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# Modeling roads and railways mortality hotspots of gray wolf (*Canis lupus*) in Poland

Conference Paper · May 2023

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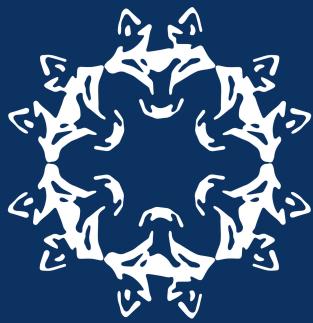
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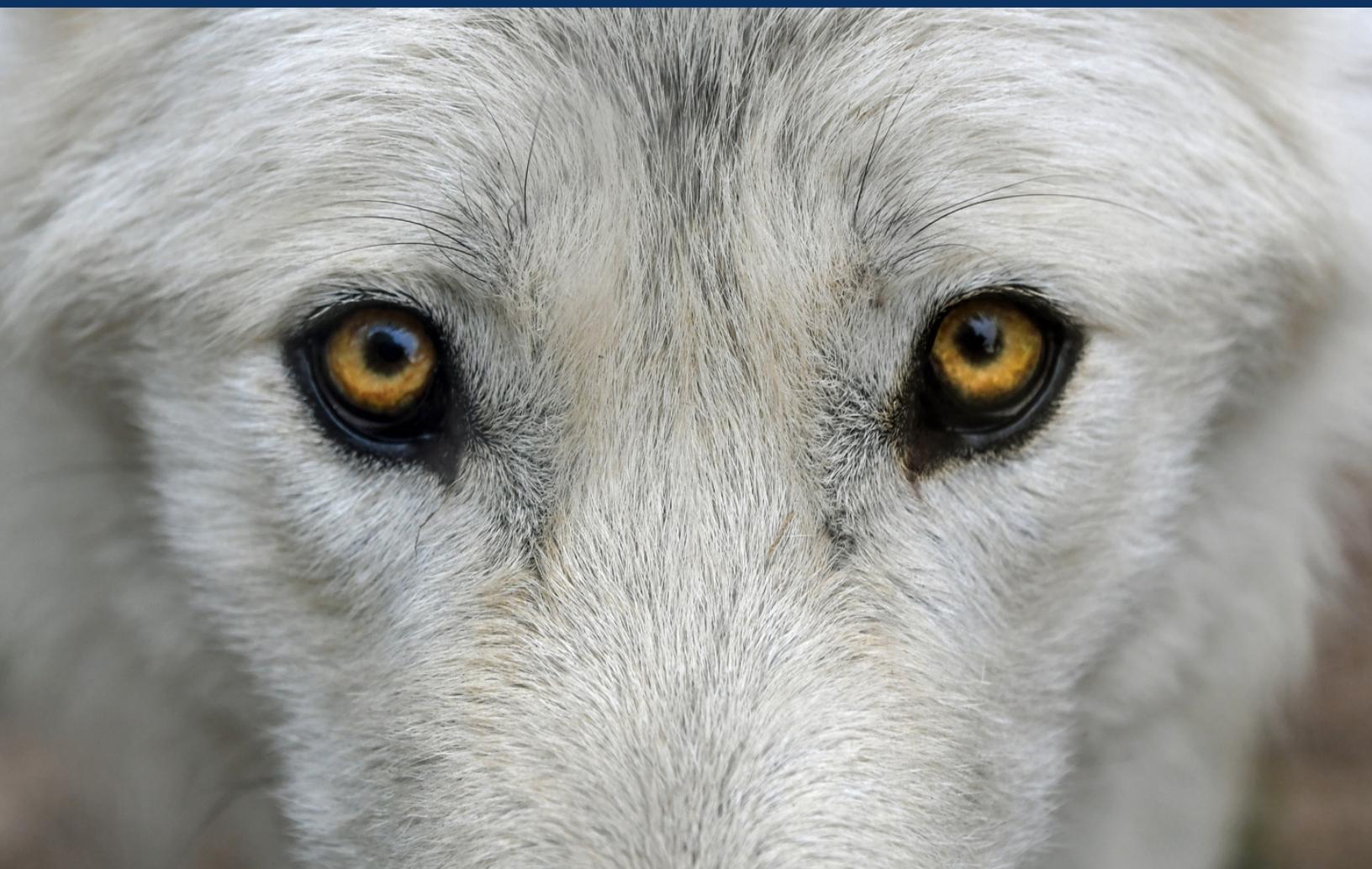
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# WOLVES ACROSS BORDERS

