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ABSTRACTS BOOK

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ORAL PRESENTATIONS

RESEARCH AND CONSERVATION OF THE ANDEAN BEAR

OVERALL PHYLOGEOGRAPHY OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*, URSIDAE, CARNIVORA) BY MEANS OF MITOGENOMICS AND POSSIBLE ORIGINS OF SOME FOUNDING EUROPEAN ZOO INDIVIDUALS

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ABSTRACT

Our laboratory was the first in the world to publish molecular genetic data of the Andean bear (Ruiz-Garcia 2003, 2006, 2013, Ruiz-Garcia et al., 2003, 2005), especially with nuclear genes (microsatellites). Nowadays, we show the first global analysis with mitogenomics for the entire geographical range of this species. For this, we analyzed mitochondrial sequences of 352 Andean bear (*Tremarctos ornatus*) individuals from all the important geographic areas in Venezuela, Colombia, Ecuador, Peru and Bolivia, where this species inhabits. A large fraction of these animals was sequenced for their complete mitogenomes and those animals, where this was not possible by degraded DNA, were, at least, sequenced for three mitochondrial genes (mt *COI*, *ND5*, and *12S rRNA*). The results showed that the mitochondrial diversification of the Andean bear was during the last phase of the Pleistocene with similar haplotypes in a large distribution area. However, two large different macro-populations seem to be present, one of them in the Northern Andes (Venezuela, Colombia, Ecuador and northern Peru) and other in the Southern Andes (southern Peru and Bolivia). Furthermore, we analyzed, with extreme detail, the spatial genetic structure of the Andean bear within each one of the countries for conservation purposes. Additionally, we compared the sequences of these animals from wild with the mitochondrial sequences obtained from remains of some European zoo founding Andean bear specimens (Switzerland and France). Mitochondrial results could identify the geographical origins of the European zoo founding individuals.

MONITOREO DEL OSO ANDINO COMO HERRAMIENTA DE GESTIÓN DE ÁREAS PROTEGIDAS

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RESUMEN

El oso andino es un Valor Objeto de Conservación y de Sistema para Parques Nacionales Naturales de Colombia, dado que el estado del oso andino y sus amenazas sirven como indicadores del éxito de la gestión de las Áreas Protegidas (AP) y del Sistema de APs al cual pertenecen. En el año 2015, en el PNN Tamamá y su zona amortiguadora se modelaron la ocupación del oso andino y sus amenazas. La información se colectó en el 50 % del área, incluyendo zonas de alta y baja accesibilidad humana. El modelo a escala de área de acción mostró una alta ocupación (Ψ=0.85) y detectabilidad (p=0.64) para la especie. Los modelos de ocupación a escala de sitio señalaron a la presencia de presiones (ganadería extensiva, pequeños cultivos, tala selectiva, caza, quemas y minería) y la cantidad de hábitat remanente, como las variables que más afectaron la presencia del oso andino. La información proporcionada por el monitoreo de oso andino y sus amenazas fue usada como información de respaldo dentro de los ejercicios de prevención, vigilancia y control, e incluida en SicoSMART. La información permitió realizar ajustes en el Plan de Prevención, Vigilancia y Control (PVC), con el aumento o disminución de rutas de patrullaje en los sectores con base en la intensidad de las presiones, el aumento de personal fijo y de apoyo en los sectores con mayor presencia de presiones, y el incremento de los recursos para realizar patrullajes. En las áreas priorizadas, se reforzó la educación ambiental enfocada a niños escolares y adultos, en temas asociados a la utilización de buenas prácticas agropecuarias para disminuir las amenazas. La información se ha socializado con autoridades ambientales, gubernamentales y comunitarias presentes en el área de amortiguación para realizar intervenciones conjuntas, optimizar los recursos financieros y físicos dentro y fuera del área protegida, y disminuir las amenazas que afectan al oso andino y su hábitat. Estos resultados muestran la importancia de vincular la información de monitoreo y PVC en la gestión y manejo del área asegurando el éxito de las intervenciones.

