association between PFOA and proximity to a factory that used PFOA in PTFE manufacture. A follow up study, conducted using otters found dead after the factory ceased PFOA use in 2012, found that this association persisted. This demonstrates the value of continued biomonitoring to understand the longevity of spatial associations with historic sources. Additionally, we have detected the presence of replacement PFASs in otters, which are often marketed as less bioaccumulative. Their presence in a top predator provides evidence of the urgent need for further research and regulatory action.

Oral Presentations

The impact of fire and drought on giant otters

Authors

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Abstract

The climate crisis is severely disrupting the hydrological cycle in many tropical regions. The Brazilian Pantanal has been enduring a prolonged drought since 2019, with rainy seasons failing to produce the regular seasonal floods. Spatial data reveals that the floodplain has lost approximately 60% of its water mass since 1985, and future projections are even more alarming.

As the region becomes drier and biomass accumulates, wildfires have grown increasingly frequent. In 2020, about 30% of the biome was devastated by fire. Between January and November of 2024, the burned area reached 1.9 million hectares, a 68% increase compared to the average of the previous five years.

Drought and fire have directly impacted the demographics of two giant otter populations monitored in different areas of the Brazilian Pantanal, reducing reproduction rates and cub survival. This presentation will explore both the direct and indirect effects, providing insights into the future of this species in current stronghold sites and highlighting the urgent need for conservation strategies to prevent local extinctions.

Oral Presentations

Pathogen exposure in southern river otters (*Lontra provocax*) and marine otters (*Lontra felina*) in Chile

Authors

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Abstract

Understanding pathogen exposure is critical for the conservation of native otter species in Chile, particularly the Southern river otter (*Lontra provocax*) and the marine otter (*Lontra felina*). This study aimed to describe pathogen exposure in these species, presenting findings from over 10 years of research.

Live animals were captured along the Chilean coast, as well as in rivers within the Valdivian temperate rainforest and the Atacama Desert. Blood samples were collected and analyzed using various serological techniques. Among the pathogens investigated, *Toxoplasma gondii* showed a notable prevalence, with 10% seropositivity in *L. felina* and 77% in *L. provocax*. These findings suggest a significant risk linked to human activities and domestic cat (*Felis catus*) densities in proximity to otter habitats. Exposure to *Leptospira spp*. was also observed in *L. provocax*, with one individual testing seropositive for the serovar Tarassovi. This pathogen is associated with agricultural and domestic animals, indicating potential spillover in rural landscapes. Notably, *L. provocax* exhibited viral exposure, with two individuals testing seropositive for Canine Distemper Virus (CDV) and one for Parvovirus (PV).

These findings highlight the vulnerability of wild otter populations to pathogens originating from domestic dogs (*Canis lupus familiaris*). Furthermore, domestic dogs and the invasive American mink (*Neogale vison*), which coexist with both domestic and wild carnivores, are probably acting as community reservoirs, spilling over these viruses to native otters. These studies underscore the importance of integrated conservation strategies that adopt a One Health approach, addressing disease monitoring, invasive species management, and habitat protection to reduce pathogen transmission risks and promote the health and long-term viability of these native Chilean otter species.

Oral Presentations

Evidence of canine pathogens in giant otters (*Pteronura brasiliensis*): a study from the Pantanal wetlands, Brazil

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Abstract

The giant otter (*Pteronura brasiliensis*) is the largest species of the subfamily Lutrinae and is endemic to South America. Several otter species are progressively designated as at risk, predominantly as a consequence of anthropogenic pressures, non-native species, and novel pathogens, with nearly half already exhibiting reductions in population size.
In this context, domestic dogs have been implicated in negative effects on the wild carnivore populations. The aim of this study is to evaluate the exposure of free-ranging *P. brasiliensis* to the most widespread viral pathogens that originate from domestic dogs.
Giant otter samples were obtained through live-trapping or opportunistic carcass recovery from Pantanal, Brazil. Biological samples were evaluated for exposure to Canine Distemper Virus (CDV) and Canine Parvovirus type 2 (CPV-2) using ELISA and qPCR techniques.
All six otters sampled tested positive for antibodies against CDV and CPV-2. However, none of the otters tested positive for the viruses through molecular methods.
The high seroprevalence observed suggests the widespread circulation of the agents in the sampled regions, highlighting the significant impact of domestic dogs in natural environments. At this time, it is not possible to determine the protective role of the detected antibodies in potential future exposures to these pathogens, nor in the immunity transferred to offspring. Future studies should explore the spatiotemporal dynamics of exposure to these pathogens in different groups of giant otters. Funding: CNPq, FAPERGS, Houston Zoo, Zoo Miami.

Oral Presentations

Impacts of artisanal gold mining on giant otter populations and neotropical freshwater ecosystems

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Abstract

Extractive activities, especially artisanal gold mining, are significant drivers of freshwater ecosystem degradation in the neotropics. Specifically, the distribution and abundance of top aquatic carnivores can be impacted by depletion of fish resources, contamination and reduced water quality. We examined the influence of mining-related human disturbance on Endangered giant otter (*Pteronura brasiliensis*) populations.
We carried out visual surveys, behavioral observations, fish sampling and water quality assessments in protected and impacted oxbow lakes of Peru's Madre de Dios region.
Several lines of evidence suggested that freshwater ecosystem degradation impacts giant otter ecology. Extractive activities drove declines in fish richness and biomass and increased mercury accumulation in fish, resulting in resource-poor and contaminated habitats for giant otters. Accordingly, despite being found throughout gold mining regions, giant otter occurrence was lower in unprotected lakes. Behavioral sampling indicated reduced giant otter foraging efficiency in unprotected and fish-poor water bodies.
We conclude that freshwater ecosystems impacted by gold mining create habitats that are habitable but suboptimal for giant otter groups. The results add to evidence of unprotected habitat degradation and human-driven deterioration of neotropical freshwater biodiversity. Possible mitigation strategies include community-based conservation, bank restoration and access limitation to specific freshwater bodies outside main protected areas.

Session 4

Conflicts and Coexistence

Chair - Gonzalo Medina Vogel

Oral Presentations

Invited Speaker

The rise of coexistence as a new paradigm in understanding and managing human-wildlife interactions

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Abstract

Coexistence, as a concept and as a management goal and practice, has increasingly attracted the attention of researchers, managers and decision makers. It has emerged in the mainstream of conservation science as an increasingly meaningful framework for understanding and improving interactions between people and wildlife. For wildlife and humans—both individuals and institutions—to coexist fairly and sustainably at scale, careful planning is essential.
In this talk, I explore how the rise of coexistence over the past decade reflects key trends in the field of conservation, including a growing integration of the social and biological sciences (interdisciplinarity) and a shift from merely engaging stakeholders (transdisciplinarity) to actively working for them in the pursuit of social justice. Additionally, I introduce the 'Planning for Coexistence' workshop process. This approach, which centers on the mutual impacts of human-wildlife interactions, provides a platform for the co-production of a Theory of Change aimed at benefiting both wildlife and the people involved. By way of illustration, I describe the experience of recent workshops that brought together representatives from government, non-governmental organizations, private sector and local communities to plan for coexistence with a variety of species, including the Spix's macaw, the jaguar, whales, the pink dolphin and the giant otter.

Oral Presentations

Singapore's Urban Otters: from conservation success to management dilemma

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Abstract

Over the past two decades, Singapore has witnessed a remarkable resurgence of its smooth-coated otter (*Lutrogale perspicillata*) population. This conservation success story has been widely celebrated, showcasing the city-state's ability to integrate wildlife into its urban landscape.

The Otter Working Group, a collaborative effort amongst various stakeholders, has been instrumental in managing human-otter interactions and mitigating conflicts. However, recent years have seen a concerning rise in human-otter conflict incidents, including biting incidents and intrusions into private properties. These events have intensified public pressure on authorities to implement more robust management strategies. Yet, amidst the growing concerns, otters continue to captivate a notable portion of Singaporeans, their charismatic nature elevating them to unofficial national symbols.

While an updated population survey was conducted in late 2024 to reassess the otter demographics, it became evident that more timely and targeted interventions were necessary to address the escalating situation. This, against the backdrop of juxtaposed public sentiments, has underscored the need for a nuanced approach to otter management. In response, with the collaboration and support of the Otter Working Group, Singapore has initiated trials of various sterilisation methods as potential measures to control the otter population growth. While the trials presented expected technical, operational, and surgical challenges, managing conflicting public sentiments proved to be an equally significant hurdle.

By sharing Singapore's experiences and ongoing efforts, we aim to contribute to the global dialogue on urban wildlife management, particularly in the context of expanding otter populations in urban environments and balancing conservation goals with the needs of human communities.

Oral Presentations

Ecotourism with giant otters in the Brazilian Pantanal

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Abstract

The Pantanal is globally recognized as one of the premier destinations for wildlife tourism. This biome harbors rich and unique biodiversity, including iconic and endangered species such as the giant otter. However, tourism in the region faces significant challenges, including unsustainable practices like the use of bait to attract animals, the invasion of sensitive habitats and a lack of effective regulations.
Since 2019, Projeto Ariranhas has been implementing continuous efforts to promote sustainable tourism in the Pantanal and conserve this iconic species. Through training local tourism guides, educating tourists on best practices, and supporting public policies, the species has gained increased visibility within the local tourism industry. Human-otter coexistence is improving, and tourism management strategies are gaining more prominence on political agendas, which in turn reinforces the conservation of the entire ecosystem.