International Conference on Wolf Ecology and Management



**DJURÖNÄSET HOTEL & CONFERENCE CENTER  
MAY 8-11, 2023 | STOCKHOLM, SWEDEN**

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# PROGRAM OVERVIEW



## MONDAY, MAY 8TH

- Keynote Speaker: Luigi Boitani
- Plenary Speakers: Luigi Boitani, Tariku Gutema, David Mech, and Yadvendradev Jhala

## TUESDAY, MAY 9TH

- Workshops 7-12
- Plenary Speakers: John Vucetich and Astrid Vik Stronen
- Interactive Poster Session

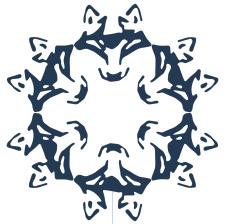
## WEDNESDAY, MAY 10TH

- Plenary Speakers: Camilla Wikrenros, Barbara Zimmermann, Francesca Marucco, Laura Scillitani, Josip Kusak, and Çağan Şekercioğlu
- Panel Discussion
- Closing Banquet and Party

## THURSDAY, MAY 11TH

- Plenary Speakers: Douglas Smith, John Linnell, and Erica von Essen
- Workshops
- Closing Ceremony



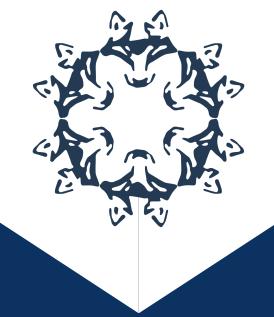


# DETAILED PROGRAM

SUNDAY, MAY 7TH

Sunday, May 7, 2023	
15:00 - 19:00	Hotel Check-In
15:00 - 19:00	Conference Check-In / Presentation Drop-Off
19:00 - 21:00	Dinner (*must be registered for Sunday*)

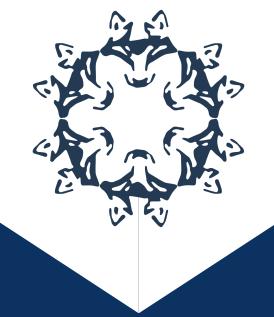
# DETAILED PROGRAM



MONDAY, MAY 8TH

Monday, May 8, 2023				
7:00 - 9:00	Breakfast (*must be registered for Sunday*)			
10:00 - 10:30	Fika (*must be registered for Sunday*)			
10:00 - 12:30	Conference Check-In / Presentation Drop-Off			
11:30 - 12:30	Lunch (*must be registered for Sunday OR lunch*)			
12:30 - 12:40	<b>Conference Opening</b>			
12:40 - 13:40	<b>Keynote Talk - Luigi Boitani</b> <i>Wolves know no boundaries: The challenge of coexistence in Europe</i>			
13:40 - 14:20	<b>Plenary Talk - Tariku Gutema</b> <i>Ecology and conservation status of the two wolf species (<i>Canis lupaster</i> and <i>Canis simensis</i>) in Africa, with a focus on the Ethiopian highlands</i>			
14:20 - 14:50	Fika			
14:50 - 15:30	<b>Plenary Talk - David Mech</b> <i>Borders? 154 of them: Wolf Conservation in the U.S.</i>			
15:30 - 16:10	<b>Plenary Talk - Yadavendra Jhala</b> <i>Status, ecology, and conservation of the ancient Asian wolves</i>			
16:10 - 16:20	Break			
16:20 - 18:00	Break Out Talks			
	Harvest and Mortality	Wolf Behavior	Conflict Mitigation	Genetics / Demography
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
16:20 - 16:35	Ausband; From protected to harvested: What have we learned after 15 years of wolf harvest in Idaho, USA?	Kluth; Do wolves living in highly human dominated landscapes inevitably become bold?	Petridou; Effectiveness of husbandry practices in reducing wolf depredation in free-ranging livestock in Greece	Cerreta; Genetic consequences of differing management regimes in a cooperatively breeding carnivore: A case study of wolves from two regions in Alaska
16:40 - 16:55	Grente; Better understanding the links between wolf depredation behavior, culling, and depredations levels with an individual-based model	Sampedro Garrido; Himalayan wolf occupancy is determined by elevation	Ribeiro; Long-term use of livestock guarding dogs in Portugal: Overall results and future challenges	Johansson; Finnish wolves: The population genetic perspective

