Life WITH BEARS

26th INTERNATIONAL CONFERENCE ON BEAR RESEARCH & MANAGEMENT

Human-bear coexistence in human dominated and politically fragmented landscapes.

BOOK OF ABSTRACTS

Ljubljana, Slovenia 16 - 21 September 2018
Conference Venue: The Grand Hotel Union

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"Human-bear coexistence in human dominated and politically fragmented landscapes."

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CONTENTS

INVITED SPEAKERS

TOM SMITH:
CHRONICLING HUMAN-BEAR CONFLICT: COMMENTARY AND CAVEATS

Brigham Young University

Biography

Dr. Tom S. Smith began a career in bear biology in 1992 when hired as a research ecologist for Katmai National Park, Alaska. Research topics at the time included brown bear ecology, human-bear interactions and bear safety research. Working jointly with Dr. Stephen Herrero, Smith has co-authored papers on human-bear conflict including the efficacy of bear deterrents and histories of bear conflict in North America. In the early 2000s, as a USGS research scientist, Smith began work with polar bears, focusing on denning ecology and human-bear interactions on Alaska's North Slope. Working closely with Polar Bears International, his studies of denned polar bears continues to present. Most recently, he has been studying sloth bear-human conflict in India with colleagues at India's Wildlife SOS. Smith currently serves as a member of the Polar Bear Conflict Work Group and as a professor of wildlife at Brigham Young University, Utah.

Abstract

Effective bear conservation is a challenging and multifaceted task faced by biologists and managers worldwide. Studies of bear habitat relationships, ecology, behaviour, physiology, and conflict with humans are critical for maintaining species' viability. Conflict with humans is not only bad for both the bear and persons involved, but also impedes conservation efforts. It is a difficult task to promote the conservation of a species that occasionally maims and kills people. Chronicling human-bear conflict is essential if we are to understand why these events occur. Insight gained from well-documented and analysed incidents helps to inform bear safety messaging that, in turn, lessens conflict. n this presentation, I discuss the importance of human-bear conflict databases. Additionally, I present how we can use those data to inform bear safety messaging in such a way that reduces conflict. Finally, I present caveats associated with these data, and suggest how we might avoid the pitfalls of over-reach when it comes to data interpretation.

VALERIA SALVATORI:
EU LIFE PROGRAMME CONTRIBUTION TO BEAR CONSERVATION

Istituto di Ecologia Applicata, Via B. Eustachio 10 – IT 00616 Rome

Biography

Wildlife conservation, applied research and management are the main interests of Valeria Salvatori. She has worked in international environments collaborating with foreign research institutes since 1992, gathering working experience in South America, Africa, Central and Western Europe. Spatial analyses of environmental processes, mainly wildlife management, policies and conflicts between wildlife and local communities are the subjects of her latest working activities. She has extensive experience in evaluating, elaborating and managing LIFE projects on large carnivores. She acted as project coordinator for the following LIFE projects: LIFE COEX, LIFE ARCTOS, LIFE IBRIWOLF, LIFE MEDWOLF and provided consultancy for LIFE WOLFALPS. Her current position at Istituto di Ecologia Applicata in Rome, Italy is project responsible for the service contract with the EU for establishing local stakeholder platforms for promoting coexistence with large carnivores.

Abstract

Since its launch in 1992 the EU LIFE programme has supported the Member States in their efforts for the implementation of the EU Habitats Directive through co-funding of specifically targeted projects aimed at improving the conservation status of species or habitats of community interest. The conservation of Brown bear (Ursus arctos) in Europe has been strongly supported by the implementation of 71 projects, of which 60 exclusively targeting bears. The most targeted populations are the smallest European ones (Cantabrian, Pyrenean, Alpine, Apennine) with the implementation of 52 projects.The overall contribution of the EC for bear conservation through LIFE programme can be estimated at over 47Mio Euros, with an amplification effect promoted by co-funding (total project costs over 71Mio Euros).Most projects were implemented by NGOs or local authorities responsible for bear management, thus increasing the probability that conservation actions could be continued after the project's end.Other targeted populations include the Dinaric-Pindos one and the Carpathian one. These are very large population that are distributed over many countries and in particular for the Dinaric-Pindos one projects have been implemented at local scales by different countries in various segments of the population.

The impact of LIFE projects is evident for the smallest populations, with a significant increase in their conservation status (e.g., Cantabrian and Alpine populations), but also for larger populations the activities implemented have provided a significant contribution at local level, triggering demonstration effects through implementation of best practice actions.

While the first projects (up to 1996) where characterised by general conservation interventions, the ones from 1997 were more focused on specifically identified threats, although they not always were coherent with those identified by the IUCN red listing. This incoherence is justified by the scale of implementation of LIFE projects, most often local, where specific context related threats may not be relevant at population of State level. Social issues have been increasingly targeted, reflecting the general trend of increasing social conflicts Europe-wide. LIFE programme represents a solid instrument for European Brown bear conservation and should continue to play this key role in the future.

ANDRÉS ORDIZ:
OVERVIEW OF HUMAN EFFECTS ON BEAR BEHAVIOR IN HUMAN-DOMINATED LANDSCAPES

Faculty of Environmental Sciences and Natural Resource Management,
Norwegian University of Life Sciences, Box 5003, NO-1432 Ås, Norway

Biography

Andrés Ordiz is a biologist born in Asturias, northern Spain. Since 1997, he has worked with large carnivores, mainly brown bears and wolves, in southern and northern Europe. He completed his PhD in Conservation Biology at the Norwegian University of Life Sciences and the University of León (Spain), working with the Scandinavian Brown Bear Research Project. Andrés' has focused his work in the last decade on brown bear behavioural reactions to human activities and on inter-specific interactions between apex predators (bears and wolves). He hopes that scientifically-sound research will be the base for conservation-oriented management of large carnivores, both in areas where their populations are currently increasing and where they are still in the brink of extinction.

Abstract

Predation risk modulates the population dynamics and habitat use of animals, forcing them to invest in antipredator behavior, e.g., trading off foraging efficiency and vigilance, potentially with fitness costs. Human-induced mortality and disturbance can be interpreted in this predator-prey framework, and it is well documented that they can affect the behavior of many species. Until recently, however, it was less clear whether predators at the apex of trophic systems would adjust their behavior to subtle variations in human-induced risk. Because people cause most predators' mortality in human-dominated landscapes, it may be expected that they also react to humans and our activities. Regarding brown bears, research has shown for example that human disturbance influences bear habitat selection across the widespread range of the species. To better understand the behavior of a growing population of brown bears in a human-dominated landscape in Scandinavia, we have studied how bears react at different spatial and temporal scales to a variety of human activities, taking also into account the marked seasonality in bear phenology during the year. Spatially, bears select for rugged terrain far from human settlements, and, at a finer scale, bears rely on dense vegetation concealment when they are closer to people. In a temporal perspective, bears become more nocturnal after bear hunting seasons start, they are more nocturnal in areas with higher road density, compared to roadless areas, and bears also become more nocturnal after encounters with people in the forest. Such encounters also trigger the displacement of bears to particularly concealed sites. Human activity also triggers physiological responses, e.g., bears show higher stress levels when they are close to human settlements, especially when human outdoor activity is most intense. Overall, we have found consistent behavioral reactions by bears at any spatial and temporal scale we have studied. Our research documents with empirical data how a large carnivore adjusts its behavior to human-induced risk and disturbance, with implicit effects in the short term, e.g., altering the optimal timing of daily activities, such as foraging and resting, and potentially with long-term effects in terms of evolution and ecological functionality. We therefore argue that behavioral and ecological perspectives should be taken into account in the management of large carnivores and human activities in the landscapes inhabited by them. For instance, bear hunting, where allowed, has traditionally payed much more attention to demographic than to behavioral issues, which also require attention. Likewise, management of nonlethal human activities targeting large carnivores, e.g., wildlife tourism, would clearly benefit from considering the information provided by behavioral studies in order to reduce negative effects on the targeted species.

JOHN D C LINNELL:
COEXISTENCE: WHAT IS IT, AND HOW DO WE GET THERE?

Norwegian Institute for Nature Research

Biography

John Linnell is a senior researcher at the Norwegian Institute for Nature Research, based in Trondheim, Norway. His research focus adopts multiple disciplinary approaches to understand the complex relationships between humans and wildlife, with a special focus on large carnivores and large herbivores. He has worked on research and conservation projects in many parts of Europe, including Scandinavia, the Baltic States and the western Balkans, as well as south America (Brazil), and central (Kazakhstan and Turkmenistan) and southern Asia (India and Myanmar). His research focus is currently moving from the study of human wildlife conflicts to the study of human wildlife coexistence, with a focus on exploring the ecological, institutional and social factors that allow wildlife and humans to share space in multi-use landscapes.

Abstract

As we have officially entered the Anthropocene it is becoming increasingly more apparent that the conservation of large-bodied and wide-ranging species like large carnivores and large herbivores cannot only be achieved by focusing on protected areas and wilderness. They will need to be allowed to also occupy human-dominated, multi-use landscapes. This is often referred to as a "coexistence" strategy. The co-occurrence of humans and large mammals in shared landscapes is very often associated with a diverse range of conflicts which include economic, social and political dimensions. These conflicts force a nuanced examination of the what is actually meant by coexistence. In this talk I will use several examples from large herbivores and large carnivores to explore both the practice and principles of coexistence in order to provide a mature conceptual view of this conservation strategy. This will then be applied to the case of brown bears in Europe – where c. 17,000 bears share a very crowded and fragmented continent with a high density human population. As well as summarising the status quo of their conservation situation, I will explore some of the emerging challenges and opportunities that will influence the future of this case study in coexistence.

DJURO HUBER:
HALF A CENTURY OF IBA CONFERENCES – AN ILLUSTRATED EVOLUTION

Djuro Huber[1], Mike Pelton[2], Al LeCount[3]
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Biography
Since 1981 Djuro Huber is conducting a brown bear study in Croatia, which in 1996 expanded to the "Study of large carnivores in Croatia" and included bear, wolf and lynx. In addition to radio-telemetry, many morphological, physiological, nutritional and genetic aspects are included in the research. So far he was conducting 18 different projects and published 165 scientific papers. He is member of all relevant national and international professional organizations like IUCN SSGs for Bears, Canids, and Veterinary Medicine, International Association for Bear Research and Management, Large Carnivore Initiative for Europe, Wildlife Disease Association. Djuro Huber is currently professor emeritus at Biology Department of the Veterinary Faculty in Zagreb.

Abstract
It is 50 years since the first "Workshop on Bear Research and Management" was held in Whitehorse, Yukon, Canada on 26- 28 August 1968. So, the International Association for Bear Research and Management (IBA) celebrates half of a century today! That year a group of 49 active bear researchers gathered in Yukon and reported their work and discussed issues such as bear immobilization, telemetry, physiological functions, denning, and management of three bear species: polar bears, (American) black bears and brown/ grizzly bears. This workshop illustrated the early progress made toward a more scientific approach of collecting and handling data on hunted bears, on aerial counts, and marking. For example, Jack Lentfer reported that in Alaska they aerially darted 171 polar bears in two seasons and marked them with "nylon collars" that lasted up to one year; the early experiences with radio telemetry were discussed separately. The workshop participants expressed a clear intention that such meetings should be held on a regular basis. The second meeting was held in Calgary, Alberta, Canada in 1970 and was referred to as a "conference". Soon the conferences were also called "international". Until 1986 the informal organization used the name "Bear Biology Association"; the name was changed to the "International Association for Bear Research and Management" (IBA). To accommodate a more international perspective, beginning in 1974 split meetings were often held in North America and Europe. Therefore, the 3rd conference was held in 1974 in New York, USA in conjunction with the American Society of Mammalogists and in Moscow, USSR as part of the First International Theriological Congress. Also, it was at the New York meeting that the attendees voted to become an official international bear organization. The 7th conference was held in 1986 in Plitvice Lakes, Croatia, Yugoslavia after Virginia, USA; the 8th in 1989 in Mura, Sweden after British Columbia, Canada; and the 9th in 1992 in Grenoble, France after Montana, USA. After changes in the bylaws in 1995 at the 10th Conference in Fairbanks, Alaska, USA, the conferences became equal, following the rule of alternating between the Americas and Eurasia. They also became more frequent, with the policy of two in 3 years; however, in practice, it became one per year. So, this September in Ljubljana the IBA will have hosted 26 conferences in 50 years!
The presentations held at the first 9 conferences were published as carefully reviewed proceedings. In 1998 the peer reviewed journal URSUS was established; this journal soon became independent of conferences regarding published papers. The official newsletter of IBA (International Bear News) was initiated in 1981. The above history reflects the strong bond of IBA members and the incredible progress and accomplishments over the past 50 years.

RACHEL HOFFMANN:
TRANSFORMING THE DISCOURSE IN CONSERVATION – A FOCUS ON THE POSITIVES

Director of Conservation Outcomes (IUCN Species Survival Commission)

Biography

Rachel is the Director of Conservation Outcomes with the International Union for Conservation of Nature's (IUCN) Species Survival Commission (SSC). She has been working with the SSC for over 9 years, managing this unique and exceptional network (of approx. 7,000 volunteer experts) to reduce the loss of biodiversity on earth and prevent species extinctions. The extraordinary potential of the SSC to have a significant impact on species conservation at the global scale is often mooted, but has never been measured or evaluated. For example, would bear conservation be any different if the Bear Specialist Group had never been established? With these questions in mind, the SSC is now looking to better evaluate its effectiveness, not only to better celebrate successes but to create a more positive vision to drive our conservation efforts in the future.

Abstract

The evidence is as clear as it is grim; we're losing species at a startling and dramatic rate and the language of biodiversity loss is frequently expressed through sobering phrases such as "catastrophic declines", "extinction crisis" and "ecological roulette". However, a number of recent studies showing that conservation does work have been instrumental in generating a global community around "conservation optimism" – essentially a movement which focuses on a positive and optimistic approach to conservation to inspire change. There is no doubt about the immense challenges facing conservation, but the successes need to be both celebrated and replicated. In demonstrating our impact, research is exploring what the situation would look like if conservation interventions had not been put in place and, in many cases, it would be considerably worse. Through its extensive network of volunteer experts, the IUCN Species Survival Commission (SSC) has been taking action to halt the biodiversity decline over the past 70 years, but has never measured what its impact on conservation has been. The SSC is now increasing its efforts to evaluate its effectiveness and to focus on a more positive vision for the future by learning from successes and failure. Supporting this positive vision, as part of the IUCN Red List, is the newly devised framework for the IUCN Green List of Species to assess the positive impact of conservation actions by comprehensively quantifying species recovery and conservation success.

Abstract ID: 10

Session:
Bear ecology, behaviour and physiology

BROWN BEARS FACILITATE SEXUAL REPRODUCTION IN CLONAL KEYSTONE PLANT SPECIES OF THE BOREAL FOREST

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Abstract
Bilberry (Vaccinium myrtillus) is a keystone species in the Eurasian boreal forest ecosystem, and provides a critical food resource for brown bears (Ursus arctos). Despite being adapted for generative reproduction with seed-containing fruits, reports of bilberry seedlings under natural conditions are extremely rare. The mismatch between the massive energetic investments of bilberries for generative reproduction and their realized clonal reproduction has confused ecologists for decades. Here, we demonstrate that brown bears are probably key to explaining this reproductive paradox. Using a greenhouse germination test with fecal samples of brown bears collected during the berry-season (N = 52, 15 July – 15 September) in our study area in south-central Sweden, we found that brown bears disperse vast amounts of viable bilberry seeds through endozoochory. We estimated that the median and mean seed load in fresh bear scat was around 36000 and 54000 viable seeds, respectively, and that some scats could contain up to over 500000 viable seeds. Furthermore, we show that bears systematically create recruitment 'windows of opportunity' (RWO) for bilberry through their bedding behavior, and supply these RWOs with bilberry seed through defecating in or in the immediate vicinity of the beds. Indeed, we systematically (85%) recorded generative recruitment in 85% of bear beds ≥ 1 year old (N = 55), whereas generative recruitment at random locations was low (20%, N = 55). In addition, the number of registered seedlings in bear beds was several magnitudes higher compared to random locations. Our results show that brown bears facilitate sexual reproduction of bilberry, and have important implications for conservation and management of seed dispersal agents and the ecosystem services they provide.

Abstract ID: 14

Session:
Bear ecology, behaviour and physiology

USING REMOTE SENSING TO UNDERSTAND GRIZZLY BEAR MOVEMENT IN RELATION TO REGIONAL PHENOLOGY OF IMPORTANT VEGETATIVE FOODS

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[2]University of Alberta, Department of Renewable Resources, Canada
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Abstract
Grizzly bears rely on a mixed diet of meat and plant matter and bears move through their home ranges searching for food as seasonally available. Foraging strategies are generally separated into three seasons. In hypophagia (den emergence-mid June) grizzly bears rely on roots. In early hyperphagia (mid-June to late July), diets shift towards graminoids and forbes. In late hyperphagia (late July to denning) berries are consumed and then roots again. It is hypothesized that changing climates are shifting phonologic dates (green up, leaf out, bearing of fruit) and thus the availability of key vegetative food groups. In this study, we observe the phenology of key plant species for each foraging season and scale observations to a regional scale using remote sensing data. At plot level, Hedysarum alpinum for hypophagia, Equisetum spp. and Heracleum lanatum for early hyperphagia, and vaccinium spp. as well as Shepherdia canadensis for late hyperphagia are monitored using digital time-lapse cameras combined with field observations. When scaling to a regional scale satellite imagery provides key phenology attributes at broad spatial extents but is often unable to resolve phenological behaviour of individual plant species. In order to achieve a fine temporal and spatial scale assessment of phenology of relevant bear foods data fusion between the 30m resolution of Landsat and daily MODIS imagery must occur. In this paper we present a Dynamic Time Warping approach which combines MODIS and Landsat datasets to generate a temporally dense phenological information across the landscape at 30 m resolution. This time series is used to create regional phenology curves for identified key species from 2000-2018. Plot level and regional observations are combined to provide an image of the region as a whole and evaluated as a driver for grizzly bear home range and movement patterns from 2000-2018.

Abstract ID: 30

Session:
Bear ecology, behaviour and physiology

DENSITY AND TEMPORAL OVERLAP OF ASIATIC BLACK BEARS AND SUN BEARS IN A TROPICAL FOREST

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[3]WWF-Thailand

Abstract
Sun bear (Helarctos malayanus) and Asiatic black bear (Ursus thibetanus) spatially overlap throughout Southeast Asia. They also have highly overlapping diets, both containing a large proportion of fruit, hence it is not well understood how they coexist. We investigated species differences in density and temporal partitioning. We used 163 baited camera trap stations to examine bear density using spatial capture-recapture and temporal overlap using kernel density functions in three sites in Thailand. Dong Phayayen (DP)-Khao Yai (KY) forest complex in northeastern Thailand has a seasonal climate and Khao Sok-Khlong Saeng forest (KSKS) in southern Thailand is largely aseasonal. Sampling occurred during seasons of low fruit availability, when competition between species was expected to be most pronounced. Density of black bears ranged from 4 times higher than sun bears in KY to 2 times higher in KSKS. In KSKS, the movement (sigma) of sun bears was half that of black bear. In KY, which has highly productive forest, we found the opposite pattern, but movement was similar between the two species in degraded forest (DP). Both species were mainly crepuscular (black bear 43%, sun bear 48%) and overlapped considerably (85-92%) in all three sites. At 64% of traps (104 traps) both species were detected, but never simultaneously; black bears stayed at these stations 6.8 times longer than sun bears in KY and 4 times longer than sun bears in DP. At KSKS they spent equal time at stations. Both species co-occurred at fine temporal scales, although black bears were more likely to monopolize resources where their density was notably higher than sun bear. However, sun bears were more likely to compete with black bears in KSKS where the movement of sun bears was half that of black bear. Additional surveys are needed in different quality forests to confirm this pattern.

Abstract ID: 69

Session:
Bear ecology, behaviour and physiology

RUBBING BEHAVIOUR AND FITNESS IN GRIZZLY BEARS

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Abstract
Several species of bears are known to rub deliberately against trees and other objects, but little is known about the reasons bears rub. Differences in rubbing behavior between males and females suggest that scent marking by grizzly bears (Ursus arctos) might be sexually selected and that rubbing functions to communicate among potential mates or competitors. Using DNA from bear hairs collected from rub objects in southwestern Alberta from 2011-2014, we completed a parentage analysis. From the parentage analysis and detection data, we determined the number of offspring, mates, unique rub objects where an individual was detected, and occasions during which an individual was detected for each grizzly bear identified through our sampling methods. We found bears with more mates were detected at a greater number of rub objects and during more occasions than bears with fewer mates. Female bears with offspring were detected at more rub objects and during a greater number of occasions than females without offspring, but there was no statistical difference between the number of rub objects at which males with and without offspring were detected. Males with offspring were detected during a greater number of occasions than males without offspring, but the difference was not statistically significant. Our results suggest that bear rubbing behaviour may be related to mate signalling; bears that were detected at more rub objects and during more occasions had a greater number of mates. For females, however, the mechanism behind rubbing might go beyond mate advertisement; actively soliciting multiple male matings might confer fitness benefits to the rubbing female, potentially by confusing paternity and reducing subsequent predation by infanticidal males.

Abstract ID: 73

Session:
Bear ecology, behaviour and physiology

DO ANDEAN BEARS (TREMARCTOS ORNATUS) IN THE TROPICAL DRY FOREST OF NW PERU USE THE MOST EFFICIENT ROUTES TO TRAVEL BETWEEN AREAS OF FOOD RESOURCES?

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Abstract
The Andean bear (Tremarctos ornatus) is considered Vulnerable by the IUCN, primarily due to habitat loss. For example, the most recent range-wide assessment predicts that >30% of bear habitat in Peru will soon be lost. To design and manage areas to effectively protect bear habitat and facilitate bears' response to climate change, we need an improved understanding of how Andean bears move across landscapes. We therefore investigated how Andean bears move between areas of food resources in the dry forest of NW Peru. To evaluate Andean bear path choice, we digitized 108 independent big game paths from high-resolution satellite imagery (50cm pixel) across a 200km2 study site. Bears appear nutritionally-limited in this simple habitat, where the two primary food sources grow in different elevation zones: 425MASL and 600MASL. Focusing on the intermediate elevations between those two zones, we measured the length, slope, and distance to human activity of the 108 independent big game trails. We then compared these values to the same attributes of simulated straight-line paths, random paths, and least-cost paths connecting the same origins and destinations as observed paths. We also compared observed paths to ridges, and least-cost paths to ridges to determine if bears follow least cost paths while traversing the zone of interest. Bears used paths ranging in slope from <1° to 57°, optimizing variables other than simple distance moved; for example, the average observed path was 21% longer than the average straight-line path connecting the same endpoints (661m, 458m, respectively). Our findings can be extrapolated and refined through analyses of bear travel routes at other sites. By characterizing and evaluating how Andean bears move between resources, we will illustrate how future research can identify potential corridors to maintain connectivity among fragmented patches of habitat throughout the Andean bear's range.

Abstract ID: 85

Session:
Bear ecology, behaviour and physiology

THE COMPARATIVE EFFECTS OF LARGE CARNIVORES ON THE ACQUISITION OF CARRION BY SCAVENGERS

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[2]Panthera
[3]University of California, USA
[4]Victoria University, New Zealand

Abstract
The effects of large carnivores on ecological communities are many and varied, and their interactions with scavengers may be an underappreciated mechanism for their effects on ecological communities. Scavenging is a widespread behavior, where species compete for limited resources in order to gain nutritional benefits and increase individual fitness. Mountain lions (Puma concolor) and black bears (Ursus americanus) are large carnivores that may affect scavenging dynamics by increasing access to carrion resources for some species and restricting access for others. We used motion-triggered video cameras deployed at deer carcasses (mountain lion kills compared to control carcasses, and a set of experimental carcasses for the effects of bears) to determine how mountain lions and black bears affected three aspects of carrion acquisition by scavengers: presence, total feeding times, and mean feeding bout durations. We found that mountain lions did not affect the acquisition of carrion by large carnivores, but limited aspects of carrion acquisition for birds anwd mesocarnivores. Through their suppression of mesocarnivores and birds, pumas apparently initiated a cascading pattern, increasing the carrion acquisition by small carnivores. In contrast, black bears monopolized carrion resources and generally had larger limiting effects on carrion acquisition of all scavengers. Black bears also limited puma feeding behaviors at puma kills, which may require pumas to compensate for energetic losses through increasing their kill rates of ungulates. Our results suggest that mountain lions provision carrion to scavengers, but selectively affect the species acquiring carrion, while black bears limit carrion availability to all other scavengers. The effects of large carnivores on scavengers appear to depend on attributes of both carnivores and scavengers (including size) and that competition for carcasses may result in intraguild predation as well as mesocarnivore release.

Abstract ID: 141

Session:
Bear ecology, behaviour and physiology

ELK HUNTING IN GRAND TETON NATIONAL PARK DOES NOT ATTRACT GRIZZLY BEARS FROM SURROUNDING AREAS

Frank van Manen[1], Michael Ebinger[1], David Gustine[2], Mark Haroldson[1], Katherine Wilmot[2], Craig Whitman[1]

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Abstract
Fall elk hunting in the Greater Yellowstone Ecosystem carries the risk of hunter-grizzly bear (Ursus arctos) conflict and creates a substantial challenge for managers. For Grand Teton National Park, Wyoming, USA, a key information need is whether increased availability of elk remains during a late fall (Nov–Dec) elk harvest within the national park attracts grizzly bears, potentially increasing the probability of conflict. Using a robust design analysis with 6 primary sampling periods during 2014–2015, we tested the hypothesis that the elk hunt resulted in a population response through temporary immigration of grizzly bears. We conducted genetic sampling in 2014 and 2015 using DNA extracted from the roots of hair samples. We detected 31 unique individuals, of which 26 encounter histories were retained for analysis. We found support for a random movement model, suggesting temporary movements were not conditional on whether animals were in or out of the study area previously. Contrary to our research hypothesis, we estimated more grizzly bears (N = 21; mean for 2014-2015) in the study area during September–October than during the November–December elk hunting season (N = 11) or July–August (N = 4). The late timing of the Elk Reduction Program likely moderates the effect of elk remains as a food attractant because it coincides with the onset of hibernation. The temporary increase in population abundance during September–October occurred during the peak of fall hyperphagia and likely reflected detection of bears as they moved through the sampling grid. Grizzly bear presence during the late season elk hunt seemed limited to a small number of resident bears that specialized in accessing elk remains. From a population response perspective, the current timing of the Elk Reduction Program represents a scenario of lowest relative risk. The risk of hunter-grizzly bear encounters remains, but it is likely a function of factors that operate at the individual bear level.

Abstract ID: 154

Session:
Bear ecology, behaviour and physiology

FEEDING ECOLOGY OF A SMALL BROWN BEAR POPULATION IN THE HUMAN DOMINATED ALPINE ENVIRONMENT USING DNA METABARCODING

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Abstract
Trophic interactions comprising a species diet, and their dynamics in natural systems have direct influence on species distribution and viability, affecting key ecological and evolutionary population processes as well as ecosystem function and species responses to environmental changes. Study and monitoring of feeding habits are therefore crucial for ecological understanding and for conservation of natural populations, especially under current accelerated human-induced habitat modifications. Most bear species exhibit complex trophic interactions with the environment they inhabit that may be difficult to study because they vary in space and time with resource availability and are mediated by individual behavior and requirements. In this study we aim to gain insight into this complexity by using spatiotemporally explicit population and individual diet data generated through DNA metabarcoding of fecal samples collected over multiple years for the brown bear population in the central Italian Alps in expansion from Trentino. We employed three universal metabarcode markers for identifying the plant, vertebrate, and invertebrate components of the omnivorous bear diet. We used the derived sequence data to i. describe the overall dietary niche breadth of the bears in the Alpine human dominated environment, ii. identify key trophic interactions (food items) and investigate their strength and diversity at the population level and for relevant population segments, accounting for seasonal and annual variation, and iii. test for the effect of environmental and anthropogenic drivers on observed patterns of resource utilization. This study provides fine scale dietary information and a deeper understanding of feeding behaviour important for conservation management of this bear population. It also demonstrates the applicability of DNA metabarcoding for efficient large-scale diet assessments from excremental samples that could benefit ecological studies of other bear populations.

Abstract ID: 156

Session:
Bear ecology, behaviour and physiology

HUMAN IMPACT ON ENDOZOOCHOROUS SEED DISPERSAL BY SCANDINAVIAN BROWN BEARS

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Abstract
Brown bears are important endozoochorous seed dispersers, especially during summer and autumn, when they feed heavily on berries. Bear feces contain many ingested seeds from Vaccinium species (e.g., bilberry V. myrtillus, lingonberry V. vitis-idaea) many of which are also viable (~70%, up to 195 viable seeds/gram air-dried feces). Bears typically defecate within the immediate vicinity of their resting sites (i.e., <5m away from >95% of bear beds; N = 52 field validations), which can act as 'recruitment windows' of opportunity for many plant species. Such recruitment windows are essential for sexual reproduction in Vaccinium species. It is unknown, however, how the human impact affects the seed dispersal process by modulating foraging (seed ingestion) and resting behavior (seed deposition), as well as movement between foraging and resting (long distance seed dispersal). Using foraging and bed sites extracted from GPS collar relocation data, we examined (1) the effect of human-related factors (e.g. distance to roads, density of buildings) on potential seed dispersal distances of 169 brown bears from 2004 - 2017. We also (2) used a path-informed resource selection function to estimate the relative influence of human variables and other spatial attributes on bear foraging and bed selection and to assess directionality between foraging and bed sites (e.g. land cover types). Our results suggest that the human footprint impacts the entire seed dispersal process: both seed ingestion and deposition occurred farther away from human footprint than random (except arable lands for foraging), and dispersal distances were positively affected by human density. Given that the human footprint can influence seed dispersal of Vaccinium species by brown bears, we suggest that humans may also indirectly affect their distribution and genetic diversity on a landscape scale. Our results show that humans can induce behavior-mediated impacts on ecosystem services provided by wildlife.

Abstract ID: 202

Session:
Bear ecology, behaviour and physiology

LONG RANGE DISPERSAL BY BEARS – PERCEPTION, NAVIGATION AND MENTAL MAPS

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Abstract
Brown bears may disperse considerable distances away from their natal areas. Such long distance movements are important for maintaining gene-flow, in particular of low-density and recolonizing populations. One of the key questions as to the mechanisms behind mammalian land movements is how the animals select where to go. Despite its importance, long-distance navigational mechanisms in large mammals are not well understood. Bears' movement paths can be markedly directional over large distances. In addition, dispersing bears not only visit new areas, but also, during the prospecting movements, may follow previously traversed paths. This may suggest a crucial role of long-range perception and spatial memory in navigation during the long-distance dispersal of bears. We investigated how bears can combine the use of olfactory perception and spatial memory for long-range navigation, by acquiring and synthesizing information during their movement. We propose a model of a 'spatially informed disperser' which constructs a mental map of its environment using directional olfactory information. We confront this model with real brown bear movement data obtained via GPS tracking.

Abstract ID: 223

Session:
Bear ecology, behaviour and physiology

BEARS NAPPING NEARBY: DAYBED SELECTION BY BROWN BEARS (URSUS ARCTOS) IN HUMAN DOMIANTED LANDSCAPE

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Abstract
Daybeds are essential for the survival of brown bears (Ursus arctos L., 1758) and may represent a population limiting resource in human dominated landscapes. In this study, we demonstrate which land-cover types and bear characteristics affect daybed selection in north-central Slovakia. We used the positional and activity data of 21 bears acquired by GPS-GSM telemetry to identify 3864 daybeds. By use of K-select analysis and linear mixed-effects modelling, we explored how bears chose these places for their daytime resting. The most important drivers for daybed selection were the presence of dense regenerating forests and forest-shrubbery belts in farmland. Bears avoided resting in older forests without suitable undergrowth. Females selected daybeds differently depending on the presence of dependent cubs. During spring/early summer, females with cubs-of-the-year avoided other bears by selecting more rugged terrain. These females also selected daybeds significantly closer to human settlements than adult males, possibly to avoid the risk of infanticide. In late summer/autumn, all bears selected daybeds closer to human settlements than in spring, probably because they were attracted by maize fields and fruit trees. Many daybeds were located outside protected areas in farmland closer to people, which could increase bear-human conflicts. We may state that the availability of human provided food resources can influence the location where bears rest during the day. Bears become more visible for people which is of great concern in Slovakia. Bear management should take these findings more into consideration then nowadays. Local people should be more educated about peculiarities in bear resting behaviour in Slovakia. However, none of the studied bears entered human villages and their appearance near settlements was temporarily restricted.

Abstract ID: 237

Session:
Bear ecology, behaviour and physiology

DEVELOPING AUTOMATED FACE RECOGNITION TECHNOLOGY FOR NONINVASIVE MONITORING OF BROWN BEARS (URSUS ARCTOS)

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Abstract
Conservation Technology is a newly emerging field of research that aims to address large-scale conservation challenges with innovative technological tools. With biodiversity conservation a global concern, computational tools that enable more frequent monitoring at larger spatial scales, but smaller resolutions, are a priority. Recent advances in camera traps and their application facilitate their use to address questions related to abundance, occupancy, behaviour, and interactions. One challenge of collecting image-based data using camera traps is the inability to recognise individuals with no unique natural markings. We propose a new method to study brown bears Ursus arctos that harnesses recent developments in a field of artificial intelligence known as deep learning. We aim to develop open-source face recognition software that can provide a highly-adaptable and cost-effective method of population monitoring for brown bears. Camera traps were used in 2017 and 2018 to capture facial images of previously identified individuals in both coastal (Knight Inlet) and interior (Selkirk/ Purcell Mountains) British Columbia, Canada. Camera trap footage was supplemented with images of individual bears previously collected during direct observations at Knight Inlet (2009-2016) and Brooks Falls, Alaska (National Park Service). Software development followed a four-step 'FaceNet' approach devised for human face recognition: face detection, face reorientation, face embedding, and face matching. Analysis indicates a current accuracy mean (±SE) of 93.28 ± 4.9%, based on the presentation of test images to a pre-trained system encompassing 26 individual bears. Preliminary results show that brown bears are able to be identified to the individual level with a relatively high degree of accuracy using facial images. With additional data collection planned to increase sample size from 2018-2020, this system presents a promising tool for future use in bear monitoring.

Abstract ID: 27

Session:
Bear ecology, behaviour and physiology

DO SLOTH BEAR FEMALES EXPERIENCE PSEUDOPREGNANCY?

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Abstract
Limited information is available on sloth bear reproduction. The physiology and endocrinology involved is largely unknown. A study was conducted on non-invasive hormone monitoring of female captive sloth bears (n = 6) from July 2015 to February 2018, as a part of ongoing research at Agra Bear Rescue Facility, India. All study females were unmated throughout the study period. Urine samples collected from specially-designed trenches in the den floors were assayed for estradiol and progesterone metabolites (standardized to creatinine concentration) by quantitative enzyme immunoassays (EIAs). Visibility of the vulva as an indicator of estrus was scored for each bear on keeper check sheets as 0 (not visible), 1 (slightly visible) and 2 (fully visible). Estrus was defined as the period during which vulva visibility score was either 1 or 2. Five females exhibited elevated urinary progesterone for periods ranging from 85 - 191 days following estrus. Urinary progesterone began increasing between 11 and 93 days after the vulva visibility score returned to 0, indicating the end of estrus. One female showed high urinary progesterone levels for long periods in 2016 (139 days) and 2017 (188 days) and was observed to dig an earthen den following the period of high urinary progesterone. The results from urinary assays and behavioural observations thus indicate the possibility of pseudopregnancy in sloth bears. More research on this aspect of sloth bear reproduction is currently ongoing.

Abstract ID: 42

Session:
Bear ecology, behaviour and physiology

COMPARISON OF TWO NON-INVASIVE BLOOD PRESSURE MONITORING TECHNIQUES IN CHEMICALLY IMMOBILIZED FREE-RANGING BROWN BEARS (URSUS ARCTOS)

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Abstract
Monitoring arterial blood pressure (BP), as a better reflection of hemodynamics than heart rate alone, in wildlife chemical immobilization is essential for preventing and treating intra- and post-operative complications. We tested reliability, precision and agreement of standard oscillometry and Korotkoff's technique in 25 anesthetized free-ranging brown bears in Croatia and Scandinavia. Further, we assessed the impact on the physiology (with a special regard to BP) made by both intrinsic and extrinsic factors of each immobilization context. BP values were corrected depending on the sphygmomanometer's cuff width and other biases. Additive models identified the factors which most influenced BP in Scandinavia. Five bears were snared and darted with xylazine and ketamine in Croatia, whereas twenty bears were darted with medetomidine and tiletamine-zolazepam from the helicopter in Scandinavia, within national and international projects. Oscillometry failed to measure BP in many attempts and several inconsistent values occurred, showing lack of precision and correlation with Korotkoff's technique, which contrarily provided more reliable trends of variations in all bear captures. Further, oscillometry mostly provided lower values than Korotkoff's technique in yearlings. Although all bears presented the common finding of a generally decreasing trend of BP over time, consistent between the two techniques, in 11 of 20 bears several increments occurred mostly during the abdominal surgery (n = 8) in Scandinavia. All bears were hypertensive: the auscultatory technique detected severe and moderate hypertension in 21,0% and 73,7% of cases, respectively, in Scandinavia, whereas 75,0% of bears only developed a mild hypertension in Croatia. Korotkoff's method resulted in a reliable and effective tool for BP assessment in brown bears, though further comparative studies with invasive BP are needed to test the accuracy of the method and to assess the incidence of target-organ damage.

Abstract ID: 43

Session:
Bear ecology, behaviour and physiology

DISENTANGLING GRIZZLY BEAR RESPONSES TO NATURAL AND ANTHROPOGENIC DISTURBANCE USING ECOANTHROMES

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Abstract
Several aspects of grizzly (brown) bear (Ursus arctos) biology are influenced by the interplay of natural resources and anthropogenic activity. Understanding how these factors interact is critical for managing and protecting habitat for grizzly bear conservation and management, including mitigating human-wildlife conflict and the impacts of economically driven activity. However, habitat covariates in grizzly bear studies often represent these factors independently of one another. To that end, we developed a novel remote sensing-driven regionalization known as 'EcoAnthromes' that combines both natural and anthropogenic characteristics to produce an integrative classification of natural habitat characteristics and anthropogenic disturbance levels, thus representing unique and important ecological regions. To develop the EcoAnthromes, we used an unsupervised two-stage agglomerative clustering technique with a suite of freely available satellite-derived input variables representing both natural factors (e.g., climate, geomorphology, fires) and anthropogenic drivers (e.g., landscape conditions, human access, land cover change). We then applied our EcoAnthrome classification to a very large dataset of grizzly bear GPS satellite collar locations and DNA hair snag data in west-central Alberta, Canada, to evaluate how grizzly bears respond to both natural and anthropogenic drivers of ecological conditions. We found that the EcoAnthromes were a powerful tool in helping explain the influences of different levels of anthropogenic activity in specific habitat types on grizzly bear behaviour, including at the individual, demographic (sex-age classes), and population level. The EcoAnthrome classification is effective, intuitive, and easily replicated using freely available data, making it a valuable tool for understanding the relationships between anthropogenic activities and ecological conditions experienced by grizzly bears and other wildlife species.

Abstract ID: 51

Session:
Bear ecology, behaviour and physiology

IMPACT OF BEECHNUT MASTING ON REPRODUCTIVE SUCCESS OF ASIAN BLACK BEAR

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Abstract
Asian black bear (Ursus thibetanus, hereafter bear) eat hard mast intensively in autumn before hibernation. Previous studies indicated that bears move farther away from general home range to search for food during poor masting years, and change diets according with masting conditions. However, it is unclear if reproduction of bears (i.e., parturition and lactation) changes in association with masting conditions. We established the following two hypotheses to clarify the impact of masting on reproductive success of bears, through changes in the cementum annulus width. Because the number of female bears that is successful to raise cubs increases, (1) annulus width become narrower in following years of good masting years, or (2) variation in annulus width becomes higher in following years of good masting years, for certain number of bears may not reproduce. We used masting data of Fagus crenata, the major food resources in autumn, from 1989 to 2015 and annulus width data of teeth obtained from bears (n = 53) culled in Ou Mountains, northern Japan because the number of bears intruding human residence is influenced by masting condition. We created liner mixed model and generalized linear model to evaluate the impact of masting on annulus width. The results showed that both annulus width and variation in annulus width were not influenced by masting, suggesting that masting of hard mast of major species have little impact on reproduction. The reasons for the results are that some bears succeed in reproduction by eating alternative food resources in poor masting years or that other bears did not reproduce due to infanticide even in good mast years. For management and conservation, it is improper to cull bears based on intrusion during poor masting years because population dynamics of bears may not only be influenced by fluctuation of major food resources in autumn.