Oral Presentations

Evaluation of the human-otter conflict in central Veracruz, Mexico: recommendations for mitigation

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Abstract

Evaluating human–wildlife conflict is necessary to reach positive long-term management solutions and aid the conservation of biodiversity.
We used indirect approaches to evaluate the Human–Neotropical otter conflict in three river basins with high fishing activity in western Mexico and provided recommendations to mitigate the conflict by identifying the variables that increase the risk of predation of ponds by otters. Human–Otter conflict was moderate, and the opinions of community members toward otters were mostly negative, particularly those of the fishing sector. However, after offering environmental education workshops, the number of people recognizing the importance of protecting the species increased, which could result in the acceptance and tolerance toward otters. Avoiding building ponds at ground level and covering ponds with metal mesh, especially in fish-farms located in the middle and upper areas of rivers, as explored with fish-farmers, merits more experimentation, since it could be a good means for reducing the conflict.

Oral Presentations

Leveraging public policy for the conservation and monitoring of giant otters (*Pteronura brasiliensis*) in Cantão State Park, Tocantins, Brazil

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Abstract

Cantão State Park (PEC), a fully protected conservation unit, is situated at the ecotone between the Amazon Rainforest and the Cerrado biome. Covering 900 km² and hosting over 800 lakes, the park supports remarkable biodiversity.

In 2022, Naturatins (Nature Institute of Tocantins) initiated the Giant Otter (*Pteronura brasiliensis*) Monitoring and Conservation Program, or Pro Ariranha, to ensure the monitoring and preservation of this threatened species within PEC. This ten-year initiative is structured around three core objectives and 17 targeted actions, emphasizing population monitoring and evaluating the effects of human activities, including tourism, on the giant otter population. Monitoring commenced in June 2022 and is conducted annually through four field campaigns. These campaigns integrate population censuses, biological sample collection, and community outreach programs, fostering engagement with riverside communities and tourism stakeholders.

To date, the program has surveyed over 500 km of rivers and meanders and more than 40 lakes, cataloging 135 adult giant otters and 31 cubs across 35 groups, with an average group size of four individuals. Births have been recorded annually, with an average survival rate of 60%. In addition to ecological monitoring, the program incorporates environmental education initiatives with local schools and citizen science activities involving seasonal farmers residing in the park.

Pro Ariranha exemplifies the importance of evidence-based public policies in enhancing the monitoring of threatened species and promoting their long-term conservation, providing a replicable framework for species management in ecologically sensitive regions.

Oral Presentations

Study of the Neotropical otter *Lontra longicaudis* as a tool for sustainable wetland management

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Abstract

Two cases are highlighted in which the study of the Neotropical otter, *Lontra longicaudis*, has served as a tool for sustainable wetland management.
The first case is Presa La Vega, one of the 144 Ramsar sites in Mexico. Of the 9 possible criteria required by the convention to achieve this designation, La Vega Reservoir meets 3. The elements needed to justify these criteria were obtained from studies on *Lontra longicaudis*. The results provided essential information to create a diagnosis identifying environmental and social issues, leading to conservation and sustainable management strategies for the site. This successful process is being replicated at Presa El Nogal in Tapalpa, Jalisco, where otter studies have provided sufficient information to establish the first UMA (Environmental Management Unit) for free-living otters in Mexico. The site is also in the process of being designated as a Natural Protected Area (ANP). As shown in the previous examples, and due to its charismatic nature, role in the food chain, and status as an umbrella species in its ecosystems, studies of the otter are essential tools that generate relevant information for sustainable wetland management.

Session 5

"How To": Advanced Techniques for Otter Monitoring and Research

Chairs - Joanna Alfaro and Carlos Calvo Mac

Oral Presentations

Invited Speaker

Cardiff University Otter Project: thirty years of monitoring using otters found dead

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Abstract

During the past thirty years, Cardiff University Otter Project (CUOP) has conducted over 4,500 post-mortem examinations on otters (*Lutra lutra*), primarily those found dead as road kill. During that time, otter populations in the UK have increased in both range and numbers.
By archiving samples and data, CUOP has created an invaluable resource that researchers can use as a 'time machine' to study past ecosystems. Meanwhile, advances in technologies and understanding have paved the way for new areas of research. What began as a small research project focused on a few otter carcasses from Wales has since evolved to play a role in shaping chemical policy in the UK, while also providing valuable environmental monitoring, conservation, outreach, education, and research. In this keynote presentation I will share some of our recent discoveries, including genomic evidence of Thai otters in England, the alarming cocktail of chemical pollutants in European rivers, and the crossover of bird flu to otter populations.
Sustaining long term research projects like this is always a challenge, but our findings highlight the enormous value that can be developed by collecting wildlife found dead.

Oral Presentations

Eurasian otter connectivity analysis and range dynamic in central Italy

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Abstract

Eurasian otters (*Lutra lutra*) underwent a dramatic decline in Italy in the last century, when the species was confined to only a few river basins of Southern Italy. National, European and international strict regulations promoted a still ongoing recovery of the species both in Italy and in all of Europe. Specifically, *Lutra lutra* is listed in Habitats Directive (92/43/EEC) – Annex II and IV, thus it is mandatory for EU members to report every six years on its distribution and population trends, and identify priority conservation areas.
According to the National action plan, priority areas include the potential expansion areas at the current range boundary. In 2022-2023 we ran a field survey along the range boundary in South-Central Italy and produced a connectivity model to identify suitable corridors and potential areas of expansion in the short term. Field standard survey covered 129 10x10 km grid cells of Central Italy for a total of 458 sampling sites. Presence data was combined with occurrence available across the whole otter range in Italy. Occurrence was combined with 21 environmental variables to produce an ensemble Species Distribution Model. Suitable areas were then implemented in Omniscape to produce a resistance map that also included seacoast as potential dispersal routes, and produced a connectivity map. The connectivity map was further analysed to separate longitudinal (i.e. within a river basins) and lateral (i.e. across river basins).
The ensemble modelling (TSS=0.966, ROC=0.827) identified larger rivers, wetlands and shrubs as important factors for otter occurrence. The lateral connectivity model identified coastal areas as important connection pathways, whereas the inland matrix across drainages showed medium-low connectivity. Results also evidenced an acceleration of expansion trend in the last few years, with three new river basins occupied in the last three years.

Oral Presentations

Current methods and challenges of monitoring sea otter population recovery

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Abstract

A variety of approaches have been used to monitor the recovery of sea otter (*Enhydra lutris*) populations from the marine fur trade over the past century. The most common monitoring approach for sea otters has been to conduct surveys of abundance and assess population trends. Survey counts tend to be biased low due to imperfect detection and some researchers assume this bias is constant through time and space, while others estimate the amount of bias and adjust abundance estimates accordingly.

Here we report how recovering sea otter populations have been monitored and suggest ways to improve monitoring. A case study to illustrate the challenges of accurately monitoring sea otter populations is the monitoring story of the translocate population on the outer coast of Washington state USA. Northern sea otters (*Enhydra lutris kenyoni*) were translocated from Alaska to Washington in 1969/1970 to repopulate a previously occupied area within their range. The native otters had been extirpated during the Pacific maritime fur trade, with the last Washington sea otter killed in 1910. Fifty-nine animals were translocated from Amchitka Island, Alaska to the outer coast of Washington, where the population has now grown to an estimated 3,000+ individuals.

Management agencies recognized that this is an under-estimate of the actual population and have struggled to conduct surveys to capture more accurate population abundance and trends based on previous counts, estimated population growth rates and stranded animals.

Oral Presentations

Habitat preferences of hairy-nosed otters in Peninsular Malaysia

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Abstract

The hairy-nosed otter *Lutra sumatrana* was believed to be extremely rare (Sebastian 1995) in Peninsular Malaysia and listed as endangered by the IUCN in 2020 (Sasaki et al. 2021). The distribution of otters in Peninsular Malaysia was reported by Pazil et al. in 2020, and it includes seven confirmed locations of hairy-nosed otters. In this survey, seven confirmed locations were added using one of our findings, Baker 2013, Tan 2015, Salahshour 2016, Woo 2020, and one photo record by Christopher David Patterson. This data was obtained by camera traps and road kill.

Locations of hairy-nosed otters were analysed using GIS land use data 2010 of the Malaysian Government. The hairy-nosed otter is thought to be solitary and similar to the Eurasian otter (*Lutra lutra*) in its behaviour. The range of Eurasian otter territory in the temperate area is about 5km (Quaglietta et al. 2014). Buffers of a 5 km radius were generated at each location to evaluate habitats. The area size of each component in the buffers was calculated using GIS data: aquaculture, mangrove, secondary forest, peat swamp (including marshland), natural forest, vacant space, sea, lake, paddy field, beach, town, agricultural land (including oil palm, rubber and coconut plantations), shrub, river, dam, and ranch. The habitat difference among locations of hairy-nosed otters was analysed by cluster analysis.

Cluster analysis indicates four clusters, each characterized by 1) agriculture, 2) natural forest, 3) paddy field and agriculture, and 4) peat swamp and agriculture. The two areas include the extensive area of the town. This analysis could not induce a typical habitat, and we concluded that the hairy-nosed otter uses many kinds of habitats. This analysis will be continued by Maxent for estimating the potential habitat in Peninsular Malaysia.

Oral Presentations

From Erlinge to AI: how novel technologies are revitalizing the ancient art of otter tracking

Authors

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Abstract

Monitoring otter populations presents unique challenges due to the species' nocturnal and elusive behavior. Traditional methods like presence-absence data often lack the detail needed to assess population demographics, territoriality, or individual identity. While DNA-based techniques provide valuable insights, they are costly and impractical for large-scale use. Camera traps, though widely used, frequently fail in aquatic environments, risking missed detections, and radio telemetry, while informative, can be invasive and limited in scope. Early tracking studies by Erlinge (1968) and later advancements by Sulkava (2006) demonstrated that otter footprints could provide extensive information on population size, structure, behavior, and territory, offering a cost-effective, non-invasive approach in snow-rich regions. Building on these methods, recent research has combined footprint analysis with machine learning (ML).
The Footprint Identification Technology (FIT), developed by WildTrack, has shown high accuracy in identifying individuals and predicting sex through footprint morphometrics, with applications across conservation.