# DETAILED PROGRAM



**MONDAY, MAY 8TH**

	Harvest and Mortality	Wolf Behavior	Conflict Mitigation	Genetics / Demography
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
17:00 - 17:15	Milleret; Mapping population-level mortality risks of an emblematic and controversial large carnivore, the wolf	Hobkirk; Feeling like a wolf: Quantifying and classifying the complexities of facial communication in wolves and domestic dogs to determine if dogs can convey 'emotions' via facial expressions like their wolf ancestors?	Schuette; Acceptance of wolf presence through effective preventive measures: Livestock protection with volunteer support	Planillo; Spatio-temporal and demographic dynamics in German recolonizing wolf population
17:20 - 17:35	Morales-González; Complacent wolves: Human-caused local mortality and high turnover of territories may explain the lack of wolf expansion in the Iberian Peninsula	Hipólito; Behavioural interpretation of bold wolves: If I can't see you, I can't fear you!	Smith; Ecological effects of using livestock guarding dogs as large carnivore deterrents	Roffler; Island biogeography and demographic history influences genetic structure of Alexander Archipelago wolves
17:40 - 17:55	Pinto da Silva; Spatial heterogeneity in wolf disappearance rates in Scandinavia	Di Bernardi; Linking wolf feeding behavior to individual predator traits	Jansman; Wolves in The Netherlands: How to reach coexistence in a highly urbanized landscape	Srinivas; Population genetics of unique and ancient wolf lineages in India
18:00 - 19:00	Break / Hotel Check-in			
19:00 - 21:00	Opening Dinner			

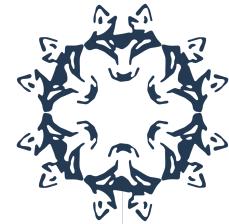
# DETAILED PROGRAM



TUESDAY, MAY 9TH

Tuesday, May 9, 2023							
7:00 - 8:00	Breakfast						
8:00 - 10:00	Workshops						
	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)	Building 4 (Room 4A)			
	Preventing livestock predation by wolves: co-designing a strategic research plan to move forward with “alternative” aversive methods (Vanderheyden)	What can passive acoustic Recorders Do For You? Using Sound to Study Wolves (Howden-Leach)	Towards a SNP-based standard for wolf/ dog hybrid detection in Europe (Nowak)	Towards an effective and socially just governance of human-wolf interactions in Europe (Donfrancesco)			
	Building 3 (Room 3A)	Participatory Stakeholder Identification and Network Mapping – purpose, preparation, participation and helpful outcomes (Grossmann)					
10:00 - 10:30	Fika						
10:30 - 11:10	<b>Plenary Talk - John Vucetich</b> <i>What ecological knowledge can and cannot do for wolf conservation</i>						
11:10 - 11:50	<b>Plenary Talk - Astrid Vik Stronen</b> <i>Tracking drivers of wolf genetic change in increasingly human-dominated landscapes</i>						
12:00 - 13:00	Lunch						
13:00 - 15:00	Break Out Talks						
	Interspecific Interactions	Wolf-Human Interactions	Population Status	Wolf-Human Interactions			
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)			
13:00 - 13:15	Tallian; Seasonal drivers of competition between wolves and bears	Gieser; When a wolf meets a group of wild boars: An anthropologist's critical reflection on the term 'hunting strategy'	Olsen; Recolonization and population patterns of wolves in Schleswig-Holstein and Denmark, 2007-2022	Lino; Livestock depredation in Portugal: Is the wolf guilty, innocent, or simply co-responsible?			