Abstract ID: 93

Session:
Bear ecology, behaviour and physiology

INTERACTIONS AMONG LARGE CARNIVORES IN DINARIC FOREST ECOSYSTEM IN SLOVENIA

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Abstract
Dinaric Mountains are the core area of the Slovenian brown bear population and have been identified as one of the biodiversity hotspots of Europe. Here bears coexist with numerous other species, including grey wolf and Eurasian lynx. In this presentation we will review recent research on interactions among these large carnivores, their prey and mesocarnivores in Dinaric forest ecosystem of Slovenia. Direct and indirect interspecific interactions are one of the key factors in ecology of animal communities, in which apex predators often have important role. Diet analyses indicated moderate to low food niche overlap among Slovenian large carnivores. We also did not notice any avoidance among them neither in distribution range, home-range distribution, nor in the space use within the overlapping home ranges. On the other hand, we observed relatively strong interactions between bears and the two predators via kleptoparasitism, as scavenging bears frequently displaced predators from their kills. On average, we detected bear presence at 20% of wolf kills and 32% of lynx kills. For lynx we further estimated that 15% of all biomass of large prey was lost due to bear scavenging and in response, lynx increased their kill rate of ungulates by 23%, thus compensating 59% of the losses. Rate of kleptoparasitism by bears on lynx and wolves varied among seasons and was strongly correlated with bear movement rates and bear density. Despite the fact that Dinaric Mountains contain one of the largest forest complexes in Europe, this ecosystem is still under strong human influence. This influence is also affecting the interactions among the apex predators, as well as their interactions with other species.

Abstract ID: 158

Session:
Bear ecology, behaviour and physiology

FUNCTIONAL SIGNIFICANCE OF SCENT MARKING IN ANDEAN BEARS: FIRST RESULTS

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Abstract
Marking behavior in bears has been continuously gaining more attention. After the historical underestimation of its relevance to the ursids, now it is known that various bear species scent mark objects and substrates in order to communicate with each other. In 2016 we described scent marking in Andean bears but the reasons why Andean bears mark remain unclear. Here we present the first explanations of those reasons. Since 2012 we have been studying marking behavior of Andean bears in Ecuador, and from 2016 as part of the project 'Marking behavior, population density estimates, and terrain use of Andean bears – generating knowledge for the conservation of a threatened umbrella species'. We work in two Ecuadorian provinces, Napo and Zamora Chinchipe, with data of two Andean bear populations collected from 2016 - 2018. We installed two camera traps at each marking site (n=7) with highest bear activity and at established experimental sites (no bear activity, n=7) to monitor differences in bear social behaviour across sex and age classes. So far, we have analysed more than 500 video recordings containing Andean bear scent marking activities. We tested several hypotheses focused on social function of Andean bear marking behaviour. Our preliminary results show that Andean bears use much wider tray of behavioral responses than previously thought. For example, next to rubbing different body parts on marked trees and objects, adult male Andean bears were pede-marking. Both, males and females, were scent rubbing. Adult males scent-marked most frequently out of all the age and sex groups. Adult males also reacted to a smell of another male's faeces on an unmarked tree at experimental sites by smelling and rubbing it. Our results support the hypothesis that male Andean bears communicate dominance through scent marking.

Abstract ID: 232

Session:
Bear ecology, behaviour and physiology

THE IMPORTANCE OF ASIAN BLACK BEAR URSUS THIBETANUS AS SCAVENGER IN JAPAN

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Abstract
Scavenging is a feeding behavior on high-quality carrion. Drastic changes in the spatio-temporal availability of carrion are leading to alterations of the behavior and survival of scavengers. In Japan, the population density of sika deer (Cervus nippon) have increased over the last decades; the number of deer carcass inevitably increased. This change would have some impacts on the scavenger's feeding behavior and its function in the forest ecosystem. However, evaluation of the impact is often difficult because there is a lack of knowledge about the deer carcass fate and the scavenger community in Japan. It is imperative to reveal the scavenger community and the role of each species in Japanese forest ecosystem. In this study, therefore, we aimed to (1)identify scavenger community, (2)quantify scavenging by each scavenger and (3)reveal carcass optionality and interspecific competition over deer carcass, in Nikko, central Japan. We monitored the fate of 56 deer carcasses by camera traps and calculated the scavenging behavior by each scavenger (total feeding-times per each carcass and feeding-bout duration per visit) during June and December of 2016 and 2017. We evaluated carcass optionality and interspecific competition by randomization and GLMM respectively. There were a community of facultative scavengers mainly composed of large and meso-mammals, and the Asian black bear (Ursus thibetanus) and the raccoon dog (Nyctereutes procyonoides) were the dominant scavenger species. Furthermore, the carcass optionality was found to be different among species; bears and raccoon dogs had high carcass optionality. Also, the feeding time of the other meso-scavengers were regulated after bears visited carcass. Our study shows that Asian black bears play an important role among the scavenger community, and the presence of bears suppresses the scavenging behavior of other scavengers. These results provide us with underlying knowledge of scavenging in the Japanese forest ecosystem.

Abstract ID: 241

Session:
Bear ecology, behaviour and physiology

PREDICTING THE HEALTH OF AMERICAN BLACK BEARS USING THEIR HAIR

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Abstract
Developing a method to assess bear health using noninvasive genetic sampling methods would be a valuable tool for bear biologists and managers worldwide. In this study, we conducted a preliminary analysis of bear hair in order to construct a predictive model used to estimate the body condition of American black bears, a measure of bear health. We calculated a scaled-mass body condition index for ~700 bears using morphological measurements from bears live-captured by Maine Department of Inland Fisheries and Wildlife in 2010-2015. We also measured stable isotopes (13C, 15N, and 34S) in hair collected from a subsample of live-trapped bears from Maine. We then modeled the relationship of body condition and covariates of live-trapped bears. We found that the top model contained stable isotope measurements and sex. Once validated, our top model can be used to assess the health of black bears throughout Maine using hair traps.

Abstract ID: 13

Session:
Bears and climate change

LINKING FINE SCALE TEMPORAL AND SPATIAL SNOW COVER TO GRIZZLY BEAR BEHAVIOR POST-DEN EMERGENCE IN CORE HABITATS OF ALBERTA, CANADA

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Abstract
Snow is an integral part of grizzly bear ecology in most parts of the species global distribution, yet is understudied in relation to bear movement and behavior. Snow cover dynamics dictate where and when food resources are available, specifically during the transition periods of den entry and emergence. Climate predictions indicate a future with shorter winters and less precipitation, highlighting the need to better understand how bears interact with snow, in order to implement sound management practices in multi-use landscapes. Satellite remote sensing enables the quantification of spatial and temporal variability in snow cover, but no dataset is readily available at a scale relevant to bear movement ecology analysis. Through fusing together the 30 meter spatial resolution of Landsat with the daily temporal resolution of the Moderate Resolution Imaging Spectroradiometer (MODIS), a snow cover product with daily 30m observations from 2000-2017 was developed over one grizzly bear management area in Alberta, Canada (28,529 km2) . The accuracy of the snow cover product ranges from 90-99%. Snow cover was than compared with grizzly bear GPS location data from 2000 – 2017 to examine relationships between snow dynamics and bear movement during a two-week period following den emergence, marking the beginning of hypophagia. We found that bears avoided locations with more than 50% snow cover during this period, and therefore selected for lower elevation locations, where they are more likely to have negative encounters with humans. Through a better understanding of the relationship between bear behavior and snow patterns, government, industry, and recreational planners can better manage the landscape for provincial grizzly bear recovery efforts, and prepare for climate change impacts that could influence human caused grizzly bear mortality rates.

Abstract ID: 91

Session:
Bears and climate change

CLIMATE CHANGE AND POLAR BEAR LIFE HISTORY VULNERABILITIES

Andrew Derocher

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Abstract
Habitat loss is the major threat facing ursids across their range. Warming in the Arctic has fundamentally altered and degraded polar bear (Ursus maritimus¬) habitat and they have become the poster-species for climate change. The effects of climate change on polar bears are understood because the life history of the bears is well-documented. The changes in polar bear life history are influenced at several critical life history points. Energy stores are the primary affected link and the key to understanding the effects of habitat loss on polar bears lies on the balance between energy intake and energy use. Energy intake is mediated by the duration of ice cover, prey abundance, and prey vulnerability but the latter two components are poorly understood. Energy use is influenced by growth, reproduction, and maintenance costs that are directly influenced by ice-free period duration and habitat conditions. Altered sea ice conditions have affected movement ecology and energy use yet these are challenging to monitor. I present a conceptual model and review the support for the key vulnerabilities in polar bear life history. Population monitoring of polar bears has focussed on mark-recapture or aerial survey abundance estimates yet the cost and current estimate interval will not provide adequate resolution for status assessment or temporal trends. Despite the diversity of monitoring options applied to polar bears, body condition and ice-free period duration are the two most cost-effective metrics

Abstract ID: 98

Session:
Bears and climate change

ADAPTATIONS TO CLIMATE WARMING BY DENNING AMERICAN BLACK BEARS?

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Abstract
Climate change has prompted increased interest in the chronology of bear denning. Several studies have identified effects of temperature and snow depth on emergence dates from hibernation, but we are unaware of studies that have explored the specific advantages to bears in emerging when they do, and how they have adapted to changing climatic conditions. We used camera traps at den sites of >40 radiocollared American black bears (Ursus americanus) in northern Minnesota (2015–2018) to examine the timing of den emergence, environmental conditions around the den (especially snow cover), and activities of bears near den sites after emergence. Bears remained near, and repeatedly entered and exited their den for up to 6 weeks after initial emergence. During this time, they commonly raked in new bedding material in an apparent attempt to keep dry while rain and snowmelt seeped into their den. We hypothesized this to be a primary motivation for their emergence: we observed several bears exiting with wet fur, and discovered wet, thin, or nonexistent bedding material when we visited dens before bears emerged. Based on other photographed activities, we surmised additional reasons for emerging but remaining near the den site: assess environmental conditions before committing to leave; enable cubs to develop walking and climbing skills; exercise muscles; rehydrate; and warm body temperature. We also deployed temperature sensors inside and outside dens to examine whether temperature, independent of snow or moisture, motivated bears to emerge from dens and leave the area. Also, GPS collars enabled us to assess how far away bears moved once beyond the range of cameras. Even though these technologies were not available when we began our research >30 years ago, our long-term data show increased selection of above-ground dens that are drier than excavated dens, but expose bears to other potential environmental hazards.

Abstract ID: 145

Session:
Bears and climate change

DIRECT AND INDIRECT IMPACTS OF CLIMATE CHANGE AND LAND USE CHANGE OVER BIODIVERSITY: A CASE OF STUDY WITH THE BROWN BEAR IN EUROPE

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Abstract
Climate and land use changes are the main drivers of biodiversity loss and species distribution range contractions. It is usually explored the direct effects of these drivers on biodiversity while ignoring the indirect effects that come through other species, driving to erroneous predictions of how global change impacts biodiversity. Here, we focus on the brown bear (Ursus arctos), a well-studied omnivore species that has trophic interactions with many different taxa. We aim understand how direct and indirect impacts of climate and land use change would affect the future distribution and vulnerability of different populations across Europe. We first conducted a literature search to gather all available brown bear diet studies in Europe, based on faecal or stomach content. We compiled information on ~100 species that are generally consumed by brown bears. We constructed a spatial dataset assigning diet to different populations. We download well-defined and located occurrence data for all species found in the diet of the brown bear from GBIF. We build species distribution models for all these species, using biomod2 in R. Single species distribution models for all species found in the diet were finally built in function of current climate and land use data. Using different scenarios for climate and land use change, we projected the future distributions of the brown bear diet species. Finally, using these projections and scenarios, we calculated the potential current and future suitable habitats of brown bear in Europe in function of its diet, climate and land use. The range dynamic of the brown bear was best explained by considering both direct and indirect impacts. Accounting for diet (indirect effect) buffered the direct impact of climate and land use change. Our results highlight the importance of taking a food-web ecosystem approach to evaluate the impact of global changes and predict modifications in the distribution and vulnerability of species.

Abstract ID: 170

Session:
Bears and climate change

EVIDENCE FOR EFFECTS OF CLIMATE WARMING ON POLAR BEARS IN CANADA: A REVIEW

Martyn Obbard

Ontario Ministry of Natural Resources and Forestry, Canada

Abstract
Climate warming is occurring at a faster rate in the Arctic than elsewhere. As a consequence, sea ice is declining in duration and distribution across the Arctic with implications for ice-dependent species such as polar bears (Ursus maritimus) and their main prey, ringed seals (Pusa hispida) and bearded seals (Erignathus barbatus). However, these changes are not uniform but are happening at different rates and with different effects in different regions. Negative effects of climate warming are well documented for 3 subpopulations in Canada, the Southern Beaufort Sea (SB), Western Hudson Bay (WH) and Southern Hudson Bay (SH) subpopulations. As expected, these subpopulations first showed individual-level effects (declines in body condition or body size), followed by population-level effects (declines in survival and abundance). I summarize the evidence for effects of climate warming on SB, WH and SH, discuss what is known currently about effects of climate warming on the remaining Canadian subpopulations, and discuss predictions for future changes in all these subpopulations.

Abstract ID: 89

Session:
Bears and society

THE EFFECT OF A BEAR-CAUSED ACCIDENT ON THE PERCEPTION OF BROWN BEARS BY WILDLIFE PARK VISITORS

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[2]Orsa Predator Park, Sweden
[3]University College of Southeast Norway

Abstract
Zoos and wildlife parks play an important role in conservation and education of the general public about wildlife. Educational materials and guided tours are commonly offered in wildlife parks. We carried out a questionnaire amongst visitors about their knowledge, perceptions, and the learning outcome of a wildlife park visit, as well as the efficacy of interpretive activities and their influence on perceptions regarding the brown bear in a wildlife park in Sweden. Randomly chosen visitors were asked questions about their knowledge and perception of brown bears as well as the information tools used during their visit. We further analyzed how a fatal bear accident influenced the perception of brown bears by visitors. We surveyed 321 visitors before entering and 291 visitors upon exiting the wildlife park between July and September 2017. The results showed that visitors performed significantly better in the knowledge questions upon exiting the park. This knowledge gain was higher in repeat visitors and prevalent both in local/national as well as in international visitors. The knowledge gain was higher when interactive interpretational activities, such as guided tours were visited. Unexpectedly, we did not find a change in the perception of local/national visitors towards bears even after the occurrence of a fatal accident inside the wildlife park during the study period (a bear mauled a park employee, who subsequently died from the injuries). Our findings underscore the importance of educational materials and proactive educational experiences in improving learning outcomes in wildlife parks as well as the important role of wildlife parks for education of the general public in conservation topics.

Abstract ID: 198

Session:
Bears and society

COMBINING ECOLOGY AND PSYCHOLOGY IN DEVELOPING INTERVENTIONS FOR HUMANS TO HANDLE FEAR OF BEARS

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Abstract
The brown bear population in Scandinavia has substantially increased the last 30 years, increasing the probability of interactions between humans and bears and the public fear of bears. The behavior of the bears during encounters with humans have been studied for many years in Scandinavia, providing knowledge on the danger of bears for humans, how bears act in close proximity to humans, and how humans should behave with bears and how to avoid encountering bears during outdoor activities. In parallel psychological research has shown that people's interpretation of danger (how dangerous the animal is), predictability (how the animal will act) and controllability (how the humans should act) are crucial for peoples' fear of large carnivores. In a collaborative project of biologists and psychologists, we aimed to develop and evaluate two specific interventions with regard to their effect on people's fear of encountering brown bears, departing from ecological knowledge and psychological theory on human-environment interaction and emotional appraisal. The two interventions studied were guided bear walks and information meetings. In both interventions, guides/presenters with extensive personal experience of bears were trained to share their know-how and knowledge to meet the participants' needs, but theinterventions differed in environmental context. The interventions were directed towards people who live within brown bear areas and express fear of encountering bears. The participants reported reduced feelings of fear for bears after the guided walks and the information meetings. The results show that interventions designed according to psychological principles andled by guides with extensive personal experience of bears, may reduce people's fear. Principles for how these interventions should be used in practice must be further developed together with large carnivore information centers and managing authorities to reach different outdoor user groups in the society.

Abstract ID: 203

Session:
Bears and society

WILDLIFE VALUES OF CONSERVATION PROFESSIONALS: A CASE STUDY OF BEAR RESEARCHERS AND MANAGERS

Lucy Rogers, Cheryl Morse

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Abstract
The values held by conservationists affect research and management goals, and successful collaboration between conservationists and the public often requires mutual communication of values. Despite a growing awareness of the relation between values and conservation policy, there remains a distinct lack of studies addressing the values and narratives of wildlife researchers and managers. Using the IBA as a case study, I surveyed and interviewed attendees at the 25th International Conference on Bear Research and Management in Quito, Ecuador to collect information about their wildlife values and personal narratives. Participants hold multiple strong values toward bears but, compared with the public, tend more toward naturalistic/mutualistic than utilitarian values. Additionally, participants from North America and Europe described a dominant narrative in which time spent in nature influenced them to enter bear conservation, whereas no prominent counter-narrative emerged from South American or Asian participants. These findings demonstrate that bear researchers and managers can capitalize upon their multiple values in order to connect effectively with many sectors of the public, and that improved understanding of the non-dominant narratives within the IBA community could make it more cohesive and accessible to members from all regions.

Abstract ID: 215

Session:
Bears and society

BEARS THROUGH THE EYES OF THE MEDIA: HOW DIFFERENT EVENTS IN THE SOCIETY AND UNDERSTANDING OF THE BEAR POPULATION INFLUENCED MEDIA REPORTING ABOUT BEARS IN SLOVENIA BETWEEN 2002 AND 2016

Aleksandra Majić Skrbinšek, Borut Kokalj, Tomaž Skrbinšek, Urša Marinko, Roman Luštrik

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Abstract
Brown bear (Ursus arctos) is a symbol of pristine nature, but in human-dominated areas it can be a difficult neighbour. In Slovenia, the majority of people only hear about bears and human-bear conflicts through media reporting, which consequently shapes their way of thinking about the brown bear. Public acceptance of large carnivores is one of the crucial prerequisites for long-term conservation of these species. An analysis of media coverage about the bear can help us to better understand public opinion and improve brown bear management accordingly. In this paper we presents a framing analysis of media reporting about brown bear issues in newspapers Slovenske novice, Dnevnik and Delo, and by the Slovenian Press Agency (STA) between 2002 and 2016. It focuses on how the media covered the stories featuring bears and which topics appeared in the news. The purpose of the research was to establish whether a population size estimate using non-invasive genetics (2008) influenced media coverage and the topics covered by the media. We analysed 804 articles using the program QDA Miner, looking at the frequency of certain topics in different media and through time for the studied period. We found that the media mostly covered current and controversial topics. We also found that the content of media coverage changed after the results of the genetic study were published. After the study, population size and culling of bears (size of the quota) stopped being the main topics. The most frequent topics became conflicts with people and bear attacks. When analysing the general sentiment of media pieces toward the bears, we didn't notice any significant change over this time period or in relation to the level of occurrence of human-bear conflicts. However, there are considerable differences in the manner different media cover these topics. It also seems that the general sentiment was significantly influenced by local elections since the median values of positive attitudes towards bears were the lowest during the election years.

Abstract ID: 72

Session:
Bears and society

BROWN BEAR ACCEPTANCE BY TEENAGERS OVER COUNTRIES WITH DIFFERENT STATUS OF THE SPECIES

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[5]Sofia University "St. Kliment Ohridski", Bulgaria

Abstract
We analyzed differences in brown bear acceptance by teenagers in four countries: two less-bear countries with sporadic occurrences: Latvia and Lithuania; along with two bear-inhabited countries: Bulgaria and Turkey. In all countries, the bears are protected, but poaching levels and human-bear conflict frequency differ. Our aim was to understand that whether bear acceptance is higher in the countries where they are abundant compared to so-called no-bear countries; whether there is a difference in terms of acceptance by urban and rural inhabitants; finally whether the lower acceptance is related to fear of the species. We used anonymous questionnaires with mostly close-ended questions. The sample size was about 1800 respondents (10 to 18 years old), with gender distribution near 1:1, and urban vs. rural distribution from 1:2 to 1:3, with no significant difference among countries. General opinion about bears in all countries was positive from 52% (Bulgaria) to 81% (Turkey). Negative opinion was stronger in Bulgaria and Turkey (11.4%, 16.5%) than in Latvia and Lithuania (4.6%, 5.4%). Negative opinion was about two times stronger in rural respondents in bear-inhabited countries compared to 1.6 times stronger in non-bear countries. Teenagers who feel fear of bears expressed four to seven times more negative opinion compared to those, who are not afraid, in all countries ($p<.001$). Predictably, future existence of bears in the region was seen more positively in no-bear countries (e.g., 74.4% in Latvia). We consider that bear-related education in Latvia and Lithuania would prevent fear of these animals and sustain their acceptance, while human-wildlife conflict management measures in Bulgaria and Turkey would be recommended to boost species appreciation. Nearly 75% of respondents in these countries would like to increase their knowledge about bears. Thus, in order to achieve a better acceptance of brown bears, awareness-raising campaigns are likely to be effective.

Abstract ID: 94

Session:
Bears and society

A GENTLEMAN WITH A 'HEAVY SHADOW': AN ETHNOGRAPHIC PROFILING OF BROWN BEARS IN ALBANIA AND IMPLICATIONS FOR THEIR CONSERVATION

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Abstract
Brown bears and humans have always persisted alongside each-other in highland Albania, intersecting their lives in commonly shared landscapes. Bears are widely known animals in Albania, prominently featuring in local stories, folklore and daily discourse. I conducted an ethnographic exploration of two highland communities in 2013-2014 with the intention to explore human-bear relationships in place, as well as relationships between humans and other large carnivores. Bear seem to enjoy an overall positive image among locals in highland Albania. Much like the other large carnivores (wolves and lynx), bears are constructed, and responded to, as social actors and as such they are integrated in the moral community of humans. Local people's perceptions of, and relations with, these animals, seem to be largely governed by moral and customary principles that regulate the social life of people living in these areas. Problems deriving from bears, such as crop raiding, livestock depredation and even attacks on humans, seem to be evaluated and measured according to local interpretations of human morality, honour and territoriality with very little consideration of their financial aspects. Conservation actors and institutions working for the preservation and management of bears in Albania should carefully consider the local cultural profile of these animals alongside ecological information, especially when designing and implementing programmes about bears.

Abstract ID: 151

Session:
Bears and society

INTEGRATING THE RESULTS OF A BASELINE SURVEY INTO FUTURE BROWN BEAR MANAGEMENT AND CONSERVATION MEASURES IN BOSNIA AND HERZEGOVINA

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Abstract
Bosnia and Herzegovina is located in the Western Balkans. Its bear population makes up a significant part of the Dinaric Pindos population, and is because of its central location critical for intra-population connectivity. Yet to date there is still virtually no scientific data on brown bears available for BiH, and very little in the sense of clear and consistent bear management. As a part of a broader pilot project we have conducted a survey among members of hunting associations and forest agencies to obtain baseline information about current management and hunting practices, and attitudes towards bears and other large carnivores in the Republic of Srpska. The survey has been conducted among 38 hunting associations and forestry agencies from April to June 2017. A similar study is taking place in the beginning of 2018 to obtain additional information for the Federation of BiH. The results indicate that hunters generally have a positive perception of bears and lynx, but also that their attitudes towards wolves are less positive. Interestingly, both the threats to the bear population as well as the perceived management needs listed by this important stakeholder group largely coincide with those identified by conservationists. Not only did the respondents express their willingness to cooperate in future activities, they also considered a stronger involvement of the scientific community as beneficial for wildlife management. The survey provides valuable insights into the current status, needs and challenges of brown bear management and conservation in BiH, and is highly relevant for identification and implementation of sound management and conservation measures. The expertise and cooperation of Hunting Associations and Forest Agencies will be the decisive element for the success of the follow-up project planned for 2018-2020, which aims to assess the bear population size by means of a genetic census and improve the management structures in the country.

Abstract ID: 167

Session:
Bears and society

WHAT CAN WE LEARN FROM PAST REINTRODUCTION EFFORTS?

Seth Wilson

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Slovenia Forest Service, LIFE Lynx Project

Abstract
Translocations of carnivores to establish, reestablish, or augment a population is a widely used conservation tool. Much literature has focused on important biological factors that influence the outcomes of translocations. However, political, social, and cultural conditions that influence public acceptance of translocations are essential for evaluating such efforts. These conditions can be understood by elucidating how well stakeholder interests are incorporated into a decision-process that encompass a translocation effort. Brown bear (Ursus arctos) reintroductions can be challenging since bears cause material, symbolic, and value-based conflicts. This analysis reviews brown bear reintroductions in Europe and North America to shed light on decision-making among stakeholders that either facilitated or hindered efforts. Four cases from Austria, France, Italy, and the United States (US) are presented. Methods include review of literature (1980-2018) and management reports; and in-depth interviews. In Austria, a decision-process that inadequately included hunters, led to illegal poaching and eventual population decline of reintroduced bears in the release area. The French case has been moderately successful for establishing a small brown bear population in the Pyrenees, despite strong local and sustained opposition to the initial decision by the French government. In northern Italy, reintroduction efforts succeeded in establishing a local bear population. This effort relied on a locally-developed plan, an inclusive process, and sustained political support from the Autonomous Province of Trentino. In the US, despite an effort by the U.S. Fish and Wildlife Service and NGOs to involve the public in a five-year process to reintroduce bears to the State of Idaho, state-led political opposition resulted in an unimplemented plan. This analysis compares and contrasts the success in Italy with the other cases and offers recommendations for future efforts.

Abstract ID: 180

Session:
Bears and society

MAXIMIZING COMMUNITY INVOLVEMENT AND SENSE OF OWNERSHIP IN BEAR-BASED TOURISM PRODUCTS - EXPERIENCES FROM LIFE DINALP BEAR PROJECT

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Abstract
Human acceptance of bears is the most important factor ensuring long-term survival of the species in human-dominated landscape of Slovenia. Due to their opportunistic omnivorous food habits, bears often cause conflicts with human activities and interests. Costs oliving with bears rarely offset material benefits. However, presence of charismatic wildlife can be seen as a valuable natural resource and opportunity to develop various bear related ecotourism products. Responsible bear tourism can generate an alternative source of income for local communities in economically distressed rural areas, therefore positively shaping attitudes of locals and tourists. Within LIFE DINALP BEAR project we have developed Guidelines for responsible non-consumptive use of bears in tourism to set recommendations for ensuring minimal impact tourism activities might have on bears. Bear friendly label was designed to award products and services that contribute to better coexistence between bears and humans in Slovenia and Croatia. The label was awarded to tourism programs that follow the guidelines. Tour operators that are willing to pay a share of their profit to nature conservation NGO's, are presented on Discover Dinarics portal, created to highlight best practice wildlife tourism products on the market. We have involved different local community groups into bear friendly labeling system to boost their sense of co-ownership and generate tourism benefits for a wider community range. Agricultural products produced by farmers who effectively protect their livestock or beehives against bear damages, were awarded with the bear friendly label. As farmers bear most losses due to living in the large carnivore areas, engaging them in tourism activities might encourage them to become more supportive of bear conservation. We will illustrate the development and up-to-date outcomes of the bear friendly scheme and bear tourism products designed to maximize ecotourism benefits to local communities.

Abstract ID: 231

Session:
Bears and society

POTENTIAL BENEFITS OF BROWN BEAR ECO-TOURISM IN THE SOUTH EASTERN ALPS

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Abstract
The conflicts between humans and bears are an issue for conservation projects, especially in highly anthropic landscapes such as those in Europe. A sustainable and long term management of bear populations is possible only when both scientific and socio-economic evaluations are taken into account. Despite the occasional damages to the agriculture and farming, the bears can provide benefit for the tourism sector, attracting nature lovers and wildlife watchers. However, the effect of activities like bear-watching on local economies and on the acceptance of large carnivore is still poorly investigated and it is a recognized knowledge gap in the literature. This work focuses on estimating the potential increase in eco-tourism demand for visiting the area of Trento (South Eastern Alps, Italy) that hosts a population of about 60 reintroduced brown bears (Ursus arctos arctos). As a first assessment we measured the monetary value of the bears' appearances in documentaries broadcast on Italian TV from 2011 to 2017. The marketing value of the bear image was on average 12.5 times the amount of money reimbursed for damages in the same period (range 2.6-34). The application of a more sophisticated econometric technique based on questionnaire is ongoing. The experimental design allows to estimate the so called "flag species" effect, i.e the impact on the image of an iconic mammal such as the bear, on a tourism destination. We expect to estimate the willingness to pay by tourists under different management and bear population size scenarios. The first prototype of the questionnaire will be administered to about 100 potential domestic tourists through an on-line survey that will take place in June/July 2018. The conference will be an occasion to share the preliminary results and to improve the questionnaire structure to develop the final international survey.

Abstract ID: 236

Session:
Bears and society

DOING TOGETHER IN A FRAGMENTED ADMINISTRATIVE LANDSCAPE: 20 YEARS OF BROWN BEAR CONSERVATION IN PYRENEES

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[6]Slovenia Forest Service

Abstract
The political complexity in Europa involves that most of the brown bear populations are trans-border populations distributed on two or more countries with different languages and different administrative organizations. This is the case of the Pyrenean brown bear population which ranges on three countries Andorra, France and Spain and whose restoration relies on the translocation of brown bears from another country, Slovenia. We describe first this political complexity, both between and within countries, which required coordination among local and national governments for conservation of this species. We focus then on the monitoring of this population and show how the coordination of monitoring protocols and the collaborative work between the field teams of the different administrative units allows to generate robust scientific results (estimation of population size, area used by the population, specific studies on inter-individual variability of different behaviours, genetic analysis) indispensable for the management and conservation of this small brown bear population. We show also how the coordination between the different administrations allows shared decisions for the management actions of this population. We illustrate this from concrete examples related to the management of problem bear, orphaned cub, bear translocation, human-bear conflicts with predation on livestock, and diffusion of information.Finally, we identify several topics to improve the coordination between the different administrative partners involved in the monitoring and management of this transborder brown bear population: public information, concerted management actions, definition of the priorities for studies to be conducted and a shared database. This cooperation is essential for the coherence of the conservation policies of the brown bear in the Pyrenees.

Abstract ID: 74

Session:
IUCN Bear Specialist Group: What would have been without us?

THE ROLE OF CONTINENTAL SCALE INSTITUTIONS IN EUROPEAN BEAR RECOVERY

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Abstract
Brown bear numbers and range have recently increased in Europe: growth has been recorded for at least 6 of 10 populations in the last 10 years. This abstract explores some of the factors that lie behind this recovery. Three main international agreements have been instrumental in setting continent wide frames on national management actions. These are CITES, the Bern Convention (Council of Europe), and the Habitats Directive (European Union). These agreements regulate trade, protection regimes, and protected areas. There has been an explosion of research in Europe, along with organised efforts to integrate science and best-practice experience into policy. A dedicated IUCN/SSC Specialist Group, The Large Carnivore Initiative of Europe (LCIE), has been central in these efforts since 1996. They have been central in developing a range of policy documents, including species action plans for the Bern Convention (2000), guidelines for population level management (2008) and lists of key actions for carnivore conservation (2015). This latter document represents one of the criteria for the evaluation of the LIFE projects which have been the mayor source of funds for bear conservation projects since 1990s. In addition, the European Commission has created a continental scale stakeholder platform to foster dialogue and experience exchange. Of course a range of conflicts remain, and some populations are still small and endangered, some population segments are not yet studied and lack sound management, but we believe that the constant engagement of pan-European structures has been crucial in fostering the ongoing recovery. The challenge remains to see if these institutions can adapt to maintaining populations once they have recovered.

Abstract ID: 115

Session:
IUCN Bear Specialist Group: What would have been without us?

SLOTH BEAR CONSERVATION IN INDIA: WHERE WOULD HAVE BEEN WITHOUT US?

Kartick Satyanarayan (presented by Yaduraj Khadpekar)

Wildlife SOS

Abstract
I have been working on sloth bear conservation as a part of Wildlife SOS for over 23 years. We have been working with the Indian government and enforcement agencies to enforce the law to combat the poaching of sloth bears and the associated practice of dancing bears. I will present a review of where sloth bear conservation was headed in India and where things currently stand. I will focus on poaching, human-bear conflicts and dancing bears. I will estimate the number of dancing bears that would have likely been present today if we had not intervened, as well as an estimate of the impact the practice would have had on the wild bear population, considering the loss of both female breeders and cubs to the wild populations. The human-bear conflict section of the talk will focus on our new sloth bear research and conservation work in the state of Chhattisgarh in central India, where the number of conflicts is so high that many were calling for the culling of the sloth bear population in the region. Luckily, Wildlife SOS was asked to assist the state government to find a way to mitigate the problem. I will also talk about the impact our anti-poaching patrols and rescue teams are having on wild sloth bears. Lastly, I will talk about our outreach programs and the impacts they are having on people's opinions of sloth bears as well as our Agra Sloth Bear Rescue Centre, which is nowfunctioning as a conservation education center, a research center, as well as the largest rehabilitation and conservation center in the world for sloth bears which cannot be returned to the wild.

Abstract ID: 123

Session:
IUCN Bear Specialist Group: What would have been without us?

IS CAPTIVE BEAR WELFARE IN EUROPE IMPROVING?

Annemarie Weegenaar[1], Agnieszka Sergiel[2], Koen Cuyten[1]

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Abstract
Many captive bears in Europe (mostly brown bears) are kept under miserable conditions, e.g. in small, barren cages next to roadside restaurants to boost customer sales, in concrete enclosures in people's backyard or in circuses. Being unable to meet their needs, unnatural behaviour is observed and their welfare is compromised. Across Europe many bears have been relocated to alternative facilities within their country or abroad where their environment is more bear appropriate, including a Large Bear Enclosure in the Netherlands, initiated by Bears in Mind. Nationwide inventories of captive bears have been completed in several countries and some places have made great progress. If these rescues and relocations had not taken place, dozens of bears might have still been lingering in poor enclosures or might have already died. But, more work needs to be done. Bears in Mind manage a Bear Alert database where people are able to report bears kept inappropriately. According to this data, combined with data from other sources in Europe, hundreds of bears are still kept in sub-standard inappropriate environments and in some countries there is currently no data available. And even though the welfare of many of the rescued bears has increased, some environments still do not meet the basic needs of bears. Beyond a suitable environment, veterinary care is often lacking, causing unnecessary suffering. A study in 2007-2009 was conducted of all bear-holding facilities in Poland and major welfare problems were identified. In this presentation we look at the situation for the bears ten years onward and whether welfare improvements have been made. Additionally, we discuss legislation, as in some countries the law referring to bear keeping is not clear, not appropriately implemented and enforced. We also address the problem of poaching bears for entertainment and private keeping that poses a serious problem to local wild populations.

Abstract ID: 128

Session:
IUCN Bear Specialist Group: What would have been without us?

LONG TERM MANAGEMENT PLAN FOR CAPTIVE BROWN BEARS IN EUROPE

José Kok (presented by Lydia Kolter)

Ouwehand Zoo Rhenen, Netherlands

Abstract
In numerous member zoos of the European Association of Zoos and Aquaria (EAZA) around 339 brown bears are currently kept. 135 bears are assigned to different subspecies. The other 204 individuals are of unknown origin. The population is managed by means of a European studbook (ESB). In December 2017 a Long Term management Plan Meeting was held at the EAZA office in Amsterdam. The purpose of this meeting was to determine roles for the captive brown bear population in EAZA zoos and work out subsequent actions of relevant stakeholders. In a two day session with experts from both in situ and ex situ the following roles for brown bears in captivity were formulated: Captive brown bears can 1.function as ambassador for the wild population by raising awareness about the threats that brown bears face and educate visitors on how people can co-exist with bears, in particular in range-states. 2.convey general biological education on bears, involving topics as hibernation, reproduction, adaptability, locomotion and ecolog 3.help fundraising for conservation projects on brown bears in Eurasia, which may involve habitat conservation. 4.facilitate research that may help the conservation or management of wild bears. This includes studies on behaviour, cryopreservation, physiology and genetics and validation of methods. A whole set of actions to fulfill the roles have been formulated. These range from the development of an education manifesto to the identification and priotization of conservation relevant research and will be presented in detail.

Abstract ID: 205

Session:
IUCN Bear Specialist Group: What would have been without us?

WHAT WOULD A WORLD WITHOUT US BE LIKE?

Ozgun Emre Can

University of Oxford, UK

Abstract
The past achievements in the field of conservation are vulnerable to political, economic and intellectual crises as ignoring science has become a trend even in some western, educated, industrialised, rich, and democratic (WEIRD) societies. The opponents of conservation have enormous political and financial resources to influence governmental and non-governmental organisations around the world. From now on, we need conservationists that have skin in the game to make a positive change for bears of the world and for the other large carnivores. But let's stop for a moment and ask a question: "What would a world without us (people working in the field of conservation) be like?" As a close observer of researchers, managers and international NGOs working in the field of conservation for more than 20 years, I will make an attempt to answer this hypothetical question in my talk. In order to do so, I will answer who "we"are and then I will try to judge our progress by "the courage of our questions and the depth of answers" and also consider "our willingness to embrace what is true rather than what feels good" (quotes from Carl Sagan). Finally, I will elaborate the risk of mistaking how we wish the world to be with how it actually is.

Abstract ID: 226

Session:
IUCN Bear Specialist Group: What would have been without us?

IF NOT FOR THE BSG SLOTH BEAR EXPERT TEAM, WE MIGHT NEVER KNOW

Nishith Dharaiya[1], *Harendra Singh Bargali*[2]

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Abstract
Working as an individual or a small organization for conservation is ineffective in the current era. Recently, sloth bears were reassessed for the IUCN Red list, whereupon it became evident that the true status of this species is unknown, and the true threats are unclear, making it impossible to formulate a meaningful conservation strategy. To address this, the Co-chairs of the Sloth Bear Expert Team (SLBET) of the IUCN Bear Specialist Group organized a meeting to gather existing information about this species and to get to know those working toward its conservation. We invited SLBET members and others working in sloth bear range. The two day meeting included presentations about research being carried out in various states of India. Presentations focussed on major findings, issues and challenges in bear conservation in different states. A brainstorming session on improving science-based conservation of sloth bears in all range countries was also organised in which important threats and obstacles to sloth bear conservation were discussed, and short and long-term future plans were adopted, including the need for future meetings. Through BSG we are able to create a community of practice to bring together expertise and interest of diverse groups. Many of the people had not known of each other previously, and were unaware of work outside their own state. We were able to make strides toward coordinating work aimed at a more unified goal for effective conservation of sloth bears. Importantly, it was apparent that had the meeting not been organized under the IUCN/BSG banner, there would havebeen less interest. The IUCN is well recognized and respected, and served as the catalyst for a successful first meeting.
This presentation will be about new things we learned, new people that became involved, and the start of new initiatives planned for the future.

Abstract ID: 3

Session:
Human-bear interactions and management

ONGOING ACRIMONY IN ALBERTA GRIZZLY BEAR RECOVERY

Courtney Hughes, Scott Nielson

University of Alberta, Canada

Abstract
Alberta, Canada's grizzly bears remain a threatened species, with recovery policy identifying society's values and actions as determinants in conservation success. However, ongoing controversy and tensions limit achievements, and this is compounded by a lack of understanding the people expected to live with grizzly bears. Using social process mapping, we examined the perspectives, values and strategies of people most proximate to grizzly bears and their recovery. Analysis revealed four unique sub-cultural groups, Homesteader, Frontiersmen, Exurban and Government, their values and attitudes towards grizzly bears and conservation, and strategies they used to achieve desired outcomes. Results reflected other similar work conducted in the past, where participants were polarized in explaining their attitudes towards grizzly bears, from viewing bears as wilderness icons to valuing their aesthetics, ecological role or existence, to fearing or loathing bears for the safety threats or negative economic impacts they could impose. However, we also found grizzly bears symbolized deeper socio-cultural and political dispute between people and conservation policy, reflecting issues of trust and power in policy processes. Findings have practical and theoretical applications in Alberta, including improving engagement processes with various public audiences and interest groups to develop contextually-relevant management, as well as considerations for change in policy governance. More broadly, this work helps contribute to advancing the utility of qualitative research and a policy sciences' approach in human dimensions of wildlife.