Oral Presentations

Activity patterns of *Lontra annectens* in two unique Mesoamerican regions

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Abstract

Camera traps have become a valuable tool for studying animal ecology and supporting wildlife conservation initiatives by improving the scientific comprehension of the activity patterns of elusive and threatened species in remote areas. In the Mesoamerica region, the activity patterns of most mammal species are not well described or remain unknown. This is the case of the Mesoamerican otter (*Lontra annectens*), a species with primarily anecdotal information about its daily activities.
This study aimed to enhance our understanding of the Mesocamerican otter's activity patterns between two separate Mesoamerican regions. We compared camera-trap data collected from August to October 2018 at the Pantanos de Centla Biosphere Reserve (PCBR) in southern Mexico with data collected from August to October 2024 at the Tirimbina Biological Reserve (TBR) in northern Costa Rica. To ensure the independence of each photographic event, a threshold of one-hour intervals was established between occurrence events. In addition, based on independent photographic events, we used a kernel density estimator to calculate each population's diurnal, crepuscular, and nocturnal activity proportions.
We obtained 105 independent records in the PCBR (244 camera trap-days) and 111 in the TBR (186 camera trap-days). Otters within the PCBR exhibited predominant activities during diurnal periods (69.52%, 73 records), with a lower proportion of crepuscular activity (9.52%, 10 records). In contrast, the otter population within the TBR exhibited bimodal activity patterns, characterized by peaks during diurnal (31.53%, 35 records) and nocturnal (33.33%, 37 records) periods. Human activities and environmental factors, such as resource availability and ambient conditions, can influence animal activities. Our study aligns with research previously conducted in Colombia and Brazil, which indicates that this species' activity cycles are adaptable.

Oral Presentations

Latrine Use by spotted-necked otters: applications for improving survey efficiency and enhancing viewing opportunities at Rubondo Island National Park, Tanzania

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Abstract

During 2006 and 2007 we conducted walking surveys to detect the latrines of spotted-necked otters (*Hydrictis maculicollis*) along five 6-km shoreline sections distributed along the shoreline of the eastern side of Rubondo Island National Park (RINP) in the southwest corner of Lake Victoria in Tanzania. We recorded habitat characteristics associated with latrines located, and subsequently developed statistical models useful for predicting shoreline habitat conditions most likely to be associated with latrines.

Based on these outcomes we subsequently (during May 2008 and February, June–August 2009) observed spotted-necked otters along a 5.17 km section of shoreline of RINP, also along the easter shoreline, to determine if their activity patterns were associated with latrines sites. For this assessment, we compared the distance of spotted-necked otters sightings associated with the shoreline (n = 207) to the distance between an equal number of GIS-generated random points to the nearest latrine for each of the respective points. The mean distances for locations of spotted-necked otter sightings to the nearest latrine differed from the mean distance of random points to latrines (171.94 [SE = 11.30] and 66.13 [SE = 8.16], respectively; t = -9.23, df = 412, P < 0.001). Sightings also were much (2.6 times) closer to latrines that occurred in groups than those that were isolated (single).

Establishing viewing sites at or near latrines (particularly those occurring in clusters) is thus an effective way to maximize opportunities to see spotted-necked otters. The various aspects of our study demonstrated that surveys to detect the latrines of spotted-necked otters can be enhanced by the a priori assessment of associated habitat characteristics, that shoreline-associated activities of spotted-necked otters are closely associated with latrine locations, and that efforts to view spotted-necked otters are enhanced along sections of shoreline with clusters of latrines.

Oral Presentations

The spread of hybridisation between small-clawed and smooth-coated otters in Peninsular Malaysia

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Abstract

Moretti et al. (2017) indicated that the smooth-coated otter population in Singapore is a hybrid between the smooth-coated otter (*Lutrogale perspicillata*) and the Asian small-clawed otter (*Aonyx cinereus*). It is assumed that this hybrid otter arrived from neighbouring Peninsular Malaysia. Thus, we investigated this hybrid speculation by conducting a molecular research to detect potential otter hybrids in Peninsular Malaysia.

To detect hybrids, we used sequence variations of the mitochondrial D-loop region, sex chromosome-specific genes DDX3X and DDX3Y, and fragment lengths of genes amplified by the microsatellite marker Lut782. Faeces were collected from August 15 to 19, 2023, in Johor areas close to Singapore. One fresh faeces was collected from each fecal site, and 14 faeces were collected and stored in 99.5% alcohol. For comparison, three faeces were collected on January 7, 2024 at Paya Indah Wetlands in Selangor, where an investigation of Asian small-clawed otters was conducted, and three faeces were collected on December 11 and 14, 2023 around Parit Buntar in Perak, where otter diet surveys were conducted.

As a result of analysis, it was determined that two faeces in Johor adjacent to Singapore (one in the central state of Selangor, and one in the northern state of Perak) were identified as hybrids. This is the first confirmation of otter hybrid in Peninsular Malaysia, and since it has also been confirmed in the southern, central, and northern parts of the country, it is assumed that the hybrid has spread over a wide area of Peninsular Malaysia over a considerable period of time.

Oral Presentations

Spraint density of the Eurasian otter (*Lutra lutra*) as an accurate indicator of its population status in urban areas

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Abstract

The most traditional method used to monitor the distribution of otters is spraint density surveys, but there has been long-standing debate regarding whether this approach is sufficiently accurate.
In response to this debate, the effectiveness and reliability of spraint density surveys as a method for assessing the otter distribution within urban areas were evaluated by comparing results with those achieved using two alternative methods: genetic analysis and camera trap-based density based on the random encounter model. In addition, the spraint density was tested as an indicator of otter habitat preferences by modeling 19 environmental factors (seven associated with prey, nine with land use, and three with the river environment) using a N-mixture model.
Spraint surveys, genetic analysis, and camera trapping were conducted at 36, 22, and 12 sites within Daegu Metropolitan City, Republic of Korea, respectively. A regression model indicated that the spraint density was strongly associated with the other two methods, while it was also found to accurately represent otter habitat preferences, with otters in urban areas preferring sites with a high density of large fish and river islets.
Consequently, spraint density surveys were the most time-effective, cost-effective, and reliable method for investigating the otter distribution in this urban environment. As a result, population status assessment using spraint density surveys can provide important information for the conservation management of urban otters

Oral Presentations

Habitat use of the marine otter *Lontra felina* (Molina 1782) in the locality of Colcura, Biobío region, Chile

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Abstract

The marine otter (*Lontra felina*), an endangered mammal, inhabits a narrow coastal strip and plays a crucial role in the ecosystem. This research, carried out in Colcura, Biobío, Chile, analysed the factors that sustain the high abundance of this species despite modifications to the coastal edge. Three approaches were used to assess i) its population, estimation of abundance, ii) terrestrial habitat, analysis of the use of containment structures such as artificial burrows, and iii) subtidal habitat, assessment of diet and subtidal food supply. The results indicate an abundance of 10 individuals/linear km, the highest recorded in Chile since 1986. 76.9% of the containment structures are used as artificial burrows. A diet based on crustaceans is observed, with *Allopetrolisthes punctatus* (44.2% frequency of occurrence) standing out, its assessment indicating that although *L. felina* has a generalist diet, it does not follow an opportunistic pattern. The high abundance of marine otters in Colcura highlights the importance of this particular habitat for the species, underlining the urgent need to conserve and protect this coastal area in the Biobío Region.

Oral Presentations

High-end microscopy techniques to localize PFAS in tissues

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Abstract

Perfluoroalkylated substances (PFASs), such as perfluorooctanoic acid (PFOA), have been extensively used for many industrial purposes and are therefore omnipresent in our environment. However, these chemicals are persistent and accumulate in human and animal bodies, leading to major health issues. Upon oral exposure, the gastrointestinal tract is the first physical barrier against these toxicants. Unexpectedly, their impacts on the intestinal wall are largely unknown.
To our best knowledge these methods have not been applied to otter tissues. We will present some applications showing the uptake, intracellular fate and toxicity of PFOA using state-of-the-art in vitro assays combined with the new imaging methodology. Notably, we correlate electron microscopy (EM), that reveals the inner morphology of the cells, with mass spectrometry (MS), that provides analytical information. In this last respect, we use Secondary Ion Mass Spectrometry (SIMS) that has both an excellent spatial resolution and an excellent detection limit, allowing sub-cellular localization at low concentration.
The combination of powerful imaging techniques with usual toxicology assays provides insightful information about the uptake, fate and toxicity of PFOA on intestinal cells and opens new opportunities in toxicology and pharmacology and could also be applied to samples of wildlife.

Session 6

Red and Green Status Assessment

Chair - Anna Loy

Oral Presentations

Invited Speaker

Measuring otter recovery and conservation impact with the Green Status of Species

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Abstract

What does species recovery mean, and how can we measure it?
The IUCN Green Status of Species addresses this pressing question, offering a standardised framework to evaluate species recovery and conservation impact. Launched in 2021, this tool was shaped in part by the IUCN SSC Otter Specialist Group (SG), whose insights during the preliminary testing phase played a crucial role in refining the method. The Otter SG's ongoing dedication to applying the Green Status framework has led to significant milestones, such as the publication of the Eurasian Otter assessment, with many more assessments underway. This talk will highlight the Otter SG's role in developing the Green Status of Species, unpack the assessment process, and explore how insights from assessments can guide strategies to accelerate otter recovery globally.