# DETAILED PROGRAM



TUESDAY, MAY 9TH

	Interspecific Interactions	Wolf-Human Interactions	Population Status	Wolf-Human Interactions
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
13:20 - 13:35	Gutema; Competition between sympatric wolf taxa: An example involving African and Ethiopian wolves	Surer; Interactions between wolves and cattle: Reviewing global experience, analysing encounter rates and depredation patterns in Switzerland and factors affecting cattle depredation by wolves	Helle; Determining favourable reference population for wolves in Finland: What did we do and learn?	Versluijs; Towards a shared forest: Studying the compatibility of free-ranging cattle and carnivores in boreal forests
13:40 - 13:55	Nordli; Beware or be aware? Temporal foraging strategies of wolverines and wolves at wolf-kills	Gula; Near humans: How wolves acclimatize to the anthropogenic landscapes of Poland	Werhahn; Phylogeny, ecology, and conservation status of the Himalayan/Tibetan Wolf	van Beeck Calkoen; Numerical top-down effects on red-deer ( <i>Cervus elaphus</i> ) in human-dominated landscapes
14:00 - 14:15	Orning; Spatial and dietary consequences of apex carnivore competition following gray wolf recolonization in the Pacific Northwest	Kudrenko; Walking on the dark side: Anthropogenic factors limit suitable habitat for the wolf in Polesia	Kusi; A non-invasive assessment of density, diet, and distribution of Himalayan wolves in Nepal	Rossberg; Livestock protection in the German-speaking Alps: First results of the only livestock protection LIFE project "LIFEstockProtect"
14:20 - 14:35	Satterfield; Space use patterns of recolonizing wolves ( <i>Canis lupus</i> ) and co-occurring cougars ( <i>Puma concolor</i> ) in a human-impacted forest landscape (Washington, USA)	Nakamura; Dynamic occupancy models predict wolf spatial use in human-dominated landscapes	Lelieveld; Wolf monitoring in the Netherlands	Sunde; Wolves in fenced nature areas: Scientific opportunities and management headaches
14:40 - 14:55	Diserens; The impact of wolves on mesocarnivore denning and foraging behaviour in Białowieża Forest	Hipólito; Afraid of the unknown: The role of humans on range limit wolf population activity	Naderi; Predicting the potential distribution of grey wolves in Türkiye under climate change scenarios	Kabir; Understanding the patterns of livestock depredation by wolf ( <i>Canis lupus</i> ) in northern Pakistan
15:00 - 15:30	Fika			

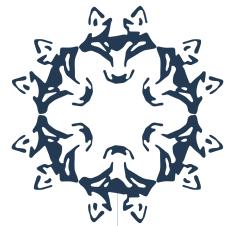
# DETAILED PROGRAM



TUESDAY, MAY 9TH

15:30 - 16:30		Break Out Talks			
		Monitoring and Methods	Demography	Diet	Conflict Mitigation
		Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)	Building 4 (Room 4A)
15:30 - 15:45	Andrén; Harvest model of wolf population using Bayesian forecasting	Simpson; Demographics of gray wolf ( <i>Canis lupus</i> ) packs recolonizing variable habitat types in Central Wisconsin	Chetri; Patterns of distribution, habitat use and seasonal diet of Himalayan wolf ( <i>Canis lupus chanco</i> ) in the central Himalayas, Nepal	Camara; Media mayhem! Wolf reintroduction and the impact of media	
15:50 - 16:05	Bauduin; Using occupancy to monitor populations. Case study: The wolf in France	Kramer-Schadt; Reconstructing 20 years of wolf comeback in Germany with individual-based models	Dymit; DNA metabarcoding reveals extensive marine resource utilization by coastal wolves in Southwest Alaska	Quétier; Getting ready for the wolves: Lessons learned in anticipating its return to central France and the case for 'wolf-smart communities'	
16:10 - 16:25	Marucco; Wolf population size estimation: An integrated approach for long term conservation practice	Kojola; Regional differences in reproductive success of wolves in Finland: Potential causes and consequences	Freund; Freshwater fish as a more common prey for wolves than originally thought: Annual observations from a boreal ecosystem	Díaz Vaquero; Coexistence between wolves and extensive livestock farming in northern Spain	
16:30 - 17:00	Break / Poster Set Up				
17:00 - 19:00	POSTER SESSION				
19:00 - 21:00	Dinner				