CARACTERIZACIÓN Y ANÁLISIS DE CALIDAD DE HÁBITAT DE OSO ANDINO (*TREMARCTOS ORNATUS*) EN LA ZONA DE AMORTIGUAMIENTO DE UN ÁREA PROTEGIDA EN LA CORDILLERA ORIENTAL COLOMBIANA

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RESUMEN

El estudio se desarrolló en la cordillera oriental colombiana dentro del área de amortiguamiento del Parque Nacional Natural Chingaza, macizo estratégico por su potencial hídrico para la sabana de Bogotá y otros municipios. El objetivo fue evaluar la calidad de hábitat utilizado por *Tremarctos ornatus* y aportar a su conocimiento y conservación a partir del análisis de composición florística, estructurales y de diversidad en bosques andinos y páramos de la región, mediante el montaje de nueve parcelas por ecosistema, ubicadas en zonas con y sin presencia de oso. En segundo lugar, con base en información obtenida del análisis anterior, se midieron las variables necesarias para obtener un índice de calidad de hábitat para la especie en la región. La composición florística y estructura encontradas son típicas de bosques jóvenes bajo procesos de intervención antrópica, lo que se evidencia por la ausencia o presencia restringida de especies propias de los bosques andinos, con pocos representantes de tallas juveniles y adultas, y con clases diamétricas tipo "J" invertida. La composición florística de los páramos de la región señala que estos en su mayoría se encuentran bajo estados de conservación más avanzados. Hubo bajos valores de riqueza para el municipio de Ubaque, donde no hay presencia de oso. El índice de calidad de hábitat señala bajos valores en áreas sin presencia de oso o con presencia reducida como el caso de Ubaque (Bosque andino 0,4/1) y Sesquilé (páramo 0,5/1) con respecto a los que presentaron los mayores valores, Choachí y San Juanito (Bosque andino 0,7/1) y Fómeque (páramo 0,83/1); mientras tanto, con respecto al bosque alto-andino, Junín, municipio con importantes procesos de paramización, presenta el valor más alto (0,77/1) con respecto a Guasca (0,46/1). Se observa que los individuos de la especie están aprovechando los recursos que brindan las áreas intervenidas.

CONSERVAMOS LA VIDA: ANDEAN BEAR CONSERVATION AT THE LANDSCAPE SCALE

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ABSTRACT

The Andean bear conservation in Colombia requires conservation planning and actions well beyond the boundaries of Protected Areas, as well as their political, financial and logistic capacities. WCS and Parques Nacionales de Colombia identified five priority conservation landscapes based on biological and socio-economic criteria, and conservation opportunity. The Tatama-Farallones de Cali-Munchique landscape, with an estimated area of 11,860 km2, is one of the priority conservation landscape for the Andean bear at the Western Range of the Colombian Andes. There, we selected 4170 km2 as our operational working area, where we are developing four phases: diagnosis, agreements, implementation, and monitoring. This large-scale unprecedented Andean bear conservation project was developed as a public-private alliance, with an initial five-year duration, involving Parques Nacionales Naturales de Colombia, Wildlife Conservation Society, Fundación Grupo ARGOS, Corporación Autónoma Regional del Valle del Cauca, Fundación Smurfit Kappa, Fundación CELSIA, Fundación EPSA, and Fundación Mario Santo Domingo. In the Diagnosis, through field work we determined a home range-scale occupancy of $\Psi 16km2=0.74$ (EE. 0.06) and a detectability of $p=0.47$ (E.E. 0.03). The best model of site- scale occupancy ($\Psi 1km2$) showed presence of free range cattle and habitat loss as the main factors decreasing Andean bear occupancy. We also found, through surveys, that damage by Andean bear attack is low (four farms, five cows). Nevertheless, the productive activities are threatened (397 from 470 farms) and vulnerable (economic vulnerability 2,7/5; management vulnerability 2/5) to Andean bear attacks, and the attitudes towards bears are not positive because people fear them. Based on the findings, the goal of the project is to maintain or increase the actual occupancy of the species by conserving a landscape of well-connected and managed protected areas surrounded by sustainable productive landscapes. Specifically, we will achieve this conservation goal by: a) improving the quality and increasing the area of bear habitats in nine priority areas and improving connectivity among protected areas and other wilderness patches, b) reducing human-bear conflicts by addressing conflict triggers, improving local livelihoods, and linking human wellbeing to the presence of Andean bears.