Oral Presentations

Sea otter, *Enhydra lutris*, conservation legacy and potential for recovery, the IUCN Green Status Assessment

Authors

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Abstract

Sea otters, *Enhydra lutris*, are marine mammals in the otter family (Lutrinae), a subfamily of the weasel family (Mustelidae). They are found throughout north Pacific nearshore areas, from intertidal areas to 100 m in depth along coastlines from northern Japan in the west Pacific to Baja California in the east Pacific. Sea otters were nearly hunted to extinction by the international maritime fur trade from 1741-1910. To date, they have recovered to almost half their pre-exploitation numbers, yet they remain absent or depleted in many areas of their historic range.

Sea otters are keystone species stabilizing and recovering nearshore ecosystems in many areas after recovery from the fur trade. Their effect is particularly notable in kelp forest, sea grass and salt marsh systems where they exert top-down control by eating benthic invertebrate grazers. They are listed as Endangered on the IUCN Red List of Threatened Species due to declining populations in the western portion of their range linked to orca (*Orcinas orca*) predation and range stagnation in the southern part of their range linked to great white shark (*Carcharodon carcharias*) predation.

The IUCN Red List is an assessment of a species' extinction risk. Newly complementary to the Red List is the IUCN Green Status Assessment, which is an assessment of the effect conservation efforts past, present and future may have in species recovery. The Green Status for sea otters was recently completed and based on efforts after the fur trade and others to recover sea otters throughout their range such as reintroductions and reducing the potential risks of oil spills in nearshore areas, sea otters are considered still largely depleted. Sea otters have a high conservation legacy and high potential for further recovery.

Oral Presentations

The Green Status of the Eurasian otter

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Abstract

The Green Status is a new global standard of measurement created by the IUCN for quantifying species recovery and assessing conservation impact. Different factors contribute towards a Green Score, ranging from 0–100%, which shows how far a species is from its "fully recovered" state. The Green Score is calculated at different points in time (scenarios) to show the current status, how conservation actions have affected that current status, what we might expect in 10 years if conservation actions were halted, and how a species' status might be improved in the future (100 years) with conservation action. This is reflected in four conservation metrics: the Conservation Legacy, the Conservation Gain the Conservation Dependence, and the Recovery Potential. The Green Score (G) is estimated at each of the bolded scenarios. For each metric, the assessment is run for each spatial unit of the species range, where the species has to be evaluated as absent, present, viable, or functional. The evaluation allows a degree of uncertainty.
In 2022 we assessed the Green Status of the Eurasian Otter (*Lutra lutra*) in 56 spatial units, corresponding to the countries within the range, and produced a map of future climate change impact on the species range, i.e. identified suitable climatic areas that will be gained, lost, or will remain stable in 2070 under RCP 2.6 and RCP 8.5.
The final Recovery Score was 41% (Largely Depleted), and included an Indeterminate Conservation Legacy, an Indeterminate Conservation Dependence, a Low Conservation Gain, and an Indeterminate Recovery Potential.

Session 7

Education, Communication and Networking

Chairs - Margherita Bandini and Arno Gutleb

Oral Presentations

Invited Speaker

38 years of the IUCN SSC OSG Bulletin

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Abstract

The IUCN SSC OSG Bulletin was first published in 1986 by Chris Mason and later edited by Dave Rowe-Rowe. Since 1994, Arno Gutleb has been the editor-in-chief.
This talk will present a quick historical overview, highlighting past, current and future challenges and anecdotes. As additional voluntary support for some tasks is hard to obtain, this issue will be raised and hopefully positive feedback will be collected from the audience regarding what the community needs in the current of the IUCN SSC OSG Bulletin.

Oral Presentations

Spotted-necked otters and Rubondo Island National Park, Tanzania: the process of developing an Ecotourism Flagship

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Abstract

To most North Americans and Europeans, otters are highly esteemed for intelligence, playfulness and attractiveness. In fact, otters are regarded by many conservationists from these regions as key indicators of the health of aquatic and wetland ecosystems. Additionally, the playful behavior and appearance of otters make them particularly appealing to many people with a recreational interest in viewing wildlife. Consequently, in addition to their potential value as bio-indicators in aquatic environments, otters also possess characteristics that make them excellent candidates for use in promoting wildlife tourism in landscapes dominated by aquatic environments. Unfortunately, otters have received little conservation and research attention in many other areas of the world – especially in Africa.

During 2007-2008 we conducted human dimensions and ecological studies at Rubondo Island National Park (hereafter, Rubondo) to evaluate the potential of spotted-necked otters (*Hydrictis maculicollis*) inhabiting the Island to serve as flagships for promoting tourism to the area. Human dimension studies focused on assessing local people's attitudes and knowledge about otters, tour operators' interest in taking clients to Rubondo to view otters, and the interest of tourists in visiting Rubondo for otter-viewing opportunities. Ecological studies focused on assessing where, when, and how to best view otters at Rubondo by assessing habitat preferences, activity patterns, and behavioral responses to the presence of people.

We discuss the outcomes of these investigations, how these outcomes can be integrated and applied by the Park for promoting otter-based tourism, and both challenges and opportunities for using the otter as a tourism flagship.

Oral Presentations

A socio-ecological approach to research and conservation of the southern river otter (*Lontra provocax*) in Tierra Del Fuego Archipelago

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Abstract

The southern river otter (*Lontra provocax*) occupies a marine/coastal population in the Tierra del Fuego Archipelago (TDF), Argentina, and is classified as "Critically Endangered" by the IUCN Red List. Identified threats included habitat degradation and modification, biological invasions, and lack of societal awareness. Currently, research needs include the identification of ecological (distribution; activity patterns; spatio-temporal, diet and trophic niches) and social (representations, knowledge and values) dimensions of this species.

We present the results of a 6 years socio-ecological study in TDF. A total of 170 km of coast were surveyed, with 28 camera traps deployed, resulting in 18,308 trap-nights, 522 faeces samples analyzed and 395 surveys conducted. 234 otter sites were identified throughout TDF. Results show that protected areas with no human presence represent the sites with most activity. Otters exhibit mostly crepuscular activity, however in areas with no humans, the activity was throughout the day. The Mitre Peninsula was identified as an important biological corridor for the species. Diet was composed mainly of fish (Patagonotothen) and crustaceans (Grimothea), along with echinoderms, depending on availability. Trophic position corresponds to a meso-predator, however in simple trophic webs, such the TDF one, the species appears to be the highest predator in the web.

Regarding the social dimensions, 77.4% of responders had never heard of this species, only 26.4% identified it as native and 7.4% knew it was critically endangered. Knowledge of the species was related to age (younger people were more aware) and nature closeness (people working or visiting nature were more aware).

This information will serve as a baseline for implementing conservation strategies for the southern river otter and decisions regarding public policies to manage introduced species and human activities, including visitation hours in protected areas. Also, we hope this information contributes with the ongoing IUCN SSC OSG efforts for the conservation of this species, as seen in the Global Otter Conservation Strategy.

Oral Presentations

A 25 year Best Practice example of how citizen science and government organisations can collaborate to monitor otter populations

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Abstract

Informed citizen science provides a valuable opportunity to acquire biological wildlife data. Citizen science can provide data routinely and consistently across time covering large areas through national initiatives and filling knowledge gaps when and where experts are missing. Encounters with wildlife and observations of dead animals can easily be reported on online platforms using own mobile devices or sent as messages through appropriate applications. Here we present a cost-effective initiative launched in 2000 to collect data on otter road kills in Italy. The initiative includes both a WhatsApp alert network comprising research institutions, national veterinary and public health services, forestry and environmental police, wildlife rescue centres, national parks and NGOs involved in otter conservation in Italy and an online distribution map (http://therio.unimol.it:8080/lontra/mappa.html) publicly available. The network grew over time increasing the likelihood of detection of otter carcasses also by leveraging the connection between the network's members and local communities. Otter carcasses are usually rapidly communicated to the network leading to their recovery, when possible, for further analyses, necropsies and storing, and providing data points on the population status and distribution. A total of 166 carcasses have been retrieved since 2000 and 13 otter sightings have been reported and verified by the network. The data collected up to now has allowed for the estimation of the impact of accidental road kills on the Italian population, has been used as an early warning of new areas colonised by otters in Central and North Italy, revealed the appearance of new parasites, and indicated that otters in Italy use coastal habitats more than expected.

Oral Presentations

African otters: conservation efforts, education efforts and research outputs over the past decade

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Abstract

Research and conservation actions aimed at otters in Africa have traditionally lagged behind compared to efforts on other continents. The African Otter Network (AON) has endeavoured to help correct this and advance otter conservation, research and education on the continent. Here we present an overview of the conservation and education efforts associated with the AON, as well as all peer-reviewed research outputs over the past decade that include information on the three otter species endemic to sub Saharian Africa (African clawless - , *Aonyx capensis*; Congo clawless - *Aonyx congicus*; and spotted-necked otter, *Hydrictis maculicollis*).

Conservation and education projects have been focused largely on central and central-eastern Africa (e.g. Tanzania, Uganda and the Democratic Republic of Congo), while some work has also been undertaken in parts of west Africa (e.g. in Nigeria and Cameroon). However, most research publications have emanated from southern Africa and focused on African clawless otters, and to a lesser extent spotted-necked otters. Notably, no research outputs on Congo clawless otters were found and we are not aware of any ongoing research efforts involving this species.

Several key research needs remain to better understand the ecology of, and threats to, otters in Africa, as well as to formulate appropriate management actions and conservation plans in the region. These include the need for long-term monitoring studies to understand the impacts of human activities and climate change effects on otters, particularly Congo clawless otters, and the ecosystem they live in.