Abstract ID: 79

Session:
Human-bear interactions and management

IDENTIFYING FACTORS ASSOCIATED WITH HOTSPOTS OF DEPREDATION ON LIVETSOCK BY BROWN BEARS IN WESTERN EUROPE. PRODUCING RISK MAPS TO HELP MITIGATING HUMAN-CARNIVORE CONFLICTS.

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Abstract
One of the main factors limiting the acceptance of large carnivores worldwide is livestock depredation. Reducing damages on livestock by carnivores (through e.g. appropriate mitigation planning) requires understanding how depredation vary in space and time as well as identifying the environmental and management factors associated with this variation. The conservation of the brown bear, Ursus arctos, population in the Pyrenees offers a relevant study case to illustrate this issue, with a minimum population size of 39 individuals recorded in 2016 and an average of 103.3±18.9 attacks per year on domestic animals between 2010 and 2016 during the summer pasture period. Previous analysis of the spatial distribution of attacks uncovered the existence of significant depredation hotspots. In the present study, we characterize the environmental conditions of predation events and of depredation hotspots through habitat suitability modelling, which is common approach to species niche distribution. Environmental variables considered were both ecological habitat features (e.g., nearest distance to forest cover) and management practices (e.g. size of the flocks). We expect that (1) risk areas (i.e. environmental conditions predisposing depredation) will overlap at least with some hotspots areas; (2) the distribution of factors promoting risk areas will be distinct from the distribution of suitable habitat of bears previously described for the species in the Pyrenees. Identifying suitable environmental conditions associated with predation events and depredation hotspots is key for producing risk maps since it allows the spatial description of sites with particularly high depredation risk. This approach can be applied to the conservation management of any remnant large carnivore population to identify priority factors to deal with for minimizing human-wildlife local conflicts as well as to project current and future priority areas to focus efforts on.

Abstract ID: 82

Session:
Human-bear interactions and management

SOFT MAST PRODUCTION DRIVES LIFE HISTORY TRAITS BUT NOT HUMAN-BEAR CONFLICTS IN SCANDINAVIAN BROWN BEARS

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Abstract
Bears often rely on seasonally restricted soft or hard mast to accumulate resources for winter hibernation. Studies from North America and Japan suggest that bears respond to years of mast crop failure by increasing movement activity and ranging farther, with a demonstrated increase in human-wildlife conflicts. In southcentral Sweden, brown bears primarily feed on bilberry (Vaccinium myrtillus) during hyperphagia. We used an eleven-year time series to evaluate the effect of temperature and snow on annual variation in berry production and how this variation affected bear life history traits and behavior. We found marked interannual variation in berry production that we could attribute in part to temperature during plant dormancy and flowering, and to precipitation during fruit ripening. Autumn weights of female bears and spring weights of yearling bears increased with bilberry production and initially light-weight females profited from high bilberry production and were more likely to produce a litter. We, however, did not detect any changes in bear movement, activity, or home range behavior in relation to berry production. Also, bears rarely visited human settlements and the number of visits did not increase in relation to shortage of natural food. Though our results demonstrate that brown bears in Sweden are food limited like bears in North America or Japan, our results suggest that the drivers of conflict between bears and humans differ among ecosystems. An explanation could be the different spatial distribution of food resources or differences in the magnitude of variation in food abundance among years which might help to explain the low number of human-bear conflicts in Sweden.

Abstract ID: 88

Session:
Human-bear interactions and management

CHALLENGES OF MANAGING A EUROPEAN BROWN BEAR POPULATION; LESSONS FROM 70 BEARS OF BEAR MANAGEMENT IN SWEDEN

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Abstract
"Adaptive management", which has been defined as the repeated iteration between management action, scientific assessment, and revised management action, leading to a strengthened foundation for management, presently is required by Swedish law to be incorporated into the management of large carnivores. We have evaluated whether the size and/or trend of the brown bear (Ursus arctos) population in Sweden corresponded to management-decided national objectives during five management regimes during the past 70 years (1943-2013). We found that the objective had been met in only one period, when it had been worded very vaguely. During the last period studied (2008-2013), when management was carried out on the county level and adaptive management was required by Swedish law, four of six counties met their trend objectives, but only one of six met the population objectives, although one was close to meeting them. As adaptive management apparently never has been implemented successfully in brown bear management in Sweden, we recommend that the Delegations for Game Management, which are responsible for management at the county level, be mandated to integrate up-to-date, scientifically documented biological information into their decisions. This is not done consistently today. Researchers should be involved in the process to inform about relevant, available information, design testable scientific "experiments" based on the predicted results of management decisions, and evaluate the results in relation to the predictions, perhaps as members of a "boundary organization" consisting of researchers, managers, and stakeholders.

Abstract ID: 135

Session:
Human-bear interactions and management

THE BEHAVIOURAL AND PHYSIOLOGICAL RESPONSE OF BROWN BEARS TO EXPERIMENTAL HUNTS AND HUMAN ENCOUNTERS

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Abstract
In Sweden, legal hunting is the primary cause of mortality in brown bears. The most common hunting method is based on the use of trained hunting dogs that are let loose on the bears. The bear is then shot by the hunters that follow their dogs. The popularity of bear hunting, the use of dogs and the number of hunters specialized in bear hunting is rising in Scandinavia. In addition to legally killed bears, the number of disturbed bears, i.e. when the bear is hunted and escapes, will thus increase. Bears also flee when encountering humans that are not hunting. Using heart rate monitors, temperature loggers, GPS and dual-axis activity data from 85 experimental hunts (with the bear allowed to flee at the end) and 96 experimental non-hunting human encounters on 46 bears in Sweden, we compared the behavioural and physiological responses of bears that were disturbed. Our findings are that: (1) Bears had higher maximum speeds and travelled longer distances the day of a simulated hunt compared to the day of a human encounter. (2) Bears had a higher body temperature and heart rate during simulated hunts than during human encounters. (3) Some bears experienced higher body temperatures and heart rates during the simulated hunts than during the rest of the summer, i.e. 1st June to 30th September. (4) The amount of time bears rested after a simulated hunt increased linearly with the duration of the hunt. (5) Heart rate variability rose during both simulated hunts and human encounters, and returned to the previous level two days later. In conclusion, escaping a hunt has a higher physiological and behavioural impact on brown bears than escaping a non-hunting human encounter. We argue that both types of disturbance are energetically costly for brown bears, and if experienced frequently could lead to fitness declines.

Abstract ID: 5

Session:
Human-bear interactions and management

RESEARCH, CONFLICT MANAGEMENT, AND A NETWORK OF ORGANIZATIONS REDUCES CONFLICT MORTALITY OF GRIZZLY BEARS TO REVERSE CONSERVATION DECLINE OF THREATENED POPULATIONS IN THE TRANS-BORDER REGION OF CANADA AND USA

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Abstract
We have been researching conservation issues and implementing a comprehensive program to reduce human bear conflicts (HBC) for over a decade in the trans-border region of southern Canada and NW USA across several small fragmented threatened populations. We found HBC significantly contributed to their threatened status by causing population declines, fragmentation, and decreased habitat effectiveness. Monitoring has found clear evidence that our efforts to reduce HBCs have resulted in reduced mortality, increased connectivity, and improved habitat effectiveness resulting in increased reproduction and survival and improved conservation status. Our program includes strategic private land purchases to reduce human densities in wildlife corridors, efforts to secure bear attractants where human settlement and agriculture exists, and non-lethal management of conflict bears and more. Attractant management includes cost-share electric fencing and other techniques, bear resistant garbage containers, and deadstock containment. We teach bear safety courses and bear spray training to increase tolerance and give people tools to avoid dangerous encounters with bears. We radio collar and use non-lethal management on potentialconflict bears and have a ~90% success rate on females. We identified the most important backcountry foraging habitats for protection with motorized access controls to reduce conflicts and mortality and provide habitat security to reproductive females. The composite effects of working across these arenas has resulted in a significant reduction in human-caused mortality and increased connectivity, habitat effectiveness, and reproduction resulting in an improved conservations status of several now-recovering threatened populations. Several challenges remain including a plethora of offspring from females living adjacent to agricultural areas. We discuss strategies to incorporate a vision for success into conflict reduction programs. What to do with all the bears?

Abstract ID: 48

Session:
Human-bear interactions and management

HABITAT USE BY BELITTLING SLOTH BEAR IN THE REGION OF MUSHROOMING MINES, INDIA.

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Abstract
We studied the habitat use by the sloth bear in Nilgiri Range from July 2017 to February 2018. The habitat use of sloth bear was based on the direct sightings, a number of den sites and from indirect evidence such as claw marks, footprints, diggings and presence of scats. Through intensive surveys and by walking on 40 km along 20 transects, we recorded sloth bear indirect evidence using GPS. Locations of direct sightings and habitat use of sloth bears were also recorded and mapped. In total, we had 12 direct sightings of sloth bears in different locations and 15 individuals including adult, sub-adult and young ones were seen. The sighting of was highest of single individuals 59%. So far we have identified 33 den sites, out of which 5 dens were actively used by bears. These dens were located in different habitats; The study area comprised of eight broad habitat types viz. Dry deciduous forest, Bamboo forest, Scrub forest, Grasslands, Rocky outcrop, Plantation, Water bodies, and Agriculture. The data on indirect evidence showed the varying use of these available habitats and land-use categories by sloth bear. Along the transects, there was a total of 102 indirect evidence which included 32 scats, 44 digging signs, 10 claw marks and 16 pugmarks. The sign encounter rate (#/km) of sloth bear based on transects was 2.55. Outside transects, 212 bears indirect evidence was recorded while carrying out intensive surveys. Most of this evidence was found in Agriculture field (31%), followed by dry deciduous forest (20%), Scrub forest (10%). Based on direct sighting and indirect evidence, sloth bears were found distributed throughout the study area and they were differentially using variously available habitats, but interestingly maximum was in the human habitation. The strategy was suggested for mitigating conflict

Abstract ID: 58

Session:
Human-bear interactions and management

WHAT CAN STABLE ISOTOPES TELL US ABOUT THE DIET OF CONFLICT BEARS IN EUROPE: A CASE STUDY ON SLOVENIAN BROWN BEAR

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Abstract
In Europe, human-bear conflicts are an important topic for research and management. There are some scientific evidences that anthropogenic foods near settlements are promoting the development of conflict behavior by bears and are therefore causing human-bear conflicts. Some countries, including Slovenia, use controversial management practices such as artificial feeding to supposedly deter bears from foraging near settlements and to prevent conflicts. However, additional research about the diet of conflict bears in relationship to non-conflict individuals is needed to study such plausible correlations. Since most of the anthropogenic food is difficult to detect with scat analysis, stable isotope analysis may be, as shown by recent studies in the US and Asia, a more reliable method to study diet of conflict bears. To study conflict bear diet we are analyzing carbon (δ13C) and nitrogen (δ15N) stable isotope values in a) archived brown bear tissue samples (liver, muscle, hair), collected from a large number of conflict and non-conflict bears in Slovenia and b) various natural and anthropogenic bear food sources. To our best knowledge, we are the first that are using stable isotope analysis to study modern brown bear diet in Europe. Based on our preliminary results, stable isotopes can be used to study the anthropogenic diet of brown bears in Europe, as there are isotopic differences between the majority of anthropogenic foods (high δ13C and δ15N values) and natural (low δ13C and δ15N values) bear foods. We will discuss the methodology of the usage of stable isotopes in Europe to study conflict bears foraging behaviour and the consumption of a) food sources provided on artificial feeding sites and b) other (unintentional) anthropogenic foods. Use of such methodology can greatly improve our knowledge about the influences of anthropogenic foods on human-bear conflicts in Europe and contribute to current bear conflict management.

Abstract ID: 67

Session:
Human-bear interactions and management

EXPERT OPINION TO ASSESS THE FREQUENCY AND IMPACTS OF HUMAN ACTIVITIES ON POLAR BEARS

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Abstract
The Arctic has a long history of indigenous inhabitants who subsist on local resources. Recently, purely recreational activities by locals and visitors have become more common in some areas as tourism has increased, with polar bear-viewing being a prime attraction. Simultaneously, polar bears are increasing use of terrestrial habitats consequent to sea ice decline, resulting in the potential for increased human-bear interactions. Little is known about the frequency and impacts of recreational activities, including organized and guided activities, on polar bears. We used a survey to elicit expert knowledge to begin to fill this information gap. Results from an earlier Delphi survey of 12 experts indicated that the only purely recreational activity affecting the highest proportion of bears, compared to other activities, was bear-viewing of feeding bears, which occurs in the Chukchi, Southern Beaufort, and Barents Sea subpopulations. Further, these initial results suggested that polar bear interactions with recreational activities remain low throughout most of their range. We have recently begun augmenting the Delphi Survey with additional data from approximately 50 participants throughout the polar bears range. This survey includes individuals who live in coastal communities within polar bear habitats, wildlife managers, and researchers. Survey results will provide information on the types of recreations that occur in polar bear habitats, any potential perceived impacts of those activities on bears, future research needs, and possible management actions.

Abstract ID: 114

Session:
Human-bear interactions and management

DEAD DOGS CAN'T GUARD: POISONED BAITS UNDERMINE A HUMAN-BROWN BEAR CONFLICT RESOLUTION TOOL IN GREECE

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Abstract
Livestock guarding dogs (LGDs) have been used for centuries for livestock protection from brown bear and grey wolf attacks. In Greece, there are three indigenous LGD breeds, whose preservation is undermined by the widespread illegal use of poisoned baits across the country. We conducted semi-structured interviews (n=78) with local shepherds to investigate LGD mortality caused by poisoned baits in Florina prefecture (1. Amynteo municipality, 05-06/2017, n=41, under LIFE15NAT/GR/001108; 2. Prespes National Park, 12/2016-01/2017, n=37). Over the last decade, the majority of interviewed shepherds (65.4%) have experienced LGD losses due to poisoned baits, with 418 LGDs poisoned in total (360 in Amynteo MUNI, 58 in Prespes NP). The mean total number of LGDs lost per herd was 8.2 (range=1-35). Lost LGDs per incident ranged from 1 to 9, with cases where shepherds lost all their LGDs in one incident. The three major causes of poisoned bait use as claimed by shepherds were: intentional poisoning related to rivalries with hunters (32.3%), other local disputes (18.5%) and accidental poisoning during illegal fox control (21.5%). Poisoned bait types mostly mentioned were poisoned pieces of meat (72.2%) and cyanide capsules (16.7%). Intensive use of poison may have multilevel deleterious effects on brown bear and wolf populations through direct mortality (e.g. at least 33 known cases of poisoned bears in Greece since 1996) or human-caused mortality due to increased livestock depredation as a result of high quality indigenous LGD losses. Furthermore, shepherds were not familiar with first-aid for LGD poisoning thus the problem is aggravated. To address these issues in the study area: (a) first-aid leaflets were disseminated to shepherds, (b) a poison detection dog unit has been recently established by the NGO HOS (c) 1200 anti-poison first-aid kits with guideline pamphlets as well as LGD puppies will be donated to shepherds by the NGO CALLISTO under the LIFE15NAT/GR/001108 project.

Abstract ID: 125

Session:
Human-bear interactions and management

MEAT OR VEG? FOOD PREFERENCE OF BROWN BEARS AT ARTIFICIAL FEEDING SITES

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Abstract
Artificial feeding of wildlife is practiced for both management and conservation purposes in many countries all over the world, though its effectiveness is still controversially debated. In Slovenia, year-round feeding of brown bears (Ursus arctos) has a deep-seated tradition and is fueled by the firm belief that artificial food diverts bears from human settlements. Traditionally, the main food types supplied at feeding sites were maize and livestock carrion, with the strong public perception that carrion is more effective than other lures. In 2004, feeding bears with livestock carrion was banned due to EU-legislations, an action which led to high public concern over potentially rising conflict levels. Feeding roadkill and game offal complies with EU regulations and allowed us to test the widespread notion that feeding sites supplied with carrion attract more bears. During 2016 and 2017, we deployed camera traps at 22 feeding sites, which were interchangeably supplied with maize or carrion of wild ungulates. We use generalized linear mixed models (GLMM) to examine differences in visitation of bears according to different predictors, such as food type, year, season and local bear density, and used individual feeding sites as random factor. Carrion may be particularly important for bears with higher protein-needs such large males, therefore, we also investigate differences in usage by social unit. Preliminary findings suggest that, overall, bears show a slight preference for carrion feeding sites and that there are noteworthy differences between social units. In particular, all social units except females with cubs preferred carrion feeding sites. Evaluating established management measures is not only crucial for mitigating human-wildlife conflicts, but is also key to promoting adaptations of traditional practices on the basis of hard facts. This is important for bear management in Slovenia, and for other countries using artificial feeding as a management tool.

Abstract ID: 129

Session:
Human-bear interactions and management

INVESTIGATING BEAR ATTACKS ON HUMANS IN SLOVAKIA

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Abstract
Most bears tend to avoid humans, but when encountered they are capable of seriously injuring or even killing people. Fear for personal safety is associated with more negative attitudes to bears. A tendency for bear attacks to be sensationalised by the media and undermine public support for bear conservation might be ameliorated by a better understanding of underlying causes. We investigated circumstances in which people were injured by brown bears (Ursus arctos) in Slovakia during the period 1999–2017. We compiled a database of bear-caused human injuries from media reports, official records and consultation with protected area staff and responsible authorities. After eliminating any which could not be credibly verified there were a total of 56 cases (mean = 2.9 / year). None of the attacks was fatal, but some resulted in major injuries, lengthy hospital treatment and long-term physical and psychological impacts. Attacks occurred in every month of the year: most frequently in June–August, least often in November–February. The groups most often involved were hunters (29%), mushroom, fruit or antler collectors (29%) and forestry workers (18%). Using a standardised protocol, we interviewed a sub-sample of 20 victims to obtain detailed descriptions of incidents and the behaviour of people and bears involved, both before and during attacks. We also interviewed witnesses or professionals who had investigated particular cases with the aim of verifying the information provided. Subsequently we visited attack sites to gather data on habitat variables, food sources and human infrastructure. These were compared with random locations 200m from each site using a pair design to identify possible risk factors associated with attacks. Results will be used to guide recommendations for human safety in areas with bears, thus contributing to ongoing efforts to facilitate human-bear coexistence.

Abstract ID: 144

Session:
Human-bear interactions and management

FACTORS DRIVING BEAR HUNTING IN CAMBODIA

Brian Crudge, Thona Lim

Free the Bears

Abstract
Overhunting has contributed to the decline of bear populations throughout Southeast Asia where bears are highly-sought after for use as pets, expensive delicacies, to stock bear bile farms and for their parts which are used in Traditional Medicines. There is growing understanding of the motivations and behaviours of those consuming bear parts but little attention has been paid to the motivations of those hunting bears in this region. We conducted 366 interviews with individuals in villages in or around five protected areas in Cambodia between March and August 2016. The primary reasons given for hunting bears were to sell (n = 166) and for food or meat (n = 132). Gallbladder (n = 19), Medicine (n = 21), and other body parts (n = 10) were also mentioned as reasons for hunting without distinction between sale and personal use. When the reason for hunting was to sell, the majority of respondents specified gallbladder (n = 100) as the body part to be sold. Fewer mentioned paw, claw, tooth, skin, and bone (n = 20 – 25). Meat was only mentioned twice as a product to sell. Not surprisingly, obtaining gallbladders to sell is an important factor driving bear hunting in Cambodia where ineffective wildlife law enforcement provides little disincentive to poaching. While behaviour change interventions have the potential to reduce external demand for gallbladder, protecting Cambodia's bears will require efforts to also address the value placed on bears locally as a source of food and medicine.

Abstract ID: 148

Session:
Human-bear interactions and management

HUMAN INTERACTION AND DISTURBANCE OF DENNING POLAR BEARS ON ALASKA'S NORTH SLOPE

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Abstract
Across the central coast of Alaska's North Slope, human-polar bear (Ursus maritimus) interactions concern both industry and wildlife managers alike. In response to sea ice reductions due to climate change, parturient polar bears in the Southern Beaufort Sea subpopulation are increasingly accessing coastal topography for suitable denning habitat. Land-denning bears are more susceptible to anthropogenic stressors, chiefly in areas with high levels of energy exploration, extraction and production. For over 30 years, denning polar bears in the Southern Beaufort Sea subpopulation have been monitored directly or through opportunistic observations. Scientists have opportunistically recorded polar bear responses to aircraft, snowmachines, track-vehicles, heavy machinery, trucks, dog teams, and humans afoot within the denning area. Concurrent studies have provided important information regarding the interaction between polar bears and anthropogenic stressors. However, the long-term nature of this work and associated human-bear interaction observations represent a unique dataset that provides wildlife managers insight into the way polar bears have responded to anthropogenic stimuli in active oil fields. Our objective here is to analyze the different disturbance stimuli at den-sites and the associated bear responses. To do so, we subdivided potential stimuli into four groups based on the the size, noise levels, and motion of each. Both field notes and video recordings of interactions were analyzed and ranked by response intensity where available. We found significant probabilities for disturbance among all stimulus classes, with aircraft showing the highest potential for initiating den abandonment. However, while all human activities elicited varying degrees of response, the overall response intensity was less than anticipated, even under high use scenarios.

Abstract ID: 160

Session:
Human-bear interactions and management

ASSESSMENT OF ANDEAN BEAR-HUMAN CONFLICT THROUGH RISK MAPPING

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Abstract
The Andean bear is the only bear species in South America and is classified as 'Vulnerable to extinction, decreasing' worldwide and 'Endangered' in Ecuador. Habitat loss and fragmentation, illegal hunting, and human-wildlife conflict are major causes of population decline. We performed species distribution modeling and pasture simulation model using RandomForest (RF) regression modeling in R as part of the project 'Marking behavior, population density estimates, and terrain use of Andean bears – generating knowledge for the conservation of a threatened umbrella species'. Based on these models we developed a first risk map assessing human-bear conflict in one of our study areas (approximately 0 ° S and 78 ° W) in cloud forests of province Napo, Ecuador. For the species distribution model, we used 123 bear sign GPS positions (marking sites, feeders, footprints, scats), collected in 2012-2017, as presence data, and pseudo absence data. For both models, we used distance to rivers, the road, and ridges, elevation, slope, aspect, and ruggedness, as variables. The pasture simulation model shows the potential of the study area for already existing and to be developed pastures. The species distribution model calculated ruggedness to be the most important terrain variable for Andean bear distribution. Andean bears preferred low to low-medium values of ruggedness suggesting that they choose rather smooth terrain. After overlapping both models we obtained our first human-bear-conflict risk map. This risk map suggests that almost all of our bear sign data are located in areas with high to moderate risk of human-bear conflict. We still need to validate our models, and add more field data. However, since the beginning of our project we have been observing that new pastures have been made close by, or directly at, our sampled sites, which might indicate that our outcomes are valid.

Abstract ID: 212

Session:
Human-bear interactions and management

SUBSIDIZING AND DISTRIBUTION OF PROTECTION DEVICES IS NOT ENOUGH TO REDUCE DAMAGES CAUSED BY BROWN BEARS AND GREY WOLVES

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Slovenia Forest Service

Abstract
Experiences from Slovenia show that only co-financing or free distribution of protection devices such as 106 cm high electric nets does not reduce damages caused by bears and wolves. During 2005-2010 Slovenia announced a call for subsidizing purchase of electric nets every year. The demand for co-financing was high and many farmers with regular damages started to use electric nets. Nevertheless, damages kept re-occurring on their property and more than half of the small livestock depredations in the country occurred on pastures, managed by farmers that received subsidies. As a consequence, the subsidy system was declared inefficient and therefore abandoned. Moreover, a common belief that nothing can be done to prevent damages spread. What went wrong? Despite the negative experience, the height of electric nets was improved and 10 sets of 170 cm height were distributed during 2011-2013. After the distribution, damages re-occurred again despite the improvement. At that point, we started an intensive cooperation with farmers.We set camera traps along the fences, carried out direct observations and regularly controlled the electric current. We found out that the reason for damages was the incorrect use of electric fences, especially poor maintenance of the fences and improper grounding which resulted in lack of electric current. Through the improvement and correct use of electric fences by these farmers, the damages caused by wolf and bear were reduced for more than 100.000 € annually. These results led to improvement of the system on the national level. We implemented regular cooperation with farmers who receive electric fences and started performing regular controls of proper use of fences. Special attention is given, if damages happen despite the use of high electric nets. Until spring 2017, we distributed 90 sets of high electric fences and on national level managed to save in average 35% or 185.000 € per year on damage
compensation.

Abstract ID: 225

Session:
Human-bear interactions and management

BROWN BEAR ATTACKS ON HUMANS: A WORLDWIDE OVERVIEW

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Abstract
Although extremely rare compared to incidents involving other wildlife, attacks on humans by large carnivores have been increasingly reported globally in the last decades. The expansion of the human population and activities within areas occupied by large carnivores together with the ongoing recovery of several populations of these species are likely behind this trend. This scenario is also true for brown bears Ursus arctos, where attacks on humans can negatively affect public tolerance toward bears and their conservation. Understanding the dynamics behind such incidents can help to reduce their occurrence, consequently improving both human safety and support for brown bear conservation. Our goal here is to provide a general overview of the phenomenon by analysing and comparing scenarios of brown bear attacks on humans worldwide. Specifically, we aim to investigate several aspects such as (a) spatio-temporal patterns of attacks at various levels and (b) bear and human characteristics (e.g., age and sex, activity and behaviour at the time of the attack). We recorded a total of 759 attacks by brown bears on humans between 1970 and 2015: 271 in North America (57 fatalities), 137 in Russia (55 fatalities) and 351 in Europe (23 fatalities). Globally, attacks increased over the period considered. Most attacks occurred during summer (55%) and during daylight (69%). Almost all human victims were adult (98%) and usually male (88%). At the time of the attack, 46% of the humans were carrying out leisure activities (e.g., hiking, camping) whereas 28% were hunting and 26% working (e.g., shepherding, farming, logging). The most prevalent attack scenarios were encounters with females with cubs (38%), followed by wounded bears (11%), predatory attacks (11%) and the presence of dogs (10%). We will discuss management implications of this study and give recommendations to avoid the occurrence of such incidents.

Abstract ID: 96

Session:
Molecular genetics in bear conservation and management

EXPLORING THE ROLE OF PAST ENVIRONMENTAL CHANGE ON THE DIVERSIFICATION PATTERNS OF URSUS BEARS

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Abstract
Ursidae is the most studied family of land carnivores in the world, providing a constantly growing amount of data for the majority of its species. Indeed, a remarkable number of mitochondrial DNA sequences and species distribution records are available for the four species of the genus Ursus, the youngest lineage of the family. Despite such available information, Ursus evolutionary history and the influence of environmental changes on its diversification patterns remain largely unresolved. Also, Ursus is the best represented taxa of bears in the fossil record for the Pleistocene. In this study we apply a novel approach that integrates phylogeographic methods, ecological niche modeling, and fossil information, a framework that allowed us to characterize the environmental niche of the Ursus species, to evaluate the role that environmental change during the last glacial maximum exerted on their diversification and distribution patterns. Our fossil-calibrated results provide further insights about the ecological trajectory and possible migration routes of these four species' mitochondrial lineages, all of them showing evidence of rapid speciation and niche expansion or contraction, supporting a signal of ecological speciation. Our proposed framework can be applied to evaluate the evolutionary history, divergence patterns and distribution of phylogenetic lineages of different taxa, but also to explore the implications of climate change considering the historical context of species distribution and ecological patterns.

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Session:
Molecular genetics in bear conservation and management

RELATIONSHIP BETWEEN EFFECTIVE AND DEMOGRAPHIC POPULATION SIZE IN GRIZZLY BEARS AND OTHER MAMMALS

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Abstract
Genetic monitoring of wild populations can offer insights into demographic and genetic information simultaneously. However, widespread application of genetic monitoring is hindered by large uncertainty in the estimation and interpretation of target metrics such as contemporary effective population size, Ne. We used four long-term genetic and demographic studies (≥9 years) to evaluate the temporal stability of the relationship between Ne and demographic population size (Nc) for grizzly bears (Ursus arctos) at 2 spatial scales, mountain brushtail possum (Trichosurus cunninghami), and brown antechinus (Antechinus stuartii). We estimated local, contemporary Ne with a single sample methods (LDNE) and demographic abundance with either mark-recapture estimates or catch per unit effort indices. Estimates of Ne varied widely within each case study suggesting interpretation of estimates is challenging. We found inconsistent correlations and trends both among estimates of Ne and between Ne and Nc suggesting the value of Ne as an indicator of Nc is limited in some cases. In the two case studies with consistent trends between Ne and Nc,, FIS was more stable over time and lower, suggesting FIS may be a good indicator that the population was sampled at a spatial scale at which genetic structure is not biasing estimates of Ne. These results suggest that more empirical work on the estimation of Ne in continuous populations is needed to understand the appropriate context to use LDNe as a useful metric in a monitoring program to detect temporal trends in either Ne or Nc. We review what is known about the ways that bears violate assumptions of Ne calculations and considerations for the use of Ne for monitoring bear population size.

Abstract ID: 150

Session:
Molecular genetics in bear conservation and management

PEDIGREE RECONSTRUCTION BY COMBINED SNP AND STR ANALYSIS IN A BROWN BEAR POPULATION

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Abstract
Wildlife management increasingly uses noninvasive genetic sampling and the data generated hereby to determine individual genotypes. The identification of close family relations and reconstruction of pedigrees would be a valuable information for effective management and wildlife research, and generating the needed data has been made more feasible by the advancement of wildlife genomics, in the form of e.g. the development of SNP-chips. However, SNP loci used for such purposes require validation to forensic standards, as errors may lead to false exclusions and unreliable pedigrees. In this study, we have utilized the increased power of SNP-chip-generated data and combined it with the reliability of validated STRs used in over ten years in the genetic monitoring of brown bears, to generate a vetted dataset for pedigree reconstruction. We applied the SNP-chip (developed on the Swedish brown bear population) to the whole set of noninvasive samples (N=993) collected on a large scale during the course of the monitoring of brown bears in Norway. We evaluated the performance of SNPs versus validated STRs in order to improve and suggest adjustments to the SNP-chip marker selection. A large number of loci showed suboptimal performance, and were removed from the combined set of SNPs/STRs. Further, we used both, validated SNPs and STRs to reconstruct pedigree structure in a natural population of brown bears where substantial data on observed family groups has been recorded (N=154). We show that the utilization of genetic information is a powerful tool to support field observations and may extend family structures by inclusion of more individuals than known solely from
observational data.

Abstract ID: 181

Session:
Molecular genetics in bear conservation and management

FOOD QUALITY MATTERS: IMPACTS OF CAPTIVITY IN THE GUT MICROBIOTA OF ANDEAN BEARS.

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Abstract
The Andean bear is an endemic species of the tropical Andes with a mostly exclusively plant-based diet. Their lack of herbivory adaptations leads to a fragile gut microbiota heavily impacted by the diet. Current captivity-associated diets for Andean bears fall short in fully satisfy their nutritional needs. Our goal was to study the captivity-driven changes in the gut microbiota of Andean bears and its development on wild-caught cubs fed with a captivity diet. Fecal samples from wild, permanently captive and wild-caught/captive-raised cubs were collected; amplicon libraries of the V4-16S rDNA gene were sequenced using the Illumina MiSeq platform. Sequences were cleaned, paired-ends assembled and OTUs assignment, diversity and statistical analyses were performed using QIIME 1.9 and PRIMER-E. We found that captive bears harbor a less diverse and taxonomically distinct gut microbiota. Although a large core of 469 OTUs was present in all the samples, only wild individuals exhibit a specialized set of unique OTUs. Furthermore, permanently captive bears showed high abundance of OTUs associated with obesity and other diseases. Interestingly, as the microbiome of wild-caught cubs developed in captivity, the shared OTUs with wild individuals reduced over time, and the microbiome converged towards a captive profile. Our results suggest that the fiber-reduced diet in captivity is modifying the structure and diversity of the gut microbiota, highlighting the possible negative outcomes for bears, especially for wild cubs raised in captivity. Our results provide strong evidence of the need to improve nutritional diet schemes under captivity, in particular when re-introduction to the wild environment is expected. These also provides insights on the understanding of the impact of anthropogenic and artificial feeding in the nutrients metabolism of bears.

Abstract ID: 192

Session:
Molecular genetics in bear conservation and management

THE POPULATION SIZE AND TREND OF THE GOBI BEAR (URSUS ARCTOS) BETWEEN 2009 AND 2017

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Abstract
Information on population size and population trends are imperative for assessing population status and evaluating the need and/or effectiveness of conservation measures. Gobi bears (Ursus arctos) are found exclusively in the Great Gobi Strictly Protected Area part "A" (total area ~46,369 km2) in southwestern Mongolia, and based on their putatively small population size and limited geographic range, are of international conservation concern. Since 1987, the Mongolian government has provided supplemental food to increase survival chances of the population. To estimate population size, we constructed 13 barbed-wire hair snares at these feeding sites and rubbing posts to collect genetic samples for genetic capture-recapture analyses. During the spring through fall of 2009 and 2013, we conducted bi-monthly sampling sessions at each of the sampling sites. We collected 604 and 690 hair samples in 2009 and 2013, respectively, and identified unique individuals using 14 microsatellite loci to create capture histories. 2009 and 2013 population estimates were 22 (95% CI = 22 -31) and 31 (95% CI = 26-40), indicating the population was small, but probably not declining. During both sampling years, the sex ratio of unique individuals and sex-specific population estimates indicated the sex ratio was heavily skewed towards males. In 2017, we established 13 additional sampling sites (total = 26) in the vicinity, but out of view of the previously-established feeding and sampling sites to address potential biases in the sex ratio due to the potential that territorial males may exclude other bears from these feeding stations. We are currently in the process of analyzing 2017 data to provide a third point-in-time population estimate and population trends spanning 8 years.

Abstract ID: 211

Session:
Molecular genetics in bear conservation and management

USING LABORATORY ROBOTICS, HIGH-THROUGHPUT SEQUENCING AND SAMPLING WITH VOLUNTEERS FOR QUICK AND COST-EFFECTIVE LARGE-SCALE GENETIC ESTIMATES OF BROWN BEAR POPULATION SIZE – TRANSBOUNDARY CASE STUDY IN SLOVENIA

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Abstract
Population size estimate is often very high on management and conservation agendas for many wildlife populations. The best currently available tool to obtain this parameter is noninvasive genetic sampling paired with mark-recapture modelling, which is now routinely done in many populations. However, in large populations where a lot of samples must be obtained if any meaningful estimate is to be had, the analyses can be very expensive and time consuming, often delaying results that are critical for management. We used laboratory robotics and recently developed genotyping methods that utilize high-throughput sequencing (HTS) to speed-up the analyses and decrease costs. In anintensive three-month transboundary effort in autumn of 2015, in collaboration with ~2500 volunteers, we collected 4687 samples over the entire bear range in Slovenia and Croatia. After ironing out specifics related to automation of DNA extraction and processing of big data, the analysis was completed in roughly nine months. Increased throughput and lower costs allowed us to analyze 4370 of the collected samples, 45.7% more than we budgeted for. The population size in both countries at the end of 2015, after yearly mortality and before reproduction, was 1392 bears (1247-1583 95% CI), and sex ratio 58.9% F : 41.1% M. Since noninvasive genetics is increasingly becoming the go-to method for estimating the size of bear populations, there is a need for this to become fast and cost-effective. In this first large-scale study using HTS we showed that genotyping using this approach provides a big step in that direction, and we managed to do it with transboundary cooperation of two countries. In addition, the benefit of obtaining genotypes at the DNA sequence level makes the data completely future-proof and transferable between laboratories. Considering the rapid advances in DNA sequencing technology we feel that this is how such studies will be done in the future, for a fraction of the current costs.

Abstract ID: 6

Session:
Spatial requirements and demographic characteristics of bear populations

LARGE CARNIVORE POPULATION RECOVERIES: UNDERSTANDING THE REMARKABLE COMEBACK OF BROWN BEARS IN GREECE

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Abstract
Understanding population recoveries is important in shaping conservation strategies and actions. We used a rear-edge population of brown bears in Greece as a case study (2000 – 2015) for understanding the patterns of a large carnivore population recovery. We analyzed genetic data from 350 individuals, tracking data from 22 bear-years, 66,500 locations of bear attacks, vehicle collisions, field evidence etc. and 8,800 compensation claims; more specifically: • We carried out a capture-mark-recapture study to estimate bear abundance in Greece: Total population size was estimated at >450 individuals, indicating a 100% population increase. • Using various analytical methods we studied the recovery genetics of bears in Greece: genetic diversity in western Greece was the lowest in southeastern Europe; we documented also a considerable genetic sub-structuring in the West. As bears in Greece are now recovering, this substructure is dissolving through a “recovery cascade” of asymmetric gene flow from South to North, mediated mainly by males. We used GAMMs to study seasonal and circadian activity and GLMMs to study factors influencing bear activity and habitat use. During their recovery bears in Greece were mainly nocturnal, while habitat selection analyses revealed a high importance of shrublands and rough terrain as refuge areas for all bears. • Using PPPMs we show that bear distribution in Greece increased significantly during the study.
• Using genotype data, we calculated genetic relatedness as well as kinship to reconstruct pedigrees to reveal family structures and dispersal patterns of the Greek brown bear population during recovery. Using geographic profiling we identify hotspots of bear activity in the country. • We carried out a thorough analysis of bear damages to human property and the existing compensation system. Faced now with a new conservation reality for bears, we identify priority research, conservation and management actions for bears in Greece.

Abstract ID: 20

Session:
Spatial requirements and demographic characteristics of bear populations

USING SPATIAL MARK-RECAPTURE FOR CONSERVATION MONITORING OF GRIZZLY BEAR POPULATIONS IN ALBERTA

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Abstract
One of the challenges in conservation is determining patterns and responses in population density and distribution as it relates to habitat and changes in anthropogenic activities. We applied spatially explicit capture recapture (SECR) methods, combined with density surface modelling from five grizzly bear (Ursus arctos) management areas (BMAs) in Alberta, Canada, to assess SECR methods and to explore factors influencing bear distribution. Here we used models of grizzly bear habitat and mortality risk to test local density associations using density surface modelling. Results demonstrated BMA-specific factors influenced density, as well as the effects of habitat and topography on detections and movements of bears. Estimates from SECR were similar to those from closed population models and telemetry data, but with similar or higher levels of precision. Habitat was most associated with areas of higher bear density in the north, whereas mortality risk was most associated (negatively) with density of bears in the south. Comparisons of the distribution of mortality risk and habitat revealed differences by BMA that in turn influenced local abundance of bears. Combining SECR methods with density surface modelling increases the resolution of mark-recapture methods by directly inferring the effect of spatial factors on regulating local densities of animals.

Abstract ID: 55

Session:
Spatial requirements and demographic characteristics of bear populations

IDENTIFYING UMBRELLA SPECIES FOR LARGE MAMMAL CONNECTIVITY CONSERVATION IN EUROPE: HOW WELL DO BROWN BEARS DO THE JOB?

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Abstract
The viability of many species depends on the potential of successful dispersal between populations across broad landscapes. This is particularly true for terrestrial large mammals, many of which are sensitive to the impacts of habitat fragmentation and isolation. Climate and land-use change further necessitate proactive management and conservation of areas that facilitate animal dispersal. Connectivity conservation is therefore one of the most widely-applied conservation measures, but needs to consider large scales and identify movement corridors that have the potential of being used by multiple species. We conducted an analysis to map connectivity between protected areas for large terrestrial mammals including Brown Bears in Europe. We simulated multiple-paths for 20 species in Europe to map the potential connectivity at species-specific scales and identified the paths that most frequently appeared for multiple species, and therefore suggested multi-use corridors. We also identified the suite of species that best represent the connectivity needs for other species, and are therefore best suited to serve as umbrella species for connectivity conservation in continental Europe. We present these results in context of the brown bear population in Europe, and its role as a focal species for connectivity conservation. Our results provide a coarse-representation of important areas for potential dispersal of multiple species and support the development of management strategies to enhance connectivity conservation in Europe.