ATAQUES POR OSO ANDINO (*TREMARCTOS ORNATUS*) AL GANADO EN EL ECUADOR

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RESUMEN

Hace 15 años se vienen reportando ataques al ganado, especialmente vacuno, por el oso andino; estos generalmente ocurren cerca de los bosques maduros donde no existe ningún tipo de manejo pecuario. Con el objetivo de contribuir a la atención y prevención de las interacciones oso-gente en el Ecuador, se presenta una compilación de las áreas históricas y actuales, que comprenden 44 localidades, 20 cantones y 10 provincias. Las áreas de interacción se identificaron a través de visitas directas donde se reportaron los incidentes y a través de entrevistas con los actores clave. La mayor intensidad de ataques sucede en los bosques húmedos montanos altos cercanos al páramo, entre los 2500 a los 3500 metros. La mayor frecuencia de ataques sucede en los bosques húmedos tropicales de las estribaciones externas de los Andes orientales, desde los 1500 a 2500 metros. Aparentemente, la intensidad y frecuencia de ataques están estrechamente relacionadas con la disponibilidad de recursos alimenticios para los osos. Los ataques inician con una persecución: el oso lanza zarpazos al cuerpo y se abalanza al ganado buscando morder el área de las escapulas. En la mayoría de casos se da una lucha en el pasto, un arrastre o empuje y, cuando hay pendientes, se observan evidencias de la caída del ganado. En el sitio donde el ataque es reciente, es fácil ver señales como pasto aplastado, huellas del oso, camino o túnel en la densa vegetación, rasguños en los troncos, plantas frescas consumidas (bromelias) y presencia de sangre. En los cadáveres existe la ausencia de órganos internos y dispersión de extremidades dentro del bosque. Generalmente el oso lleva partes de su presa a las plataformas en los árboles, o a los encames en el suelo donde se observa la vegetación aplastada por su peso y los huesos esparcidos de sus presas. La mayoría de individuos que aprovechan del ganado muerto por accidentes o enfermedades posteriormente aprenden a atacar. A través del fototrampeo se demostró que son muy pocos los osos que depredan. Se estima que en el país existen entre 15 y 20 ejemplares con este hábito depredatorio.

EVALUACIÓN DEL ESTADO POBLACIONAL DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN LA PROVINCIA DE IMBABURA, ANDES NORTE DEL ECUADOR

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ABSTRACT

En la provincia ecuatoriana de Imbabura es esencial conocer el estado poblacional de una las especies regeneradoras e indicadoras más importantes para la conservación de los ecosistemas proveedores de bienes y servicios ambientales. La información levantada permite tomar decisiones efectivas para la gestión territorial de los recursos naturales. Estas especies no solo muestran el buen estado de conservación de los ecosistemas, sino también sus desequilibrios. Imbabura es una de las divisiones políticas más afectadas por las interacciones oso-gente, lo que ha evidenciado en los múltiples ataques hacia el ganado. El objetivo de evaluar el estado de las poblaciones de oso andino es de vital importancia para el entendimiento de esta problemática, la conservación de la especie y su hábitat. El importante vínculo entre la política pública y la conservación es la clave para alcanzar iniciativas locales pragmáticas a favor del bienestar de la naturaleza y del ser humano. Desde el año 2015 se viene realizando el estudio de las poblaciones de oso andino a través del fototrampeo. Se mantuvo un mismo esfuerzo de muestreo durante 180 días/cámara en 10 estaciones muestrales, durante seis meses con cámaras activas las 24 horas, lo cual se traduce en 43,200 horas efectivas en campo por cada localidad. Se han evaluado dos localidades en la cordillera oriental (Cantón Pimampiro, zona de Sigsipamba y Mariano Acosta) y una en la cordillera occidental (Cantón Cotacachi, zona de Íntag), y se han registrado cerca de 60 individuos entre adultos, juveniles y crías. Se identificaron áreas de alto interés para el avistamiento, monitoreo y protección de las poblaciones silvestres. El área evaluada corresponde a un 10% del territorio provincial. Las áreas de mayor interacción están relacionadas estrechamente con los espacios donde hubo mayor pérdida de cobertura vegetal en los últimos 10 años.