Oral Presentations

Launching #ShareSavvy, the new social media campaign

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Abstract

During the last year, members of the OSG have been working to produce a document depicting guidelines that aim to reduce the risk of images of otters being harmfully perceived when shared on social media, in order to protect the welfare of captive otters globally, as well as to protect the greater conservation of wild otters.
This document is especially important in the launch of the new #ShareSavvy campaign, focussed on raising awareness on the impact social media can have on the conservation of wild animals, using otters as its champion species. The oral presentation will remind the audience about the importance of social media and describe the #ShareSavvy mission in order to spread the concern and solutions revolving around our daily online actions.

Oral Presentations

Introducing the Otter Youth Circle

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Abstract

Published in 2023, the official IUCN Youth Strategy specifically acknowledges the critical role of youth in conservation as young generations will inevitably face the consequences of any present actions undertaken or, on the contrary are refrained from. At the same time as the strategy was published, the Otter Youth Circle was founded as a new initiative within the OSG, as an outcome of several active youth members attending the 15th IOC in Sospel, France.
The current OYC board consists of four youth members and is advised by the OSG Communication Coordinator. By working closely together with the official OSG management team and co-chairs, the philosophy of the OYC is to connect the management team with OSG youth members from 18-35 years of age and represent their overall ideas and needs.
To facilitate how IUCN SSC Specialist Groups and, in particular, the OSG is functioning, as well as to reduce potential barriers, the OYC follows several objectives. These include the enhancement of youth representation within the OSG, the increase of youth presence in otter research, the connection of youth to respective resources, assisting early career scientists with finding suitable funding and increasing the overall chance for them to remain in otter conservation longterm. Following the official OYC strategy, connection and communication are the key elements of the approach, also represented in the current OYC action plan for 2023-25. Several actions were already completed, including online presence, the setup of an official email address and the production of educational material aimed at young researchers.
To identify the needs of OSG youth members, a survey was conducted in 2023. Based on the results, a webinar series featuring otter conservation and research topics was successfully initiated in 2024 and covers the need for training resources online. In addition, external funding was secured by OSG internal donors to allow several youth the attendence of the 16th IOC in Lima, Peru. Also, as part of the OYC related activities during the conference, a youth mentor mixer will take place to facilitate networking between youth and professionals. Awards for the best youth oral and poster presentations will highlight innovative research conducted by early career scientists. In the upcoming years, the OYC will continue to work on their strategy and address challenges, such as securing external funding for youth-related activities and to closely collaborate with the official OSG board to make sure youth will remain an integral part of otter conservation in the future.

Workshops

Workshops

Necropsy Workshop
Establishing effective post mortem projects for research and conservation

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Abstract

Background
Detailed and standardised post mortem investigations of otters found dead offer valuable data and samples for research which provides insights into the status of populations and provide unique insights into individual, population and ecosystem health. Since the late 20th century the value of otter post mortem research has been increasingly recognised for management, regulation and policy, in diverse areas including wildlife conservation (population monitoring), human health (zoonotic disease) and chemical regulation (ecosystem exposure monitoring). To date, long term otter monitoring programmes only exist in a few countries, such as the United Kingdom and Sweden. European collaborators have come together to share practical advice, including biometrics, parasite collection techniques or storage of samples, and there is a recognised need to set up similar schemes in more countries within Europe as well as outside, and to share best practice and harmonise methods so that data can be widely shared and compared.

Content
Participants will discuss the critical steps it takes to build a robust monitoring programme, to conduct standardised post mortem investigations and to set up a biobank in accordance with individual needs, which also facilitates broader collaboration. This includes legal aspects, such as national and international conservation policies, hunting laws and hygiene measures. Relevant steps of a thorough necropsy, including sample and data collection, will be explained using different case scenarios. A minimum set of samples, most important to be taken, will be proposed, including standardised handling and storage.

Outcome
Our goal is to provide all participants with a toolkit of knowledge encompassing the most important aspects to build an otter post mortem monitoring scheme. Based on group discussions identifying individual and country or species specific challenges, participants are encouraged to develop problem solving approaches. Case studies from existing post mortem programmes will highlight the potential of such monitoring schemes, especially with regards to aspects such as mitigation measures for environmental pollutants, One Health and biodiversity frameworks.

Workshops

eDNA Workshop

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Abstract

In this workshop all attendees can acquire essential information to plan an otter monitoring campaign using environmental DNA (eDNA), with a specific focus on the quantitative PCR approach. We will navigate all fundamental stages of an eDNA study from assay design to DNA extraction. The workshop is available to anyone interested in retrieving valuable ecological data, especially from cryptic or rare otters.

eDNA is a novel technique to rapidly detect species occurrences in the environment, particularly useful with species that are difficult to detect through traditional methods. Living cells containing DNA shred into the environment are retrieved through the collection of environmental samples and processed with the barcoding methodologies. Quantitative PCR (qPCR) is a species-specific eDNA approach that is more sensitive to low DNA concentrations compared to the wide used eDNA metabarcoding approach. The collection of water samples and the analysis through qPCR eDNA techniques can easily unveil the presence of rare and elusive freshwater species as otters are, living in harsh districts of the world often difficult to survey. Thus qPCR eDNA can be used to infer the conservation status of otters that are poorly known.

The aim of this workshop is to provide extensive guidelines to use eDNA for large-scale monitoring programmes on otters to reveal unexpected distribution and acquire otter occurrences to be used for ecological inferences. Participants will learn the critical steps of an eDNA workflow, including genetic screening on genetic databases for accurate assay design, the validation process of primers and probes, the planning of a sampling design, the requirements of the aquatic environmental conditions, the collection of water samples and the filtering procedures, and the extraction stage.

Poster Sessions

Poster Sessions

Wildlife associated with the giant otter (Pteronura brasiliensis) in the Brazilian Pantanal

Authors

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Abstract

The giant otter (*Pteronura brasiliensis*) is a top predator and a bioindicator of the conservation of aquatic ecosystems. The species uses different spaces, like excavated dens latrines and campsites along riverbanks.
This study aims to evaluate the use of giant otter terrestrial structures by other species and highlight their role in terrestrial ecological interactions. During the dry season (July to November) of 2024, camera traps were installed along the Rio Negro in Aquidauana municipality, southern Pantanal, Brazil (MS), (occupied by giant otters or no recent signs of occupation) on dens, latrines and campsides. In the preliminary results, we observed 17 species, including seven birds, four mammals, one reptile, one amphibian and four insects. Birds were the most abundant group, accounting for 40% of the records, with most observations associated with active dens. Bird species recorded included the crested caracara (*Caracara plancus*), yellow-headed caracara (*Milvago chimachima*), bare-faced curassow (*Crax fasciolata*), Amazonian motmot (*Momotus momota*), grey-necked wood rail (*Aramides cajaneus*), chaco chachalaca (*Ortalis canicollis*), and blue-throated piping guan (*Pipile cumanensis*). Among mammals, the lowland paca (*Cuniculus paca*) was the most frequently observed, accounting for 30% of the records and being exclusively associated with inactive dens. Other mammals observed included puma (*Puma concolor*), capybara (*Hydrochoerus hydrochaeris*) and one unidentified mouse. The black-and-white tegu (*Salvator merianae*) was the only reptile identified. Additionally, one unidentified amphibian species and insects such as flies, dragonflies and ants were also recorded.
These results can show a complex ecological role of giant otters not only in aquatic ecosystems as apex predators and aquatic sentinels, but also in terrestrial ones acting as ecosystem engineers. Fulfilling multifunctional roles and providing resources for other organisms. This study contributes to understanding and underscores the importance of integrated conservation strategies that consider interspecies interactions and reinforces the need for holistic approaches to preserve biodiversity.

Poster Sessions

ManyOtters1: a pilot study on long-term memory in otters using puzzle feeders

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Abstract

ManyX groups take the big team science approach to investigating animal cognition (e.g., ManyPrimates, ManyDogs, ManyFishes). We have initiated a ManyOtters group to promote studies with larger sample sizes and a variety of species of otters, while developing a collaborative network of scientists. We will share our progress in developing this collaboration and hope to recruit new members to our team here!

ManyOtters1 focuses on long-term memory. We are conducting a pilot study with three facilities and three species of freshwater otters: North American river otters (*Lontra canadensis*), Asian small-clawed otters (*Aonyx cinereus*), and spotted-necked otters (*Hydrictis maculicollis*). The otters are presented with 15 puzzle feeders varying in difficulty depending on the number and type of actions required to obtain a food reward. Some puzzles are replications of those used in previous studies while others are original.

Initial data was collected in January 2024 with repeated exposure to the puzzles about two months later to assess whether the solution time or strategies change, providing evidence of long-term memory. The pilot study results will be used to refine the project procedure, which will then be shared and expanded to other scientists and facilities who want to join our team.

Poster Sessions

The secret life of *Lontra felina*: nocturnal records and use of an artificial breakwater by the marine otter at Playa Valdivia in the district of Asia, Lima-Peru

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Abstract

The marine otter, also known as "chungungo" (*Lontra felina*), is a coastal predator from the Mustelidae family, commonly characterized by its diurnal habits and its ability to utilize anthropogenic structures as part of its habitat. However, little is known about its nocturnal activity and how it makes use of these man-made features within its habitat, limiting our understanding of its spatial and temporal ecology.

This report documented the nocturnal behaviour of *Lontra felina* and the various uses it makes of an artificial breakwater located at latitude -12.86635° and longitude -76.51588° (Asia, Lima-Peru).

To achieve this, a camera trap was installed in the galleries inside the artificial breakwater, complemented by periodic inspections during battery changes. These inspections enabled the identification of biological traces such as food remains, faeces and anal secretions. Over the course of 13 trap nights, 106 detections were recorded, of which 42 were visual and auditory records of the marine otter. Observations were classified into four periods: dawn (5:00 to 6:00), day (6:00 to 18:00), dusk (18:00 to 19:00), and night (19:00 to 5:00). Of the visual and auditory detections, 40.48% were diurnal, 33.3% nocturnal, 14.29% during dawn, and 11.9% during dusk. Additionally, a significant number of biological traces were found: 21 faeces, 4 anal secretions, and approximately 50 remains of purple crabs (*Platyxanthus orbignyi*).