Abstract ID: 83

Session:
Spatial requirements and demographic characteristics of bear populations

THE ENCOURAGING BUT STILL UNCERTAIN FATE OF ONE OF THE MOST ENDANGERED BROWN BEAR POPULATION IN EUROPE: CONSERVATION STATUS OF THE PYRENEAN BROWN BEAR POPULATION

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Abstract
The Pyrenean brown bear population was on the edge of extinction in mid-90s with only 5 relict individuals detected in the western side of the Pyrenees Mountains in 1995. To save the population, a total of 9 adult bears from Slovenia were successively reintroduced on the central Pyrenees in 1996-1997, 2006 and 2016. The transboundary cooperation among France, Spain and Andorra has allowed driving intensive long-term monitoring of the population. The monitoring rests essentially on non-invasive field methods, based both on systematic (collection of bear signs on transects equipped with hair traps and camera trapping) and opportunistic (verification of bear sign testimonies from people) designs, coupled with genetic analyses. From 1996 to 2006, population size was quite stable, ranging about 10 individuals, including only 1 male and 3 females involved in reproduction. Since the second reinforcement in 2006, population size has increased regularly but slowly, thanks to regular reproduction events. Over the last 4 years (2014-2017), this increase speeded up 31, 32, 41 and 43 bears, including 5, 3, 5 and 4 litters cumulating at least 31 cubs. Over this period, 10 females and 4 males were involved in the reproduction. In 2017, the population is composed of 14 adult females, 7 adult males, 15 subadults and 7 cubs of the year. It ranged over 4900 km2, what is 800 km2 more than in 2014. From 2011, only 2 adult males occupied the Western nucleus of the population. But in 2017, for the first timesince 2000, we detected movements of 3 adult males between the Western and Central subpopulations. However, the fate of the Pyrenean brown bear population is still uncertain, due to consanguinity and small population size, andthis population probably remains one of the most endangered brown bear population in Europe.

Abstract ID: 19

Session:
Spatial requirements and demographic characteristics of bear populations

CHARACTERIZING GRIZZLY BEAR (URSUS ARCTOS) HABITAT SELECTION USING 3D REMOTE SENSING

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Abstract
Forests in western Alberta, Canada are characterized by having an extensive network of anthropogenic disturbances (roads, oil well pads, forest harvest operations, and long linear forest cuts known as seismic lines) that impact and encroach on grizzly bear (Ursus arctos) habitat. An assessment of the responses by grizzly bears to these disturbances is needed to guide conservation actions. Grizzly bears move across large home ranges through many stages of forest development, however, the effect of fine-scale patterns in forest structure on bear movement is not well understood. Light Detecting and Ranging (LiDAR) is an active remote sensing technology that may be used to describe forest structure in 3 dimensions; in production forestry applications its use is well established, however, in the context of wildlife conservation the relationship between LiDAR-derived habitat metrics and biodiversity is still developing. In this paper we review the development and use of LiDAR data to contextualize disturbance and characterize forest structure, presenting preliminary relationships between LiDAR metrics (including vertical distribution of vegetation, cover, and topography) and models estimating habitat use. These models are then compared to more traditional, land-cover/land-use based habitat selection models to illustrate the value of using fine scale, continuous data in the context of habitat and biodiversity assessments.

Abstract ID: 32

Session:
Spatial requirements and demographic characteristics of bear populations

ESTIMATING SUN BEAR (HELARCTOS MALAYANUS) OCCUPANCY IN TWO DIFFERENT AREAS OF MYANMAR

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Abstract
Size and distribution of wild populations are key elements in determining their conservation status, especially for vulnerable species as the Sun bear (Helarctos malayanus). Myanmar is part of the native Sun bear range: the mainland contains most of the potential species range in Southeast Asia, with wide areas currently referred to as unknown. Hence, for bear conservation it becomes fundamental to increase our knowledge on this species, one of the least studied and known of the eight bears species across the world. In this study we apply an occupancy-based sampling technique using detection/non detection data from camera traps in two different regions of Myanmar with different habitat types as well as different protection levels: in Rakhine, near the Rakhine Yoma Elephant Range Wildlife Reserve, and in Sagaing, inside the Htamanthi Wildlife Sanctuary. Within the two study areas, 8 survey sites were selected and a camera trapping scheme was implemented positioning 30 camera traps for each site, activated for about 45 days during the dry season, between November 2016 and May 2017. During more than 10000 trapping days, 65 Sun bear videos were recorded. Both detection and occupancy varied greatly across study sites. Preliminary results show that habitat type influenced detection values, indeed in more dense habitat (e.g. evergreen forest) detection resulted lower than in open habitat (e.g. degraded forest). This result underlines the importance to take into account the ability to detect target species in different areas to avoid misleading results on species presence and distribution. Moreover power test points out as the effort (number or camera trap stations) should be increased to reach lower occupancy standard errors and some habitat type could be better investigated. Results achieved so far provide baseline information to identify priorities for future Sun bear conservation strategies in Myanmar.

Abstract ID: 109

Session:
Spatial requirements and demographic characteristics of bear populations

PATTERNS OF SPATIAL RECOVERY IN THE CANTABRIAN BROWN BEAR (URSUS ARCTOS) POPULATION

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Abstract
The Cantabrian brown bear population (Ursus arctos) is recovering after decades of regression. Different works have been developed about the trend of the population (bear censuses with offspring, genetic estimates, demographic models) but their distribution had not been updated since the population began to recover. In this paper, we describe the changes in the distribution of the population between 1982 and 2012 comparing the area occupied between three periods: 1982-1992, 1993-2002, 2003-2012. For this, we compiled different databases mainly from the governments of the autonomous communities, and we established a distribution area and a reproduction area by means of four methods: 1) Administrative (municipalities) 2) Atlas (5x5 km2 squares) and two probabilistic methods (LoCoh and Kernel). A regression is observed between the first two periods and a large increase (70% on average) in the distribution of the population in the third period over the second, clearly delimiting a single population. The reproduction area is kept constant and divided into two nuclei throughout the three periods. We analyzed the differences between colonized zones and extinct zones, or that could have colonized by their proximity but did not. The probability of colonizing in the second period is directly related to the quality index of natural habitat, however, despite what would be expected, it is inversely related to the quality of human habitat. In the case of the third period, a territory is more likely to be colonized because of its proximity to the center of the subpopulation and because it has a good quality of human habitat. The results regarding the reproduction area indicate that the main changes between the periods have to do with the proximity to the existing nuclei. Finally, we discussed the need to update the Recovery Plans of the autonomous communities since they do not include a large amount of area (8186 km2 on average) that is earned in the decades following the realization of these plans.

Abstract ID: 118

Session:
Spatial requirements and demographic characteristics of bear populations

A SHOPPING LIST OF RESEARCH PRIORITIES FOR SOUTHEAST ASIA'S BEARS

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Abstract
Conserving Southeast Asia's bears requires site-level information on the trends and viability of populations, and general information on bear habitat use, response to human development, and the impact of threats on populations. Studies on these topics are emerging throughout Southeast Asia, however, bears are often under-prioritised by conservation organisations, which tend to focus on mammals that have greater public appeal, such as tigers, elephants and orangutans. Consequently, projects that include bears as a focal species are rare and unevenly distributed, with no strategic focus on research topics or on geographical sites of priority. Southeast Asia's bears urgently require research and management actions to be strategized and prioritised by topic and by site. Here we provide a shopping list of site-specific research and management priorities for sun bears Helarctos malayanus and Asiatic black bears Ursus thibetanus in Southeast Asia. We aim to increase efficiency (i.e. use of time, funding, effort) by guiding researchers towards projects that will fill in knowledge gaps on bears. We used maps of potential range connectivity within Southeast Asia to identify where bear populations may be most at risk from local extirpation. We also reviewed current literature on bear research, to identify gaps in scientific and geographical knowledge. We identified multiple sites throughout Southeast Asia where bear-focused studies are absent and where bear populations may be threatened by habitat fragmentation and shrinking habitat extent. We summarised the research and/or management actions that are most appropriate for each site. We encourage researchers to collaborate in tackling these knowledge gaps and we promote the inclusion of bears in existing multi-species monitoring programs. Would-be bear researchers can browse our shopping list and contribute to actively addressing the research priorities that will fill in the knowledge gaps for these threatened bear species.

Abstract ID: 142

Session:
Spatial requirements and demographic characteristics of bear populations

MAPPING HABITAT CONSERVATION PRIORITIES FOR BROWN BEARS IN THE ROMANIAN CARPATHIANS

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Abstract
Recovery of large carnivores in the European human-dominated landscapes has sparked a debate regarding the optimal landscape conditions in which carnivores can thrive and coexist with humans. Here, we use brown bears (Ursus arctos) in the Romanian Carpathians to test and develop a framework for identifying habitat conservation priorities based on a novel integration of resource selection functions, home rangespatial location data, and systematic conservation planning. We used a comprehensive GPS telemetry dataset from 18 individuals to (1) calculate sex-specific seasonal home ranges, and (2) characterize population-level habitat selection. We then used systematic conservation planning software Zonation to identify contiguous areas of high conservation value for males and females by using Manly's habitat selection ratios as weights for habitat layers, and home range information as a smoothing parameter for habitat connectivity. Home ranges were smallest during winter (median [IQR] for November-February: 28.2 km2 [9.8-42.4]), and largest during the intense-feeding season (September-November: 127.3 km2 [62.2-288.5]), with males having larger home ranges across all seasons. Females consistently selected for mixed forest habitat during all seasons. Males selected mixed forest during winter; then switched to a rather generalist approach, selecting regenerating forest, and mixed and coniferous forests during low-feeding/reproduction and wild berries seasons. We identified large tracts of forest habitat (~14% of the landscape) that was selected across all seasons as key habitats for brown bear conservation in the Eastern Carpathians. Spatially, high-value winter habitat was the most dissimilar for both males and females, suggesting that conservation actions should focus on protecting contiguous denning habitat. These key findings can inform the management and conservation of the brown bear population in the Romanian Carpathians by identifying critical intervention areas.

Abstract ID: 201

Session:
Spatial requirements and demographic characteristics of bear populations

LANDSCAPE GENETICS OF SLOTH BEARS IN CENTRAL INDIA

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Abstract
Sloth bears (Melursus ursinus) are endemic to the Indian subcontinent. It is the second most widely distributed carnivore species in the Central Indian landscape (CIL), which is one of their major strongholds in terms of population abundance and habitat availability. However, their distribution has gradually decreased and become fragmented due to habitat loss and incresed human disturbance and activities. Their large metapopulation in CIL still has ongoing geneflow due to forest connectivity, but no systematic study is done to map their connectivity and delineate corridors for sloth bear movement and geneflow. We use genetic data generated using 7 microsat loci and 55 individuals from CIL to first parameterize and optimize resistance surfaces and then map their connectivity. Subsequently we identify the landuse and landcover classes that affect sloth bear connectivity and geneflow. This information would be useful for systematic conservation planning for this iconic bear species in CIL and would serve as a replicable model for other landscapes in its range.

Abstract ID: 11

Session:
Bear ecology, behaviour and physiology

BROWN BEAR HAIR AS INDICATOR OF EXPOSURE TO ENVIRONMENTAL TOXIC METALS

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Abstract
Cadmium, lead and mercury are inorganic, persistent environmental pollutants confirmed as toxic for wildlife. Because of their long life and apex trophic position, bear species have been proven to reflect the toxic metal levels from the environment well. In the European brown bear, toxic metals were thus far monitored in soft tissues, bone and blood, samples necessitating death of an animal or invasive sampling. Non-invasive samples, like hair, have not been explored as indicators of metals in brown bears, although it was successfully used to study changes in metal accumulation in Canadian brown bears feeding on salmon and assess exposure to mercury in polar bears. Keratin, the key structural protein of hair is abundant with thiol groups (-SH) that have high affinity for binding metals. Deposition of metals in hair from endogenous sources (blood) is carried out in periods of hair growth, so hair metal levels represent a medium-term exposure indicator, in contrast to blood (recent exposure) or soft tissues and bone (long-term exposure indicators). The aim of this study was to explore hair as a bioindicator for prominent inorganic pollutants in two European brown bear populations, Dinara-Pindos and Carpathian. Hair was sampled between 2009 and 2017 from free-living bears in Croatia (N=88) and Poland (N=21). Cadmium (mean±SD, median; 0.027±0.024, 0.018 mg/kg dry mass) and lead level (0.635±0.753, 0.367 mg/kg) did not differ in the hair of the two populations. Mercury in hair of bears in Croatia (0.291±0.2012, 0.277 mg/kg) was higher ($t=4.65$, $p<0.001$) than in Poland (0.141±0.117, 0.104 mg/kg). Measured mercury in European brown bear hair was somewhat lower than in Canadian bears and much below the threshold for subclinical alterations observed in polar bears (5.4 mg/kg). Cadmium and lead levels were similar to those found in Canadian brown bears.

Abstract ID: 18

Session:
Bear ecology, behaviour and physiology

BEHAVIOUR OF THE EURASIAN BROWN BEAR AT RUB TREES IN THE ITALY

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Abstract
This study analyses the marking behaviour of the Eurasian brown bear filmed during a three-year survey by camera traps placed in front of 25 rub trees in the central Italian Alps. We cumulated over 500 videos of bears through a sampling effort of about 9000 camera days. The bears captured in the videos were classified according to age and sex, and type and duration of each behaviour was recorded. Data allowed to assess temporal patterns of rubbing behaviour, differences within sex, age and among individuals. Rubbing was significantly more performed by adult males with a peak during the breeding season. Adult males used a variety of positions to mark the trees compared to the other classes, confirming that this behaviour is mainly related to the mating strategy of the species. Rubbing was also observed during the non-breeding season, but with much less intensity, while investigation of rub trees was performed by bears of all ages and sexes throughout the seasons. The only tree female bears who rubbed the trees were recorded in autumn, outside the breeding season. Rubbing on a tree by a bear triggered a response in individuals subsequently passing by the same rub tree: 62% of the times the second bear either rubbed or investigated, with a proportion that differed significantly from a random sample. Results support the hypothesis that rubbing the trees is a mean of communication during the mating season, as already documented for grizzlies and brown bears in North America.

Abstract ID: 21

Session:
Bear ecology, behaviour and physiology

EVALUATION OF BODY CONDITION USING BODY MASS AND CHEST GIRTH IN BROWN BEARS OF HOKKAIDO, JAPAN (URSUS ARCTOS YESOENSIS)

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Abstract
The Hokkaido brown bear (Ursus arctos yesoensis) is the largest terrestrial mammal in Hokkaido, Japan, and scientific information including relationship between reproduction and nutritional condition is necessary for their appropriate conservation and management. To establish a useful method for evaluation of nutritional condition, the present study is conducted. Chest girth and body mass of 3,576 brown bears killed for conflict management in Hokkaido, Japan during 1991–2012 were used to establish methods to assess body condition and to compare the body condition of bears by sex, month, year, and reproductive status. The body mass was estimated based on the chest girth in cases with no measurements of the bear body mass. Using the measured and estimated body mass, a growth curve by age was demonstrated to ascertain the mean asymptotical body mass (245 kg for males, 114 kg for females) and ages at 95% asymptotic body mass (14.2 years for males, 7.1 years for females). The body condition value of bears was evaluated as body mass difference (kg) between the individual body mass and the standard body mass as estimated from the growth curve. Body condition value changed seasonally with a low in summer and the highest in the autumnal hyperphagic period. Female body condition value was higher than the males during September. Fluctuation in annual body condition value was found for females; however, there was no difference between solitary adult females and females with offspring (cubs, yearlings, or offspring of unknown age). No significant fluctuation was found for males. Our body condition evaluation method using chest girth and body mass of brown bears is useful to elucidate different trends across sex, year, and season.

Abstract ID: 23

Session:
Bear ecology, behaviour and physiology

MICROHABITAT AND FOREST STRUCTURE CHARACTERISTICS OF CAVE DENS IN VELEBIT NATURE PARK

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Abstract
The aim of this research was to establish habitat characteristics of cave dens in Velebit Nature Park. In total, 63 dens were found out of which 89% were cave dens and 11% other den types (nest dens 6%, stump dens 3%, trunk dens 2%). A coordinate for each den was determined by GPS device. On the basis of each den's coordinate, together with geological and pedological maps, parent material, geological age and soil type of dens were determined. In relation to den's altitude, climatic category according to Köppen was defined. In the 25-meter radius around each den, habitat and structural characteristics were measured: rockiness, developmental stage of forest, canopy density, tallest tree height, forest site index, tree basal area, and tree species composition. In relation to parent material, the largest percentage of caves was on the limestone and dolomite parent material, and the smallest percentage on schist and sandstone parent material. In relation to geological age, the largest percentage of cave dens was found on the paleogen and neogen age foundation. 43% of cave dens were on calcocambisol. 61% of cave dens were in climatic category of moderate, rainy climate at 800 to 1000 m altitude. The main tree species around cave dens is silver fir. The largest percentage of cave dens were situated in partial canopy density of the third forest site index with tree heights between 16 and 20 m. Rockiness of terrain was significantly higher and tree height was significantly lower in the cave dens in comparison to other den types. Coniferous species composition was dominant in the cave dens. Most cave dens (71%) were in high forest stands with tree basal area of 21 to 30 m2/ha, and the least in degraded stands (10 %).

Abstract ID: 28

Session:
Bear ecology, behaviour and physiology

VULVA RUBBING BEHAVIOUR IN FEMALE SLOTH BEARS IN ESTRUS

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Abstract
Vulva rubbing and scent marking behaviour by female bears in estrus has been documented in some species, but not in sloth bears. A study of reproductive physiology and behaviour in captive sloth bear females (n = 36) was initiated in June 2015 at Agra Bear Rescue Facility (ABRF), India. These bears were observed rubbing the vulva on the den floors, walls and other surfaces, especially during estrus, as indicated by swelling and color change of the vulva. In this study, data on each bear were collected throughout the year with keeper check sheets scoring vulva visibility and presence or absence of vulva rubbing. The data were collected daily during estrous period (April to July), and twice a week during rest of the year. Visibility of the vulva was scored on keeper check sheets as 0 (not visible), 1 (slightly visible) and 2 (fully visible). The presence of vulva rubbing behaviour was scored as 1 and the absence was scored as 0. There was a significant, positive relationship between vulva visibility and vulva rubbing scores ($P < 0.001$; logistic regression).This indicates that vulva rubbing is a probable method of scent marking by female sloth bears in estrus. Further research on this subject may shed light on the reproductive chemical communication of sloth bears.

Abstract ID: 33

Session:
Bear ecology, behaviour and physiology

ACTIVITY PATTERNS OF ASIATIC BLACK BEARS USING TWO AXIS ACCELEROMETERS IN GPS COLLARS IN TAIWAN

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Abstract
Circadian rhythms are fundamental to animals and assumed to improve individual survival and reproductive fitness. Activity patterns and time budgets in response to environmental variables may yield insights into key factors affecting animal life histories. We aimed to examine potential parameters related to diel variations in activity of Asiatic black bears (Ursus thibetanus formosanus) in the Yushan National Park, Taiwan. During November 2014–January 2018, we monitored three male and four female equipped with GPS collars containing a two-axis accelerometer and an activity logger. Based on 429,993 5-min activity readings, we found bears were mainly diurnal and had a significant 24-hour periodicity, which were resembled the patterns described in the only earlier VHF-telemetry based studies. Seasonal activity variations were detected, with extensive crepuscular and nocturnal activity during acorn seasons. For examining the variation of bear activity pattern, we further analyzed individual, temporal and environmental factors and their interactions, including sex, age, time of day, season, year, mast production and areas.

Abstract ID: 46

Session:
Bear ecology, behaviour and physiology

BEHAVIOR-SPECIFIC HABITAT SELECTION BY ASIAN BLACK BEAR

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Abstract
Understanding resource selection by wildlife is important for understanding ecological characteristics of each species. Habitat selection analysis using location data and environmental information allows us to understand what environment factors would be required for target species. However, if we only use the location data, it is unknown what the animal did at the place. Therefore the results obtained from location data only might lead to misguided habitat management such as failure to detect correct habitat requirement that depends on each behaviors, and we may overestimate and/or underestimate the habitat environment. So, we have to analyze habitat selection in more detail such as classified the behavior. In this study, we aimed to clarify the behavior-specific habitat types by analyzing the habitat selection, separating the behaviors by Asian black bear based on the GPS location data (n=9) and activity sensor data. To separate bears' behavior, we applied the switching state-space model for the location data, and classified the behavior into 'Move', 'Active stay' and 'Inactive stay'. We analyzed how the habitat selection differed between the location data classified by each behavior and pooled location data. As a result the trends of the habitat selection patterns were similar between active stay and pooled location data. However there are differences between inactive stay and pooled location data in summer. These results indicate that the suitable habitats differed according to behavior and the analysis of results using the pooled location data does not reflect the behavior-specific selection. These results indicate that traditional habitat selection analysis with all the location data pooled showed the possibility that the suitable habitat cannot be evaluated correctly. "

Abstract ID: 47

Session:
Bear ecology, behaviour and physiology

A COMPARISON OF SLOTH BEAR MATERNAL AND RESTING DENS

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Wildlife SOS

Abstract
Very little is currently known about sloth bear denning, and this includes a paucity of information about maternal dens (used to give birth to and raise cubs) and day dens (used by sloth bears as a place to rest in safety during the daylight hours when sloth bears are generally not active). Wildlife SOS located maternal dens (n=41) and day dens (n=500) in the rocky habitat of northeastern Karnataka. This landscape is a mosaic of boulders of varying shapes and size, cliffs, crags, thorny bushes, stunted trees, and boulders of varying shapes and size. These granite boulders create many caves and hollows, which bears use for both day and maternal dens. Much of the habitat is designated as Reserved Forest, and therefore has minimal protection and considerable human disturbance, including the illegal harvest of trees and rocks. Additionally, most of the area is surrounded by farmlands. We were able to inspect both maternal and day dens and take physical measurements; we also collected data regarding den-site characteristics such as slope; aspect; vegetation composition; orientation of den opening; distance from water; and distance from human disturbances such as trails, roads, farms, and other building or structures. We compared the physical characteristics of these two den types as well as data regarding their locations on the landscape. Lastly, we compared distances of both den types to various human disturbances on the landscape.

Abstract ID: 54

Session:
Bear ecology, behaviour and physiology

BEHAVIOR AND ACTIVITY PATTERNS OF ASIAN BLACK BEARS BEFORE DEN ENTRY

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Abstract
Understanding the factors that influence the timing for when bears begin their denning process is important for an adequate bear management. Although long distance movement to den sites and a decrease in daily activity appear to be characteristic of the denning process in other bear populations, it is unknown whether there are universal behaviors related to den entry even for Asian black bears. To characterize pre-denning behaviors and explore the climatic factors associates with the timing of pre-denning behavior, we surveyed pre-denning behavior in Asian black bears in the Ashio-Nikko Mountains, Japan using global positioning system collars and activity sensors. Pre-denning behavior was detected in 18 of the 21 (85.7%) bears observed. The pre-denning behavior began 4.4 ± 1.6 SD days before den entry, and long distance movement coinciding with pre-denning behavior (1.099 ± 701 m SD) began shortly after decreases in daily activity were detected. We were unable to find a relationship between the date when pre-denning behavior began and climate conditions. In summary, Asian black bears also demonstrate characteristic pre-denning behaviors, with the initiation of denning appearing to be the beginning stage of pre-denning behavior.

Abstract ID: 60

Session:
Bear ecology, behaviour and physiology

THE EFFECTS OF ETHANOL STORAGE ON STABLE ISOTOPE VALUES FOR BEARS

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Abstract
Stable isotopes derived from muscle and liver tissues of bears can be used to study their diets at the population and individual level. Ethanol (high concentrated ethanol-water solution) is a commonly used preservative for such samples, because it is relatively inexpensive, easy to handle and safe. As such it has been long used for long-term storage of biological samples (archived samples) or for storage of samples when working on the field. Unfortunately, prior studies on other vertebrates have shown that ethanol can have an effect on the stable isotope values of stored tissues. We performed a paired experiment on 26 brown bear muscle and liver samples collected in Slovenia to study the effects of ethanol storage on δ13C, δ15N, and δ34S values. Our results indicate that ethanol storage can caused a small increase in δ13C values in both tissues (muscle: +0.4 ± 0.5 ‰; liver: +0.6 ± 0.3 ‰) but do not affect their δ15N and δ34S values. Increases in δ13C values were not related to the time of storage. Evidence suggests that ethanol storage increases δ13C values because ethanol acts as a solvent, extracting 13C depleted lipids from tissues. As lipids are normally chemically extracted prior stable isotope analysis, or they do not have a notable effect on δ13C values in bear muscles and liver, we recommend that researchers should store bear muscle and liver samples in ethanol prior stable isotope analysis. Archived bear muscle and liver samples preserved in ethanol can also be used for stable isotope analysis purposes.

Abstract ID: 61

Session:
Bear ecology, behaviour and physiology

INSIGHT ON RESOURCE USE BY THE ANDEAN BEAR IN COROSHA DISTRICT, AMAZONAS, PERU

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Abstract
The Andean bear (Tremarctos ornatus) is the only South American bear species and one of the least studied bear species worldwide. It is considered vulnerable with decreasing populations according to IUCN, mainly due to habitat loss related to human development activities, illegal killing and climate change. We collected data of Andean bear activity through a sign survey conducted in the tropical rainy montane forests and grasslands of Corosha district, Amazonas region, in northern Peru (Copal and ACP Hierba Buena). One hundred (100) records of bear signs were obtained between April and May 2016 by walking transects of a total length of 43.4 km and at altitudes ranging from 2120 to 3041 m a.s.l. Results showed that bears used different vegetation types with variable intensity as follows: mountain cloud forest (74%), jalca grassland (13%) and elfin forest (7%). Signs were allocated in eight different categories: feeding signs were recorded more frequently (47%), followed by scats (15%), tracks (14%), scratch marks (7%), tree rubs with hair (7%), tree climbs (7%), daybeds (2%) and one tree nest (1%). Identification of plants consumed and scat analysis revealed a 100% herbivorous diet, which consisted of 12 taxa belonging to four families, i.e. Bromeliaceae (66.2%), Lauraceae (23.5%), Arecaceae (8.8%) and Ericaceae (1.5%). These findings counterbalance local communities' beliefs that bears are responsible for livestock depredations as we did not find any indications of animal consumption. Furthermore, the extremely rare tree nest detected during the survey and located on the top of a tall Lauraceae tree, revealed another aspect of Andean bears ecology. Lastly, presence of bear hair on rubbing trees seems promising in opening new perspectives for a future and more in depth study of the Andean bear population genetic status in the area.

Abstract ID: 64

Session:
Bear ecology, behaviour and physiology

TEMPORAL PATTERNS OF THE BROWN BEAR DIET IN NORTHWESTERN ANATOLIA AND ITS ROLE IN THE SEED DISPERSAL OF PLANTS

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Abstract
We studied the dietary habits of the brown bear (Ursus arctos) in a mixed temperate forest in northwestern Anatolia, Turkey. A total of 201 fecal samples were collected monthly (from May to November) for two consecutive years in 2013 and 2014 to be able to identify the annual, seasonal and monthly variability of the dietary patterns. We identified the ingredients of each fecal sample using a reference plant tissue database constructed by field collections and reference books for identifying animal hairs. Germination ability of seeds found in fecal samples was also studied by comparing those of fresh seeds collected from the field. We found that the diet of the brown bear was composed mostly of plant material, but also including several insect and mammal species. Plant taxa that most frequently consumed by the brown bear were Pyrus elaeagnifolia, Prunus mahaleb, Castanea sativa, Rubus spp., Prunus spinosa, Vaccinium arctostaphylos and Puccinellia festuciformis. Among insects; wasps, ants and beetles were the most common groups, and hairs of variety of mammals were also detected in fecal samples, including Canis familiaris (domestic dog), Sus scrofa (wild boar), Cervus elaphus (red deer), Capreolus capreolus (roe deer) and Meles meles (European badger). The diet of the brown bear varied monthly, seasonally, and annually, driven by the phenology of plant species consumed. Seeds of Malus sylvestris (European wild apple) and Pyrus elaeagnifolia (wild pear) had significantly higher germination in feces than the control group. Our study reveals the diversity and temporal variability of the foods consumed by the brown bear. The results also suggest that the brown bear is an important seed disperser in temperate mixed forests of Anatolia, and the germination of seeds of wild fruit trees enhance after passage through the brown bear gut. Our study has implications to reduce the intensity of the human-brown bear conflict in the region.

Abstract ID: 84

Session:
Bear ecology, behaviour and physiology

RELEASE OF A NEW BROWN BEAR MALE IN PYRENEES FROM SLOVENIA

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Abstract
For 20 years, one male has monopolized the reproduction in this reintroduced Brown bear Pyrenean population. With objective of increase the genetic variability of this small population, an adult male, 205 kg weight, was released, from Slovenia, in Catalonian Pyrenees in 2016 June 6. It was collared with GPS-GSM (Vectronic) and radiotracked by IRIDIUM satellite. For 2016 and 2017 it was radiolocated in 11,256 times. Two hibernations were detected in the same valley in Catalonia; first, in winter 2016-2017, at 2.300 m altitude; second, in winter 2017-2018, at 1.750 m elevation. Two periods started at the end of November and ended at the beginning of March. For this period (19 months), this male caused 42 attacks. 24 were on livestock, with 31 sheep and four horses predated; and 18 were on bee-keeping, with 57 hives destroyed. Daily activity and movements were significantly nocturnal, with a bimodal activity. Between 7 P.M. and 6 A.M. the activity was more than 50% and movements were over 350 m (straight line). Using consecutive monthly locations, a high negative correlation was found between nocturnal and diurnal activity. Results confirmed differences in seasonal activity, with minimum values in winter (December, January and February) and maximum values in summer (May and June). Home range occupied in 2016 (seven months) and in 2017 (12 months) was analyzed by Kernel 95% and 50%) and by Minimum Convex Polygon (100% and 50%). Home ranges were larger in summer > in spring > in autumn. This large territory has occupied part of three French departments and two Catalonian counties. Until now, it's unknown if this males have been offspring, but it has been very close of several females in 2016 and 2017.

Abstract ID: 87

Session:
Bear ecology, behaviour and physiology

RESOURCE DISTRIBUTION IN DISTURBED LANDSCAPES – CLEARCUTS, BERRIES AND BEARS

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Abstract
To survive winter hibernation, brown bears need to store excess energy during late summer and autumn. Scandinavian brown bears strongly rely on berries during the hyperphagia, but berry distribution varies depending on forest structure and age. Our aim was to model temporal dynamics of berry abundance on clearcuts up to 15 years after final cutting and determine whether bears adjust their space use according to forage availability on clearcuts. In autumn of 2017 we collected bilberries (Vaccinium myrtillus) and lingonberries (Vaccinium vitis-idea) in 935 random plots on 29 clearcuts in south-central Sweden. GPS relocation data of 20 bears were used to evaluate whether bears adjust clearcut use to the availability of berries on clearcuts. We found a nonlinear temporal dynamic between years after finally cutting and both bilberry presence and abundance. On young clearcuts (1-4 years after felling), bilberry occurrence and abundance was low with bilberries occurring in about 34.1% of sampling plots and a predicted 12.7 bilberries per m^2. Bilberry abundance increased and peaked around 8 years after felling (probability of occurrence: 67.2%, 31.3 number of bilberries/m^2). Bears adapted to these temporal dynamics of bilberry abundance by using clearcuts of intermediate age with high bilberry presence and especially abundance when being active. This trend was not observed in selection for lingonberry, most likely due to the smaller size of lingonberries and wider availability of bilberries in the year of study. Overall, clearcutting as a method of commercial harvesting of forest landscapes was found to have significant effects on hyperphagia food abundance and bears adjusted their space use to forage on clearcuts with a high abundance of bilberries.

Abstract ID: 104

Session:
Bear ecology, behaviour and physiology

THE INFLUENCE OF HUMAN DISTURBANCE ON OCCUPANCY AND ACTIVITY PATTERNS OF THE BROWN BEAR (URSUS ARCTOS) IN THE ITALIAN ALPS USING SYSTEMATIC CAMERA TRAPPING

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Abstract
As human activities increase in natural areas, so do threats to wildlife, potentially leading to immediate and long-term impacts on species' distribution and activity. This is particularly relevant for large-bodied vertebrates that are sensitive to human presence and human-driven habitat changes. Assessing the impact of anthropogenic disturbance requires data on species distribution and activity patterns in relation to human presence. Here, we used camera trap data to study the influence of human disturbance on a population of brown bear (Ursus arctos) in a mountainous area in the eastern Italian Alps. In 2015, we sampled a study area of 220 km2 with 60 camera trap locations deployed across a regular grid (one camera trap every 4 km2). Camera traps run for 30 days in each site and cumulated 1,978 camera trapping days, yielding 39 independent detections of bear in 20 sites. We used detection/non-detection data to model brow bear's occupancy and detection probability in relation to a suite of environmental and disturbance covariates. Our analysis revealed that human disturbance plays a significant role in influencing bears' detection probability, while we found little evidence of significant relationship between occupancy and anthropogenic disturbance. Specifically, we found that bear's detectability was negatively correlated with capture rate of humans at sampling sites and positively correlated with distance from settlements. We also assessed bears' daily activity patterns and found that the overlap with human's decreases significantly at sites with higher human presence. Results suggest that bears respond to the ubiquitous presence of humans in the area by becoming more elusive in areas with higher human presence and by minimizing overlap in activity pattern. Importantly, these results come from the first year of a systematic monitoring programme, with sampling that has been repeated annually, offering avenues for future assessment of bear's population changes.

Abstract ID: 105

Session:
Bear ecology, behaviour and physiology

FOOD HABITS AND ACTIVITY PATTERN OF HIMALAYAN BROWN BEAR IN SECHU-TUAN NALA WILDLIFE SANCTUARY, PANGI VALLEY, HIMACHAL PRADESH, INDIA.

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Abstract
There are five wildlife sanctuaries in Chamba district of Himachal Pradesh in which reasonable population of Himalayan brown bears have been recorded in three wildlife sanctuaries. Sechu-Tuan Nala wildlife sanctuary having area of (103) square kilometre is situated in Pangi valley, which is the interior most tribal area in Himachal Pradesh of Northwest Himalayas. The present study conducted by direct observation on 09 brown bear during May to October 2016 documents and contributes significant information on food habits and activity patterns of brown bears in their natural habitat. The food habits of Himalayan brown bears were also investigated by analyzing 22 fresh scat, 18 feeding site investigation, 04 hours of total direct observation and 60 minutes of video footage on foraging and activity behavior. Indirect signs such as digging/stone uplifting/scats were also recorded in randomly placed 14 linear transects in different habitat types. Based on direct feeding observation, they were found to feed on 32 herbs including agriculture crops like Hordeum vulgare (seeds) and Fagopyrum esculatum (seeds). Scat analysis also reveals the presence of Morchella esculenta (fungi). Among the food plants, there were mainly 2 fruit trees, 2 shrubs, 24 herbs, 2 grasses and 2 agricultural crops. Feeding activity was found to be directly correlated with availability of food plant in the study area. For long term conservation and management of Himalayan brown bear population in this harsh climatic conditions, information on its food habits, habitat use and activity pattern are necessary. Key words: Fagopyrum esculatum, Morchella esculenta.

Abstract ID: 107

Session:
Bear ecology, behaviour and physiology

DIETARY HABITS OF BROWN BEAR (URSUS ARCTOS) IN THE HYPERPHAGIC SEASON: LONG-TERM FOOD COMPOSITION ANALYSIS IN THE EASTERN CARPATHIANS, ROMANIA

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Abstract
High quantities of crops and fruits can attract brown bears to woody-agricultural landscape mosaics in the late summer and fall. Studying the seasonal food composition of bears, the available supply and different habitat factors can help us to understand how and why local conflicts may arise between humans and bears. Here, we present a long-term dataset on the feeding habits of brown bears during the hyperphagic season (October-November 2005-2017) from a hilly area close to the Călimani and Ghurgiu Mountains. We sampled bear scats 11 times near Bistra Mureşului and near Lunca Mureşului, and 7 times near Brâncoveneşti along fixed transects. In August 2016 and 2017 we surveyed the woody vegetation in these three areas using random transects (n=84 in total). Prior to 2017, we determined the components of the scats macroscopically at the site, and collected undeterminable parts for future analysis. In 2017, a more detailed analysis was carried out: after macroscopical analysis we also collected representative samples from the scats to be analyzed in a laboratory. This enabled us to test the effectiveness of previously applied field methods. Based on frequency of occurrence data, the most important components of the scats were oak and beech hard mast (ca. 50%), wild pear (ca. 40%), herbaceous fibers (ca. 20%) in Bistra Mureşului (number of scats = 715); wild pear (ca. 65%), plum (ca. 25%), apple (ca. 15%) in Lunca Mureşului (n = 370) and wild pear (ca. 45%), oak hard mast (ca. 25%), plum (ca. 20%) in Brâncoveneşti (n = 165). Identification of dominant components in the field was in good accordance with results obtained from laboratory analysis: other plant species were rarely found and only in small amounts. We argue that in the case of wide spatial or temporal scale projects on-site macroscopic analyses can provide reliable information about feeding habits. Despite known limitations of the method it can efficiently inform conservation management.

Abstract ID: 116

Session:
Bear ecology, behaviour and physiology

IT IS NOT JUST ABOUT THE BEAR

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Abstract
The concept of umbrella species in conservation refers to a species whose conservation can help protect many other co-occurring species due to its large area requirements. The Andean bear has been reported to use a wide range of ecosystems, however, there is a lack of knowledge and research particularly in the Boliviano-Tucumano ecoregion, one of the most biodiverse in the Tropical Andes but also among the most degraded and least protected. For this study, we explored the Andean bear role as umbrella species, by performing a medium to large terrestrial mammal inventory using camera-trap data in south Bolivia. A total of 18 species of medium and large terrestrial mammals were found in the study site, being Geoffroy's cat and puma the most frequent. The results also include first records of jaguarundi, lesser tamandua and Pampas cat for the region. Despite small mammals being excluded from the inventory, is important to mention the presence of the endemic and critically endangered Bolivian chinchilla rat. These findings support the concept of using the Andean bear as umbrella species for conservation planning in the area, as well as promoting further research in the dry forests of the Boliviano-Tucumano ecoregion.

Abstract ID: 124

Session:
Bear ecology, behaviour and physiology

SLOTH BEAR (MELURSUS URSINUS) IN A HUMAN DOMINATED LANDSCAPE OF CENTRAL INDIA: INSIGHTS ON ADAPTIVE BEHAVIOUR AND FUTURE PERSPECTIVE

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Abstract
Spatial pattern of occupancy and behaviour response of sloth bear (Melursus ursinus) determine human-bear conflict and consequent conservation responses. We investigated this aspect in Sanjay Tiger Reserve, Madhya Pradesh from March 2016 to April 2017. To assess sloth bear distribution, sign surveys (N=2; 1,466 km effort) were carried out throughout the core zone (831.25 km2) of Sanjay Tiger Reserve considering Forest Beats (~18.5 km2) as sampling units (N=45). To estimate the relative abundance, understand activity patterns, and anthropogenic pressures in sloth bear habitats, 149 pairs of camera traps were deployed in 4 km2 grids for a period of 45 consecutive sampling occasions. Based on 611 km effort in pre-monsoon and 855 km effort in post monsoon, we estimated encounter rates (# signs/km±SE) of 0.64±0.05 and 0.30±0.03 respectively. Camera trapping resulted in 184 photographs of sloth bear (0.03±0.004 per trap location), 6596 human activities (1.08±0.17) and 4734 livestock (0.78±0.09) based on 6082 camera trap nights effort. The results revealed that sloth bears were mostly active during the crepuscular period and had bimodal peaks in their activity pattern. Activity overlap between sloth bear and human was 31% during December 2016 to February 2017 and 40% from March 2017 to April 2017. Similarly, activity overlap between sloth bear and livestock was 30% and 24% for the respective period. Human interference is extensive due to presence of villages inside the core zone of the Tiger Reserve which needs to be addressed by the management authorities. In addition to generating long-term ecological and behavioural knowledge of the species, a comprehensive conservation action plan also needs to be implemented to ensure long-term survival of sloth bear.