DETERMINACIÓN DEL PATRÓN DE ÁCIDOS BILIARES EN EL OSO ANDINO: UNA HERRAMIENTA PARA DETERMINAR PRESENCIA Y ASPECTOS DE HISTORIA NATURAL DE LA ESPECIE

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RESUMEN

Se presentan la primera evaluación y determinación del perfil de ácidos biliares (AB) y colesterol (Co) en las heces de oso andino (*Tremarctos ornatus*) por medio de cromatografía en capa fina (CCF). La CCF es una técnica que se emplea por primera vez en el estudio de esta especie como técnica especie-especifica. Para tal fin, se han comparado los patrones de ácidos biliares de muestras biológicas testigos obtenidas de distintas reservas naturales y estaciones de fauna, pertenecientes al oso andino y otras especies de carnívoros simpátricos (jaguar, *Panthera onca*; puma, *Puma concolor*, y zorro colorado, *Lycalopex culpaeus*, entre otros) con muestras posibles de oso colectadas en campo en el noroeste de la Argentina. Para realizar los análisis se ha extraído un gramo de hez con benceno:metanol. Posteriormente se hizo una siembra en placas de silicagel siguiendo la metodología estándar; se han utilizado los AB de referencia y el Co siguiendo las recomendaciones de diversos autores en la literatura, y también se emplearon extractos de las heces conocidas y las heces colectadas en campo. Las placas fueron eluidas con tolueno:ácido acético:agua y reveladas con anisaldehído: ácido acético glacial:ácido sulfúrico. Se determinó el índice *Rf* (*rate of flow*) definido por la distancia de desplazamiento de cada mancha, la cual es la medida obtenida de dividir el recorrido de los analitos (AB y Co) desde el punto de aplicación entre la distancia que se dejó desplazar la fase móvil (frente de disolvente) en la placa de cromatografía. La técnica empleada ha permitido extraer y determinar los ácidos biliares del oso andino. Usando CCF fue posible discriminar las heces de oso andino de vida libre de otras especies de la región. Así también, se han podido discriminar los extractos de las heces de oso en función de la dieta y el origen vegetal o animal de la misma. Los osos han preferido el consumo de materia animal, aprovechando mamíferos pequeños y la oferta de carcasas de ganado vacuno, accediendo incluso a la médula ósea de huesos largos, lo cual le ha brindado mayor grado de asimilación digestiva y energía.

RIQUEZA Y COMPOSICIÓN DE FAUNA SILVESTRE Y DOMÉSTICA EN NUEVE MUNICIPIOS DEL MACIZO CHINGAZA CON Y SIN PRESENCIA RECURRENTE DE OSO ANDINO *TREMARCTOS ORNATUS* EN COLOMBIA

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RESUMEN

Se evaluó la presencia de fauna silvestre y doméstica en zonas con y sin presencia recurrente de oso andino mediante el uso de cámaras trampa en los municipios Fómeque, Guasca, Sesquilé, Choachí, La Calera, Junín, Ubaque (Cundinamarca), San Juanito y El Calvario (Meta). Se instalaron 120 cámaras trampa en cuadrículas de 13 cámaras por municipio, con una distancia de 750 m entre sí, con un total de 381.890 capturas, de las cuales 10.850 fueron efectivas para el registro de especies de fauna silvestre y doméstica. Se identificaron hasta el nivel de especie 34 aves, 17 mamíferos silvestres y tres domésticas. El municipio con mayor número de especies de mamíferos fue Junín (15), mientras los que tuvieron menos fueron Ubaque (8) y Sesquilé (5). Para las aves, los municipios con mayor número de especies registradas fueron San Juanito (20) y La Calera (15), en contraste con El Calvario (5) y Guasca (3). El mamífero más abundante fue *Cuniculus tackzanowskii* (Tinajo)), seguido de *Odocoileous virginianus* (Venado cola blanca); mientras que *Conepatus semistriatus* (Maputiro) y el *Cerdocyon thous* (Zorro perruno) se registraron una vez. Las aves más abundantes fueron *Turdus fuscater* (Mirla), *Atlapetes pallidinucha* (Gorrión montés), *Penelope montagnii* (Pava de monte) y *Grallaria ruficapilla* (Tororoí). Durante el estudio no se registraron *Puma concolor* (Puma) ni *Dinomys branickii* (Guagua), especies reportadas en estudios previos para la zona de estudio. En todos los municipios se registró la presencia de perros en las áreas silvestres, siendo Ubaque Junín y Fómeque los que más registraron, y San Juanito y el calvario los que menos; se registró una secuencia de imágenes de perros persiguiendo un venado en el municipio de Fomeque. El ganado se registró en cuatro de los mueve municipios y los caballos solo estuvieron ausentes en San Juanito. Los resultados indican que la diversidad de especies fue alta y no difirió entre los municipios con presencia de oso, mientras que Ubaque y Sesquilé, sin registros de osos, presentan la más baja. El presente estudio permite destacar la importancia del oso andino como especie sombrilla y herramienta importante en la conservación de la vida silvestre.