The similarity in the proportion of diurnal and nocturnal records demonstrates the nocturnal habits of the "chungungo" and underscores the importance of investigating the circadian activity patterns of this species. Furthermore, the traces found indicate multiple uses of the breakwater, suggesting that its different areas serve specific functions, such as feeding zones, latrines, and territorial marking areas.

Poster Sessions

Renal Agenesis: necropsy findings in a southern river otter (*Lontra provocax*) from the Chiloé Archipelago, Southern Chile

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Abstract

Road-killed wildlife and postmortem examinations are valuable sources of information, revealing insights into diet, parasites and other biological characteristics. In Chile, the southern river otter (*Lontra provocax*), known locally as the "huillín," faces significant conservation challenges. These are mainly due to past exploitation by the fur industry and habitat degradation in the Valdivian temperate forest. As a result, the species is classified as "Endangered" by the IUCN.

Postmortem studies of the huillín are scarce in Chile. According to the National Fisheries and Aquaculture Service (SERNAPESCA), only three road-kill cases have been recorded, and the one described in this poster is the only case involving a juvenile male. The animal was found on the roadside near Lake Tarahuin in Chonchi, Chiloé Archipelago. SERNAPESCA authorized the postmortem examination at Andrés Bello University, following the necessary biosafety and transportation protocols. The individual, a juvenile male, was found to have died from cranioencephalic trauma and showed a healthy body condition. Morphometric measurements and weight were recorded, and samples were collected for genetic and histopathological studies. Among the most notable findings, a total absence of the right kidney and adrenal glands was observed, marking the first reported case of this species exhibiting such an anomaly. The existing kidney displayed a multilobed structure.

This case could be associated with the significant reduction in the genetic diversity of the huillín, along with the high pollution levels in southern Chile's rivers and lakes, both of which impact its conservation and genetic health.

Poster Sessions

Elaboration of a management and conditioning routine in giant otters for breeding under human care

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Abstract

Giant otters (*Pteronura brasiliensis*) under human care have always had several factors against their reproductive success. That is why in this study we addressed the problem directly, implementing a management and conditioning routine before, during and post partum in a pair of giant otters housed at the Parque de las Leyendas Zoo (Lima, Peru) in order to obtain successful pups that exhibit behaviors such as feeding and swimming, thus guaranteeing their survival.

The otters were conditioned using the three areas of their facilities: exhibit area, roosting area and feeding area, each with different characteristics. The routine was employed to facilitate passage to each zone, either for daytime exercise, feeding or overnight resting. Secondary reinforcers such as voice commands and a whistle were used to prompt movement between the different environments; primary reinforcers such chicken or fish were used for each well-performed action, with chicken being preferred by the otters.

The otters responded satisfactorily to the routines, which were modified according to their biological needs. Operant conditioning facilitated actions such as: monitoring, biometrics, vitamin supplementation, physical condition evaluation, swimming exercise and feeding of the pups, as well as supplementation and monitoring of the parents, resulting in the reproductive success of the pair of giant otters in their second gestation with 2 pups. Recommendations include areas with a diversity of substrates and adequate access and the use of cameras in different areas (to better monitor the animals).

Poster Sessions

Identification of otter feeding habitats and conflicts with paddy field stakeholders in Perak, Malaysia

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Abstract

Paddy fields in Perak, Malaysia, are used by local people for a variety of purposes, including irrigating aquaculture systems and catching fish for consumption. Meanwhile, predators such as the Asian small-clawed otter (*Aonyx cinereus*) and the smooth-coated otter (*Lutrogale perspicillata*) also prey on small animals such as fish, crustacean and mollusks in aquaculture farms, irrigation canals and paddy fields.

In this study, to determine the potential for conflict between humans and otters over food resources, we used faecal DNA barcoding analysis to determine the feeding habits of otters in paddy fields.

First, we created a database of the small animals found in paddies in Perak. Next, prey collected from faecal samples of the same area was sequenced using a next-generation sequencer and analyzed in conjunction with the created database and the database in GeneBank. The original DNA database was created for the state of Perak, as a reference sequence for small animals found around paddy fields.

We collected 26 fish species, 2 crustacean species and 3 shellfish species from the paddy field. These 31 samples were sequenced from tissue samples for the original DNA database. A total of 72 faecal samples were collected around the paddy field during both the rainy and dry seasons from December 2023 to August 2024. DNA was extracted from 23 faecal samples and sequenced using primers for fish (MiFish-U), mollusk (MOL16S) and crustacean (MiDeca) species.

In this poster, we report the results of this analysis and discuss stakeholder relationships.

Poster Sessions

Survey of the southern river otter (*Lontra provocax*) in high conservation value areas

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Abstract

Since 2010, we have been annually monitoring the presence of *Lontra provocax* in areas recognized for high conservation value according to the Forest Stewardship Council (FSC) certification.
This monitoring was conducted within the river basins of the Toltén and Boldo rivers, Chile, which are embedded in a landscape dominated by *Pinus radiata* and *Eucalyptus globulus* plantations. Despite these conditions, the otter population has shown stability over time. *Lontra provocax* inhabits the Boldo and Licancuyín rivers within these basins, where riparian vegetation composed of native species creates a continuous hydric corridor that meets the autoecological requirements essential for the species' survival. The regional landscape is further enriched by a swamp forest primarily composed of *Blepharocalyx cruckshanksii* and *Myrceugenia exsucca*, which supports a series of lowland lagoons that serve as a biodiversity reservoir.
Field monitoring was conducted during two main periods of the year (spring-summer and autumn-winter), involving visits to transects to record signs of otter presence (tracks, faeces, and direct sightings) and the deployment of camera traps. This methodology enabled the creation of annual records of *Lontra provocax* presence and the estimation of individual numbers in the area, confirming stable abundance over the last decade. In recent years, water quality analysis has been incorporated into the study, focusing on the Boldo and Licancuyín rivers to assess the impact of forestry and agricultural activities on water quality.

Poster Sessions

Potential distribution of the huillín (*Lontra provocax*) in the middle and lower basin of the Chadmo River, X Region, Chile

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Abstract

The southern river otter (*Lontra provocax*) is an endangered species that currently has a limited distribution in Chile, mainly due to land use change, increased human colonization and channelization of watercourses. The difficulties in direct observation and natural low population density have generated a scarce ecological and geographic knowledge of the species.
Our objective was to determine the potential geographic distribution of *L. provocax* in the middle and lower basin of the Chadmo River, Quellón, Chiloé Island, Chile. We surveyed for otter field signs (direct observation, tracks, faeces). We used the MaxEnt algorithm to model suitability habitat in the middle and lower basin of the Chadmo River with six uncorrelated environmental variables and seven presence records without spatial correlation.
The results indicate that suitable areas for the species are scarce, with suitability values between 0.428 and 0.685, and no areas of high suitability. The variables of greatest contribution to the model were elevation and slope, aligning with conditions that favor the presence of freshwater and marine macrocrustaceans, the main prey of the species in the study site. In addition, possible anthropogenic threats were noted, such as cattle ranching and forest clearing, which degrade the habitat and limit the distribution of *L. provocax*.
We recommend future research studies in areas that were marked as highly suitable for the species but that presented a lack of occurrence data. This would allow for the confirmation of the presence or absence of the otter in the area. In addition, we recommend studies including other variables to refine and adjust the models, such as the distribution of river macrocrustaceans that make up the diet of the species, water pollutants and flow velocity.

Poster Sessions

Exploring behavioral patterns of neotropical otters in communal latrines

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Abstract

The Mesoamerican otter (*Lontra annectens*) is a solitary species that strategically uses communal latrines for intraspecific communication, revealing essential aspects of its behavioral ecology. However, the difficulty of locating and monitoring these latrines has limited our understanding of this otter's behavior, leaving important aspects poorly documented.

Our study aims to explore otter behavioral patterns at latrine sites and identify co-occurring species within their habitats. We present preliminary data collected between May and October from an ongoing otter camera trap monitoring in two communal latrines along the Sarapiquí River within the Tirimbina Biological Reserve, Costa Rica. To date, three camera traps (Hawkray Trail Cam and Browning Strike Force) have captured 1,037 20-second videos, of which 31.34% (n=325) featured otters visiting the latrines. Three distinct males were identified based on physical traits and unique markings like scars, while females were also observed visiting the latrines but lacked identifiable features to distinguish individuals. The otter behavioral patterns at the latrine sites have been systematically documented to create an ethogram outlining 12 distinct behaviors. We have identified a total of 35 fauna species in the otter latrine sites, including the ocelot (*Leopardus pardalis*), northern tamandua (*Tamandua mexicana*), and greater grison (*Galictis vittata*).

These preliminary findings enhance our understanding of the use of communal latrines by otters and highlight the diversity of species that share these habitat features. Future analyses will extend into a long-term study, monitoring the sites over at least three years and exploring potential interactions with other species. This ongoing research aims to inform conservation strategies focused on habitat preservation and emphasize the ecological significance of communal latrines for the Mesoamerican otter.

Poster Sessions

Necropsy findings: the first record of a rodent in the southern river otter diet and its link to rodenticides in Southern Chile

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Abstract

During the winter of 2024, two cases of southern river otters (*Lontra provocax*) killed in road traffic accidents were reported near Lake Tarahuin, Chiloé Island, Los Lagos Region, Chile. Both incidents were associated with culvert road bridges, a factor that may increase the vulnerability of this species in fragmented habitats.