Abstract ID: 131

Session:
Bear ecology, behaviour and physiology

DEVELOPMENT OF SPECIFIC MONOCLONAL ANTI-BEAR IGG FOR ASIATIC BLACK BEAR (URSUS THIBETANUS)

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Abstract
To restore the population of Asiatic black bear (ABB), which is globally endangered species, the bears have been released into the wild in Jirisan National Park, Republic of Korea. However, there were little surveys on the history of disease infection in those bears after releasing, and also no ABB specific serological diagnostics, to the best of knowledge. Thus, the purpose of this study was to develop specific monoclonal anti-bear IgG, which is the first step for development of serological diagnostics of ABB. The ABB were immobilized intramuscularly with 2 mg/kg tiletamine/zolazepam and 0.04 mg/kg medetomidine, and blood samples were collected from the jugular vein. The samples were centrifuged and obtained serum was stored at -80°C before the experiment. Bear IgG was purified by affinity chromatography with Protein G resin and was employed immunizing BALB/c mice. Hybridoma cell lines secreting specific anti-bear IgG were attained with spleen cells from overimmunized BALB/c mouse and SP2/0 myeloma cells. It was confirmed seven attained hybridoma cell lines secreted anti-bear IgG. Among these, five hybridoma cell lines have high concentrated anti-bear IgG titer were selected for more specific immune reaction. Then, cross-reactivity tests between these cell lines and serum from 11 different animal species were performed, and only two cell lines shown no cross-reactivity were selected. Obtained clones from selected two cell lines were injected into BALB/c mice, and after 14 days it was confirmed high concentrated monoclonal anti-bear IgG in ascites of the mice. This monoclonal antibody would be useful to develop serological diagnostics of infectious diseases in ABB.

Abstract ID: 133

Session:
Bear ecology, behaviour and physiology

PRACTICABILITY OF THE COLLAR MOUNTED CAMERA SYSTEMS TO THE BEHAVIORAL ECOLOGY STUDIES ON ASIAN BLACK BEARS

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Abstract
Recently, "bio-logging" has become more popular method for wildlife studies, and has been applied particularly for birds and marine mammals. A collar mounted camera system is one of the bio-logging systems, and has also been deployed on some terrestrial mammalian species (e.g., white tailed deer, brown bear, and polar bear). The collar camera system has reported as a useful device for the ecological studies. Before we introduce the collar camera system for our bear study project, we carried out a preliminary study for evaluate practicability of the system. During 2014 to 2017, we deployed two types of the collar cameras (Lotek 7000UC and Hand-made camera) for three free-ranging black bears (two adult males and one adult female) in Okutama Mts. and in Nikko-Ashio Mts. The camera shooting timing was pre-set for fixed interval (e.g., every 1 hr. for 5 min. shooting). In the result, we obtained a total of 45 hr. and 36 min. video clips: an adult male (ID=OM99: 21 hr. and 59min.), an adult male (ID=OM97: 4 hr. and 53 min.) and an adult female (ID=AF19: 18 hr. and 43 min.). We classified the bear behavior into serval categories, and realized that large part of the video clips were occupied by in-active behaviors (i.e., sleeping and resting) especially for those males: OM99 = 84.1%, OM97 = 60.45 and AF19 = 34.2%. Also, we found that considerable part of the video clip views were obstructed (i.e., black out) by the bear body, ground and vegetation: OM99 = 40.1%, OM97 = 74.9% and AF19 = 29.8%. Those results may indicate that a large part of the obtained video clips through the preliminary study was not contained practical information for the behavioral study. This phenomena can be different to previous studies carried out on birds and marine mammals. We therefore concluded to add motion sensor or illuminometer to determine the adequate trigger timing of the camera shooting. We, thus, have starting to develop a modified camera collar system.

Abstract ID: 136

Session:
Bear ecology, behaviour and physiology

EXCEPTIONAL AGGREGATION OF CANTABRIAN BROWN BEARS DURING HYPERPHAGIA

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Abstract
Brown bears are opportunistic omnivores, and aggregations around clumped food resources have been described. Recent research has shown the importance of kin-related social structures in the spatial ecology of bears, particularly matrilineal assemblages. The long-term monitoring carried out in the Cantabrian Mountains (>25 years estimating the minimum number of females with cubs of the year), has allowed us to observe events of spatial tolerance between females with cubs, multiple courtships with up to 5 adult bears involved and low-density concentrations of bears feeding on fruits. But in 2017, during the hyperphagia period, an exceptional aggregation of bears has been observed. Food shortage have been remarkable in this fall. In May 2017, heavy frosts affected the flowering and production of all fruit trees in most of the bear range. However, a small area in the Sil river valley (Northwest of Leon province, north of Spain), with rocky slopes covered with mixed forest and oaks (Quercus petraea, Q. pyrenaica) and altitude between 800 and 1,260 m, kept a good production level of oak acorns, apparently due to orographic and microclimatic reasons. In September, we detected the first 5 bears feeding upon acorns on the trees. Between September 8 and December 19 we dedicated 41 days to the visual monitoring of the bears in the area, locating and filming between 1 and 17 different bears each day. The analysis of videos, field data and simultaneous observations allowed us to identify at least 31 different bears feeding in an area of ca. 50 ha: 18 adults and youngs and 5 different females with cubs. Although some bears showed alert behaviour a few times, no agonistic behaviour was observed, and tolerance, temporal bonds or even play events were registered. This situation supports bear opportunism and behavioural flexibility, and provides new insights on their social structure and the importance of key areas of high trophic quality for bears.

Abstract ID: 146

Session:
Bear ecology, behaviour and physiology

DRUGS ADJUSTMENTS TO OPTIMIZE ANAESTHESIA AND RECOVERY TIMES FOR RADIOTAGGED BROWN BEARS IN GREECE

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Abstract
Brown bear (Ursus arctos) radio-tagging for research purposes is applied in Greece over the last 18 years. In summer 2003 and 2004, we used zolazepam-tiletamine/medetomidine and atipamezole for anaesthesia reversal and faced problems with prolonged recovery time in a densely human populated area. During the following years (2007, 2008, 2011, 2012, 2014) we tried to minimize the quantity of administrated drugs and optimize the immobilization process and timing. In 2003-04, the zolazepam-tiletamine (ZT)/medetomidine (MT) dose ranged from a min of 4,7mg/26μg per kg (of bodyweight) to a max of 11,4mg/64μg/kg with an mean dose of 7,45mg ZT/58μg MT/kg. With this combination the atipamezole initial effects started within 36'(mean), whereas complete bear recovery reached 5h and 19'. In 2007, the combination of ZT/MT ranged from a min of 1mg/3μg/kg to a max of 2.3mg/6μg/ with a mean of 1.48 mg ZT/ 4.5μg MT (sample n=10). The antipamezol dosage ranged from 15μg to 37μg/kg (mean 24μg/kg). Total recovery time dropped to a mean 22.5'. In 2008, ZT/MT was delivered with a min of 0.5mg/3μg/kg to a max of 1.31mg/6μg/kg (mean 1.0mg/3.7μg). The antipamezol ranged from 13μg to 26μg/kg (mean 19μg/kg) (sample n=8).Total bear recovery time dropped to 3-9'(mean 5.5 min). In 2011, ZT/MT was 1.1mg/1μg/kg min to 1.4mg/3μg/kg max (mean 1.2mg/2μg) (sample n=6). The antipamezol dosage ranged from 2μg to 15μg/kg (mean 7μg/kg).Total bear recovery time dropped to 2-8'(mean 4 min 12 sec). In 2012, ZT/MT was from 0.8mg/1μg/kg min to 1.5mg/5μg/kg max (mean 1.1mg/2μg) (sample n=7). The antipamezol dosage ranged from 4μg to 13μg/kg (mean 10μg/kg). Total bear recovery time dropped to 1-6' (mean 4.5 min). In 2014, the combination of ZT / MT ranged from a min of 1.25mg/20μg/kg to a max of 1.78mg/16.4μg and the anaesthesia was completed within 8-11' (sample n=5). We tested and adjusted drug doses for immobilization and recovery of bears, addressing both crew safety and bear welfare issues.

Abstract ID: 152

Session:
Bear ecology, behaviour and physiology

SIMPLE FEEDING HABITS OF BROWN BEARS ON KUNASHIRI ISLAND – A COMPARISON WITH BROWN BEARS IN SHIRETOKO PENINSULA AND SHIRANUKA, HOKKAIDO, JAPAN

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Abstract
Brown bears (Ursus arctos) are distributed on Kunashiri and Etorofu Islands located among the Southern Kuril Islands. Their ecology, however, has not been well understood because of the Northern Territory issue between Japan and Russia. On the other hand, in Hokkaido ecological researches of brown bears have been actively conducted. In this study, we determined C and N isotopic compositions of hair samples from Kunashiri Island, Shiretoko Peninsula, and Shiranuka to clarify the characteristics of feeding habits of brown bears on Kunashiri Island. To estimate their diet in time series, we cut the hair samples into sections from root to tip by 5 mm length, then measured and analyzed them separately. A strong positive correlation between C and N isotopic compositions of hairs from Kunashiri bears was observed, indicating a small variation in food sources. Moreover, all the bears showed a similar isotopic pattern from the hair root to the tip. This pattern suggested that the bears of Kunashiri had a similar feeding history, consuming plants in spring and salmons from summer to autumn. While most of the Shiretoko bears showed a similar pattern to Kunashiri bears, some of the bears had higher C isotopic composition; should be associated with consumption of deer. While no correlations were detected between C and N isotopic compositions, lower N and higher C isotopic compositions were observed on hair samples from Shiranuka bears. This isotopic pattern should be associated with consumption of crops and deer. The pattern of Shiranuka bears indicated that the animals consumed not only plants and salmons but also utilize various food because of influence by the increasing number of deer and human activities. Kunashiri bears were characterized by the simple feeding habits representing abundant salmon and plants, no limitations on their food resources, and no influences of human activities.

Abstract ID: 155

Session:
Bear ecology, behaviour and physiology

CORRECTION FACTORS FOR DIFFERENT FOOD CATEGORIES IN ASIATIC BLACK BEARS BASED ON SCAT ANALYSIS

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Abstract
Asiatic black bears (Ursus Thibetanus), one of the largest carnivores native to Asia, are opportunistic omnivores that feed on a variety of food, including succulent vegetation, insects, berries, hard mast and vertebrates. Our knowledge about their food habits has mainly relied on scat analyses, although this method is often biased by different digestibility of various foods. The study objective was to estimate the correction factors (CFs) that related the dry mass of various food items consumed by Asiatic black bears to the dry mass of the corresponding residues in scats. Four captive adult Asiatic bears (2 males and 2 females) from the Low Altitude Experiment Station of the Endemic Species Research Institute, Taiwan, were fed with 6 different food types: drupes of Machilus zuihoensis, vegetation (sweet potato and water spinach), fruits (apple, papaya, orange and kiwi), chestnut (Castanea mollissima), mealworms (Tenebrio molitor) and mammals (pig meat, bone and skin). Scats were collected for 3 consecutive days. Fecal samples were washed on 2-mm, 1.19-mm and 0.70-mm mesh sieves and the dry mass of their remains were then measured. The mean CFs was 7.1 (±1.9 SD) for chestnut, 9.2 (±3.6 SD) for Machilus zuihoensis, 11.4 (±5.0 SD) for mammal, 16.6 (±4.7 SD) for fruits, 20.3 (±5.7 SD) for vegetation and 32.7 (±18.5 SD) for mealworms, respectively. The CFs was negatively correlated to the dietary fiber content and positively correlated to the apparent digestibility of food items. We also found that other variation may result from different food handling behavior and digestibility among bear individuals. Therefore, we suggested that CFs was an appreciative method for further inference of real food biomass consumed when scat analyses were applied.

Abstract ID: 171

Session:
Bear ecology, behaviour and physiology

RESULTS OF THE LONG-TERM STUDY OF THE BROWN BEAR ECOLOGICAL NICHE IN THE WEST OF EUROPEAN RUSSIA

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Abstract
Based on the example of the brown bear of the Central Forest Nature Reserve and the surrounding areas (south-west of the Valdai Upland, European Russia), we demonstrated the results of studying several aspects of its ecological niche: spatial, temporal and trophic. For 10 years (2008-2018) we conducted studies on the ecology of the brown bear using various approaches. The spatial niche was described using habitat suitability models constructed using two different ways: discriminant analysis and the maximum entropy method. These analyses used 1666 GPS-points of the bear presence and environmental characteristics (multispectral data from the Landsat, relief, landcover typology, anthropogenic impact). Habitat suitability index maps were constructed. The temporal niche was studied using a network of 29 camera traps, according to which the daily and seasonal activity patterns were determined. In the study area bear had cathemeral activity with big diurnal part. The description of the trophic niche of the bear was based on the definition of the diet and the analysis of food relations with other species. The diet was calculated on the basis of an analysis of 474 scats. The most important were apples (EDEC=31.1%), hazelnuts (19.1%), oats (12.5%), mammals (11.1%), blueberries (6.8%) and forbs (4.3%). Detailed field observations on the trophic ecology of the species made it possible to identify the features of consumption of the most important food items and determine their significance. Additional valuable information was obtained with the help of unmanned air vehicles, thanks to which a superhigh resolution survey of the open areas with the greatest HSI for the brown bear was carried out. Together, these aspects were able to present a picture of the ecological niche of the brown bear of the study area, one of the most densely bear populated regions in European Russia. This work was supported by the Russian Foundation for Basic Research, grant № 13-04-00221-a.

Abstract ID: 172

Session:
Bear ecology, behaviour and physiology

ACTIVITY PATTERNS OF THE REINTRODUCED BROWN BEARS (URSUS ARCTOS) IN THE PYRENEES ESTIMATED BY PHOTO-TRAPPING CAMERA

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Abstract
Information on intra-specific activity patterns in non-social species, such as the brown bear (Ursus arctos), is important for understanding behavioral strategies of avoidance among individuals, specially between different age-sex classes during the breeding season. These studies are particularly important in small and reintroduced populations that are growing and recovering in locations with high human activity to apply effective conservation measurements. In this study, we reported the intra-specific activity patterns of the bear population in the Pyrenees (Northern Spain and Southern France), between March 2010 and December 2017, in relation with individual avoidance according to sex (males, solitary females and females with offspring), reproductive class (adults, sub-adults and cubs) and dominant males in the study area (dominant and sub-dominant), using a camera-trap survey. We found strong evidence that activity differed between two reproductive classes, sex and seasons. In general, bears were primarily nocturnal, with crepuscular peaks at 6h and 20h (sundial time); however, we present first evidence for this area suggesting that intra-specific activity differs among individuals as an adaptive behavioral strategy, namely: (1) females with cubs avoid males during the mating season, (2) females with cubs and sub-adults are more diurnal, (3) the activity periods of solitary females and males is similar, and (4) nocturnal activity, in Pyrenees, is a temporary strategy to avoid encounters with humans. Results revealed a high overlap between the activity pattern of males and solitary females, and also between dominant and sub-dominant bears. Indeed, the overlap between males and females with young, and between adult and sub-adult, was lower. These findings support the idea that temporal activity segregation, in the Pyrenees, have become an avoidance strategy among individuals, decreasing the chances of infanticide, and random encounters with humans.

Abstract ID: 173

Session:
Bear ecology, behaviour and physiology

MEASURING THE CONCEPTION RATE VIA EMBRYO RECOVERY FROM UTERUSES OF BROWN BEARS AFTER EMBRYONIC DIAPAUSE

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Abstract
In brown bear females the fertilized ovum remains free-floating in the uterus (embryonic diapause) for up to five months, only attaching to the uterine wall at the beginning of hibernation when the "real" pregnancy begins. Reproductive cycle of brown bear is slow with exact effects on ultimate reproductive success rate is still unknown. Major processes of the reproductive cycle include ovulation, implantation, fetus development, parturition and neonate nurturing. It is of interest to know which of these processes has the greatest effect on the success of the whole cycle. One way to gain insight is to compare the success rates of each of the processes. In majority of domestic mammals, major cause of reproductive failure is early embryonic mortality with a mortality rate up to 40% of fertilized eggs. We examined female sexual organs immediately after being shot in legal hunting. The uterus was flushed with 60 ml of Ringer lactate solution and embryos were microscopically searched in Petri dish. We also searched for presence of corpora lutea (CLs) on ovaries as indicator of mating and ovulation, and compared it with number of recovered embryos. Study was performed in November 2017 when implantation and active development of conceptus should begin since active fetal growth in bear lasts for 60 days and parturition in den is usually in January. Study included 4 adult females that altogether had 8 embryos and 8 CLs. One female had 3 CLs and 3 embryos, two had 2 CLs and 2 embryos each, while one had one CL and one embryo. All embryos were active with significantly more than 200 cells per embryo (activated stage). According to our findings, there was no proof of any embryonic mortality in observed bears after embryonic diapause stage, since number of recovered embryos corresponded with number of CLs. Hence, the conception rate was 100%! Further research is needed to detect precise mechanisms involved in embryonic and fetal development of brown bears.

Abstract ID: 177

Session:
Bear ecology, behaviour and physiology

CAMERA TRAPPING AS TOOL FOR STUDYING THE BROWN BEAR BEHAVIOUR AND AS SUPPORT FOR GENETIC SAMPLING

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Abstract
The Eastern Alps is a sink area for Brown bear (Ursus arctos), between the Dinaric- Pindos and Trentino populations: the study of the behaviour and of habitat use of bears that living in this area represents an important conservation issue. We have studied the behaviour of 12 male bears, on the basis of 800 videos obtained with camera trapping, GPS fixes (from 6 bears radiocollared), every 2-4 hours, and activity data (true acceleration) on two axis, X and Y, every 5 minutes. The videos obtained at feeding points-hair traps (FHT), were analysed to detect the frequency of presence, in different months and hours, at the monitoring sites. The behaviour, observed in the videos, was combined with the activity data (true acceleration obtained from the collars), for defining the numeric interval of true acceleration, corresponding to: resting, feeding and locomotion and genetic analysis. For each hours of the day and in the different month, we have estimated the percentage dedicated to the main behaviour. The bears show different seasonal pattern and data obtained with camera trapping confirm a monthly, daily and hourly pattern. The utilisation of FHT changes with the season and during the fall season the bears seems to reduce the utilisation of artificial food (maize and corn product) points at the hair traps. The integration of GPS fixes, activity data (true acceleration) and camera trapping is a promising approach to study the behaviour and energy requirement, and feeding choice of the brown bear in the Alps and can permit to describe the different individual strategies to utilise the natural and anthropogenic resource of food. The camera trapping can also reduce the amount of samples needed for genetisampling and analysis.

Abstract ID: 179

Session:
Bear ecology, behaviour and physiology

RADIO-CESIUM CONTAMINATION OF ASIAN BLACK BEAR IN FUKUSHIMA, JAPAN

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Abstract
After the TEPCO Fukushima Dai-ichi Nuclear Power Station (FDNPS) accident, a large amount of radionuclides was emitted to the environment and The radionuclides, especially radio-cesium (134Cs and 137Cs) were transported to various ecosystems and were detected in wildlife that lived near the FDNPS. Asian black bear (Ursus thibetanus) which was distributed in Fukushima prefecture was also contaminated by radionuclides and radio-cesium activity concentration of the bear muscle exceed the limit of radio-cesium activity concentration in general food (100 Bq/kg). To elucidate and prevent the risk of radionuclide contamination in wildlife, it is important to understand the variation of radionuclides in wildlife. However, few studies on radionuclide transfer of bear species have been conducted. In this study, we focused on the 137Cs contamination of Asian black bear in Fukushima prefecture after the accident, especially factors effect on individual variation. We measured 137Cs activity concentration of bear muscles (muscle 137Cs) that were killed by hunting or nuisance kills in Fukushima Prefecture from May 2011 to March 2016. Then, we analyzed relationships between muscle 137Cs and 137Cs ground deposition in the soil at the kill site (soil 137Cs), using liner mixed model (LMM). In addition, we analyzed seasonal variation of muscle 137Cs using generalized additive mixed model (GAMM). We also estimated total dose rate from muscle 137Cs and soil 137Cs using ERICA tool. In the results, muscle 137Cs was positively related to soil 137Cs, which corroborates the results from previous studies of other species. The GAMM showed that muscle 137Cs varied seasonally, that muscle 137Cs decreased from spring toearly autumn, before increasing to winter. These results suggested the variation of 137Cs contamination in Asian black bear were influenced by 137Cs contamination level of habitat and seasonal variation of diet, habitat use, and physiology.

Abstract ID: 186

Session:
Bear ecology, behaviour and physiology

LONGTERM PAIN AND ANTI-INFLAMMATORY TREATMENT WITH MAVACOXIB IN BROWN BEARS (URSUS ARCTOS)

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Abstract
Pain and inflammation from arthritis and chronic arthrosis is often diagnosed in rehabilitated or geriatric bears in captivity. A daily use of painkillers and anti-inflammatory drugs is normally prescribed to maintain the wellbeing of an aging individual. Meloxicam and Carprofen are commonly used non-steroidal anti-inflammatory drugs (NSAID) in veterinary practice and the most prescribed painkillers used in bears for chronic pain. However, in the period before hibernation, captive bears often tend not to respond to their daily routines, and during hibernation itself daily routines are obviously absent. Hence, during these weeks or months, no painkiller or anti-inflammatory drug can be given and no information exists about the development of the disease or the perception of pain during this time. Mavacoxib is a selective cyclooxygenase-2 (COX-2) inhibitor, with a very good painkilling and anti-inflammatory action in dogs. Due to its selectivity towards COX-2, almost no side effects, like renal or gastrointestinal tract problems, are seen in dogs. After reaching an appropriate plasma level, it remains active for up to one month. Hence, only once a month a tablet has to be given. We closely observed six bears in captivity with known arthritic pathologies. All bears responded appropriately to the pain management plan with Mavacoxib (2 mg/kg once, repeated after 14 days and then every 28 days), showing signs of pain relief and increased welfare. None showed signs of discomfort or typical side effects from long term NSAID treatment (vomition, melena, gastric ulcerations, renal failure). Two individuals had to be euthanized after 1.2 years and 2.1 years of continuous Mavacoxib treatment, due to further geriatric pathologies. No abnormality was seen histologically in the GI tract or kidneys, which could normally be associated to chronic painkilling treatments. Mavacoxib is becoming a popular drug, used in geriatric, chronic pain patients, with no major side effects.

Abstract ID: 187

Session:
Bear ecology, behaviour and physiology

SEASONAL ALOPECIA IN A POLAR BEAR (URSUS MARITIMUS) FEMALE

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Abstract
A female polar bear was presented with recurrent seasonal alopecia from September to February. The first symptoms start in August with pruritus and stereotypies, and hypotrichosis develops in October. In January the hair loss reaches a peak and is characterized by symmetrical alopecia with partly bald areas. From February onwards, the hair starts to regrow and the bear has a normal fur from April to August (observed from 2010 – 2017). Diagnostics included skin biopsies, exclusion of ectoparasites and fungi, haematology, serum biochemistry, hormones (progesterone, estrogen, testosterone, cortison, trijodidthyronin, thyroxin), vitamin and heavy metal status. All parameters were within published references or negative. Histological examination of skin biopsies from completely alopecic regions revealed a complete absence of hair follicles, a moderate perivascular, mainly lymphocytic and plasmacellular infiltrate, a partially parakeratotic and partially orthokeratotitc hyperkeratosis associated with a moderate epidermal hyperplasia and hyperpigmentation. The animal was treated with 0.4mg/kg/day Oclacitinib (Apoquel, Zoetis, Switzerland) from July to February. Apart from a period of two weeks in September, no itching and stereotypies could be observed. For the first time, she had almost normal fur throughout the winter, although symmetric thinner hair quality was seen in some areas, while no areas were completely bald anymore. The alopecia seems to be the consequence of an atopic dermatitis-like inflammatory reaction of yet unknown cause. In the following year, the bear was treated with 0.012mg Buserelin (Receptal, Swissmedic) in April, to induce ovulation. The female ovulated, showed signs of pregnancy or pseudopregnancy, showed denning behaviour for 45days and did not show any signs of the above mentioned pathologies like itching, stereotyping, alopecia. We assume the disease is multifactorial and one factor might be a progesterone deficiency in autumn.

Abstract ID: 188

Session:
Bear ecology, behaviour and physiology

PROTEIN ELECTROPHORESIS IN BROWN BEARS IN CROATIA

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Abstract
Serum protein electrophoresis is used as a routine test for health assessment in veterinary medicine. The aim of this study was to determine serum protein fractions using agarose gel electrophoresis and to compare the results with available literature. The study included 21 brown bears, 17 free-living and 4 captive animals (8 females and 13 males). Serum samples were collected during 2015 and 2016 from free-living bears while capturing and radio-collaring and from captive ones during veterinary procedures. Serum protein electrophoresis yielded five protein fractions; albumin (A), α1-globulin, α2-globulin, β-globulin, γ- globulin, and albumin-globulin ratio (A/G), while globulins (G) were calculated. Results showed that females had significantly higher absolute values (g/L) for A and A/G, while males had significantly higher absolute values (g/L) for total proteins, G and γ- globulin as well as significantly higher relative value (%) for γ- globulin. Free-living bears had significantly higher absolute values (g/L) for A and A/G as well as significantly higher relative value (%) for A compared to captive animals. Captive bears had significantly higher both absolute (g/L) and relative value (%) for γ- globulin. Younger animals (yearlings and subadults) had lower values for total proteins (g/L) and γ- globulins (g/L) than adults. Our results (g/L) for total proteins and γ- globulins in younger animals were higher than reference values for yearling brown bears in Sweden. Also, our results for α2-globulin and β globulin in adults were higher and A/G ratio was lower than reference values for adult brown bears in Sweden. Changed albumin/globulin ratio is one of the first signs of protein composition disorder. Lower A/G ratio found in free-living animals could be due to capturing method and time spent in the snare, therefore we recommend taking all possible measures for shortening the time from the moment of capturing by snare till immobilization of bears.

Abstract ID: 193

Session:
Bear ecology, behaviour and physiology

INSIGHT INTO CROATIAN BROWN BEARS HEALTH STATUS FROM LIVER AND MUSCLE FATTY ACID COMPOSITION PERSPECTIVE

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Abstract
Presence or absence, together with different ratios of some fatty acids (FA), especially essential FA in tissues, can give an important insight into health status. To our knowledge FA composition of brown bear liver and muscles was not investigated until now, so the objective of this study was to determine the FA composition of liver (L), m. gluteus superficialis (MG), m. semitendinosus (MS) and m. vastus lateralis (MV). The study was conducted on 38 animals (11 females, F; 27 males, M). Thirty-three samples of L, 18 of MG, 17 of MS and 15 of MV were collected during the legal hunting season (March-May; September-December 2015) and 5 L, 6 MG and MS and 5 MV samples (all M) were collected following interventional shooting or after vehicle collision (non hunted bears). Tissue samples were homogenized, total lipids extracted than composition of FA was determined by gas chromatography. Significantly higher percentage of C18:3n-3 was found in J in F in spring (N=8) than in M (N=19). Significantly higher percentage of C18:2n-6 was found in MG, MS and MV in F (N=4; N=3, respectively) in spring compared to M (N=13, 14 and 12, respectively). Significantly higher percentage of C15:0 in MS and C20:5n-3/C22:6n-3 ration in MV was found in F in spring (N=3, respectively) compared to M (N=9, 10, respectively) in both muscles. When comparing important FA representation in tissues of hunted (N=9) to non hunted bears (N=5), in hunted subadult M significantly higher percentage of C22:6n-3 were found in MS while significantly higher percentages of C15:0, C20:4n-6/C20:5n-3 in MV. FA such as C15:0, C18:2n-6, C18:3n-3, C20:4n-6, C20:5n-3 and C22:6n-3 have a positive association with an individual's health and are required for normal physiological functions linked to membrane integrity and regulatory cell signals. Larger samples size is needed, but results show importance in respect of securing the availability of natural foods and taking more care about the food given at feeding sites.

Abstract ID: 195

Session:
Bear ecology, behaviour and physiology

THE EFFECT OF ANATOLIAN HIGHWAY ON WILDLIFE: PRELIMINARY RESULTS FOR BROWN BEAR

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Abstract
Turkey is a developing country, and there are ongoing vast investments on infrastructure projects, especially highways, which have reached to 17,000 kms. in the last decade. However, their effects on Anatolian wildlife and especially large mammals have not yet been assessed. The present study is an intensive and an initial project covering the underpasses along the highway connecting Ankara and Istanbul, which are two major provinces in Turkey. To determine the effect of highway on the brown bear population in the surrounding forest, 4 brown bear individuals were captured and collared at the region; and camera-trapping surveys conducted between April 2017-September 2017 with more than 75 camera-traps. Camera-trap stations were placed systematically at the adjacent forest habitats at the both sides of the road, and also at each underpass of the highway. The results in general show that the existing underpasses serve to carnivores more than herbivore species in the region. Although the use of underpasses by brown bear has been documented by underpass-located camera traps, the comparative analysis of underpass and systematic camera trap data, in addition to the spatial area use of collared individuals, reveals that the highway restricts the movement of the brown bear in the region.

Abstract ID: 197

Session:
Bear ecology, behaviour and physiology

HAIR CORTISOL LEVEL IN THE DIFFERENT GENOTYPES OF BROWN BEAR IN THE EASTERN ALPS

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Abstract
The cortisol levels reflect the degree of activation of the HPA axis in response to the animal's energy needs and are therefore a measure of its well-being. We have analysed the level of cortisol, from hair samples of 9 different genotypes of brown bear, 3 of them collared with GPS systems, identified from 2004 to 2016 in the Eastern Alps- Friuli Venezia Giulia region – Italy. The hair samples were collected with hair traps for genetic monitoring and during capturing session. We have studied the level of cortisol present in bear's hair to test significant differences for different periods of the year, genotypes and presence of collar. According to this study, the levels of cortisol in bear hair appear to change from a minimum of 1.5pg /mg to a maximum of 28.11pg /mg, with an average of 7.92g /mg. In some individuals the cortisol values change in the different areas of the body, indicating that sampling in the different areas is not indifferent (CV=0,34). The cortisol level grows, as average, from winter (5.51 pg/mg) to spring (7.76 pg/mg) and summer (9.41 pg/mg). No significative effects were founded between genotypes and presence or absence of collar. The cortisol assessments have to integrate to the normal monitoring techniques to achieve important information on the physiological status of the single individuals in relation to environmental factors and effect of the collar. The sampling of hairs, by hair traps for genetic sampling, should supported by camera trapping to detect from which parts of the body the samples come.

Abstract ID: 199

Session:
Bear ecology, behaviour and physiology

PEDE-MARKING OF ANDEAN BEARS IN ECUADORIAN CLOUD FORESTS

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Abstract
According to the growing scientific evidence, the main function of chemical signaling in bears is indirect intraspecific communication. Pede-marking is one of the behavioral displays of scent marking, and recent research has shown that represents yet another way of communication in brown bears. While pede-marking, brown and sloth bears apply scent from their pedal glands by twisting their feet into the ground. So far, we have described that Andean bears rub different parts of their bodies against trees and objects. Here we present the first description of Andean bear pede-marking as part of the project 'Marking behavior, population density estimates, and terrain use of Andean bears – generating knowledge for the conservation of a threatened umbrella species'. Since 2016, we have been video-recording two populations of Andean bears with camera traps in two study areas in cloud forests of Ecuador. In both study areas we have been monitoring 7 marking sites with highest bear marking activity, as well as 6 established experimental sites. On these experimental sites, we applied faeces of a captive adult male bear on trees of different species and diameters, that were not previously scent-marked by bears. So far, we recorded 3 male bears in study area 1, and 4 males in study area 2, pede-marking. Bears walked with stiff-legged gait and were twisting their feet into the ground. Bears were pede-marking with their both hind legs but we also recorded quadrupedal marking. Pede-marking occurred while bears were standing, walking forward, or walking backward. On experimental sites, bears pede-marked after sniffing the captive male faeces. On regular marking sites bears pede-marked after another male rubbed the marked tree or a female passed the site. Although our evidence is preliminary, we suggest that pede-marking in Andean bears is a means of intraspecific communication.

Abstract ID: 207

Session:
Bear ecology, behaviour and physiology

WHO'S THE BOSS HERE? FIRST RESULTS OF AN ANDEAN BEAR EXPERIMENTAL STUDY

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Abstract
Recent studies show that Andean bears, similarly to other ursids, scent-mark trees and objects. Previously we suggested that Andean bears communicate with each other in this way, however, the functional significance of scent marking remains unexplained. Therefore we established 3 experimental sites in cloud and mountain forests in the South of Ecuador as part of the project 'Marking behavior, population density estimates, and terrain use of Andean bears – generating knowledge for the conservation of a threatened umbrella species'. Here we present behavioral responses of a wild Andean bear population to the scent of a captive male Andean bear, 'the stranger', on the experimental sites. For experimental sites we chose a group of trees along bear trails that were not previously scent-marked. On each site we installed 2 camera traps that were video-recording the group of trees for 6 consecutive months. Then we rubbed 3 experimental trees of different species and diameters with faeces of the captive male forming in this way 4 diametral rings at heights of 0.5m, 1m, 1.5m, and 2m from the ground. Fifteen individuals passed or scent-marked the experimental trees. Ten (66.7%) individuals sniffed the experimental trees. Four male bears (26.6%) scent-marked the experimental trees by i) Facial marking, ii) dorsal orientation, iii) dorsal marking, iv) ventral orientation, v) ventral marking and iv) pede-marking. Our results show that male Andean bears react to 'the stranger's' scent by scent marking, i.e. covering the 'stranger's' scent by its own scent. Although our research is still ongoing, we suggest that male Andean bears communicate dominance in this way.

Abstract ID: 7

Session:
Bears and climate change

RESPONSES OF A BROWN BEAR POPULATION TO CLIMATE CHANGE BASED ON PREDICTABLE FOOD RESOURCE ALTERATIONS

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Abstract
Survival of an increasingly number of species is threatened by climate change, which can produce range shifts or even extinction if global warming keeps rising. Plants are among the most vulnerable groups to this phenomenon, due to their limited ability to follow suitable environmental conditions. Plant range shifts may cause animal species at higher trophic levels, which rely on plant availability, to be affected by patterns of population declines or extinction cascades via bottom-up effects. In case of small and isolated animal populations, effects of climate change on their trophic resources may greatly override conservation and management effort performed at other levels. Brown bears Ursus arctos dedicate much effort to foraging on plants, particularly in temperate forested habitats, with bears in the south-western Europe being among the most vegetarian of European populations. Some evidence exists that, in the endangered brown bear population of NW Spain (Cantabrian Mountains), changes in bear diet and land use in relation to changing climate conditions have already occurred. The aim of this study is to conduct an assessment on the potential impact of climate change on the future distribution and viability of this brown bear population. Here, based on the long-term field survey on bear distribution and the latest climate projections, we applied both abiotic and biotic variables to bioclimatic models to predict potential changes in the spatial distribution of the bear population and its main food resources and shelter (i.e., beech Fagus sylvatica, blueberry Vaccinium myrtillus, chestnut Castanea sativa, pedunculate oak Quercus robur, Pyrenean oak Quercus pyrenaica, scots pine Pinus sylvestris, sessile oak Quercus petraea) in this century. Predicted range shifts of plants might determine range shift of brown bear from wilder mountainous areas towards more humanised areas, where we can expect an increase in both conflicts with humans and bear mortality rates.

Abstract ID: 2

Session:
Bears and society

ALBERTA BEARSMART IN THE PEACE REGION

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Abstract
Established in 2008, Alberta BearSmart is a proactive educational outreach program to raise awareness of various audiences about bear biology and how to reduce or prevent conflicts and stay safe in bear country. The program uses standardized messaging and products developed for communities, recreationists. agriculture and industry, and delivered by Government of Alberta staff, non-profit organizations, municipal governments, and individuals. Engaging people in this program is vital for both black bear and grizzly bear management. This presentation provides an overview of the Alberta BearSmart programming province-wide, and then focuses on implementation in the Northwest Peace Region, an expansive area with varied human land use, cultural influence, and human-bear interactions. We discuss the policy and practical challenges of implementing this educational outreach program, how our work links to Grizzly Bear Recovery, and evaluation needs. We close with highlighting how ingenuity and collaboration have helped us achieving objectives, and provide suggestions for future work.

Abstract ID: 4

Session:
Bears and society

GRIZZTRACKER: AN INNOVATIVE CITIZEN SCIENCE AND EDUCATIONAL PROGRAM

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Abstract
Grizzly bear population size and distribution is currently not well known in Northwest Alberta. Local government staff routinely receive reports of sighting grizzly bears from community members, Indigenous Peoples, industry and forestry personnel. While helpful at signalling the presence of bears, these reports are not necessarily useful in science-based management given their opportunistic nature. To address this issue, the Northwest Grizzly Bear Team, a collaborative working group comprised of government, industry, non-government organizations and public, developed an innovative citizen science program called GrizzTracker. This smartphone app uses systematically collects citizen-reported observations of grizzly bears across Bear Management Area 1, and innovatively collects observer effort data through the phone's internal GPS system, greatly improving the utility of otherwise opportunistic reports. This program also includes an educational website and online mapping tool, to share updates, bear pictures and mapped products. This presentation reviews the processes, challenges and benefits of developing a citizen science program, including policy limitations and financial needs, engaging audiences, app design and launch, use of data collection in decision-making, raising awareness of grizzly bear biology and scientific methods and processes, and bear safety. Moreover, and importantly, this presentation discusses how working together can strengthen relationships between organizations and individuals with the aim of fostering a stewardship ethic, and recognizes the role of public participation in scientific research for achieving wildlife management.

Abstract ID: 26

Session:
Bears and society

IS THE BROWN BEAR WANTED IN LATVIA?

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Abstract
The population of the brown bear in Latvia, although still being rather small and estimated at 20-50 individuals, is gradually expanding, mostly thanks to influx from Estonia and Russia. It is a new challenge for the society of Latvia, where most of people are related to the countryside on a certain extent. Casual communication to various people reflect very diverse attitude to the species, starting from acceptance and ending with fear from a potentially dangerous predator. To obtain reliable and measurable results on the attitude of the society, a comprehensive survey was performed in 2017 during the development of the action plans for the three large carnivores in Latvia: wolf, lynx and brown bear. A questionnaire was designed consisting of four sections: Large predators and the society (22 questions), Nature and the society (6 questions), a special section for hunters (5 questions) and a special section for farmers and beekeepers (11 questions). In addition, respondents provided some information about themselves (8 questions). The questionnaire was distributed through schools involving all family members of pupils, as well as hunting societies. In total, 595 respondents from the general public and 560 from the hunters have sent in filled questionnaires. The survey confirmed that the society was rather tolerant of the species and had a good understanding about the current population size (21.7% reflecting the official scientist opinion and 56.4% marking it lower), as well as was aware about the main distribution regions. Mostly having neutral (42.8%) or positive (39.6%) attitude against the brown bear, 47.6% believed that the population should be maintained at the current level and 24.8% voted for a slight increase. In addition, 72.4% of the respondents noted that Latvia has responsibility in maintenance the bear population in the Baltic Region.

Abstract ID: 34

Session:
Bears and society

WILDLIFE CORRIDORS AND ECOLOGICAL CONNECTIVITY CONSERVATION ON A STRATEGIC VISION AND POLICY SCALE THROUGH THE IDENTIFICATION, MONITORING AND EFFECTIVE MANAGEMENT IN ROMANIA

Ancuta Fedorca, Mihai Fedorca, Georgeta Ionescu, Roxana Cazacu, Marius Popa

National Research and Development Institute in Forestry Marin Dracea, Romania

Abstract
At the moment, human activities, infrastructure development and habitats fragmentation give birth to major challenges in elaborating conservation strategies and ensuring connectivity of large carnivore's populations. Conservation and management efforts needs to be expanded into large landscape scale, also considering the new IUCN designation of Areas of Connectivity Conservation (ACC – currently under review). Thus, we need to highlight the importance of a well-connected protected areas system and adding connectivity into national legislations. In the Romanian legislation, ecological corridors designation, management and monitoring were defined within the OUG no. 57/2007 (with modifications in the law no. 49/2011), however a clear procedure on how to implement this at various levels was lacking. During 2016-2017 together with the stakeholder's we worked on improving cooperation between competent authorities in order to ensure connectivity and to include the necessary aspects for the recognition of brown bear ecological corridors in various sectorial policies (agriculture, water management, forest management, territory and urban planning). By sharing values among stakeholders our joint initiative and experience became very important in supporting the resilience of brown bear population and associated ecosystem services, elaborating adaptive management measures and advocating for policies, plans and strategies that champion large landscape conservation.