LA DATACIÓN DE SIGNOS INDIRECTOS DE USO DEL HÁBITAT PARA EL MONITOREO Y CONSERVACIÓN DEL OSO ANDINO

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RESUMEN

Los estudios de uso de hábitat evalúan las diferentes maneras en que un animal utiliza una colección de componentes del hábitat. La datación del uso del hábitat es una variable que revela información clave respecto a la identificación de territorios que pueden tener mayor relevancia para la supervivencia de las poblaciones y, por consecuencia, ser prioritarios para su conservación. El presente trabajo buscaba i) evaluar la variación en el tiempo de permanencia de oso andino en diferentes transectos en banda en los cuales se analizaron variables relacionadas con la disponibilidad y accesibilidad de recursos, y ii) transferir los resultados y métodos a gente y guardaparques locales. El trabajo se realizó en los páramos del Parque Nacional Podocarpus (PNP) en el sur del Ecuador; se establecieron 16 transectos en banda de 6 metros de ancho por ~1000 metros de largo, los cuales se revisaron mensualmente durante un año para el registro y datación de señales indirectas y la medición de covariables. El esfuerzo total de muestreo fue de 1152 km/año. La datación de registros indirectos requirió un trabajo previo de entrenamiento, en el cual se monitorearon semanalmente las características de envejecimiento de signos indirectos de edad conocida. Se establecieron cuatro rangos de edad: una, dos, tres y cuatro semanas respectivamente. Las covariables se agruparon en dos factores ortogonales (PCA) que se analizaron junto con la variable de respuesta (tiempo de permanencia en cada transecto) mediante modelos lineales generalizados (GLZ). Los resultados del GLZ ($p<0,001$) indican que los osos andinos permanecen mayor cantidad de tiempo en aquellas áreas de páramo que muestran mayor densidad de bromelias disponibles para comer en una distribución espacial más homogénea, a menor altitud, menor exposición eólica y con mayor temperatura y precipitación promedio anual. La experiencia, métodos y resultados han sido transferidos a más de 15 guardaparques y diez voluntarios del PNP y otras reservas privadas del sur de Ecuador, y similar número de estudiantes de pregrado de la UTPL. Esperamos tener la mayor eficiencia posible en lograr que los tomadores de decisiones consideren estos resultados para el manejo y conservación de vida silvestre a nivel local.

TOPOGRAPHIC AND LANDSCAPE FEATURES AFFECTING TRAIL USE BY ANDEAN BEARS (*TREMARCTOS ORNATUS*) IN THE TROPICAL DRY FOREST OF NW PERU

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ABSTRACT

The Andean bear (*Tremarctos ornatus*) is considered Vulnerable to extinction by the IUCN, primarily due to loss of habitats. Loss will continue for the foreseeable future, driving the need to designate reserve areas that will support Andean bear populations, and to effectively manage bear habitat in unprotected areas. Greater understanding of Andean bear spatial behaviors and responses to variability in the landscape will improve the likelihood that sufficient suitable habitat is preserved. To facilitate the investigation of Andean bear space and habitat use throughout the species' range we evaluated potential movement corridors. We characterized ridges and big-game trails by digitizing a 50cm resolution satellite imagery of a 200km2 Andean bear study site in the dry forest of NW Peru. Bear trails were readily visible in satellite imagery because vegetation there was relatively sparse. We compared topographic and landscape characteristics of ridges with trails, ridges without trails, and randomly selected points to identify how those characteristics affect large mammal travel. We also compared trails to least- cost paths in the same landscape to evaluate the established, but untested, hypothesis that bear travel routes minimize energy expenditure. Models developed from this site will be extrapolated to predict the locations of travel routes at other study sites in Peru. These models will be validated and refined using comparisons with field data on bear presence/absence. Identifying how topographic and landscape features affect the movements of bears will inform conservation efforts to identify potential corridors to link patches of habitat in landscapes undergoing continued fragmentation.