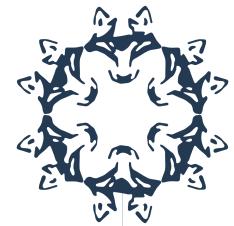
# DETAILED PROGRAM



**WEDNESDAY, MAY 10TH**

Wednesday, May 10, 2023				
7:00 - 8:00	Breakfast			
8:00 - 8:40	<b>Plenary Talk - Camilla Wikenros &amp; Barbara Zimmermann</b> <i>The Swedish-Norwegian border causes source-sink dynamics for wildlife but results in a win-win for research</i>			
8:40 - 9:20	<b>Plenary Talk - Francesca Marucco &amp; Laura Scillitani</b> <i>Transboundary wolf conservation actions for better wolf-human coexistence at the population level: Challenges and perspectives</i>			
9:20 - 10:00	<b>Plenary Talk - Josip Kusak &amp; Çağan Şekercioğlu</b> <i>Challenges and opportunities of wolf studies in Croatia and in Türkiye</i>			
10:00 - 10:30	Fika			
10:30 - 12:00	Break Out Talks			
	Predator-Prey Relationships and Trophic Interactions	Wolf-Human Interactions	Cross border management and relations	Genetics - Methods, Diversity, and Inbreeding
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
10:30 - 10:45	Eriksson; Sea otter recovery affects feeding ecology and population demography of an isolated wolf pack	Reinhardt; Fencing against African Swine Fever poses barriers for wolves	Lelieveld; Interactive mapping of wolves across borders	Salado; Out of the woods? Decline of genomic diversity in a demographically stable gray wolf population in Western Europe
10:50 - 11:05	Nowak; From forest dweller to suburb tenant: Wolf territories and food habits in human-dominated landscapes of central Europe	Kjeldgaard; Human activity drives diel activity patterns of wolves in Denmark	Lyly; Wolf territory cooperation: Local platforms for joint management and knowledge sharing	Dziech; A step closer towards enriching and unifying the methodology of grey wolf genetic studies
11:10 - 11:25	Kuijper; Paws without claws? Ecological effects of large carnivores in human-dominated landscapes	Ausilio; Environmental and anthropogenic features mediate human hunting risk and wolf predation risk for moose	Martinsen; Flexibility or free-riding? Challenges of transboundary management of a wolf population	Nowak; CEwolf: Harmonized genetic monitoring allows to reconstruct wolf recolonization of Central Europe's human-dominated landscapes
11:30 - 11:45	Dickie; Resource exploitation efficiency collapses the home range of an apex predator	Blount; Habitat selection of wolves in a highly disturbed anthropogenic habitat	Wabakken; Wolf management challenges across an international border: Predation on domestic sheep in Norway are dominated by Swedish-born, crossborder dispersers	Valtonen; Validation of a recent method for identification of hybrids in the Finnish wolf population
12:00 - 13:00	Lunch			

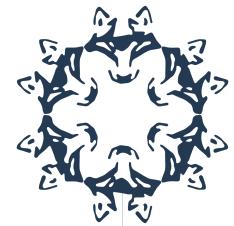
# DETAILED PROGRAM



**WEDNESDAY, MAY 10TH**

13:00 - 15:00	Break Out Talks			
	Harvest and Mortality / Wolf Behavior	Wolf-Human Interactions	Conflict Mitigation	Monitoring and Methods
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
13:00 - 13:15	Liberg; Origin and dispersal distances for individual wolves establishing territories on the Scandinavian Peninsula 1999 -2020	Antonucci; Maiella wolves do not like livestock? 20 years of research and experience on feeding ecology of Apennine wolf ( <i>Canis lupus italicus</i> )	Blanco; When wolf damage to livestock causes a major conflict: The challenge of wolf and cattle coexistence in Ávila province (central Spain)	Dupont; Landscape-level patterns in wolf home range size revealed by non-invasive spatial capture-recapture
13:20 - 13:35	Sand; High turnover rates of territories in the Scandinavian wolf population: Causes and consequences	Iliopoulos; Wolf ecology in agricultural areas at the Axios-reiver basin national park in northern Greece	Brandisauskas; From relatives to enemies: Evenki reindeer herders and hunters agreement with wolves in the changing environment of East Siberia and the Russian Far East	Boiani; How much is enough? Effort optimization for wolf population size estimation at a regional scale
13:40 - 13:55	Kusak; Wolf territory sizes and winter densities of wolves in Croatia and Türkiye	Ale; Recolonizing Himalayan wolf and conflict with pastoralists in Gaurishankar Conservation Area, Nepal	Camara; Wolves & Gen. Z: How to communicate to the next generation about wolves	Bojarska; Wolf activity patterns revealed by camera traps and accelerometers: What are we missing?
14:00 - 14:15	Bump; Wolf personalities, ecosystem impacts, and the possibility of wolf cultures	Tikkunen; Wolf attacks on dogs in Finland and a potential solution to mitigate the conflict	den Hartog; Carnivore depredation on cattle, and measures to prevent this: Comparing experiences across Europe and North America	Costa; Impact assessment on wolves: Can we do it better?