Necropsies conducted at Universidad Andrés Bello within 24 hours of death provided relevant insights into the analyzed individuals. A juvenile male tested positive for rodenticides but showed no significant gastric content. In contrast, an adult lactating female had abundant stomach contents, including remains of a native rodent identified as Irenomys tarsalis through morphological analysis of guard hairs. The analysis of scats collected in the area also revealed rodent remains, suggesting that southern river otters in this region include mammals in their diet, a behavior not previously documented in the country.

While these findings advance the understanding of the species' biology and ecology, further research is needed to determine the frequency of this behavior and its potential implications. This study underscores the importance of conducting timely necropsies on wildlife to gain critical information about diet, exposure to chemical compounds, and other factors that may affect their health and survival. Although preliminary, these findings open new questions regarding the interactions between southern river otters, their environment, and human activities in southern Chile.

Poster Sessions

A flood of pictures - the monitoring of Eurasian otters in Germany

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Abstract

With a distribution ranging from Europe to Asia to North Africa, the Eurasian otter (*Lutra lutra*) is the most widespread otter species around the globe. Due to intensive hunting, habitat loss and environmental pollution, otters were considered extinct in most federal states of Germany in the 1960s. Despite banned hunting and rehabilitation of habitats leading to rising population numbers, the species is still listed as "Threatened" in Germany. Therefore, it is crucial to find applicable methods for population monitoring.

For two years, camera traps, spaced 200 metres apart, were installed along the waterways of a fish farm in Eschede, Northern Germany, to estimate abundance and spatiotemporal activity patterns. Otters were detected on land as well as swimming and diving. In the first year, 4.5 million pictures were taken, but only 25% showed animals. The empty pictures were generated by sun reflections, high water levels and fast growing foliage, especially in spring and early summer. Consequently, in the second year of the study, camera checks were carried out every two weeks instead of every 4 weeks in the critical season, decreasing the amount of empty pictures by 70%. This also reduced the manual processing effort of data immensely, as AI models like "megadetector" that were tested still lack in performance analysing pictures of water bodies.

This study highlights the importance of survey design as well as placement and maintenance of camera traps deployed in semi-aquatic habitats. Not only does this decrease the amount of work needed to process the flood of pictures, but it also saves energy and memory consumption of the cameras. Since existing AI models are mainly trained on terrestrial pictures, this study points out the ongoing value of manual processing of data and also the necessity to include pictures of animals and habitats that are still underrepresented in the training set of these models.

Poster Sessions

Too good to go - how otters found dead serve conservation legislation

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Abstract

The role of wildlife found dead as a means of passive surveillance for ecosystem health has long been underestimated. With appropriate guidance, non-specialists can perform standardised post-mortem examinations and sample collection without expensive equipment. Data and samples provide valuable insights into individual, population, and environmental health, which can be relevant to other species, including wildlife, domestic and farmed animals, and humans. Long-term and spatially widespread collection of carcasses allows for assessing temporal trends, whereas short-term investigations can address other questions. Biobanking samples facilitate a wide diversity of research areas, including retrospective investigations as new questions are asked, new methods are developed, or funding becomes available. For example, research can focus on direct health indicators such as infectious (zoonotic) diseases or parasite infestations, as well as population genomics and chemical pollutants. Indirect indicators, include species distribution and habitat use. Determining causes of death helps to reveal important risk factors for wildlife, including their sources and drivers, like vehicle collision or poaching. Conservation legislation differs among countries, but overarching guidelines, such as the EU Habitats Directive or the Stockholm Convention on Persistent Organic Pollutants provide common frameworks for protected habitats and species. Member states must regularly report on the status of their protected habitats and species, so monitoring is imperative. Direct observation is challenging for elusive species like otters. Thus, information gained post-mortem can make a significant contribution to understanding. On a pan-European level, tissue samples from otters and other predators have been used as an effective indicator of chemicals in the environment, demonstrating their potential to inform regulation of persistent, bioaccumulative, and toxic chemicals in Europe (e.g., REACH, registration, evaluation, authorization, and restriction of chemicals). Such efforts are an excellent example of combining resources between countries and underscore the importance of transnational cooperation in a One Health context.

Poster Sessions

Distribution and habitat use of the Neotropical otter (*Lontra longicaudis*) in the Northwest of Corrientes Province, Argentina

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Abstract

The Neotropical otter (*Lontra longicaudis*) is a semi-aquatic carnivore considered a top predator in aquatic freshwater ecosystems. While it is classified as Near Threatened globally and in Argentina, mostly because of its wide range, in the province of Corrientes is considered by law as a provincial natural monument. However, only a few studies were done in this area. Therefore, the objectives of this research were to evaluate distribution and habitat use of *L. longicaudis* in the Riachuelo Basin, including both protected and unprotected areas within the province of Corrientes, Argentina.
We found twenty-one signs of the presence of the Neotropical river otter during February, April and May. The species did not demonstrate an observable pattern of distribution according to different kinds of habitat and degree of protection of studied areas. The anthropic presence does not seem to be an important factor to determine the presence of the Neotropical otter in this study area. However, it appears that residual water bodies during drought periods would be a factor to consider in determining space use. From this study, new questions arise to continue long-term research on the species in the region, and it represents the beginning of monitoring efforts in both protected and non-protected areas to make conservation recommendations for the species.

Poster Sessions

Potential suitable habitats for the Eurasian otter *Lutra lutra* in Germany

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Abstract

The Eurasian otter (*Lutra lutra*) is granted strict protection within the European Union under the Habitats Directive, obligating member states to designate Special Areas of Conservation for the species, safeguard its habitats, and achieve a favourable conservation status. Achieving these conservation objectives requires a thorough understanding of the Eurasian otter's ecological requirements and local conservation strategies.
In this study, a species distribution model (SDM) for *Lutra lutra* in Germany was developed, based on presence-only data. The presence data was obtained from the locations of otter carcasses, collected between 2015 and 2024 as part of several collaborative research initiatives focused on Eurasian otters in Germany. To assess the Eurasian otter's ecological needs, the MaxEnt presence-only model was applied, with which otter occurrence was related to a range of environmental variables, including climatic, hydrological and anthropogenic factors.
With this modelling approach, potential suitable habitats in Germany were identified as the Eurasian otter continues to recolonize its former range towards the west and south. By modelling the species' potential distribution and the most suitable areas for its recolonization in Germany, the study identified priority regions for conservation efforts and pinpoints areas where conflicts between Eurasian otter conservation and fish farming may arise in the future, thus aiding in conflict and conservation management.
Our findings indicate that *Lutra lutra* potentially expands beyond its current estimated range in Germany, underscoring the existence of high-priority areas for its conservation based on habitat suitability.

Poster Sessions

Giant otter imagery in the Youtube digital platform

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Abstract

The giant otter (*Pteronura brasiliensis*) is a semi-aquatic, social mustelid endemic to South America. In the past, hunting for its pelt led to the extinction of many populations. Currently, habitat loss and degradation, unregulated tourism, climate change and negative human interactions exacerbate threats to the species, which is classified as "Endangered" by the IUCN. Despite its charismatic nature, the giant otter is still perceived negatively by certain segments of the public. This perception can lead to intolerance toward these carnivores and make it difficult for human and giant otters to coexist.

The YouTube digital platform has become an essential channel for disseminating and popularizing wildlife, however, not all content shared is necessarily beneficial to the image of the species portrayed. Therefore, this study aimed to understand how YouTube video content influences public perception of the giant otter. To achieve this goal, a total of 609 videos were identified using the keywords: "giant otter, "*Pteronura brasiliensis*", ariranha", "lobo del río", "lobo gargantilla", "lontra", "onça-d'água" and "lontra gigante" from 2010 to 2022. Among these, the 100 most-viewed videos featuring giant otters were selected.

Variables measured for each video included title and thumbnail image, number of likes and dislikes, and number of comments. To calculate engagement, the number of likes, dislikes, and comments was divided by the number of views and then summed for each video. Additionally, the videos were classified into three thematic categories: "giant otter and human interaction" "giant otter and other species interaction" and informational videos about the species. Furthermore, adjectives describing the species in the videos' audio were also analyzed using sentiment analysis and word clouds. Of the 100 videos analyzed, 50 were categorized as "giant otter and other species interaction" 31 as "informational videos" and 19 as "giant otter and human interaction". Most video thumbnails (N=47) featured giant otters alongside other species, 25 of which depicted predation scenes. Among these, the video titled "Giant Otter Families Can Fight Off a Jaguar | Wild to Know" had the highest engagement. Out of 39 adjectives identified, 17 were negative and 22 positive. The most frequent negative adjectives were "aggressive" and "dangerous," while the most common positive ones were "cute" and "beautiful." The analyses suggest a trend of greater popular engagement with videos showing interactions between giant otters and other animals, particularly in predation or chase scenarios. These interactions are more likely to generate negative feelings toward the species.

Poster Sessions

Diet composition and ecological insights of sympatric populations of marine otters and American mink in the Valdivian coastal zone, Chile

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Abstract

The Valdivian Temperate Rainforest in southern Chile is a region of high biodiversity and endemism. This ecosystem faces numerous threats such as the introduction of invasive species, including the American mink (*Neogale vison*). This mustelid coexists in coastal habitats with the marine otter (*Lontra felina*), classified as "Endangered" by the IUCN. However, this coexistence has not been widely studied.
Our study evaluates the potential dietary overlap between these two species. We selected two study sites: Calfuco (39°32′S), where both species are present, and Pilolcura (39°47′S), where no minks are found. Faecal samples (13 from *N. vison* and 29 from *L. felina*) and vibrissae (14 from *N. vison* and 9 from *L. felina*) were collected. Dietary overlap was analyzed using the Renkonen index and isotopic analysis ($\delta^{13}C$, $\delta^{15}N$) using SIBER in R.
Both species primarily consume crustaceans and fish, although *N. vison* also includes birds in its diet. The overlap was not significant: 43.6% based on faecal analysis and 24% based on isotopes. *N. vison* had a broader trophic niche, with lower $\delta^{13}C$ values and higher $\delta^{15}N$ values, indicating different food sources. For *L. felina*, the diet varied between sites. This preliminary study provides valuable information on *L. felina* and *N. vison*. The results highlight the usefulness of combining dietary analysis methods to study shared ecosystems and establish a foundation for future research on *L. felina*'s ecology and conservation challenges.