USO DE HÁBITAT POR PARTE DEL OSO ANDINO EN LA ZONA DE AMORTIGUAMIENTO DE UN ÁREA PROTEGIDA EN LA CORDILLERA ORIENTAL DE COLOMBIA

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RESUMEN

Este estudio se desarrolló en la zona de amortiguamiento del ala oriental del Parque Nacional Natural Chingaza, entre los departamentos de Meta y Cundinamarca, sobre la cordillera oriental colombiana. Allí se encuentra uno de los principales núcleos poblacionales de *Tremarctos ornatus*, afectado por procesos de intervención. El propósito de la investigación fue evaluar el uso que la especie hace de su hábitat durante dos periodos climáticos, mediante senderos de ancho fijo para el seguimiento de rastros a lo largo de bosques andinos, bosques altoandinos y páramos. Los rastros se dividieron en comederos de bromelias terrestres, comederos de bromelias epífitas, comederos de palmas, rascaderos, rasguños, fecales, huellas, encames en suelo y en árboles; los pelos y senderos se tomaron como evidencia de presencia de oso. Se encontró mayor número de rastros en temporada lluviosa (154), con predominancia de comederos terrestres, seguidos de rasguños y fecales, contrastando con una cantidad menor en la temporada seca (64), en la cual predominan los rasguños, seguido por fecales y comederos de bromelias terrestres, señales que podrían estar asociadas al marcaje de territorio ya que esta época corresponde al momento de cortejo en la población y las condiciones climáticas favorecen la permanencia de olor en los árboles. Se evidencia que las bromelias terrestres son un recurso muy utilizado por la especie en el área de estudio, lo que sugiere que este puede estar sustituyendo otros componentes de la dieta del oso como Lauraceae y Arecaceae, prácticamente ausentes en la región a causa de los procesos de intervención. Con respecto a los municipios, se observó que aquellos que presentan mayor grado de intervención y procesos de paramización son los más utilizados por el oso andino, lo cual puede estar apoyando la idea de que los espacios intervenidos están brindando nuevos recursos para la supervivencia del oso y que, además, sustentan la plasticidad de la especie frente a cambios ambientales. La evaluación del uso que una especie hace de su hábitat permite entender su función en el ecosistema y enriquecer el conocimiento acerca de su ecología, favoreciendo así programas de conservación y de manejo de áreas silvestres.

EVALUACIÓN DE CALIDAD DEL HÁBITAT DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN LOS MACIZOS DE MAMAPACHA Y BIJAGUAL, BOYACÁ, COLOMBIA

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RESUMEN

Los macizos de Mamapacha y Bijagual están ubicados sobre la cordillera oriental colombiana en el departamento de Boyacá y cuentan con áreas de importancia para la conservación de las poblaciones locales de oso andino, además de ser importantes en la oferta de servicios ecosistémicos; sin embargo, se desconocen aspectos importantes sobre las dinámicas ecológicas que se presentan en la región, razón por la que se desarrolló la presente investigación con el apoyo de las corporaciones regionales Corpoboyacá y Corpochivor. El objetivo era evaluar el estado del hábitat del oso y la fauna acompañante a partir de un modelo cartográfico con cinco variables biofísicas consideradas importantes para *Tremarctos ornatus* (vegetación, precipitación, pendiente del terreno, distancia a fuentes hídricas, distancia a fuentes de intervención humana) y el reconocimiento de registros directos e indirectos de la especie. Los índices de calidad de hábitat generados evidenciaron que el 28,8% del área evaluada fue considerado como un hábitat de alta calidad (para un total de 137.334 ha). La validación del modelo mostró, mediante una correlación positiva, la preferencia del oso andino por estas zonas que se ubican principalmente en bosques con pendientes suaves (entre 0 y 30º), precipitaciones entre 1481 y 2356 mm, y distancias cercanas a los afluentes de agua y distantes de las fuentes de amenaza como carreteras, cultivos y potreros. Mediante el uso de cámaras trampa y un esfuerzo de 1253 trampas-noche se obtuvieron 2055 fotografías efectivas que permitieron registrar 20 especies de vertebrados que coexisten con el oso y que, en su mayoría, prefieren los espacios catalogados como hábitat de alta calidad, resaltando el papel que cumple el oso andino como una especie sombrilla en los ecosistemas que habita. Además, fue posible establecer el registro de siete individuos de la especie diferenciados mediante sus machas faciales, lo que ha generado una línea base en el reconocimiento de los ejemplares de la zona para futuras investigaciones y monitoreos. Este estudio aporta información sobre las áreas de importancia para el oso andino, su calidad y estado de conservación, además de sus especies acompañantes y los patrones de biodiversidad de la fauna en el territorio.