# DETAILED PROGRAM



**WEDNESDAY, MAY 10TH**

	Harvest and Mortality / Wolf Behavior	Wolf-Human Interactions	Conflict Mitigation	Monitoring and Methods
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
14:20 - 14:35	Stępiak; Communication between wolf and domesticated dog revealed from experimental scent marking	Romanski; Status of wolf introductions in Isle Royale National Park, USA	Eriksen; Wolf conflicts in Denmark: Management between a rock and a hard place	Angelucci; Physiologic evaluation of capture and anesthesia with Fremont® Humane Foot Snare and Medetomidine-Ketamine –Acpromazine in free ranging Apennine wolf ( <i>Canis lupus italicus</i> ) and implications on animal welfare
14:40 - 14:55	Vorel; Formation of wolves' territorial system during the colonization process	Sillero; Conservation with hard borders: Wolves and people in the highlands of Ethiopia.	Ambarli; The relationship between wolves' food habits and human-wolf conflicts in Turkey	Fahlman; Reversible immobilization of free-ranging wolves by helicopter darting: Advantages and challenges
15:00 - 15:30	Fika			
15:30 - 16:30	<b>PANEL DISCUSSION 1</b>			
16:30 - 16:40	Break			
16:40 - 17:40	<b>PANEL DISCUSSION 2</b>			
17:40 - 18:00	Break			
18:00 - 24:00	<b>Closing Dinner and Banquet:</b> Folkparken Games (18:00 - 22:00) BBQ Buffet Dinner (18:30 - 20:30) Folkparken Band (20:00 - 22:00) Main Building DJ (22:00 - 24:00)			

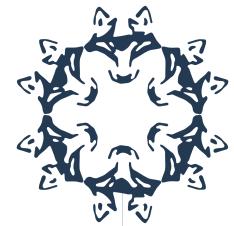
# DETAILED PROGRAM



THURSDAY, MAY 11TH

Thursday, May 11, 2023				
7:00 - 8:00	Breakfast			
8:00 - 8:40	<b>Plenary Talk - Douglas Smith</b> <i>When protected areas don't protect</i>			
8:40 - 9:20	<b>Plenary Talk - John Linnell</b> <i>Games without frontiers? Challenges of conserving wolves in politically, socially and ecologically fragmented landscapes</i>			
9:20 - 10:00	<b>Plenary Talk - Erica von Essen</b> <i>Goodwill hunting: Co-existence through culling?</i>			
10:00 - 10:30	Fika			
10:30 - 11:00	Pack and Check-out			
Break Out Talks				
	Predator-Prey Relationships and Trophic Interactions	Legislation, Policy, and Social Science	Monitoring and Methods	Wolf-Dog Hybridization and Anatomy
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
11:00 - 11:15	Guimaraes; The role of wolf predation on wild boar to control African Swine Fever: Insights from a multi-prey system in central Europe	Hommen; Applying human-wildlife-conflict-research in practical management	Marti Domken; Identifying the presence of pups in a chorus to monitor wolf populations	Donfrancesco; Transcending problematic dualisms in managing wolf-dog hybridisation
11:20 - 11:35	Hoy; The role of wolves in regulating a chronic non-communicable disease, osteoarthritis, in prey populations	Pettersson; Key insights for proactive wolf governance in the Anthropocene	Palacios; Detection of howling activity around rendezvous sites using automatic recorders and its usefulness for wolf monitoring	Myslajek; Management and ecology of wolf-dog hybrids in Poland
11:40 - 11:55	Gerber; Effects of wolf return on red deer movement behaviour and habitat selection in a cultural landscape: Insights from a long-term telemetry study	Kraus; The role of social drivers in shaping attitudes towards wolves and the spatial prediction of human-wolf conflicts in Sweden and Italy	Smith; Acoustic localisation as a tool for non-invasive monitoring of wolf movement and behaviour	Rostovskaya; What big skulls you have! Cranial morphometry of grey wolf ( <i>Canis lupus</i> ) in Eurasia