Abstract ID: 50

Session:
Bears and society

BEAR VIEWING BEST PRACTICES AND CHALLENGES FACED IN CHINITNA BAY, ALASKA (LAKE CLARK NATIONAL PARK AND PRESERVE)

Jason Rupp

Alaska Bear Camp

Abstract
Chinitna Bay, Alaska, which is part of the 4,000,000 acre (1,631,000 hectares) federally-protected Lake Clark National Park and Preserve, has over the past decade become one of the most popular bear viewing destinations in all of Alaska. During the summer in this small bay, a combination of protein- rich sedge meadows, many active salmon streams, as well as numerous other food sources has created a concentration of hundreds of brown bears in the area. I currently work as the Lead Bear Viewing Guide for a small private company called Alaska Bear Camp, which is located in Chinitna Bay and is surrounded by Lake Clark National Park on all sides. Every summer for the past twenty years Alaska Bear Camp has set up a remote camp out there, where people fly out to in a bush plane from all over the world to experience the maginifcence of the brown bears and the Alaskan wilderness, and where for a few days and nights they truly live among the bears. The presentation will briefly cover the following topics- an overview of Lake Clark National Park and Preserve and the increase in bear viewing activity within the Park; an overview of Alaska Bear Camp and its history; description of the unique brown bear activity in the area; best practices set forward by Lake Clark National Park; best practices that Alaska Bear Camp has discovered to work best over the past few years: type of training we go through; current challanges faced in regards to safe and ethical bear viewing: and finally a few recommendations on how to sucessfully improve bear viewing as a whole both locally and internationally.

Abstract ID: 63

Session:
Bears and society

THE MARSICAN BROWN BEAR (URSUS ARCTOS MARSICANUS): A FLAGSHIP SPECIES FOR REWILDING IN THE CENTRAL APENNINES

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Abstract
The Marsican bear is a critically endangered subspecies of the brown bear in Italy. Taking advantage of its high ecological value and public visibility we set up a project in the Central Apennines, to promote bear conservation and rewilding in the area, with a special focus on important habitat corridors between the national and regional parks. From 2012 – 2018 we carried out the following actions:
• Establishment of a first Bear Smart Community through the provision of electric fences and bear-proof waste bins. This action resulted in a 99.8% reduction of bear-induced damages by 2017 and the moving away of food-conditioned brown bears from human settlements.
• Extensive canine vaccination campaign, during which >3,000 dogs were treated; since then no disease transmission to bears has been recorded. • Lobbying against the development of habitat-damaging infrastructure (i.e., hydropower station at Aventino river, wind turbines in wildlife connection areas). • Anti-poaching activities during which a female bear was freed from a snare. • Mitigation of bear – vehicle collisions through the installation of technical mitigation measures and a speed reduction at Road SR83.• Increasing production of abandoned orchards through the pruning of 200 fruit trees, to drive bears away from other food sources.• Reducing bear – beekeeping conflicts by securing 6 apiaries with electric fences, compensating damage to non-secured properties and promoting bear smart practices. • Promotion of bear-friendly products, thus creating an incentive for local entrepreneurs to protect bears. • Public awareness and education campaigns (i.e., 3 educational activities with schools and 5 public events/year) to improve human – bear co-existence. Our conservation approach has contributed to halting the decline of the Marsican bear, but also benefited other local wildlife, thus improving the overall biodiversity status of the Central Apennines.

Abstract ID: 68

Session:
Bears and society

EFFECT OF DISSEMINATING CONSERVATION EDUCATION AMONG THE VULNERABLE COMMUNITY OF ODISHA, INDIA

Prakash Mardaraj

PRAVA

Abstract
Education plays an important role in reducing the conflicts if proper communication strategies along with management interventions are adopted. This paper deals with different successful perspectives of participatory processes and, briefly, the key elements of enabling sloth bear environments protection. We concentrated in 12 villages around the sloth bear affected villages in the study area. We conducted school level painting competitions among the selected 31 students from 12 schools participated. The goal of initiating conservation ethics among the children and aware them about the sloth bear and its habitat which was achieved. Training programmes for locals with the forest field staffs in Swarnachuda and Mitrapur RF were performed, the forest dwellers and the front level field staff were trained to resolve the conflict situation. With the successful implementation of the training programs, four sloth bear rescue operations were conducted jointly with the help of villagers. With the awareness and education programmes in the conflict villages, the local people helped the staff in saving the bear instead of retaliation killing. we are working more in the constitution of village committees which would help in confidence building and creation of awareness among the people of the affected areas through more outreach programmes. Participation is sometimes difficult but the rewards of truly participatory processes can be impressive, particularly if forests are conserved effectively. This will greatly help conservation of sloth bears in the Nilgiri Range which is highly affected by human sloth bear interactions in Balasore Wildlife Division of Odisha, India.

Abstract ID: 76

Session:
Bears and society

THE EUROPEAN UNION LEGISLATION AND THE CHALLENGES OF POPULATION LEVEL MANAGEMENT OF BROWN BEAR IN THE ALPINE-DINARIC REGION

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Abstract
The Habitats Directive requires from member states to set up strict protection system for brown bear. In 1992 when the Directive entries into force there were only islolated populations of brown bear in 3 member states (Spain, France and Italy). The situation changed completely after accession of new member states from Finland and Sweden, Baltic states, Poland, Czech Republic, Slovakia, Slovenia, Croatia and Romania, when essential parts of brown bear populations become part of the jurisdiction of the EU legislation. The contribution focuses the situation in the Alpine-Dinaric region with great natural differences between Alpine and Dinaric part, as well as tradition in co-existence. Additionally the population is within different countries with different legal systems, competent authorities, different management approaches but rather common problems. The Habitat directive is giving rather rigid legal frame, but on the other hand it gives some freedom to national authorities to reach the Directives goal. But population level co-ordination is essential, thus support of research, knowledge, European Commission guidance documents are helpful for member states and relevant candidate/accession countries in the region. The legal challenge remains how to manage regularly brown bear population within the strict protection regime and how to reach population management goals within different national legal and organisational circumstances. The contribution is dealing with current situation and suggestions for implementing population level management in the Alpine – Dinaric region through supra national co-ordination of national instruments.

Abstract ID: 77

Session:
Bears and society

GRIZZLY BEAR RECOVERY IN THE LOWER-48 UNITED STATES: REQUIREMENTS UNDER ENDANGERED SPECIES ACT

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Abstract
There are many common misconceptions about Recovery Plan requirements under the Endangered Species Act (Act). The act has three major facets: the five-factor analysis for listing/delisting decisions, recovery plans, and post-delisting monitoring plans. The Act requires the U.S. Fish and Wildlife Service (Service) to determine if a species is warranted for listing as endangered or threatened or recovered based on a five-factor analysis. These factors include habitat destruction and modification, disease or predation, overutilization, inadequacy of existing regulatory mechanisms, and other natural or manmade factors. Once a species is listed, the Service is required to develop and implement recovery plans for endangered and threatened species, unless it would not promote the conservation of the species. Recovery Plans are guidance documents that must include site-specific management actions; objective and measurable criteria; and an estimate of the time and cost required to implement the recovery plan. Upon delisting a species, the Service must develop a Post Delisting Monitoring Plan and monitor a species for at least 5 years. The Service frequently receives questions and comments from partner agencies and the public about the 2975 listing of grizzly bears as a threatened species in the lowe-48 United States, the Grizzly Bear Recovery Plan, Conservation Strategies, and Post-Delisting Monitoring Plans. The Service identified six ecosystems for potential recovery in the original listing and subsequent recovery plans. This presentation will address frequently asked recovery plan questions, such as: When does the Service have to update recovery plans? Do all recovery criteria have to be met to remove a species from the list of endangered and threatened wildlife? Do the ecosystems in identified in the Recovery Plan qualify as Distinct Population Segments? What is the intent of the Service for grizzly bear recovery in the future?

Abstract ID: 99

Session:
Bears and society

UNDERSTANDING THE PREVALENCE OF BEAR PART CONSUMPTION IN CAMBODIA: A COMPARISON OF SPECIALISED QUESTIONING TECHNIQUES

Elizabeth Oneita Davis[1,2], Brian Crudge[3], Jenny Anne Glikman[2], Thona Lim[3], David O'Connor[2], Vichet Roth[3,4], Matt Hunt[3]

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Abstract
The trade in bear parts for medicine and for status is a conservation challenge throughout Asia. The Asiatic black bear (Ursus thibetanus) and the sun bear (Helarctos malayanus) are endemic to this region, and populations are estimated to have declined throughout their ranges due to widespread illegal killing of bears and trade in parts, combined with loss of habitat. Previous studies have indicated that legislation alone is insufficient to prevent illegal hunting and trade, indicating instead a need to address demand for bear parts and products. We conducted mixed-method surveys in Cambodia to understand the attitudes and beliefs individuals hold towards bears, as well as the key motivators for individuals to consume bear parts. Bear part use is illegal in Cambodia and may therefore be considered a sensitive behaviour, in that individuals may be reluctant to admit to it. To counteract possible biases, four specialised questioning techniques were used in this study: randomised response technique (RRT), unmatched count technique (UCT), nominative technique (NT), and false consensus bias (FCB). All four methods serve to shield a respondent's admittance of a sensitive behaviour from the interviewer. The results presented here show that great variability exists in anonymous methods' efficacy in certain contexts. However, the results overall indicate that individuals in Cambodia are under-reporting their consumption of bear parts when directly asked, and that the prevalence of bear part use in Cambodia may be as high as 15% of the population, representing a significant conservation challenge.

Abstract ID: 113

Session:
Bears and society

HAVE A CROSS TO BEAR: DETERMINATION OF FACTORS OF CONFLICT BETWEEN BROWN BEAR (URSUS ARCTOS) AND HUMANS IN SLOVENIA

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Abstract
The brown bear (Ursus arctos) is Slovenian largest carnivore, whose habitat overlaps with the area of human activity, therefore interactions on different levels are inevitable. To maintain successful and sustainable coexistence of humans and the brown bear low level of conflicts should be kept. In order to achieve that it is essential to monitor different stakeholders' opinions since they live and work in the same area. Furthermore, it is crucial to analyse collected data and to plan further actions according to conclusions. The aim of the study* has been determination of a meaning of the conflict between the humans and the brown bear. In total 1209 questionnaires have been included in the study. A spectrum of human-bear conflict situations identified through focus group discussions was shaped intoa questionnaire and respondents assessed how problematic or likeable was the situation for them personally on a 5-point scale. Factor analysis identified two components which were interpreted as "perceived threat" and "economic damages" and later on used to determine a conflict. Components have been analysed against following independent factors: study area (Dinarics, Alps), sociodemographic factors (age, gender, education), belonging to a stakeholder group (hunter, beekeeper, farmer), personal experiences with the bears and knowledge about the bears. Regardless of mentioned factors, respondents scored positively on "perceived threat" component, meaning that majority actually appreciates "perceived threat" situations such as "seeing bear tracks in nearby forest". On the other hand, "economic damages" has been assessed as problematic by all groups, especially those in Dinaric Mts. - study area with high density of bears. Therefore, for sustainable coexistence actions that tackle the issue of preventing damages caused by the brown bear are proposed, starting with raising awareness of damage prevention. *The study has been conducted as a part of project LIFE DINALP BEAR.

Abstract ID: 140

Session:
Bears and society

LOLA THE BEAR: THE HISTORY OF PROTECTION, EXTERMINATION AND WORLD'S FIRST LARGE CARNIVORE REINTRODUCTION

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Abstract
Understanding how relationships between large carnivores and humans have evolved and been managed through centuries can provide relevant insights for their conservation. In the past, the status of many large carnivores have followed a similar pattern, from royal game to persecuted as pest, with subsequent local extinctions followed by reintroductions. Here, we describe a widely shared history of large carnivore management, exemplified by a site-specific history of brown bear Ursus arctos in Central Europe's Białowieża Forest based on a detailed survey of historical literature and Russian archives. From the end of the Middle Ages to the end of 18th century, the brown bear was considered animalia superiora (i.e., game exclusively reserved for nobility and protected by law). Bears were not considered as a threat; they were a source of public entertainment and measures against damages to forest beekeeping were implemented at that time. In the beginning of 19th century, bears became a main target of hunters due to their valuable pelt. This, together with an effective anti-carnivore policy enhanced by bounties, led to bear extirpation in 1879. Different approaches to scientific game management appeared (planned extermination vs sustainable hunting. Bear reintroduction in Białowieża Forest began in 1937 and represented the world's first reintroduction of a large carnivore motivated by conservation goals. The outbreak of WWII spoiled what might have been a successful project; reproduction in the wild was documented for 8 years and bear presence for 13. Soft release of cubs born in captivity inside the forest but freely roaming with minimal human contact proved successful. Release of captive human-habituated bears, feeding them, and the lack of involvement of local communities were weaknesses of the project. Large carnivores are key components of ecosystem-function restoration, and site-specific histories provide important lessons in how to preserve them for the future.

Abstract ID: 148

Session:
Bears and society

ECOTOURISM TO SUPPORT BROWN BEAR CONSERVATION EFFORTS IN GREECE.

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Abstract
Carnivore-human conflict is one of the most challenging issues in wildlife. This type of conflict is expressed intensely in rural communities which suffer substantial and diverse costs from carnivore presence. Ecotourism development has arisen as part of the solution, translating the global value of carnivores into tangible local benefits, i.e. financial incentives. In 2014, CALLISTO and "Natural Greece" co-designed and ran a pilot ecotourism project which supports brown bear (Ursus arctos) conservation efforts. Ever since, this project has been contributing to the resolution of human-bear conflicts by supporting local economies in areas with pronounced bear presence, as well as by funding initiatives for coexistence, e.g. CALLISTO's Livestock Guarding Dog Network. Throughout this project, animal welfare and ethics in wildlife interactions have been a major concern; thus, bear watching is left to chance and not guaranteed. Specifically, activities focus on bio-indices and display of scientific monitoring methods, i.e. camera-trapping and telemetry. Bear experts serve as guides and provide information on bear biology, ecology, and behavior as well as on the natural and cultural features of the area.The project provides a choice between a 5 and 8-day program. So far, 57 travelers allocated in 11 groups, have visited bear habitat in Northern Pindos Mt range and became familiar with local people and traditions. Participants are mostly over-50 travelers from developed countries (UK, USA, Australia etc.) with a higher-educational profile. Solo-travelers, couples, families and groups have chosen this wildlife escape and rated this project as a 5-star experience. There been noticeable increase in travelers participating in wildlife recreational programs and well-designed ecotourism projects seem to make a change in attitudes towards wildlife conservation in local communities, highlighting the effectiveness of ecotourism in conflict resolution

Abstract ID: 153

Session:
Bears and society

'LIVING WITH BEARS – EXAMPLES FROM A NON-BEAR COUNTRY'

Koen Cuyten

Bears in Mind - Project Coordinator

Abstract
The natural habitat of wild bears is disappearing fast and is becoming ever more fragmented. Human-bear conflicts are on the increase as human populations are expanding into the bears' range. For the past 25 years Bears in Mind, a Dutch-based NGO, has been able to support a wide variety of conservation, education and ex-situ bear-related projects. With the invaluable commitment of its local partners, most of the eight bear species have been at the core ofthe financial contributions by Bears in Mind and received expert input in order to improve the bears' wild habitat, human-bear coexistence or overall welfare status in captivity. From the cloud forests of the Ecuadorian Andes where a team of young researchers investigates the marking behaviour of Andean bears in order to better understand these elusive bears, their needs and to promote peaceful coexistence, to the arid and extremely remote canyons of Southeast Iran where research is done on the western-most range of Asiatic black bears, their distribution, human-bear conflicts, as well as education programs to involve locals in the protection of these charismatic animals. The lion's share of the conservation projects supported by Bears in Mind are focused on European brown bears and their current distribution, monitoring population size or preventive measures like the use of traditional livestock guard dogs or the use of electric fencing around corn fields, beehives and orchards. Several long-term commitments to bear conservation have resulted in changes in people's attitude towards these important umbrella species. Bears in Mind strives to have a lasting positive impact on the future of these magnificent animals and their habitat – a future where wild bears and people can coexist side-by-side in harmony.

Abstract ID: 166

Session:
Bears and society

COMMUNICATION AS A TOOL FOR HUMAN-BEAR COEXISTENCE: THE CHALLENGING EXPERIENCE OF TRENTINO

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[2]MUSE - Science Museum of Trento, Italy

Abstract
Communication about large carnivores is a great issue, essential for their conservation worldwide. Communicating about wolves, bears, lynx, is not easy and it includes many aspects which have to be taken into account to implement an efficient communication strategy. There are many stakeholders involved and the populations of large carnivores are dynamic over time, they change in size and distribution and, consequently, their interactions with humans and human activities change as well. Brown bears were reintroduced in Trentino 20 years ago. From that moment, the population has grown up to about 60 bears, mostly concentrated in western Trentino. At first, the public attitude towards the bears seemed to be positive, but during the years the tendency has switched to the opposite side (from the 75.4%. of favourables to the reintroduction project in 1997 to the 64.6% of people against it in 2011). This could be due to several causes argued in the presentation. Communication has been implemented during these 20 years though three phases: the first phase (2002-2009), after the bear reintroduction, with the purpose to continuously inform the population about the presence of the species in the territory. The second phase (2010-2015), after the publication of the PACOBACE (the main document on brown bear conservation in the central-eastern Alps), with the objective to inform particularly about the management aspects of the brown bear presence in Trentino and the third phase (2016-2018) based on a new Brown bear Communication Plan and aiming at a wider scale global and effective information at many different levels.

Abstract ID: 168

Session:
Bears and society

A HISTORICAL PERSPECTIVE OF THE GRIZZLY BEAR (URSUS ARCTOS) IN MEXICO AND A STEPWISE PROPOSAL FOR THE GREAT BEAR'S REINTRODUCTION

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Abstract
Anywhere human populations are growing and encroaching on wildlands, there is a familiar consequence: Human-Wildlife Conflict (HWC), often involving domestic livestock or crop production. Hence, the recent extirpation of Mexico's grizzly bears in the 1960s. Livestock predation or crop damage by bears can cause real or perceived economic impacts to livestock and cropland owners, especially those operating on subsistence or economically marginal levels, such as rural communities in Mexico. The usual consequence of this conflict is the illegal killing of the species, which causes a cascade of ecological disruption. This was the cause and effect for Mexico's grizzly bear and wolf (Canis lupus). Efforts to restore the once extirpated wolf to Mexico are currently under way, while current and future bear-human conflict resolution solutions are limited, due to the historical range of Mexico's grizzly bear habitat now currently entirely within private or communal land ownership. We propose a stepwise process that promotes the future restoration of brown bears and their coexistence with private-land livestock operations in an anthropogenic landscape, through the implementation of an educational program using still extant black bears (Ursus americanus) for our current and next generation of ranchers and agriculturalists.

Abstract ID: 220

Session:
Bears and society

BEAR CONSERVATION-RELATED ATTITUDES, LOCUS OF CONTROL, KNOWLEDGE AND BEHAVIORS OF THE GRADE-6 STUDENTS IN SOUTHERN TAIWAN

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Abstract
Green citizens are the basis for conserving threatens biodiversity, and the key step for enhancing outreach program for conserving is to understand public attitude and related knowledge and behavior background. The study purpose was to assess the environmental attitudes, personal responsibility, locus of control, behaviors, and knowledge regarding conserving endangered Formosan black bears (Ursus thibetanus formosanus) of grade-6 children in southern Taiwan. We collected 1047 copies of questionnaires with a return rate of 91.8%, including 329, 110 and 230 from aboriginal community, rural area, and city, respectively. Respondents from three areas showed high agreement on the rarity and need of conserving Formosan black bears (90-91%). Among students of three areas, we found that with increasing level of urbanization, attitude toward bear-related issues, personal responsibility, knowledge about bears and natural resource management tended to increase. Instead, teachers had higher impact on students from aboriginal communities than from rural areas, and cities. However, there were no significant difference between different areas in other three factors, i.e., locus of control, environmental behavior, and family influence. Indeed, environmental behavior were related to all other factors (r=0.20-0.49). In the regression model of predicting bear conservation-related and environmental behavior, it further showed that family influence, environmental attitude and personal responsibility could significantly explain the variation. Our result revealed the importance of family education on cultivating environmental manners of children. Moreover, we suggested further integration of affective domain teaching in school curriculum to enhance children's environmental attitude and personal responsibility.

Abstract ID: 221

Session:
Bears and society

INTERNATIONAL PROJECTS: POWERFUL TOOLS TO HARMONIZE AND IMPROVE THE MANAGEMENT OF LARGE CARNIVORES

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Abstract
In Europe, large carnivore populations typically span national, state, and regional borders. This makes comprehensive and cooperative population management a challenge, despite this shared vision among many managers and researchers. Additionally, the historical differences in management approaches across countries furthers the obstacles to successful implementation of transboundary population-level management.The European Union's LIFE Program supports efforts to improve transboundary conservation and management of wildlife. We offer preliminary results from an emerging project called LIFE DINALP BEAR that was supported by the EU and is designed to foster transboundary population management and conservation of brown bears. Initial cooperative efforts began during the proposal writing phase to the European Union's LIFE Program and brought together brown bear experts from Austria, Croatia, Italy and Slovenia who had a history of working together. After the proposal was awarded in 2014, a series of workshop and strategic meetings were organized among partners over the next few years. The first strategic document that was produced by the partnership, Guidelines for Common Management of Brown Bear in the Alpine and Northern Dinaric Region, has support of the ministries of all four countries and is designed to be incorporated into national policy over time. A second document, Guidelines for Bear Intervention Groups, will standardize protocols for management teams to respond to bear damages and emergencies. And the third document, Protocol for Data Gathering, will help synergize important datasets on bear occurrence and distribution and will be housed in a common monitoring database. Moreover, during the process of development of the common management guidelines more countries approached and joined the team, working on the document. Guidelines were finished with the involvement of experts and decision-makers from all countries connected by the Alpine Convention and Bosnia and Herzegovina. This way (cooperation with B&H and Switzerland), the practice of common, population-level management of brown bear already outgrew the borders of the European Union.

Abstract ID: 228

Session:
Bears and society

BUILDING, IMPLEMENTING AND EVALUATING COMMUNICATION PLAN IN BEAR CONSERVATION: LIFE DINALP BEAR PROJECT CASE STUDY

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Abstract
Large carnivores, including bears, are often either loved or hated by the public. Due to these strong feelings, effective communication and honest interpretation of brown bear management is a key to successful conservation of this charismatic species. International project about bear and bear management - LIFE DINALP BEAR addresses complex and diverse challenges of brown bear conservation in the human-dominated landscapes of northern Dinaric Mts. and the Alps. In the start of the project, communication plan as a proactive measure was prepared in order to get stakeholders and decision-makers to understand the project purpose, outputs and results as part of the external communication (1). However, communication team was aware that internal communication (2) among project partners is important as well. Since there are nine beneficiaries from four neighbouring countries collaborating in the project, general communication tips and ground rules needed to be set up. Open and consistent communication toward identified target groups makes the project team trustworthy and professional. Communication team has drafted the plan on the basis of the project application – key objectives, target groups, what they need to know and how they will tackle them, afterwards the whole project team make their inputs based on activities they are responsible for. Public awareness campaign and actions targeting bear conflict prevention and mitigation were used to improve human attitudes toward bear and bear management decisions. One of the main expected results of this project is improved public acceptance of bears and bear coexistence with humans. However, evaluation of the effectiveness (3) of such actions requires detailed previous assessment of public attitudes and knowledge, media coverage of the project and bear management topics, and yearly evaluations of the communication plan following new results and experience gained in the project. Therefore, development of the communication plan by balancing the interests of target groups and project partners and evaluating its success is an ongoing project task. It produces a “living” internal document build on “lessons learned” and demonstration of the importance in the tight project team collaboration forsynchronization of conservation actions.

Abstract ID: 52

Session:
Ex situ conservation

THE UTILIZATION OF ELECTROSURGICAL VESSEL SEALING DEVICE FOR ORCHIETOMY IN THE ASIATIC BLACK BEAR (URSUS THIBETANUS)

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Abstract
Orchiectomy is the best regulation of population in captive wildlife because of surgical simplicity and efficiency. Castration also decreases male aggressiveness, roaming, undesirable urination behavior and androgen-related diseases. This case report describes the use of electrosurgical vessel sealing device (LigasureTM, VSD) for orchiectomy in the Asiatic black bear (Ursus thibetanus). Two male Asiatic black bears, excluded from species restoration program of Korea National Park Service, were presented for sterilization. Bear A was a 138 kg 7-year-old male, and bear B was a215 kg 13-year-old male. Surgical procedure of orchiectomy was carried out by closed method using VSD through prescrotal skin incision. Spermatic cord was cauterized with VSD and transected using a blade. Subcutaneous tissues of the incision site were sutured by simple interrupted pattern with absorbable suture material, and the skin incision was closed with tissue glue. Results: The bears behaved normally after recovering from anesthesia. No postoperative swelling or complications were observed. The total surgical times were 26 min in bear A and 24 min in bear B. This is the first case report that describes the use of VSD for orchiectomy in the Asiatic black bear. Orchiectomy using VSD is afeasible method of sterilization, and did not induce major peri- or postoperative complications. This technique seemed to be applicable to other wildlife species.

Abstract ID: 12

Session:
Human-bear interactions and management

EUROPEAN BROWN BEARS LIVE TRAPPING: EFFICIENCY FOR RESEARCH PURPOSES.

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Abstract
Many wildlife research studies and management strategies targeting free-ranging animals require the need for temporarily hands-on opportunities to collect biological samples, assess physiological conditions or install monitoring devices. The basic requirements when trapping wildlife are that the animal does not get injured or excessively stressed, or accidentally killed, and that it continues the normal ranging activities after being handled by researchers. Furthermore, trapping campaigns are logistically and financially demanding, and therefore, there is an increasing need to optimize captures success. The objective of this study was to use the 36 years of trapping experience and dataset from free-living European brown bears captures in Croatia to test four hypotheses related to bear's capturing success. Thus, we hypothesised that capturing success of Aldrich foot snare trap will be determined by factors associated with: (H1) trapping design, associated with the trapping area, season and set; (H2) bait design, linked to the bait type, frequency of re-baiting and occurrence of pre-baiting; (H3) trapping events, dependent exclusively on the way animals behave at the trapping-sites; (H4) or a combination of any of those factors. 416 Aldrich type traps were set at 164 trapping-sites, during 2,994 days, comprising a total of 7,298 trap-nights and 63 captured bears. These trapping-sites were monitored in 45 trapping-sessions in both Gorski Kotar and Lika regions. The results highlighted that longer trapping-sessions and the use of bait at trapping-sites increased capturing-efficiency. Also, bears' visit to the sites enhanced the number of captures; however in cases where bears managed to eat the bait, the capturing success was lower. Lastly, the importance of some capturing criteria was different for the two study regions, evidencing the influence of trapping areas' characteristics in the capturing efficiency.

Abstract ID: 25

Session:
Human-bear interactions and management

HUNTING BAN, UNFORTUNATE DECISION FOR THE BEAR POPULATION IN ROMANIA

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Abstract
The Brown Bear population size in Romania is approximately 7300-7600 individuals, which is projected to be 3000 individuals over the ecological carrying capacity. The Habitats Directive imposed certain protection rules on European Union (EU) Member States with Brown Bear populations. These however allow countries like Sweden, Croatia, Slovakia, Estonia to hunting as management tool, harvesting up to 10% of the surplus bear population annually. From the point Romania joined the EU to 2016, active conservation management has contributed to maintaining the highest and most genetically diverse Brown Bear population in Europe. Importantly, there has been good coexistence between people and bears and low levels of human-bear conflict. After social pressure and campaigning by some non-governmental organisations citing issues over monitoring, the environment minister decided in September 2016 to stop the use of hunting as a management tool for bears. Against this background, this paper provides a set of recommendations to resolve the current conflict in Romania. These include the need for collaborative decision-making to reduce conflicts between stakeholders and mechanisms to reduce current human-bear conflicts, which have increased by 50 percent in the past year.

Abstract ID: 38

Session:
Human-bear interactions and management

THE IMPACT OF THE FEEDINGSITES ON THE HOME RANGE AND RESOURCE SELECTION IN EUROPEAN BROWN BEARS

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Abstract
The supplementary feeding is a common and widespread game management practice, targeting ungulate species.Recentlyit has beenproved that this feedinghas a significant impact on bear movement and behavior. Yet, the level and scope of changes of bear home range and resource selection due to the presence of artificial feeding sites are insufficiently studied and poorly understood. Through GPS/GSM telemetry data and kernel density estimation we analyzed the amount of overlap of the kernel home range of 7 European brown bears (2 females and 5 males) and the 50% and 90 % kernel contours of 102 feeding sites in the region of Central StaraPlanina Mountain. The availability of natural food sources and the number of artificial feeding sites in each bear core area (50 % kernel contour) and other area (between 50% - 90 % kernel contours) were compared to answer the question if there is a difference in natural resources selection in the core and other area of their home range. Additionally we compared the numbers of artificial feeding sites in both core and other area of the bears' home range, to have a better understanding of how the feeding sites spatially form and shape the bears' home range core areas.

Abstract ID: 40

Session:
Human-bear interactions and management

FOOD HABITS OF BROWN BEAR (URSUS ARCTOS) IN CROATIA – SHORT-ASSESSMENT STUDY

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Abstract
The diet of free-ranging bears is an important part of their ecology. In Croatia, there is no recent study on bears' natural food preferences and about the influence of the supplemental feeding sites (mainly used for hunting purposes) on their diet. Knowledge about the effects of supplemental feeding can improve our understanding about their ecology and effective management. During 2017, 53 stomachs from Brown bear (Ursus arctos) were collected for food content analysis from two Croatian regions: Gorski kotar and Lika. Forty-three stomachs were collected from legally hunted, 2 and 5 from car and train killed bears, respectively, and 3 from intervention shooting. Stomach contents were washed through a sieve of 1.5 mm mesh width and sorted by hand to assess the frequency of occurrence, percent volume and mass of each ingested item. Allium ursinum, Poaceae family, berries of Cornus mas, beech nuts, mushrooms and various plant parts (i.e. dry leaves, buds, conifers needles and twigs) composed 42% occurrence of the consumed items. Corn from the feeding sites fulfilled 20% occurrence of bears' diet, 26% was animal matter and 12% of the consumed food were apples and pears. Animals as wild boar, horse, domestic pig, cattle, roe deer and small mammals were identified through hair samples found in the stomachs. Supplemental food was more frequently chosen by bears than natural food. The sub-adult bears were the age group who most showed dependency from feeding sites.

Abstract ID: 70

Session:
Human-bear interactions and management

HUNTING SLOTH BEARS FOR MEDICINE: A STUDY ON ITS MYTH AND REALITY

Prakash Mardaraj

PRAVA

Abstract
Folk or traditional medicine originated from primitive man's reactions or attitudes to natural events. Magic and witchcraft played an important role here. In these societies, where witchcraft and religious beliefs were of great importance in treating disease and health. Animals have been used as medicinal resources for the treatment and relief of a myriad of illnesses and diseases in practically every human culture. Although considered by many as superstition, the pertinence of traditional medicine based on animals cannot be denied since they have been primitive methods of cure for the tribals. The phenomenon of zootherapy represents a strong evidence of the medicinal use of animal resources. Sloth bear parts such as skin, Hair, Penis and testicles, claws, teeth, and bones are thought to be in most demand use for traditional medicine and witchcraft. These are commonly used for child fever, immune and sex. The demands also encourage for retaliation killing and trade of their body parts and skins have beenpostulated as a cause for concern. We undertook a questionnaire survey to document informed opinion and evidence for the occurrence of local trade and consumption in sloth bear body parts across Balasore and Mayurbhanj district of Odisha India. Twenty people dealing with such from 7 places participated in the questionnaire survey. The main difference we found was with the method of preparation and the parts used. Hairs (90%) and genitals were (60%) mostly used by the people. Parts were (45%) purchased by these people followed by fake materials (35%) and rest by killing by themselves. Research on the traditional use of parts and their by-products should be one. It is discussed that proper education and awareness will only eradicate the magical and supernatural myths and will guide towards conservation.

Abstract ID: 81

Session:
Human-bear interactions and management

BEAR ATTACKS AND DAMAGES ON LIVESTOCK AND APICULTURE IN CATALONIA: ARE EFFECTIVE THE PROTECTION MEASURES?

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Abstract
Since 1996, when brown bear returned to Catalonian Pyrenees, bears has attacked and caused damages on livestock, and since 2004 on apiculture. To avoid an elevated number of predations, we have implemented several measures to protect the livestock, mainly sheep, and the beehives in Catalonia. In the last years the livestock protection measures are based in the group of small flocks in a big flock, which is easier apply effective protection measures. These other measures applied are the contract of a shepherd, who takes flocks during daylight time and keep the sheep by the night, so shepherd protects the flock for 24 hours. Sheep flock pass the night inside of an electric fence, with several protection dogs, in or out of fences. From administration, we work to make the shepherd life easier and more comfortable, for 4-5 months he/she pass on the mountains, thanks to shepherd cabins, material provided by helicopter, one helper, students in practice, visits by bear teams, etc. When we compare between protected and not protected flocks, bear damages on not or deficiently protected were significantly higher than on protected flocks. Sometimes, exceptional damages can happen, when some sheep lost and remain out of protection by the night, or with smog. The apiary basic protection is an electric fence. When fences were kept adequately, damages were very carce, for example controlling if electricity was working and cutting the geese growth under the electrical wires. In the last two years, we have some bears what dig under the fences and other ones push the fences by where there is not electricity. Despite bear population is increasing, until reach more than 40 individuals, the number of damages per each bear is decreasing significantly, because of the implementation of these protection measures.

Abstract ID: 86

Session:
Human-bear interactions and management

ESTIMATING THE WISCONSIN BLACK BEAR POPULATION USING A BAYESIAN STATE-SPACE MODEL WITH AGE-AT-HARVEST DATA

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Abstract
Population estimation is essential for the conservation and management of fish and wildlife, but accurate estimates are often difficult or expensive to obtain for cryptic species across large geographical scales. Accurate statistical models with minimal financial costs and field efforts are needed for hunted populations, and using age-at-harvest data may be most practical. Several rigorous statistical approaches that use age-at-harvest and other data to accurately estimate populations have recently been developed, but these are often dependent on a) accurate prior knowledge about demographic parameters of the population, b) auxiliary data, and c) initial population size. We developed a two-stage state-space Bayesian model for a black bear population with age-at-harvest data, but little demographic data available and no auxiliary data, to create a statewide population estimate and test the sensitivity of the model to bias in the prior distributions of parameters and initial population size. The abundance estimate from our model was reasonably similar to an independent capture-recapture estimate from tetracycline sampling and was robust to bias in the prior distributions for all parameters except for reporting rate. Our state-space model created an accurate estimate of the black bear population in Wisconsin based on age-at-harvest data and improves on previous models by using little demographic data, no auxiliary data, and not being sensitive to initial population size.

Abstract ID: 92

Session:
Human-bear interactions and management

PROBLEMS IN MANAGING BROWN BEAR IN BOSNIA AND HERZEGOVINA

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Abstract
Although the brown bear is protected by a closed season, the lack of management plans leads to inadequate management of this species in Bosnia and Herzegovina. Brown bears of Bosnia and Herzegovina belong to the Dinaric - Pindus population. Bears management conducted at the population level and therefore the obligation of each country to align its management plans with international conventions. Bosnia and Herzegovina does not have a Brown Bear Management Plan. It can be said that bears management in Bosnia and Herzegovina was only reduced to claiming a regular quota for culling. Problems are numerous, from the methodology of estimating of abundance to the non-implementation of CITES. Research has shown that in 2015 and 2016 the average loss of bears was 133.5 individuals per year, of which the losses in legitimate hunting were 11.27% and on illegal hunting at least 6%. For the remaining 82.73% it was not possible to determine the reason for the loss of bears. Also, Bosnia and Herzegovina shares about 52 bears with neighboring countries (with Croatia, Serbia and Montenegro). Due to all the above, and given that the bears inhabit about 40% of the territory of Bosnia and Herzegovina, and that their number is officially estimated at around 1260 individuals, it is very important that the Brown Bear Management Plan is done as soon as possible. Key words: Brown bear, Bosnia and Herzegovina, CITES, Management Plan, poaching

Abstract ID: 95

Session:
Human-bear interactions and management

LOCAL ATTITUDES TOWARD BROWN BEARS IN A LONG-ESTABLISHED NATIONAL PARK: INSIGHTS FOR CONSERVATION ISSUES

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Abstract
Human-carnivore coexistence is a multi-faceted issue that requires an understanding of the diversity of attitudes and values of human populations living with large carnivores. This information is crucial for promoting behavioral change to achieve conservation goals. To address this, we focused on the attitudes, beliefs, and knowledge of local communities coexisting with Apennine brown bears (Ursus arctos marsicanus) in a long-established protected area, the Abruzzo, Lazio and Molise National Park (PNALM), in central Italy. The Apennine brown bear is under serious extinction risks due to its persistently small size. We interviewed 1,611 people in the PNALM to determine attitudes and values towards bears held among park residents. We found that support for the bear's legal protection was widespread throughout the area, though beliefs about bears' benefits varied between geographic regions. Detailed and spatially explicit understanding of the heterogeneity of attitudes and beliefs towards the animal of conservation interest, as shown here, can help policy-makers and managers to identify areas of controversy within protected areas where public participation and educational efforts are most needed.

Abstract ID: 102

Session:
Human-bear interactions and management

PREDICTING THE OCCURRENCE OF BROWN BEAR DAMAGE TO APIARIES IN THE NORTHEASTER CARPATHIANS

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Abstract
The conflicts arising from large carnivore damage undermine conservation efforts, raising concerns and challenges for conservationists worldwide. Thus, predicting where and when damages are more likely to occur is pivotal to prevent and mitigate conflicts and promote human-large carnivore coexistence. This study aimed to identify and map the areas more vulnerable to brown bear (Ursus arctos) damage to apiaries in the Bieszczady Mountains (SE Poland) in the northern Carpathian range. We calculated several ecological and anthropogenic variables (e.g., length of forest ecotone and human density) in 194 cells in a 5x5 km grid overlapping bear distribution. We used logistic regression models to analyze the occurrence of bear damage to apiaries in 2007-2014. Preliminary results showed that bear damage to apiaries tended to occur in places with a large density of apiaries, a high probability of bear presence, and low forest cover. We finally assessed the spatial risk of bear damage to apiaries in relation to the probability of both the presence of bears and apiaries. We discuss the management implications of this study and give recommendations to managers and policymakers to minimize bear damage occurrence in the region.

Abstract ID: 103

Session:
Human-bear interactions and management

BETTER ALONE THAN IN BAD COMPANY: BROWN BEAR'S SOCIAL AVOIDANCE AT FEEDING SITES IN SOUTHERN SLOVENIA

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Abstract
Habitat selection is a hierarchical process that requires trade-offs between food acquisition and avoidance of predation risk. For the brown bear females with cubs foraging decision requires taking into account both risk of humans and potentially infanticide males. In the present study, we analysed how intraspecific predation risk affect the social behaviour of brown bears in southern Slovenia, where hunters maintain numerous artificial feeding sites to divert bears from human settlements and for hunting. We monitored eighteen feeding sites with camera traps for 2 years (supplied interchangeably with corn/carrion of wild ungulates). All recorded pictures were analysed to get information on number and sex (females with cubs, other) of the bears using feeding sites. We also added information on date and time of the picture acquisition, type of used bait (carrion and corn vs. corn) and bear density around feeding site (in a 1×1 km grid). We analysed the relationship between "female with cubs" vs. "others" use of feeding sites and a set of independent variables, using generalized linear mixed models (GLMM). Specifically, we considered as independent variables time, season, type of bait, and bear local density. Our results indicate that females with cubs visited feeding sites relatively more often during daylight and less often during mating season and used carrion feeding sites less often than corn feeding sites. All observed patterns are in agreement with predictions of sexually selected infanticide theory. Contrary to our expectations local density of the bears apparently did not affect relative use of feeding sites by females with cubs compared to other categories of bears. Our results provide evidences to show that females with cubs are adapting their use of feeding sites to avoid intraspecific predation risk, having severalimplications also for monitoring and management of the species.