Poster Sessions

Co-occurrence between the marine otter (*Lontra felina*) and the Peruvian scallop (*Argopecten purpuratus*) aquaculture

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Abstract

Otters coexist with humans by inhabiting aquatic areas and using the same resources, many of which hold economic value. This overlap of human economic activities and otters may pose a risk to the conservation of these animals. The marine otter (*Lontra felina*) is an endangered species that lives on the coasts of Peru and Chile, where scallop aquaculture is an important economic activity in the regions of Ancash and Ica (Peru), and Coquimbo and Antofagasta (Chile).

This study evaluates the co-occurrence between *L. felina* and *Argopecten purpuratus* aquaculture. To do so, online surveys were conducted using a snowball sampling method, targeting authorities in each region involved in aquaculture activities, including officials, inspectors, park rangers, researchers, stakeholders. A total of 17 questionnaires were filled out but only 11 (65%) complied with inclusion criteria for this study. Out of the valid responses, 5 (45%) were from Ancash, Peru, and 6 (55%) from Ica, Peru; results from Chile were still pending upon submission of this abstract. Questionnaires were completed by 3 (27%) female professionals, 8 (73%) male professionals. Five respondents (45%) did not know of or had not witnessed neither co-occurrence nor interaction between otters and A. purpuratus farms; out of the 6 (55%) that responded positively, 4 (67%) had observed an interaction described as the presence of otters in or near aquaculture facilities, using it as shelter, foraging grounds and/or preying on other species. One person described consumption of *A. purpuratus* by *L. felina* in Ancash region.

The activities listed as a response to the interaction between *L. felina* and aquaculture were protection, chasing away and aggression. This could become a potential threat to the economic activities and therefore have a negative impact on the species' human perception.

Poster Sessions

Presence and genetic characterization of canine parvovirus and distemper in domestic dogs, endemic and invasive mustelids in South-Central Chile

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Abstract

Our study presents one of the detrimental effects of the introduction of invasive species as the transmission of pathologies to native fauna. In central and southern Chile, the native mustelids *Lontra felina* and *Lontra provocax* are sympatric and syntopic with American mink (*Neogale vison*) and domestic dogs (*Canis lupus familiaris*), both invasive species responsible for the spread of canine parvovirus (CPV) and canine distemper (CDV).
In this study, both diseases were detected serologically and molecularly characterized by qPCR-HRM. For this, serum and conjunctival, nasal and tonsillar tissue samples were obtained from these four species in three sectors of the Valdivian Temperate Rainforest. All four species studied showed the presence of parvovirus either by serological evidence, genetic evidence, or both. The serological presence of parvovirus was detected in a large part of the *L. felina* population studied and a match was found with the genetic variant of parvovirus from *N. vison* from the same locality and from domestic dogs from a nearby locality, but which differed from the genetic variant observed in *L. felina*. Furthermore, parvovirus variants similar to those observed in *L. provocax* were also detected in *N. vison*. On the other hand, VDC was only found in dogs that had parvovirus.
The results support that *N. vison* acts as a host for VDC and PVC between domestic dogs and native fauna, and that this species together with domestic dogs also constitute a reservoir of multiple genetic variants of parvovirus. Therefore, population control and mitigation of interactions between American mink and domestic dogs can reduce the effects that the current range expansion of *N. vison* can generate on the genotypic diversification of PVC.

Poster Sessions

Now there are two species, but what do we know about the otter *Lontra annectens* (Major, 1897): a review of the current knowledge and gaps to be addressed

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Abstract

The recent taxonomic division within the species complex of the Neotropical otter (*Lontra longicaudis*) has prompted the need to reevaluate existing information for both species, particularly for the northern species, *Lontra annectens*. The distribution of both species is divided by the Andes mountain range and, consequently, data that previously applied to a single species must now be separated and evaluated independently.
The aim of this study was to compile existing studies on this newly recognized species to identify information gaps and to establish strategies for future conservation studies. An extensive search was conducted in academic databases to locate studies published in scientific journals, theses, dissertations, and scientific notes focusing on the Neotropical otter in the countries of its newly defined range. Descriptive analyses were carried out on the disciplinary focus of the studies, as well as their location, year, and type of publication. Additionally, a proposed distribution map for this species was developed, based on hydrological data and records from the former subspecies *Lontra longicaudis annectens* obtained from studies and GBIF. We propose a new range for the species covering 12 countries, from Mexico to the western Andes in Colombia, Venezuela, Ecuador, and Peru.
We identified 1,714 records of the species, and only 1,845 of these records include geographic coordinates within this new distribution. In total, there are 140 studies on the Mesoamerican otter (*Lontra annectens*), primarily focused on distribution (25%), diet (19%), habitat description (11%), and abundance estimation (9%). Only 7% of these studies are directly related to conservation issues. Mexico has the highest number of studies, with 90 (65%), followed by Colombia with 25 studies (18%), Costa Rica with 11 studies (8%), while other countries account for the remaining 11 studies (9%). It is crucial to continue promoting the study and conservation network for the otter in Central America and to prioritize research focused on assessing conservation status (e.g., abundance, threats) and strategies to mitigate conservation threats (e.g., coexistence and habitat restoration).

Poster Sessions

Traffic mortalities of the southern river otter and road passes

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Abstract

In Europe, a major cause of otter deaths is road traffic accidents. However, there are very little evidence regarding the same threat on South American otters.
Here, we present three cases of southern river otter (*Lontra provocax*) mortality due to traffic accidents. The first report of otter death occurred in 2014 in the Araucanía Región, Chile. The second and the third case occurred in 2024 in the Chiloé Island, Los Lagos Región, Chile. All three cases were associated to culvert road bridges. An analysis of water speed though the pipes, the distance between de river water surface and the road, and artificial structures close to the road regularly used by otter were named as the conditions that favour the use of the road and not the pipes by the otters to move from one side of the bridge to the other. Instead, southern river otters in the Chiloé Island regularly use the girder-type bridges.
We recommend the removal of road crossings culvert bridges by girder-type bridges like beam bridges to prevent more southern river otter deaths.

Poster Sessions

Sanitary implications of the interspecific co-occurrence of a domestic and wild mammal assemblage in central-southern Chile

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Abstract

In natural environments, invasive species import diseases for native species. In temperate rainforests from central-southern Chile, the latrines of the endemic mustelid *Lontra provocax* are frequently visited by different species of mammals, including invasive rodents (genus *Rattus* and *Mus*), American minks and domestic dogs, which suggests that such sites may constitute potential sources of contagion of long-lasting airborne pathogens.
Between spring 2022 to summer 2023, we characterized types and frequencies of interspecific co-occurrence between native and invasive mammals, and estimated the probabilities of contagion of canine distemper, parvovirus, leptospirosis and yersiniasis. This was based on a surveillance system using camera traps on several *L. provocax* latrines along a riparian forest sector in a significant north-Patagonian hydrographic basin in Chile.
We identified 14 mammal species (9 native and 5 invasive). The invasive *Neogale vison* and the native *L. provocax* had the greatest interspecific paired co-occurrence both with each other and with other species in both seasons. Another noticeable fact is the activity and infective potential of the native long tail rat (*Oligoryzomys longicaudatus*), which are a well-known reservoir of pathogens and are even more frequent than the most common invasive species (domestic dog and American mink).
Our results showed that the potential pathways of disease transmission to native fauna are more complex than those traditionally reported for south-central Chile. This implies the need to consider these species into management programs to mitigate the risks of contagion, considering their distribution and reproductive plasticity as bringers of pathological agents to native biodiversity.

Poster Sessions

Threats to the smooth-coated otter in the Karnali river, Nepal

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Abstract

in Nepal, the illegal poaching of otters has been revealed through confiscation and seizures of 755 pelts between 1989 to 2017. However, the threats dynamics has changed in recent years. Since 2018, poaching has not been a relevant threat in the area. In the Kauralia River (west channel of the lower region of the Karnali River), human disturbance (presence and activities) is the major threat. One of the objectives of the Darwin Initiative funded project "Strengthening communities' livelihood and stewardship to conserve Otters in Karnali" is to conduct threat assessment of smooth-coated otters (*Lutrogale perspicillata*) using absolute the threat rank system to inform the development strategies for the species and its habitat protection. Altogether, 23 threats were listed through literature review of 13 studies during the 1984-2021 period. Direct observations and six community consultations were conducted. Absolute Threat Ranking was applied in which the scope, severity and irreversibility were divided into three categories with specific valuation and smooth-coated otters, habitat and fish were the targets. 12 threats were listed. Poaching was not observed, noticed or heard of in recent years. Such activities were common in last two decades ago. On the other hand, we received complaints from river dependent communities on depredation of fish from their gill nets left overnight in the river and streams, highlighting potential competition between smooth-coated otters and river dependent communities. Retaliatory killing at small extent occurs. We recommend that future conservation strategies include; changing the current practice of using mosquito nets in the local fishing gears used by river-dependent communities; monitoring and reducing overfishing during the breeding season of fish (March-May), low water flow and dry season; reducing the quantity of river aggregate extraction; reducing intense use of chemical fertilizers and pesticides in the farmlands and discouraging electrocution and poisoning during fishing activities.

Credits

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