# DETAILED PROGRAM



THURSDAY, MAY 11TH

	Predator-Prey Relationships and Trophic Interactions	Legislation, Policy, and Social Science	Monitoring and Methods	Wolf-Dog Hybridization and Anatomy
	Main Hall	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)
12:00 - 12:15	Szewczyk; Spatial organization and population dynamics of a recolonizing wolf population are affected by the presence of an introduced ungulate species, the fallow deer <i>Dama dama</i>	Mink; The effect of wolves on the exit and voicing exit of Swiss mountain farmers	Santos; Can physiology inform management? Extrinsic determinants of hair cortisol concentration in Iberian wolves	Kwiatkowska; "How do I look?" Changes in phenotype in wolf-dog hybrids
12:20 - 12:35	Mols; Humans and wolves together create a landscape of fear for deer in a human-dominated landscape	Kaushik; Social understandings of categorizing biodiversity: Using wolves and tigers as a case study	Kozyra-Zyskowska; Modeling roads and railways mortality hotspots of gray wolf ( <i>Canis lupus</i> ) in Poland	Figura; Rescue, rehabilitation, and post-release monitoring of wolves injured in snares and traffic accidents
12:45 - 13:45	Lunch			
13:45 - 15:45	Break Out Workshops			
	Building 7 (Room 7A)	Building 5 (Room 5A)	Building 6 (Room 6A)	Building 4 (Room 4A)
13:45 - 15:45	The role of poaching in wolf research and management (Liberg)	Lessons Learned to Achieve Conservation Success: It's about Working with People! Human Dimensions Research with Applied Facilitation and Conflict Resolution Creates Solutions (Bath)	Challenging positions and perception in wolf conflicts (Hansen)	Enhancing stakeholder engagement through dialogue, case studies and examples (Nyman)
	Building 3 (Room 3A)	Building 1 (Room 1A)		
	Trapping wolves with leghold traps when bears are around (Kusak)	Changepoint analysis and animation of movement data in R (Versluijs)		
15:45 - 16:15	Closing Ceremony			
16:30	Buses leave for Stockholm (Arlanda and Stockholm C)			

# ORAL PRESENTATIONS

## Modeling roads and railways mortality hotspots of gray wolf (*Canis lupus*) in Poland

Katarzyna Kozyra-Zyskowska (1, 3), Tomasz Zajac (2), Heliodor Wierzbicki (1), Dawid Zyskowski (3), Andżelika Haidt (4), and Rafał Kurek (5)

(1) Wrocław University of Environmental and Life Sciences, Poland

(2) Cardinal Stefan Wyszyński University, Poland

(3) Naturalist Work, Poland

(4) Forest Research Institute, Poland

(5) Workshop for All Beings Association, Poland

The subject of the research was to determine the factors influencing the mortality rate of the gray wolf *Canis lupus* as a result of collisions with vehicles in Poland. Based on the available data on the mortality of wolves on roads and railways in Poland, an analysis was carried out to determine the so-called hot spots, i.e. sensitive places where the risk of collision is highest. For this purpose GIS (Geographic Information System) modeling techniques were used utilizing the MaxEnt program, based on positive occurrences (in this case, places of confirmed death of individuals) and using variables (predictors), that determine the key factors influencing the probability of animal death on roads or railways. This allowed us to pinpoint places of particular importance regarding the collisions. Additionally, the cases of collisions with regards to the season of the year and the age of wolves were analyzed and the case-by-case analysis of communication solutions has been compared to the model's results. One of the goals of the analyzes was to determine "good practices" involving the application of measures to minimize collisions with vehicles, i.e. recommendations on methods of determining and securing vulnerable places, which could be recommended in the species protection plans and taken into account at the stage of planning of the expansion or modernization of the national and local communication network. Our work emphasizes the importance of protecting ecological corridors.