Abstract ID: 111

Session:
Human-bear interactions and management

FREE FOOD FOR EVERYONE: VERTEBRATE COMMUNITY USING ARTIFCIAL FEEDING SITES FOR BEARS IN SLOVENIA

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Abstract
Artificial feeding of bears is a commonly used practice in Europe (for brown bear Ursus arctos) and often also in North America (for American black bear Ursus americanus), serving as a tool for achieving a range of conservation and management goals. The effects of artificial feeding on bears have been studied to some extend and mostly in Europe, however little is known about the effects of artificial bear feeding on non-target species. We used automatic video surveillance to monitor visitation rates of non-target species at artificial feeding sites (n=15) established primarily for brown bears in Dinaric Mountains, Slovenia. We also studied how type of artificial food (only plant-based food vs. mixed food including carrion) affects the vertebrate species using the feeding sites. In total, we identified 23 vertebrate taxa, including the brown bear, visiting the feeding sites. Brown bear and wild boar (Sus scrofa) were the most frequent species using the feeding sites with and without carrion, respectively. More herbivorous species were using the feeding sites with plant-based food only, while some carnivorous mammals (grey wolf Canis lupus, golden jackal Canis aureus and marten Martes sp.) were observed only at the feeding sites with carrion. Birds represented a substantial part (36%) of the vertebrate species using the feeding sites, including some rare and protected species, such as white-tailed eagle Haliaeetus albicilla. Feeding sites were regularly used also by game species for which artificial feeding is forbidden in the study area (e.g. roe deer Capreolus capreolus). Our study indicates that artificial feeding affects numerous non-target species, which could have several ecological and management-relevant effects, some likely unwanted. If applied, artificial feeding of wildlife should thus be carefully planned and we provide some recommendations on how to mitigate the side-effects on non-target species.

Abstract ID: 122

Session:
Human-bear interactions and management

ASSESSING THE EFFECT OF CATTLE PRESENCE ON THE ANDEAN BEAR DISTRIBUTION IN A PROTECTED AREA OF NORTHERN PERU

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Abstract
Several factors influence how Andean bears are distributed across their range. This study aims to investigate whether Andean bear distribution is affected by the presence of cattle in the Laquipampa Wildlife Refuge, a protected area in Northern Peru. I will use spatial distribution models (SDMs), existing field and remote-sensed data, and spatial planning tools to optimize conservation plans for Andean bears. I will use existing camera trap data from a survey study that was conducted from September 2015 to February 2016 in the Laquipampa Wildlife Refuge to determine the effect of cattle presence on habitat use by Andean bears; 62 camera stations (equally divided in two seasons) were installed in an approximate 1km2 grid. The objectives of this study are 1) to develop a framework for estimating Andean bear distribution in the Laquipampa Wildlife Refuge using available data; 2) to model the temporal and spatial co-occurrence of cattle and bear in the Laquipampa Wildlife Refuge.

Abstract ID: 126

Session:
Human-bear interactions and management

HOW HUNTING AFFECTS BROWN BEAR (URSUS ARCTOS) BEHAVIOUR AT FEEDING SITES

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Abstract
Human disturbance, especially hunting, can have a strong impact on wildlife behaviour. Most large carnivores such as brown bears (Ursus arctos) do not have natural predators and hunting is thus in many regions a leading cause of adult mortality. In Slovenia, brown bears are usually hunted at feeding sites, where artificial food such as maize is available the whole year. During the hunting season (October - April), bears face a trade-off between foraging at feeding sites, where food is easily accessible, and the risk of being hunted. Consequently, monitoring of bears at feeding sites provides an excellent opportunity to investigate the human-induced landscape of fear bears may experience during the hunting season. In 2016 and 2017, we deployed camera traps at 22 feeding sites to monitor bears continuously throughout these two years. Pictures of bears were grouped into social units including females with cubs in their first year of life/second year of life, big adult males and solitary bears, to investigate whether they show different visitation rates. We will generate GLMMs (Generalized Linear Mixed Models) to analyse visitation rates according to time of the day, social unit, month and year and use feeding site ID as a random effect. We expect behavioural changes within all social units, but a less pronounced effect on females with cubs, which are protected from hunting. Moreover, we suggest that hunted social units (large males, solitary bears) may counterbalance their increased mortality risk during the hunting season by shifting to a more nocturnal use of feeding sites. Recently, it has been shown that hunting can even be an evolutionary force changing live-history strategies of bears. With this study, we want to contribute to our understanding of how hunting affects bears and to which extent possible behavioural changes may even establish in local bear ecology.

Abstract ID: 132

Session:
Human-bear interactions and management

APENNINE BROWN BEAR CONSERVATION: GOOD NEWS AND THREATS FROM THE MAJELLA NATIONAL PARK, A RECENTLY RE-COLONIZED AREA IN THE CENTRAL APENNINES, ITALY

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Majella National Park, Italy

Abstract
The Apennine brown bear is a critically endangered endemic subspecies of the Central Apennines, Italy, whose population is estimated at 50 (C.I. 45-69) individuals. The majority of the population lives in the Abruzzo, Lazio e Molise National Park where bears escaped human-caused extinction. In the adjacent Majella National Park, bears have been an irregular presence, but between 2012 and 2017 at least 10 bears were detected, two of which were reproductive females. Beyond these good news, in 5 years of monitoring, including telemetry monitoring of a female, we identified threats to bear survival and reproduction that can contribute to the development of a territory-specific (i.e. more effective) conservation strategy. Our data reveal that special attention has to be paid to i) the impact of disturbance, which has also been registered during hibernation when consequences can heavily affect bear fitness, ii) the availability of anthropogenic food for bears, leading to problematic behaviours and iii) lack of awareness of the importance of bear conservation not only on the part of the local population, but also local and regional policy-makers. Our data stress the need -especially for recent protected areas or non-protected areas - to invest significantly in communication, human-dimension and personnel training in order to raise awareness and minimize human impacts on bear fitness. At the same time, they underline that political problems are serious and a major threat is represented by the inconsistent land management strategies. Given the critical status of the population, solutions to problems must be found promptly and a stronger focus on the conservation of this subspecies at the national and international level is needed to push Italian local administrators to concretely work for Apennine brown bear survival.

Abstract ID: 139

Session:
Human-bear interactions and management

MANAGEMENT OF PROBLEM BEARS IN THE ABRUZZO LAZIO AND MOLISE NATIONAL PARK (CENTRAL APENNINES, ITALY)

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Abstract
The critically endangered Apennine brown bear population is mostly restricted to the Abruzzo Lazio and Molise National Park (PNALM) and its outer buffering area. Although natural foods are largely available in the park ecosystem, anthropogenic foods are widespread and easily accessible in the human-modified landscape of the central Apennines, facilitating food-conditioning in a few bears. By review data compiled since 1994 and report the occurrence of habituated and problematic bears in the PNALM, in an effort to evaluate management actions aimed to mitigate the phenomenon. From 1 to 4 bears have developed habituated or problematic behavior each year, for a total of 7 individuals from 1994 to present. Ideally, habituation and conflictual behavior should be prevented as to avoid any removal of problematic bears from this genetically depleted population. Since 1994, however, 1 problematic bear had to be captivated, 1 was probably illegally killed, 1 dispersed outside the PNALM causing damages elsewhere, and 4 have been subject for 1–12 years to aversive conditioning. Simultaneously, the park authority lobbied with local township administrators and stakeholders (e.g., livestock owners, farmers) to try limiting year-round accessibility to anthropogenic foods. Although the management program has been relatively successful, and the emergence of habituated and/or conflictual behavior affects a small portion of the bear population, we discuss some factors that currently limit reach and effectiveness of management actions. Among these, the lack of administrative integration among different institutions, and recurrent public misinformation that does not facilitate public awareness and support for management initiatives. By advocating an evidence–based approach in dealing with management bears, management authorities aim to increase social acceptance and participation while contributing to the development of best practices to be exported beyond the park boundaries.

Abstract ID: 147

Session:
Human-bear interactions and management

BEARS IN A HUMAN-DOMINATED LANDSCAPE, IN NW GREECE: A MONITORING SURVEY WITH CAMERA TRAPS

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Abstract
Camera trapping is widely used to evaluate presence and relative abundance of wildlife species, as well as to better understand habitat selection. In the frame of the LIFE15NAT/GR/001108 project, we conducted an intensive survey on brown bear (Ursus arctos), in NW Greece. The study area spans up to 700km2 and includes dense deciduous forests, a relatively large number of small settlements and an extensive road network. This study aims to assist the implementation of management actions which limit the negative human-bear interactions. The camera survey design included 12 IR cameras placed over a 5*5 km grid in a period of 5 consecutive months (July-December, 2017). Placement sites with high probability of animal detection were selected. We performed site rotations within each grid cell to maximize the probability of capture-recapture. Within 1612 trapping days, 150 bear events were recorded in the first 3 sites. We defined bear events as a capture within 15min. The existing data allows a large variety of statistical analyses. We plan to conduct an occupancy modelling combining bear presence data with fine scale habitat composition. Possible covariates may include: distance to nearest human infrastructure, distance to water stream, distance to forest, temperature, rainfall, elevation, land cover etc. We estimated the sub-population relative abundance, and investigated the impact of human activity on bear circadian activity, habitat and food source selection. We expect that orchards and plantations (anthropogenic habitat) at forest edges are intensely used by bears as easily accessible food sources. Human-bear interference should be more frequent during the spring and summer due to the available food resources, whereas during fall, we expect bears to retreat more to the highly productive forest. We believe the outcomes of this study will support the competent authorities' management schemes and reinforce brown bear conservation strategies.

Abstract ID: 157

Session:
Human-bear interactions and management

BEARFENCE: AN INNOVATIVE PREVENTION SYSTEM FOR BEAR MANAGEMENT AND RE-EDUCATION

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Abstract
The population of reintroduced brown bear (Ursus Arctos) in Central Alps (Trentino, Italy) successfully expanded to 50–60 individuals from its inception in 2000. Within the population, some confident brown bears approached and used anthropic resources, raising conflicts. A close understanding of behaviors of use of anthropic resources and development of related management measures are crucial to increase acceptance by local stakeholders and ultimately to preserve the conservation of the reintroduced population. In this context, we developed BEARFENCE, an innovative technological system that has the double scope to prevent bear damages and to re-educate confident individuals. BEARFENCE consists of a tag apposed on the bear and of several fixed devices which are deployed near sensitive resources, such as beehives or livestock night recovers. The fixed elements detect the presence of the tagged individual, to then activate a randomized sequence of deterrents, which are designed to minimize the risk that the bear habituates to the prevention system. Moreover, in case of bear detection an alert message is immediately sent to the emergency personnel. We performed a long-term test of BEARFENCE under different deterring scenarios, to evaluate its performance. To do this, we repeatedly simulated the detection of a bear, and we evaluated the correctness of the dissuasion protocol by comparing the expected and observed BEARFENCE response. We found that both simulated bear detections and the consequent deterrents sequences worked properly in all instances (n = 112). We foresee BEARFENCE application to be effective in the Alpine brown bear coexistence context, as well also for other populations, and other bear species. We conclude that the technical advances promoted by BEARFENCE represent an example of how combining technology with wildlife management can represent a valuable way to ensuring a long-term coexistence of bears and humans.

Abstract ID: 161

Session:
Human-bear interactions and management

RECORDS OF BROWN BEAR-KILLED AND INJURED PEOPLE IN RUSSIA, 1932-2017

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Abstract
We collected 322 cases of brown bear killed and injured people from 1932 to 2017 in Russia, where the bear population increased from about 130,000 bears in 1992 to 245,100 in 2017. This communication focuses mainly on 256 bear cases recorded between 1991 and 2017, because data availability varied between the Soviet and Russian periods. For example, human bear encounters with no human injuries appeared to be highly underrepresented in Siberia and Far East prior to 1991. Casualties happened more frequently in Siberia and the Far East than in the European part of Russia, which has higher human density and fewer bears. Single bears were involved in most of the cases (73%). Casualties occurred mainly during daytime, especially in summer and autumn - 108 and 113 cases respectively. Nevertheless, there were also cases during nighttime, in human settlements, and when people were inside their houses or hunting cabins, i.e., not only when people were outdoors. In order to identify the factors contributing to conflicts, main biomes, productivity at bear feeding grounds, forest cover, probability of forest fires, and human activities will be reported at the regional scale. Limited food resources, for instance, may increase the number of “hanging bears”, which do not hibernate, wander in forests, are dangerous to people, and rarely survive until the next spring. Preliminary exploration of the data suggests that human activities appeared to lead, directly or indirectly, to bear-caused human injuries and fatalities. People have been injured when gathering wild resources (67 cases), in settlements (43), when involved in outdoor professional activities (40) and hunting (34). We will analyze the potential relation between bear-related variables, e.g., bear population size, human activities of people injured and killed by bears, and habitat-related variables (e.g., berry and stone pine productivity), and the occurrence of casualties.

Abstract ID: 165

Session:
Human-bear interactions and management

EVALUATING THE DETERRENT EFFICIENCY OF NON-LETHAL AMMUNITION EM-A/B FOR THE APPLICATION IN NUISANCE WILDLIFE MANAGEMENT

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Abstract
The EDM-company is leading in the sector of non-lethal ammunition for police operation purposes in the German-speaking region. On this background, requests from shepherds have resulted in the development of advanced processed products (EM-A/B) with different kinetic energy targeted at animal defense use for primarly protected species like the bear and the wolf. The IWJ has been requested to assess the use of these prototypes from a wild-biological point of view, by inspecting whether this special ammunition serves the functional purpose also in compliance with the animal ethics and to what extent its application can fill a demand gap in nuisance wildlife management. We tested different types and brands of non-lethal ammunition by shooting on simulants that in their composition resemble the skin and muscle tissue of these animals. The EM-products were distinguished in comparison to conventional projectiles by their superior targeting precision with an appropriate impact. Rubber bullets have proved to be too mild whereas rubber pellets pose a high risk of eye injury due to its large dispersion. The flexible tail of the super-sock-technology stabilizes the projectile optimally, so that the risk of ricochets is minimized. The cross-sectional area is doubled when the projectile strikes the animal and thus protects it against serious injuries. This high-tech-invention convinces not only by its excellent ballistic but also by its pharmaceutical properties. In particular, the aspect of first aid after shelling is to be positively stressed in terms of animal ethics: the pharmaceutical active ingredients incorporated into the projectile have a hemostatic and disinfecting effect on the wound. A further aim is to test and to evaluate the repellent efficiency of the EM-products on the living animal in practice. This study is part of a PhD project at the IWJ which primary aim is to promote integrated wildlife management and to implement sustainable use of game in Romania.

Abstract ID: 169

Session:
Human-bear interactions and management

ARE WE MISUSING THE TERM "BEAR ATTACK"? INSIGHTS FROM HUMAN-BEAR ENCOUNTERS WITH PHYSICAL CONTACT IN THE CANTABRIAN MOUNTAINS (SPAIN)

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Abstract
In the Cantabrian Mountains, there is a small, protected population of brown bears (Ursus arctos), which has increased from 6 females with cubs of the year in 1989 to 40 in 2016. We have collected data on encounters with physical contact between humans and bears, commonly termed as "bear attacks", in that area since 1989, when we started a continuous and intense bear monitoring, to March 2018. This survey has most likely detected all these kind of events occurred during this period. During 29 years, we recorded 7 events (men aged 35 to 77). All of them were defensive behaviours, caused by sudden encounters, in six cases with solitary bears and in one case with a female with cubs. No predatory attacks were recorded. Only in two cases did the bears cause serious, but non-life threatening, injuries to people, who were bitten on one thigh and one forearm. In the other five cases, the bears caused minor or no injuries at all. One bear bit a man on one foot, which required two stitches; in two other cases, the bears bit the men in the shoulder and in the lower leg so softly that they did not cause any bleeding. In two cases, men aged 75 and 77 suffered minor injuries when falling down after been hit by the bears. In all cases, the events lasted just a few seconds and the bears fled away. All the events were concentrated in the eastern nucleus, where there are just 1/6 of all the bears of the Cantabrian Mountains. This information illustrates the fact that some human-bear encounters are being termed as "bear attacks", when they are just defensive reactions in which the bears try to escape from people at close distance without harming them.

Abstract ID: 178

Session:
Human-bear interactions and management

TECHNICAL PROPOSALS TO REDUCE THE BROWN BEAR DEPREDATION ON LIVESTOCK IN THE EASTERN ALPS AND TO PROMOTE THE ESTABLISHMENT OF BEAR ALPINE-DINARIC-PINDOS METAPOPULATION

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Abstract
To promote the coexistence between large carnivores and local people, in the Alps, it is necessary to apply innovative technical solutions that can reduce the risk of depredation, and in the same time, are economical and technically sustainable. The establishment of a Dinaric-Pindos and Alpine brown bear metapopulation will occur only if the presence of the bear will be accepted by the Alpine human populations, also thanks to the reduction of the risks of damage. From 2009 to 2017 we have sampled, through hair traps and opportunistic monitoring, in the Eastern Italian alps, 23 different genotypes of bears, of these 6 from Trentino population and 17 from Dinaric population. We have captured and equipped with a GPS/GSM collar 6 male bears (3-10 years old), one of which was from Trentino. The data of damages, on the Italian side, from 2009 has been analysed (56800 euros refunded for 136 claims) and interviews were carried out on a sample of 31 farmers. The farms most attacked by the bear, were sheep flocks and mixed with goats; in particular the small flocks, with a fixed fence, in small villages or near scattered houses. Another important type attacked were the free and unattended flocks in summer pastures only periodically controlled by the owner. The attitude of breeders, on the Italian side, is not negative also thanks to the long period of coexistence (the bear is present from 1970). The distribution of damages and bear habitat use has allowed to build a risk maps. The negative interactions between brown bear and livestock activities depend from the behaviour of individual, the environmental characteristics and the night management of the animals. The adoption of systems that allow the presence of dogs in mountain pastures, of suitable breeds, and automated night containment system must be implemented. Some innovative operational proposals are presented.

Abstract ID: 184

Session:
Human-bear interactions and management

BROWN BEAR (URSUS ARCTOS) ATTACKS RESULTING IN HUMAN CASUALTIES IN SCANDINAVIA 1977-2016; MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS

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Abstract
Human persecution and habitat loss have endangered large carnivore populations worldwide, but some are recovering, exacerbating old conflicts. Carnivores can injure and kill people; the most dramatic form of wildlife-humanconflict. In Scandinavia, the brown bear (Ursus arctos) population increased from ~500 bears in 1977 to ~3300 in 2008, with an increase in injuries, fatalities, and public fear of bear attacks. We reviewed media coverage and interviewed victims to explore how bear population trends, hunter education, and other factors may have influenced the number of injuries and fatalities in Scandinavia from 1977 to 2016. We found 42 incidents with 42 injuries and 2 fatalities; 42 were adult men, one was an adult woman conducting forestry work, and one was a boy skiing off-piste. Thirty-three adult men were hunting bears, moose, or small game, often with a hunting dog, and 26 had shot at the bear at 8±11 m before injury. Eleven nonhunters were conducting forestry work, inspecting a hunting area, picking berries, tending livestock, hiking, harassing a denned bear, and one person was killed outside his house at night. Eight of the 11 incidents of nonhunters involved female bears with cubs; three of these family groups were in dens and two were on carcasses. The annual number of hunters injured/killed was mostly influenced by the increase in the bear population size. The pattern was similar regarding injuries/fatalities to other outdoor users, but the relation with the bear population size was weaker than for hunters, and the null model was equally supported. Bear physiology at denning may make encounters with bears more risky in the fall, when bears show prehibernation behavior. Awareness and education efforts, especially among hunters, seem important to ensure human safety. Recreationists and forestry workers should avoid dense vegetation or make noise to warn bears of their presence.

Abstract ID: 196

Session:
Human-bear interactions and management

WOLFEXPLORER: A TOOL FOR VISUALIZATION AND EXPLORATION OF COMPLEX MULTI-YEAR MULTI-SPECIMEN DATASETS

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Abstract
Visualising multi-specimen data in both spatial and temporal context has proven to be an arduous task. Conventional approaches utilising GIS software suffer from a lack of interactivity, particularly when analysing a batch of samples from numerous animals. Yet such datasets offer an invaluable insight into movement patterns, habitat utilization and life histories of studied animals. Here we present wolfexplorer - a tool for visualization and exploration of complex multi-year multi-specimen datasets. It enables users to select samples from animals of interest and displays them on a map. When complemented with parentage data - the standard output of COLONY software - the functionality of the package is expanded with (1) suggestions of selected animals' offspring and (2) the ability to plot family pedigrees on-the-fly. wolfexplorer is an example of a novel approach in data exploration, aimed at helping researchers interpret complex datasets. Package, incorporating user-friendly GUI, is written in R, with the source code available on GitHub.

Abstract ID: 206

Session:
Human-bear interactions and management

EFFICACY OF BEAR DETERRENT SPRAY WITH WILD POLAR BEARS

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Abstract
The purpose of this work was to address common misconceptions about the effectiveness of bear spray for polar bear deterrence. We address the three main barriers to spray use in polar bear country: 1) no chemicals can stop an attacking polar bear, 2) the wind and temperature in the Arctic render spray deterrents useless, and 3) it is useful at too close of a range for reliance. To address each of these objections we 1) collected and summarized the results of human-polar bear incidents involving bear spray, 2) we ran a series of lab experiments to document the effects of temperature and wind on bear spray. We found bear spray to be 94% effective in 17 cases we studied. Temperature affected can pressure, which in turn, affected both distance and diffusion of sprays. However, in the worst case scenario (-40deg C), we found spray stills reached 4 meters and would easily disable a bear. Finally, we discuss the effects of wind, noting that bears are largely not actie in high winds and, in a worst case scenario, sprays will reach a bear but at close range which is admittedly better than carrying nothing at al.

Abstract ID: 213

Session:
Human-bear interactions and management

VOLUNTEERS CAN HELP WITH CONSERVATION OF BROWN BEAR TAKING ON A ROLE OF MODERN SHEPHERDS IN THE ALPINE PASTURES

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Abstract
In the last two decades, brown bear population in Slovenia is recovering and is gradually spreadinginto the Alps. Consequently, more conflicts with brown bears started to appear in the Alpine area, especially with sheep breeders who, in the time of brown bear's absence, changed traditional shepherding practices. Members of the Dinaricum society carried out a pilot project to demonstratethat with collaboration between sheep breeders and "shepherd volunteers" conflicts in the area canbe mitigated by preventing damage to livestock from brown bears. Throughout the grazing season, volunteers took the role of shepherds and every evening enclosed sheep in electric nettings andreleased them in the morning to graze freely on open pastures. This pilot study demonstrated thatzero damage cases, even though the bear was present in the areas, can be achieved, that there ishuge interest among volunteers for shepherding and that the subject is interesting for the media toreport on these activities. Five take-home messages: (1) regular and honest communication withstake-holders is crucial, (2) if the enclosure is properly maintained and livestock supervised daily by a shepherd, electric nettings can be an effective tool to protect livestock from brown bear attacks, (3) prior shepherding experiences of volunteers are not key for successful work with sheep if they areproperly trained and motivated to work, (4) sheep do not appear to need habituation to specificshepherds and can be managed using standard procedures and (5) collaboration with local community is paramount for success.

Abstract ID: 222

Session:
Human-bear interactions and management

COMPARISON OF BROWN BEAR HUNTING PRACTICES IN SWEDEN AND CROATIA

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Abstract

Sweden and Croatia have a long tradition of brown bear (Ursus arctos) hunting. While in Croatia commercial hunting is performed exclusively at feeding sites from elevated hides with use of bait, in Sweden different methods are allowed, like still hunting, hunting with dogs, stalking and baiting (since 2013). We analysed 869 questionnaires (233 from Croatia and 635 from Sweden) filled by hunters after bear hunt, consisting of 31 questions about hunting conditions and weapons used. In both countries 60% of hunted bears were adult, but higher percentage of males were hunted in Croatia (74%) than in Sweden (55%). Average body mass of hunted bears in Croatia vs Sweden was 155 vs 94 kg, respectively. The heaviest bear in Croatia had 351 kg and in Sweden 305 kg. In Sweden the most frequently used hunting methods were baying dogs (45%), drive (25%) and stalking (15%), while bait was not used by any of respondents. In Croatia bears were predominantly hunted in the evening (18 - 21 h), while in Sweden during the morning (9 - 12 h). In both countries hunters mostly used 30-60 Springerfield calibre, bullet mass of 11.6 and 11.7 g and most of the bears were shot in right or left shoulder. In Croatia significantly higher percentage of fired shots hit the bear (94%) than in Sweden (76%, $p<0.0001$). Out of all hunting methods used in both countries, the highest percentage of bears that were not found after being shot was during drive hunt (7,6%) and the lowest while hunting with baying dogs (4,1%). However, for those cases where the bears were not found after shooting, none of the differences between all methods in both countries was significant.

Abstract ID: 223

Session:
Human-bear interactions and management

HUMAN DIMENSIONS WHEN BEARS ARE ALMOST GONE: INSIGHTS FROM SHEEP FARMERS IN WESTERN PYRENEES, SPAIN

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Abstract
We evaluated knowledge, perceptions and attitudes on brown bears by the extensive sheep farmers (n=63) who take their flocks to summer mountain pastures in an area where around two bears remain in the last years. Farming practices are mainly family and single owner properties, with an average owner's age of 50 years. Sheep farming has suffered a strong decline in the last decades in the area and flocks belong to four breeds, two severely endangered. Under this scenario, despite the sporadic presence of bears in many areas, and the extremely low abundance here, bear presence was perceived as incompatible with sheep mountain herding. One third of the sheep farmers have experienced attacks on their sheep. There was a generalized negative attitude towards bears, although it was not considered as the main problem of the farming practices. After wildlife (brown bear and Eurasian griffon Gyps fulvus) and stray dogs (Canis lupus familiaris) attacks on livestock, sheep farmers were able to change their husbandry practices, increasing vigilance, hiring shepherds and using livestock guarding dogs, whose work is generally considered satisfactory by the sheep farmers. Interestingly, there was a general ignorance of the existence of prevention aids, such as guard dogs or electric fences. Compensation for the attacks by regional administrations was seen in a clearly unsatisfactory way, in terms of tardiness, distrust in the opinion of the farmers and quantity paid. Overall, sheep farmers perceived that the implementation of aids, support and compensation is insufficient. There was a generalized rejection of the presence of the bear by sheep farmers, even although bears are almost absent in the area, together with a remarkable lack of knowledge about the systems of livestock aid and damages compensation.

Abstract ID: 1

Session:
Molecular genetics in bear conservation and management

POPULATION GENETICS OF THE MAIN POPULATION OF BROWN BEARS IN SOUTHWEST ASIA

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Abstract
Genetic studies of the Eurasian brown bear (Ursus arctos) are mostly from Europe and North America, while their current main distribution occurs in Asia. We focused our attention on the bear population inhabiting in the north east of Turkey to unveil population genetic parameters for one of the main brown bear populations (about 2000) in the region. Using both noninvasively collected samples (hair, n=147) and tissue samples (n=7) collected between 2008 and 2014, we found that levels of genetic variation (10 microsatellite loci) were high. Bear samples (hair) taken from rubbing trees worked better for genotyping than those collected from power poles. We showed that the population had no substructure, and that gene flow remains intact despite ongoing massive habitat alterations. This population has the potential to serve as a genetic reserve for future reintroductions in the Middle East, southwest Asia.

Abstract ID: 9

Session:
Molecular genetics in bear conservation and management

INFANTICIDE IN BROWN BEAR: A CASE-STUDY IN TRENTINO (ITALIAN ALPS): GENETIC IDENTIFICATION OF PERPETRATOR AND IMPLICATIONS IN SMALL POPULATIONS

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Abstract
Sexually Selected Infanticide (SSI) is thought of as a male reproductive strategy in social mammalian species, because females who lose cubs may quickly re-enter oestrus. SSI has rarely been documented in non-social mammals and, in brown bears, SSI has been studied mainly in an eco-ethological perspective. We examined the first genetically documented infanticide case which occurred in May 2015 in brown bears in Italy (Trentino). The infanticide killed two cubs and their mother. Hair samples were collected from the corpses as well as saliva, through swabs on mother's wounds, with the aim of identifying the genotype of the perpetrator. The samples were genotyped by PCR amplification of 15 autosomal microsatellite loci, following the protocol routinely used for individual bear identifications within the Action Plan for Brown Bear Conservation in the Central-Eastern Alps (PACOBACE). Reliable genotypes were obtained from the mother, cubs and putative perpetrator. The genotypes were matched with those populating the PACOBACE database and genealogies were reconstructed. Both mother and perpetrator genotypes were already present in the database. Kinship analyses confirmed mother-cubs relationships and identified the father of the cubs. In this study, for the first time, we used the open-source LRmix STUDIO software, designed to analyze human forensic genetic profiles, to solve a case in wildlife. Through LRmix STUDIO, those alleles that do not belong to the victims were isolated and, finally, the perpetrator was identified. We present a method that allows, through the application of different models, the genetic identification of the conspecific perpetrator with the highest probability. The identification of the infanticidal male is relevant for the better management and conservation of wild populations with small effective population size and low population growth rate, especially in the case of recently established populations in human-dominated landscape.

Abstract ID: 22

Session:
Molecular genetics in bear conservation and management

TESTING DIFFERENT CONSERVATION METHODS TO MAXIMIZE FECAL DNA EXTRACTION IN BROWN BEAR

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Abstract
The success in extraction rate of fecal DNA in brown bear (Ursus arctos arctos) may be problematic owing to the low efficacy of conservation methods. In Italy, the mean genotyping success of samples collected between 2003 and 2016 was very low (17%). We therefore tested new preservation methods to evaluate the possibility of increasing the success of DNA extraction rate. In 2017, 26 feces of different individuals belonging to the Brenta population (Trentino, Italy) were collected within 48 hours from deposition. For each sampled scat, 4 portions were preserved in 4 different compounds: 96% ethanol, silica gel, DETs buffer and ATL buffer (a tissue lysis buffer used in nucleic acids purification and the first extraction reagent of Kit QIAGEN, used for the extraction process). The samples were sent to the genetic laboratory of ISPRA (The Italian Institute for Environmental Protection and Research) on the same day of collection. DNA was extracted from each scat (sub) sample after being stored for 3-4 days at -80°C, to nullify the occurrence of Echinococcus sp. DNA extraction was repeated for the same scat, after 1 and 2 weeks; during this time scats were kept outside, in an accessible forest area. Preliminary results using a mixed modeling approach assuming a binomial structure, showed a higher (albeit not significantly) conservation efficiency for ATL and DETs buffers compared to other methods. The individual genotyping success was highest in fresh feces (ATL: ca. 65%; DETs: ca. 70%; others: ca. 50%), whereas the success after 1 week and 2 weeks was lower for all compounds (< 10%). Our results provide useful indications as how to maximize the success of fecal DNA extraction in brown bear, and more generally in wildlife, by selecting the most appropriate preservation protocol.

Abstract ID: 36

Session:
Molecular genetics in bear conservation and management

HOW TO PRODUCE COMPARABLE DATA IN CONSERVATION GENETICS FOR THE APENNINE BROWN BEAR

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Abstract
The Apennine brown bear (Ursus arctos marsicanus Altobello, 1921) is an Italian iconic endangered taxon, turned by prolonged isolation into a unique evolutionary unit that requires a constant monitoring to assure its conservation. An issue in conservation genetics is the comparability of data produced by different labs with different methods to allow the creation of a common database and to establish standardised laboratory methods to be used in conservation actions. In the last decade, two different labs (WGI, Wildlife Genetics Internation, B.C., Canada and ISPRA, Istituto Superiore per la Protezione e la Ricerca Ambientale) conducted the genotyping of the Apennine brown bear. For individual identification, these labs used 10 shared markers (STRs) plus sex, to which each one of them added two exclusive markers. In order to allow the comparison between the two databases and thus assure the reliability of future monitoring, we are updating the extant ISPRA database with the complete set of 14 markers used by both labs, by re-typing old and new samples collected by both labs. Our preliminary results show a substantial overlap of the individual genotyping carried out by the two labs, allowing increasing the chance of individual identification and lessening the probability of identity and shadow effect, an important goal in the conservation of a population characterised by a particularly low genetic variability as the Apennine brown bear.

Abstract ID: 41

Session:
Molecular genetics in bear conservation and management

GENETIC STRUCTURE OF A BROWN BEAR (URSUS ARCTOS) SUBPOPULATION IN THE EXTREME NW PART OF GREECE.

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Abstract
Greece hosts the southernmost brown bear (Ursus arctos) populations on the European continent. The minimum population size in the country is estimated at around 500 individuals inhabiting two separate geographical areas. The largest population occupies the area of Pindos Mountain range and is part of the wider Dinara-Pindos biological population whereas the other population nucleus occupies the Rhodope Mountain range in the East and is part of the wider Eastern Balkan population. The scope of this project is to investigate the genetic diversity and robustness of a brown bear subpopulation of the western nucleus located in the extreme NW part of Pindos range. This work is part of a wider project titled «Improving Human-Bear Coexistence Conditions in Municipality of Amyntaio–LIFE15NAT/GR/001108», in cooperation with the NGO "CALLISTO" project partner. Samples were collected, non-invasively, during field surveys in the study area from May to July 2017. Most samples were hairs (n=208), collected from a network of hair-traps with barbed wire attached to power poles covering the entire bear range in the prefectural unit of Florina. In addition, 8 stool samples were collected. DNA from 170 hair samples was successfully extracted. DNA samples were amplified and scored at ten microsatellite loci with ABI 3500 genetic analyzer (Applied Biosystems®). Each sample has been genotyped to estimate genetic parameters of the population including expected and observed heterozygosity values, number of alleles, Hardy–Weinberg equilibrium test and bottleneck effect. The effective population size was also calculated. Two sets of primers for SRY and ZF genes were used to calculate the sex ratio. Evaluation of the population status of bear population in Florina area is crucial for the efficient management of human-bear interactions and the proper management and conservation of the species both at national and trans-boundary levels. The population will also be genetically monitored in 2019.

Abstract ID: 62

Session:
Molecular genetics in bear conservation and management

A PILOT STUDY FOR THE USE OF SNP MARKERS FOR PARENTAGE ANALYSIS WITH NON-INVASIVE SAMPLES. THE CASE OF THE ALPINE BROWN BEAR POPULATION.

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Abstract
Parentage analysis through molecular markers is of great importance in conservation biology, since it allows estimates of breeding success, inbreeding level and effective population size. Pedigree reconstruction may also shed light on the mating system, social and dispersal behavior. The elusive and endangered brown bear survives in the Italian Alps thanks to the translocation of 9 individuals from Slovenia during the 2000s, followed by 15 years of genetic monitoring using 15 microsatellites (STRs). Since only a few of the founders reproduced, all present individuals are closely related. As generations progress, differences among individual multilocus genotypes may decrease due to inbreeding, and the identification of parentage relationships become more challenging. As a result, more informative markers are needed to perform parentage assignments with high probability values. Here we compare the effectiveness of microsatellite and single nucleotide polymorphisms (SNP) marker sets in parentage analysis of the endangered brown bear population in the Italian Alps, using two parentage analysis packages: Colony and FRANz. The combination of 45 SNPs and 15 STRs provided no incongruent results as compared with 15 STRs and a slightly higher mean probability of assignment (15 STRs= 98,58%; 45SNPs+15STRs=99,99%). More interestingly, much higher minimum values were found using the combination of markers, even if a few mismatches among correct trios were found, indicating the presence of genotyping errors in a few SNP genotypes. Given these results, we conclude that a combination of STR and SNP markers is more efficient in parental assignments than STRs or SNPs alone. We propose a routine method to be applied when analyzing parental relationships using SNPs, taking into account challenges derived from the use of non-invasive samples.

Abstract ID: 137

Session:
Molecular genetics in bear conservation and management

FILLING THE KNOWLEDGE GAPS:ASSESING BROWN BEAR POPULATION SIZE IN A PIONEER PROJECT IN MONTENEGRO (MNE) AND BOSNIA AND HERZEGOVINA (BIH)

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Abstract
The Dinaric-Pindos Brown bear population is the third largest in Europe. Like many other European bear populations, it seems to be recovering, but very real challenges to its conservation still remain. A serious obstacle in dealing with these challenges is "management fragmentation", with management being spread over many countries with very little coordination. Valid scientific data on basic ecological parameters are still lacking or non-existent in many areas, leaving the management decisions to be made on basis of "soft data". This may reverse the current positive population trend and should be considered a serious threat to the population's long-term viability. While MNE and BiH harbour a considerable part of the entire population, there is almost a complete lack of scientific knowledge for the region. In order to improve bear management in these two countries, this issue needs to be urgently addressed. As a first step, we have conducted a non-invasive genetic survey of Brown bears in two pilot areas in MNE and BiH. The main aim of the study was to test the methodology, identify challenges and demonstrate a good practice example by providing for the first time hard data about resident bears in these two countries. In collaboration with hunters we collected 98 (MNE) and 25 (BiH) bear scat samples, respectively, between September and November 2017. The samples have been genotyped using next-generation sequencing to provide data compatible with research done in neighbouring countries. The results of the study and the lessons learned will be used for the implementation of a national genetic population assessment in 2018 and provide important information for the development of an effective bear management in MNE and BiH in the future. We would like to share the experiences and discuss (considerable) challenges that were encountered during this pilot study in a region which is currently as far as reliable data on bears is concerned still a blank spot on the map.

Abstract ID: 176

Session:
Molecular genetics in bear conservation and management

POPULATION GENETIC ANALYSIS OF THE BROWN BEAR (URSUS ARCTOS) IN THE AKAN—SHIRANUKA REGION, EASTERN HOKKAIDO, JAPAN

Ayumi Kato[1], Tetsuji Itoh[2], Ken'ya Mizunashi[1], Yasuyuki Ishibashi[3], Tsutomu Mano[4], Yoshikazu Sato[1]

[1]Rakuno Gakuen University, Japan
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Abstract
In the southern periphery of the Akan–Shiranuka region, nuisance control kills of brown bears have been performed repeatedly to decrease the levels of human–bear conflicts (HBCs). Although a number of bears have been killed since the latter half of the 1990s, the rate of HBCs has been increasing, and this circumstance brings the need for kill more intensively. In this study, in order to know the natal area of bears, we examined mtDNA haplotypes and six microsatellite DNA loci of 203 bears that were killed in the peripheral area. As a result, bear migration to the peripheral area was confirmed not only from the core but also from the marginal area with low population density. In the analysis of genetic diversity, we also confirmed that the observed heterozygosity in the 2000's was lower than in the 1990s, while the expected heterozygosity was higher, which would be caused by increasing in apparent genetic diversity. This increase would be derived from "Wohlund effect" because sampling in the peripheral area would have included not only from resident bears but from transitional migrate bears born in population core and marginal area. The present results also suggest that the negative spiral of continuous HBCs and high human-derived mortality of bears caused by indiscriminate kills in the peripheral area and following maladaptive migration of other bears from core and marginal areas to the peripheral "attractive-sink" like area, where is high in habitat quality and also high in human-derived mortality for bears.

Abstract ID: 200

Session:
Molecular genetics in bear conservation and management

DNA MONITORING OF THE SCANDINAVIAN BROWN BEAR POPULATION

Jonas Kindberg, Henrik Brøseth, Jenny Mattisson, Øystein Flagstad, Oddmund Kleven, Mari Tovmo, Jan Arne Stokmo, Frode Holmstrøm

The Norwegian Institute for Nature Research

Abstract
Sweden and Norway have a common bear population of around 3000 individuals. The monitoring in both countries relies primarily on identification of individuals using DNA from non-invasive samples (scats or hair). This method has been in use since 2001 in Sweden and 2005 in Norway. The information of individual identity, date and location is stored in a database common for both Norway and Sweden. In addition, all dead individuals are sampled for DNA, measured and the age determined (using a tooth). These data are available for managers in both countries and furthermore, most information is open to everybody to view through the database www.rovbase.no. A liberal openness provides interest groups and the public with information and understanding of the monitoring system. The data is very important for monitoring purposes, as parts of the population is shared between the countries. Transborder population monitoring that use common methods, and with genetic laboratories that are calibrated for the same DNA microsatellite markers, are essential e.g. to reduce over-estimation of population sizes. Today, there are more than 30 000 analysed genetic samples and over 5000 individuals in the Scandinavian database “Rovbase”.

Abstract ID: 229

Session:
Molecular genetics in bear conservation and management

EVOLUTION AND DETERMINANTS OF GENETIC COMPOSITION IN THE ENDANGERED PYRENEAN BROWN BEAR POPULATION FOLLOWING TRANSLOCATIONS

Camille Beaumelle[1], Pierre-Yves Quenette[2], Christian Miquel[1], Jean-Jacques Camarra[2], Pierre Taberlet[1], Marta De Barba1

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[2] French National Hunting and Wildlife Agency (ONCFS)

Abstract
A number of small and isolated brown bear populations in southern Europe has been the subject of translocations to counteract negative demographic trends and possibledeleterious effects of loss of genetic diversity. The ecology and evolution of these populations differ in several aspects from large once due to the small number of founders, isolation from other populations, and vulnerability to deterministic and stochastic causes of decline. We document the genetic evolution of the brown bear population in the Pyrenees that has undergone translocations in 1996-1997, 2006 and 2016. We used data obtained primarily from long term non-invasive geneticmonitoring through standard and high-throughput microsatellite genotyping (>2000 samples, 58 genotypes since 1993) to track changes in genetic composition associated with demographic expansion and translocation events. The wild pedigree constructed from genetic parentage analyses revealed that the rapid population growth since the translocation in 2006 was mainly driven by the reproduction of 2 translocated individuals (a male and a female) that contributed to 68% of the total genetic pool of the population. This high variance in reproductive success, combined to small population size, isolation, and potential human-caused mortality, determined a decline in genetic diversity and increasing rates of inbreeding since the initial translocation, and an extremely small effective population size and high genetic similarity in the current population (He=0.59, F=0.12, Ne= 3.6 in 2016). Our analysis also showed that the male with the highest reproductive success had the lowest individual heterozygosity among founders. These results shed light into determinants of genetic evolution in this population and more broadly underline the importance of adopting translocation strategies favoring equal reproductive contribution and maximizing genetic diversity of released individuals to reduce genetic erosion in translocated populations.

Abstract ID: 230

Session:
Molecular genetics in bear conservation and management

GENETIC STATUS AND STRUCTURE OF BROWN BEARS IN THE BRYANSK REGION (RUSSIA)

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Abstract
The Bryansk Region is located in the central part of the eastern European plain. An isolated bear population has formed in the Bryansk Region, numbering about 45-50 individuals.We collected samples of the bears in 2014-2017. The study area encompassed the «Bryansky Les» Nature Reserve (52°25′ - 52°33′ N. and 33°48′ - 34°07′ E) and its environs, covering a total area of 350 sq. km. The entire study area was divided into quadrants of approximately 3x3 km. Hair snares were set up in each quadrant. A camera trap was also placed at each of the snares. The camera trap eases collection of data, because one can immediately see on the photos which bear came to the site and when. It also provides a photograph of the bear, whose fur is being collected. The traps operated from April to December and were checked every two weeks during the entire study period. In four seasons, 9,400 trap-days were registered. One hundred and fifty hair samples were collected. Of the 56 hair samples analyzed, 32 (57%) were amplified to 10 microsatellite loci (Mu10, Mu23, Mu51, Mu59, G10L, Cxx20, T259, T647, G10X). Additionally, the genotypes were analyzed for two bear cubs from the Clean Forest Biostation released in 2014 in the Nature Reserve «Bryansky Les». Among the analyzed samples, we identified 19 different individuals, including two families consisting of a she-bear and two cubs. Four bears (one female and three males) were registered twice during the year, while the bear families were represented in a total of 11 samples from three traps. The rest of the identified bears were met only once each. One adult male of the bears were photographed on the camera trap had a very light straw-colored coat, and same coat color in three cubs. We assume that those bears could be carriers of the mc1r gene polymorphism, that causes white coat color in some organisms, including the American black bear, but this assumption is yet to be proved.

Abstract ID: 239

Session:
Molecular genetics in bear conservation and management

POPULATION GENETIC ANALYSIS OF THE BROWN BEAR IN THE AKAN-SHIRANUKA REGION, EASTERN HOKKAIDO, JAPAN

Ayumi Kato[1], Tetsuji Itoh[2], Kan'ya Mizunashi[1], Yasuyuki Ishibashi[3], Tsutomu Mano[4], Yoshikazu Sato[1]

[1]Rakuno Gakuen University, Japan
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Abstract
In the southern periphery of the Akan–Shiranuka region, nuisance control kills of brown bears have been performed repeatedly to decrease the levels of human–bear conflicts (HBCs). Although a number of bears have been killed since the latter half of the 1990s, the rate of HBCs has been increasing, and this circumstance brings the need for kill more intensively. In this study, in order to know the natal area of bears, we examined mtDNA haplotypes and six microsatellite DNA loci of 203 bears that were killed in the peripheral area. As a result, bear migration to the peripheral area was confirmed not only from the core but also from the marginal area with low population density. In the analysis of genetic diversity, we also confirmed that the observed heterozygosity in the 2000's was lower than in the 1990s, while the expected heterozygosity was higher, which would be caused by increasing in apparent genetic diversity. This increase would be derived from "Wahlund effect" because sampling in the peripheral area would have included not only from resident bears but from transitional migrate bears born in population core and marginal area. The present results also suggest that the negative spiral of continuous HBCs and high human-derived mortality of bears caused by indiscriminate kills in the peripheral area and following maladaptive migration of other bears from core and marginal areas to the peripheral "attractive-sink" like area, where is high in habitat quality and also high in human-derived mortality for bears.

Abstract ID: 240

Session:
Molecular genetics in bear conservation and management

SCAT-DETECTION DOGS: A PROMISING TECHNIQUE FOR MONITORING BROWN BEARS IN THE PYRENEES

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Abstract
In the Pyrenees, estimation of brown bear abundance and distribution is based primarily on non-invasive genetic sampling of hair and scats collected either opportunistically or systematically in the field. But finding bear scats in such remote and rugged mountainous habitats is particularly challenging, since Pyrenean brown bears are rare, elusive and live at low density over large areas. We report here the development and application of a novel non-invasive sampling technique, relying on the use of a highly reward-driven domestic dog, selected at 7 weeks old based on its temperament and play drive, and specially trained to readily locate brown bear scats in the field. In 2014, our first trained dog, named Iris (a Belgian Malinois shepherd dog), became at 15 months old the first experienced scat-detection dog in France. The use of Iris greatly enhanced our sample acquisition rate, since the ratio of the average annual number of scats collected by the average annual number of bears detected in the French Pyrenees increased by 264% between 2010-2013 (without dog) and 2015-2017 (with dog) periods. The contribution of Iris to the total number of scats collected from 2014 to 2017 represented 73%. The scats found by Iris coupled with DNA analyses enabled to identify 8 of the 12 cubs detected from 2014 to 2017 and to detect during 2015 fall the presence of 4 different bears over a 1-km² area, suggesting a selection of this restricted area by bears during the hyperphagia period. Our scat-detection dog technique has been successfully applied on other dogs (e.g., in Val d'Aran, Spain and in France) and other targeted species (e.g., minks, wolves) with the same dogs. This method provides a promising cost-effective sampling tool not only for monitoring the Pyrenean brown bear population, but also for addressing a variety of wildlife management and research questions (population dynamics and genetics, occupancy, spatial ecology, diet, endozoochory, stress...).

Abstract ID: 8

Session:
Spatial requirements and demographic characteristics of bear populations

REVIEW OF BROWN BEAR HABITAT SELECTION IN RELATION TO ANTHROPOGENIC DISTURBANCES

Maja Mohorović, Klemen Jerina, Miha Krofel

Biotechnical Faculty of Ljubljana, Slovenia

Abstract
For successful large carnivore conservation it is important to understand mechanisms how large carnivores adapt to human presence, including anthropogenic environmental modifications. Widespread Holarctic distribution throughout various levels of human-use makes the brown bear (Ursus arctos) an appropriate model species for studying response to anthropogenic effects in large carnivores. We reviewed the literature throughout entire species' range to examine how bears modify their habitat use in response to the intensity of anthropogenic modifications of their environment. Results indicate that bears in general avoid human structures, with strongest avoidance observed for permanently inhabited areas and high-traffic roads. We observed their stronger avoidance of human structures in areas with higher human population densities. Comparison between Europe and North America indicate stronger avoidance of urban areas among European bears, while no obvious differences were observed for other types of anthropogenic infrastructure. We suggest caution when comparing responses among study areas, because most bear habitat-use studies reported only relative habitat selection (i.e. use relative to the availability) and there is lack of reported data on absolute habitat use. Therefore we recommend analysis of original data across the species' range in order to advance our understanding of bear habitat-use across a gradient of intensity of human disturbance.

Abstract ID: 24

Session:
Spatial requirements and demographic characteristics of bear populations

ANALYZING AND MAPPING THE STRUCTURES WHICH MAY BE USED AS POTENTIAL PASSING CORRIDORS BY BROWN BEAR: CASE STUDY COMARNIC-BRAŞOV SECTION

Mihai Fedorca, Marius Popa, Georgeta Ionescu, Ancuta Fedorca, Claudiu Pasca, Cezar Spataru

National Institute for Research and Development in Forestry Marin Drăcea, Romania

Abstract
Road and railway mortalities represent a major risk and combined with habitat loss and fragmentation can negatively affect wildlife populations on long term. Thus identifying the existing structures (bridges, culverts) that can be used by brown bears to cross the roads and railway infrastructures and determining their functionality is very important (in order to reduce the costs of building new structures and to restore them if necessary) and only few studies have been conducted in Romania. During 2017 we monitored 109 bridges and culverts in the most crowded section Brasov-Comarnic (National Road DN1), which can potentially act as existing wildlife passage. We installed photo trap cameras and we used track monitoring and records of road and train accidents in which brown bears were involved (in the last 10 years). The results indicated us that these structures were acting as wildlife passages, and represents connectivity facilitators for the habitats on the both sides, which are disconnected by the road and railway infrastructure. However, the number of species that used them for crossing has increased with the size of these structures.

Abstract ID: 31

Session:
Spatial requirements and demographic characteristics of bear populations

HABITAT SUITABILITY AND CORRIDOR ANALYSIS FOR SLOTH BEAR IN GUJARAT USING REMOTE SENSING AND ECOLOGICAL MODELLING

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Abstract
Ecological corridors have been proved effective for the conservation of wildlife in various situations (e.g. urban, agricultural, production forest landscapes), although individual species vary in their use of corridors. Retained areas of native forest within plantations are beneficial for wildlife conservation. Habitat fragmentation is a well-known issue in wildlife conservation limiting the habitat range especially for large mammals. This research aims at using geospatial and niche modelling techniques of habitat suitability integrating remote sensing based land use/land coverpreferences of the Sloth bears in Gujarat, which is the western most limit of its distribution. The research work focuses on connecting the fragmented habitats of sloth bear in Gujarat state by identifying suitable habitat. The study area was systematically inventoried using 5 x5 km grid overlaid on 1:50 k map to mark the GPS tagged presence signs of sloth bear. Habitat suitability modelling was carried out using bioclimatic preferences of the sloth bear as well as shelter and food habitat availability. All the base layers like transport, settlements and drainage and water bodies from 1:50k scale topo-maps were extracted. These layers along with the current forest cover map were overlaid to carry out overlay analysis to identify suitable zonation based on proximity to wilderness. 20% of the forest land out of total forest cover present in Gujarat is designated as sloth bear landscape. Our study found 1.45% of the area is suitable to raise as potential corridors. We have identified total twelve corridors connecting five major protected areas and unprotected bear habitats where sloth bear are known to occur. These corridors ranging from 12km to 77km were designed looking at the basic habitat requirements of sloth bear. The detailed corridor map was prepared and shared with the state forest department with recommendations of habitat improvement in the potential corridors.

Abstract ID: 35

Session:
Spatial requirements and demographic characteristics of bear populations

TITLE: BROWN BEAR (URSUS ARCTOS ARCTOS) MONITORING IN THE TRANSBOUNDARY AREA OF EASTERN ITALIAN ALPS IN 2012-2017

Lorenzo Frangini[1], Francesca Davoli[2], Stefano Filacorda[3], Patrizia Giangregorio[2], Paolo Molinari[4], Ettore Randi1, Umberto Fattori[5], Mario Cozzo[2], Nadia Mucci[2]

[1]Università di Bologna, Italy
[2]Institute for Environmental Protection and Research, Italy
[3]Università di Udine, Italy
[4]Progetto Lince Italia
[5]Regione Autonoma Friuli-Venezia Giulia, Italy

Abstract
Brown bear is a flagship species whose conservation needs international efforts. Today, in Europe brown bears live in 10 fragmented populations due to habitat loss and historical human persecution. A reintroduced brown bear population in Central Italian Alps presently numbers 52-63 individuals. This population risks loss of genetic variability due to very small effective population size (Ne = 18 individuals) and inbreeding depression, because 20 years after thetranslocations no gene flow has been recorded with the closest Dinaric population. In order to ensure its persistence a brown bear metapopulation system could sustain dispersal movements and gene flow. In this context the Friuli-Venezia Giulia region could have a key role because is the only area frequented every year by males from both populations. Aiming to assess the role of this study area, we monitored brown bear presence in 2012-2017, integrating an existing dataset with new observations obtained mainly by noninvasive genetics and telemetry. Results confirmed the exclusive presence of males dispersing from both Slovenia and Central Italian Alps. Individuals showed a great turnover highlighting a high degree of environmental permeability. Genetic variability of Slovenian bears roaming in Friuli is higher than Central Alpine bears. However, the establishment of a reproductive stepping-stone population asks for the presence of females that could be translocated to Friuli and international cooperation for the species' management. Translocations needs to be carefully evaluated taking into account human dimension and other socioeconomic aspects.

Abstract ID: 59

Session:
Spatial requirements and demographic characteristics of bear populations

MORPHOLOGICAL IDENTIFICATION OF INDIVIDUALS FROM CAMERA TRAP PHOTOGRAPHIES: A NEW PROMISING TECHNIQUE FOR SAMPLING SMALL POPULATIONS OF BEARS LACKING NATURAL MARKINGS

Cécile Vanpé[1], Nicolas Bombillon[1], Jérôme Sentilles[1], Jean-Jacques Camarra[1], Elodie Courtois[2], Pierre-Yves Quenette[1]

[1]French National Hunting and Wildlife Agency (ONCFS)
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Abstract
The ability to recognize and follow individuals of a population over space and time is fundamental for wildlife managers and researchers in many ways, such as to evaluate individuals' survival, movements, home ranges, habitat use, etc. It is also a key requirement to estimate animal population size based on capture-recapture surveys. For endangered elusive species, non-invasive methods such as genetic sampling or camera-trapping are clearly preferred to identify individuals. While photographic capture-recapture methods have now been routinely used in a wide range of large carnivores, no study, to our knowledge, has yet tested the reliability of morphometric traits measures to identify individuals from camera trap photographies of whole body profiles, in a large carnivore species lacking natural markings. We filled this gap by testing the use of such a technique in the endangered Pyrenean brown bear population. No intra-observer effect was detected on the four selected morphological measurements. We identified the Ward's linkage method as the best clustering algorithm to discriminate between known individuals identified by independent sources such as molecular tools or artificial marks (eartags, radiocollars). Applying this method on a larger dataset of bear photographs collected between 2010-2016, we could reliably discriminate between individuals from different age-classes, between adult males and females, as well as among adult males but not necessarily among adult females. Our results suggest that this non-invasive technique is promising to help recognizing individuals from small bear populations. But cautious should be exercised, since the reliability of such a technique is constrained by the inter-individual variability of the traits at the population level, the stability of the traits over the duration of the study period, the visibility of the traits under different environmental conditions and the precision of trait measurements.

Abstract ID: 65

Session:
Spatial requirements and demographic characteristics of bear populations

ALL THE FACES OF THE ALPINE BEAR: INTEGRATING MULTI-SOURCE DATA IN AN INDIVIDUAL-BASED SPATIAL RELATIONAL DATABASE FOR THE BROWN BEAR (URSUS ARCTOS) IN THE ALPS.

Andrea Corradini[1,2,3], Natalia Bragalanti[4], Francesca Cagnacci[2], Marco Ciolli[1], Claudio Groff[4], Aaron Iemma[5], Luca Pedrotti[3,4], Ferdinando Urbano

[1]University of Trento, Department of Civil, Environmental and Mechanical Engineering, Trento, Italy;
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[3] Stelvio National Park, Bormio, Italy
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[5]MUSE, Museo delle Scienze di Trento - Vertebrate Zoology Section, Trento, Italy

Abstract
The Alpine bear (Ursus arctos) population in Trentino, Italy, is probably one of the most surveyed large carnivore populations in Europe. Since the first reintroductions in the early 2000s, it has been continuously monitored and genetically sampled through the joint effort of various authorities. This long-term monitoring, combined with the advent of new technologies, has produced a comprehensive and ecologically precious dataset. However, the high amount of data has been generated by different sources, making the combined use of the data difficult. In order to reduce the loss of data significance, an accurate work of data integration has been done. As a result, an individual-based spatial relational database has been implemented, pooling a large amount of multi-source georeferenced data available in the Central Alps. Specifically, the spatial database contains the GPS location data (n≈ 50.000 fixes) coming from sensors deployed on 16 bears and information (n≈ 9.000 records) concerning genetics, kinship, damages, VHF radio tracking, sighting, and tracks regarding 144 bears (including the individuals equipped with GPS collars).The spatial database was implemented in PostgreSQL with the extension PostGIS. The database benefits fully from the software capabilities, such as data integrity, data consistency, storage capacity, reduced data redundancy, long-term storage, and advanced permission policy (allowing the sharing with partner institutions). Moreover, the high interoperability of PostgreSQL allowed the creation of a gapless workflow with both data analysis software (such as R) and GIS environments. The applications of this individual-based spatial relational database are manifold. From individual-based models considering inherited behavioral traits as potential drivers of movement parameters, survival, and reproductive success, to the creation of finely detailed life-history for each monitored individual.

Abstract ID: 75

Session:
Spatial requirements and demographic characteristics of bear populations

CHARACTERISTICS OF DE-POPULATED RURAL LANDSCAPE DETERMINED THE DISTRIBUTION OF SEASONALLY CRITICAL FOOD FOR ASIATIC BLACK BEARS.

Chihiro Takahata

Mountain Science Institution, Shinshu University, Japan

Abstract
The extent of risky habitat appeared to determine the carrying capacity for local wildlife populations. Therefore, identifying landscape characteristics that strong influence on spatial distribution of critical resources, particularly in the season of nutritional bottleneck, is necessary to know limiting factors on species fitness. In the case of Asiatic black bears in Japan, such resource bottleneck usually occurs during summer when secure habitat in remote lands is limited, resulting increased bear use of risky human-dominated lands. To evaluate the effect of such risk-prone foraging on bear fitness, we need to identify landscape factors associated with spatial distribution of seasonally critical food. I focused on the major summer food of bears; cherries, berries, vines and other fruiting trees, which have a distinct flowering period in spring that enables us to locate them easily. Along mountain-valley gradients in a typical Japanese rural area, I conducted spring survey to locate flowering trees and shrubs to estimate effects of human-disturbed landscape on spatial distribution of the natural bear food. Notably, most of flowering species aggregated in small patches around farmlands and riparian woodlands, which were more abundant in the lower elevation where humans actively dominate. The majority of landscape characteristics strongly associated with summer bear food was abandoned farmlands and collapsed plantations. This means that lands unsuitable for human use provide foraging sites for bears, hence play a crucial role to support the local population. The results in this study indicate that the declined human resource exploitation was one of key factors responsible to frequenting bears near human-settled lands. If we have better understanding how bears utilize human-disturbed landscapes, the increase of abandoned lands also gives us one opportunity to develop the way of land-sharing with bears as with further de-population in the future.

Abstract ID: 78

Session:
Spatial requirements and demographic characteristics of bear populations

STATUS AND DISTRIBUTION OF HIMALAYAN BROWN BEARS IN PANGI VALLEY, HIMACHAL PRADESH, INDIA.

Bipan Rathore

Department of Higher Education, India

Abstract
Pangi valley situated in north part of Chamba district of western Himalayan state of Himachal Pradesh, India, is one of the remote tribal areas and represent temperate climate with harsh weather conditions.The tribal people of Pangi are called the "Pangwal." The high altitudinal villages of Pangi Valley are called Bhatories and their residents are referred to as "bhots." The status and distribution and food habits of Himalayan brown bears (Ursus arctos isabellinus) were studied in valley (Area 1503 square kilometres) including one wildlife sanctuary and four sub-alpine pastures/dhars from May to October 2017. The information on distribution of Himalayan brown bear in the entire valley was collected through semi structured interviews with bhot community, questionnaires, direct observations and field surveys. Density and encounter rate of Brown bear were found to be comparatively higher in sub-alpine pastures of Sechu-Tuan Nalla wildlife sanctuary. Maximum number of brown bears sighting were recorded in month of September and a total of 22 individual brown bears sighting were recorded in Sechu-Tuan Nalla wildlife sanctuary (9), Sural dhar (4), Puhali dhar (3), Cheni dhar (4), and Gul dhar (2) indicating that Pangi valley offers ideal habitat for Himalayan brown bears and maximum individual bears were identified inside protected area and various bhatories indicating that bhot people due to their religious belief offer better protection to wild animals in spite of depredation to their livestock. Increasing dependency on natural resources in these bhatories are key threats and actions like effective management of fragmented potential brown bear habitats need special attention in the valley.

Abstract ID: 108

Session:
Spatial requirements and demographic characteristics of bear populations

ROADLESS AREAS FOR BROWN BEAR CONSERVATION IN EUROPE

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Abstract
In Europe, brown bears (Ursus arctos) occur in 22 countries, forming 10 distinct populations (Alpine, Baltic, Cantabrian, Carpathian, Central Apennine, Dinaric-Pindos, Eastern Balkan, Karelian, Pyrenean, Scandinavian). The species is strictly protected in most European countries and is listed in Annex II and IV of the EU Habitats Directive (92/43/EEC), which implies that Member States should avoid the deterioration and disturbance of bear habitats. Habitat loss due to infrastructure development is the main threat for brown bears in the highly fragmented European landscapes. In this context, Roadless Areas (RAs) have been recognized as conservation targets that provide numerous benefits to biodiversity and complement the EU protected area network (Natura 2000), enhancing its effectiveness. We tested whether large RAs could support the conservation of brown bear habitats in the EU27 populations. We defined RAs as natural and semi-natural areas where roads are absent or that have few roads with low traffic. We applied a 1 km buffer along the main transportation network (OpenStreetMap) and removed human-induced areas (CORINE Land Cover 2000). We then calculated the number and size of RAs within and out of bear range. We identified 9,531 RAs (≥1 km2) (mean size= 67.01 km2) within brown bear range in the EU27. These RAs covered 70.8% of the species range, of which 58% were covered only by large RAs (≥100 km2). In forest areas, out of bear range, the mean size of RAs (13.9 km2) was significantly lower than within bear range, highlighting the importance of large RAs for brown bears. RAs size was highly variable within and across the 10 bear population ranges. Indicatively, we found RAs spanning up to almost 60,000 km2 in the Scandinavian population range and up to 370 km2 in the Central Apennine population range. We believe that RAs could play an important role in ensuring the conservation and long-term viability of brown bear populations in Europe.

Abstract ID: 127

Session:
Spatial requirements and demographic characteristics of bear populations

MAPPING FOR BEARS: IDENTIFYING CORRIDOR POTENTIAL USING REMOTE SENSING DATA

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Abstract
Following a general European trend and successful conservation efforts, brown bears (Ursus arctos) are currently expanding their range in Greece, recolonising parts of the mainland from which they have been absent for over five decades. Contrastingly, suitable habitats are becoming increasingly smaller and fragmented due to human development. Therefore, identifying and protecting landscape connectivity is a major component of large carnivore conservation efforts across Europe in the 21st century. In this study we modelled the ecological networks of the Greek brown bear population, expanding to the lower end of the Dinaric-Pindos population in the northwest, as well as part of the Balkan population in the northeast. The aim of the study was to compare assessments of landscape connectivity resulting from two differing approaches to habitat suitability (HS) modelling. An HS model was created on MaxEnt using field data (brown bear telemetry and observational data) to test the reliability of a model based purely on landscape layers and expert knowledge of bear ecology. The presence and quality of habitat connectivity between core areas was subsequently analysed using the spatial analysis toolbox CorridorDesigner. The comparison of the two resulting corridor models reveals a significant overlap in the corridor layers, suggesting that analysis of remotely sensed landscape data, combined with a comprehensive understanding of the species ecological requirements, may also be an effective tool for corridor modelling. We suggest that the latter has the potential to identify zones of critical importance to landscape-scale connectivity for bears, allowing for targeted field work and conservation planning. However, we caution that these findings require ground-truthing to assess the validity of the model outputs.

Abstract ID: 143

Session:
Spatial requirements and demographic characteristics of bear populations

THE CHALLENGE OF ESTIMATING BROWN BEAR (URSUS ARCTOS) DENSITY IN THE ROMANIAN CARPATHIANS

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Abstract
Accurate population size estimates are important information for sustainable wildlife management. The Romanian Carpathians harbor the largest brown bear (Ursus arctos) population in Europe, yet current management relies on estimates of density from track surveys that lack statistical oversight and ignore uncertainty. In this study we investigate an alternative approach to estimate brown bear density using sign surveys along transects within a novel integration of occupancy models and home range methods. We performed repeated surveys along 2-km segments of forest roads during three distinct seasons: spring 2011, fall-winter 2011, and spring 2012, within three game management units and a Natura 2000 site. We estimated bears abundances along transects using the number of unique tracks observed per survey occasion via N-mixture hierarchical models, which account for imperfect detection. To obtain brown bear densities, we combined these abundances with the effective sampling area of the transects (i.e., estimated as a function of the average core home range of 12.1 ± 3.3 km2 based on telemetry data from 17 bears tracked for 1-month periods overlapping our surveys windows). Our analyses yielded average brown bear densities (and 95% confidence intervals) for the three seasons of: 6.3 (3.4 – 9.2), 6.1 (3.2 – 9.0), and 6.8 (3.8 – 9.8) individuals/100 km2. Across game management units, mean densities ranged between 4.1 and 8.1 individuals/100 km2. Our method incorporates multiple sources of uncertainty (e.g., effective sampling area, imperfect detection) to estimate brown bear density, but the inference fundamentally relies on unmarked individuals only. While useful as a temporary approach to monitor brown bears, we urge implementing DNA capture-recapture methods regionally to inform brown bear management.

Abstract ID: 182

Session:
Spatial requirements and demographic characteristics of bear populations

THE ABUNDANCE OF THE BROWN BEAR IN THE CULTURAL LANDSCAPE OF ESTONIA: THE SITUATION DURING THE LAST 10 YEARS

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Abstract
The population of the brown bear in Estonia definitely forms the core of the overall Baltic population of the species. While Estonia currently supports 700-800 individuals, numbers in the both other Baltic States are much smaller - only 20-50 individuals in Latvia, and just occasionally observed individuals in Lithuania. However, the distribution of the brown bear is not even in Estonia. There are regions, which the species favours more. The aim of the current research was to investigate the abundance of the brown bear families (females with cubs) during last 10 years (2008-2017) on the scale of 25 larger landscape regions of Estonia. Official annual monitoring data provided by the Estonian Environment Agency were used for the analyses. The number of observations in each landscape region was recalculated to relative values per 1000 km2. The highest bear abundance is being observed in the North-East landscape regions of Estonia with a gradual decrease towards the South and West. The abundance analyses show a bit surprising results. In some landscape regions (e.g., Alutaguse Lowland, Middle-Estonian Plain, The Gulf of Finland Coastal Lowland), a high proportion of natural landscapes – forest and wetlands – seem to be obvious explanation for the high abundance of bear families; however, landscape regions with a high share of agricultural land (e.g., Viru Plateu, Pandivere Upland, Middle Estonian Plateau) may host as equal number of bear families as natural landscape dominating regions. It may suggest that the species can adapt to cultural landscape, where easily available food resources are provided by agricultural land, and trades off security for food, particularly in a mosaic landscape where forest patches still provide shelter.

Abstract ID: 194

Session:
Spatial requirements and demographic characteristics of bear populations

TRENDS IN LITTER SIZE IN THE CANTABRIAN BROWN BEAR POPULATION: A 25 YEAR-PERIOD PERSPECTIVE

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Abstract
Bear monitoring in the Cantabrian Mountains is based on estimating the minimum number of females with cubs of the year (mainly through direct observations and bear tracks). This approach has allowed to collect valuableinformation on bear litter size over time (>25 years of bear monitoring). Since 1989, the minimum number of females with cubs has increased from 4 and 2 breeding groups to 34 and 6 in 2016, for the western and eastern segments of the population, respectively. Current estimates translate into more of 300 bears in this population. Taking into account reliable information from 412 females with cubs between 1989 and 2015, bear litter size in the Cantabrian population ranged between 1 and 3 cubs, with an average litter size of 1.83±0.64 cubs. This figure was 1.88±0.63(n=349) and 1.54±0.59(n=63), for the western and eastern population segments, respectively. The most common litter size in western population segment was 2 cubs (58.45% of cases), followed by 1 (26.65%) and 3 cubs (14.9%), whereas in eastern one was 1 cub (50.79%), followed by 2 (44.44%) and 3 cubs (4.76%). Despite observed population increase, we did not detect a significant variation in litter size over time. However, there have been more cases of females with 3 cubs in recent times in both population segments. In addition, the number of observations of females with 1 cub has increased over time in western population segment. Detailed information about litter size can help to better understand the trend of the endangered Cantabrian brown bear population.

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Session:
Spatial requirements and demographic characteristics of bear populations

REPRODUCTIVE STATUS AND LANDSCAPE FACTORS AND THEIR INFLUENCE ON THE MOVEMENT ECOLOGY OF BARREN-GROUND GRIZZLY BEARS

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Abstract
For Arctic female grizzly bears (Ursus arctos) with cubs, den emergence can be challenging as mothers move in search of high quality resources. We used satellite-telemetry data and step-selection functions (SSF) to model the movements of adult female grizzly bears grouped by their reproductive state (solitary, with young cubs, and with older cubs) in the Mackenzie Delta region of the Northwest Territories, Canada. We used Akaike's Information Criterion weights (AICw) across individuals to determine the most parsimonious model. We averaged beta coefficients and variances for the top model across individuals by group. We found that all females with or without cubs selected for areas with taller shrubs that balanced early season forage availability and security cover. Solitary females and females with older cubs with greater mobility also selected for dwarf shrub habitat, which provided a trade-off of higher quality forage but reduced security cover. Open areas dominated by tussock/lichen were generally avoided by all groups. Areas of greater habitat diversity were selected by all groups, which may provide greater nutritional, thermal, and security needs than lower diversity areas. Movement during the post-denning period is a critical period for resource-depleted females, and selected travel routes may be a balance between accessing quality habitat while reducing the risk of predation from infanticidal males. Individual-based SSF provided an effective tool for identifying factors influencing female grizzly movement. Understanding the factors influencing post-denning movements is important for mitigating impacts of development.

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Session:
Spatial requirements and demographic characteristics of bear populations

SEASONAL MOVEMENT CORRIDORS FOR BROWN BEARS IN CROATIA

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Abstract
Habitat loss and fragmentation can severely hamper species ability to undertake long-distance movements (e.g. dispersal, migration), impeding both gene flow and access to critical habitat. In some European brown bear populations, the need for increasing pre-wintering food intake can lead to individual migration-like movement patterns, with animals completing long-distance round trips to resource-rich areas from their summer ranges. In this study, we used Global Positioning System (GPS) relocations collected from Dinaric brown bears in Croatia (from 2005 to 2017, 21 bear-year-seasons) to project suitable corridors connecting summer and fall habitat. To this aim, we used Resource Selection Functions (RSFs) based on bear relocations representing stationary behaviour (i.e. feeding or resting) to model suitable habitat patches in summer and fall separately. Second, we used Step Selection Functions (SSFs) based on animal trajectories representing active travelling by bears to predict the degree of landscape friction to bear movement, disentangling bear responses to both environmental and anthropogenic features that may act as barriers. Finally, we used Randomised Shortest Path (RSP) algorithms to project potential bear corridors at the landscape scale. Compared to traditional algorithms, which assume either random (e.g. current models) or optimal (least cost path) animal movements, the RSP method allows for more ecological realism. Our results show substantial differences between habitats selected by bears during the two seasons, possibly reflecting main dietary shifts between the seasons. According to our findings, bears can successfully travel across sub-optimal patches to reach suitable habitat in the fall, although the presence of anthropogenic structures such as highways, main paved roads, railways, and cultivated fields strongly decreased the probability of bear traveling. Ours is a promising approach to integrate more classical habitat selection studies and cutting-edge movement algorithms to predict animal connectivity across human-modified landscapes.

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Session:
Spatial requirements and demographic characteristics of bear populations

BEARS NAPPING NEARBY: DAYBED SELECTION BY BROWN BEARS (URSUS ARCTOS) IN A HUMAN DOMINATED LANDSCAPE

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Abstract
Daybeds are essential for the survival of brown bears (Ursus arctos L., 1758) and may represent a population limiting resource in human dominated landscapes. In this study, we demonstrate which land-cover types and bear characteristics affect daybed selection in north-central Slovakia. We used the positional and activity data of 21 bears acquired by GPS-GSM telemetry to identify 3864 daybeds. By use of K-select analysis and linear mixed-effects modelling, we explored how bears chose these places for their daytime resting. The most important drivers for daybed selection were the presence of dense regenerating forests and forest-shrubbery belts in farmland. Bears avoided resting in older forests without suitable undergrowth. Females selected daybeds differently depending on the presence of dependent cubs. During spring/early summer, females with cubs-of-the-year avoided other bears by selecting more rugged terrain. These females also selected daybeds significantly closer to human settlements than adult males, possibly to avoid the risk of infanticide. In late summer/autumn, all bears selected daybeds closer to human settlements than in spring, probably because they were attracted by maize fields and fruit trees. Many daybeds were located outside protected areas in farmland closer to people, which could increase bear-human conflicts. We may state that the availability of human provided food resources can influence the location where bears rest during the day. Bears become more visible for people which is of great concern in Slovakia. Bear management should take these findings more into consideration then nowadays. Local people should be more educated about peculiarities in bear resting behaviour in Slovakia. However, none of the studied bears entered human villages and their appearance near settlements was temporarily restricted.

Abstract ID: 238

Session:
Spatial requirements and demographic characteristics of bear populations

MEASURES FOR PREVENTION BROWN BEAR VEHICLE COLLISIONS ON RIJEKA-ZAGREB MOTORWAY IN CROATIA AS A PART OF THE EU PROJECT LIFE DINALP BEAR

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Abstract
Mitigation measures for reducing traffic caused bear mortality on roads, highways and railways are important from two aspects: decreasing bear mortality and also risk to drivers and passengers, respectively. Each year on the Rupa-Rijeka-Zagreb motorway in Croatia (A7, A6) that extends over a length of 187 km around fifty accidents involving animal species with more or less severe consequences were recorded, including an average of three bear-vehicle collisions per year before the LIFE DINALP BEAR project started. Variety of measures are continuously undertaken to reduce these risks to the lowest possible level and also to preserve the natural habitat and its continuity that is interrupted by motorway corridors. Within the LIFE DINALP BEAR project we installed 60 km of electric fence both-sides along 30 km of motorway in addition to the existing wire mesh fence. To facilitate the animals that anyhow enter the motorway route we installed 10 big and 20 small one–way exit doors that may be opened only from the motorway side, as well as 6 jump out ramps. The highway intervention team in case of appearance of a brown bear on a highway was established as well. To decrease attractiveness of bears and other animals to enter the motorway route we installed 25 ”bear proof” garbage bins on the pull out stops along the road. The effect of the applied mitigation measures is continually monitored and analysed. The initial results indicate that the stated goal of 50% reduction of accidents is more than achieved since not a one bear is killed in traffic accident since the beginning of the project.

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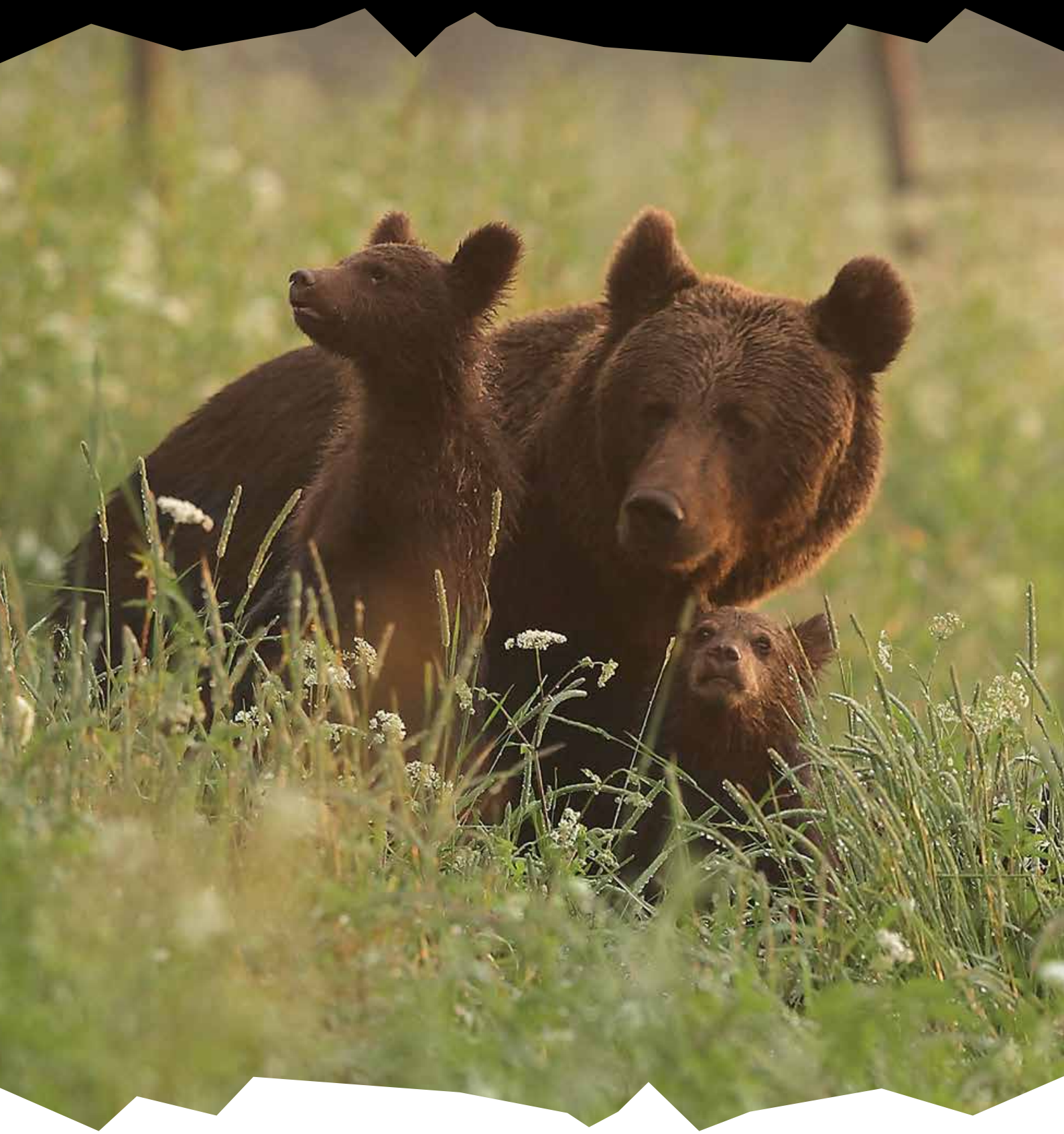

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