YUMBO: EXPERIENCIAS DE LA REPATRIACIÓN DE UN OSO ANDINO

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RESUMEN

Yumbo es uno de cinco osos que salieron de su hábitat en diferentes regiones del Ecuador por distintas razones en el año 2013. El Ministerio del Ambiente, como autoridad ambiental, destinó los osos a diferentes proyectos de conservación con el objetivo de reintroducirlos. En el año 2015, cuatro osos fueron liberados en diferentes lugares del país; dos de ellos murieron por distintas causas luego de su liberación, otro oso fue liberó en un parque nacional y continua con vida, y Yumbo fue el único oso repatriado, es decir, fue liberado en el mismo lugar donde fue rescatado años atrás. Yumbo fue liberado con un radio-collar GPS, con la colaboración de distintos investigadores y organizaciones para asegurar su permanente monitoreo. Desde el principio de su liberación, Yumbo empezó a mostrar un importante comportamiento de colonización de su territorio, interactuando y siendo aceptado por la población local de osos, como ha sido registrado en cámaras trampa y observado por pobladores locales. La efectividad en su liberación responde a que el oso fue tratado y manejado bajo protocolos especiales diseñados con miras a su futura liberación. Yumbo se ha convertido en un ícono para el Distrito Metropolitano de Quito y el proyecto del corredor del oso andino, pues su figura es ahora utilizada por organizaciones de conservación a través de diferentes actividades para crear conciencia sobre la conservación del oso andino, demostrando que pobladores locales pueden compartir el territorio con sus originales habitantes silvestres. La efectividad de la repatriación de Yumbo es un indicador que muestra el impacto positivo de los proyectos de investigación realizados en el corredor del oso andino desde el año 2008.

ESTRUCTURA Y REPRODUCCIÓN DE LA POBLACIÓN DE OSOS ANDINOS EN EL MACIZO CHINGAZA, CENTRO DE LA CORDILLERA ORIENTAL COLOMBIANA

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RESUMEN

Entre 2012 y 2016 se recopilaron 391 archivos visuales de osos andinos provenientes de cámaras trampa en el Macizo Chingaza (centro de la cordillera Oriental colombiana). Se determinó el sexo de los individuos mediante características externas (tamaño, morfología genital) y reproductivas (preñez, lactancia, presencia de oseznos), identificando aspectos poblacionales como proporción de sexos, cantidad de crías y épocas reproductivas. Los ejemplares de esta población no muestran manchas conspicuas y los machos pueden pesar hasta 150 kg, mientras que las hembras pesan 40 kg en promedio en animales capturados y pesados. En total se identificaron 20 hembras diferentes con oseznos. Excluyendo los indeterminados, la proporción de sexos fue de 3♂/1♀. Se obtuvo un registro de cortejo durante diciembre, coincidiendo con los registros de preñez durante los primeros meses del año (enero-marzo). Se registraron hembras con oseznos entre diciembre y febrero, en época de bajas precipitaciones, lo que sugiere que los nacimientos se presentan entre septiembre y diciembre, durante las máximas precipitaciones en el área de estudio. Dos hembras capturadas en el 2013 fueron recapturadas en el 2016, una de ellas con una segunda camada. El promedio de oseznos por hembra es de 1,33. Se evidenció el primer suceso conocido de una hembra con dos camadas al tiempo: un cachorro de más de un año en compañía de dos oseznos de aproximadamente tres meses. Las hembras se ven con cría cuando sacan los oseznos de sus oseras, aproximadamente tres meses posparto, pero después no se vuelve a registrar su presencia. Se presume que los retiran de las áreas de alto tránsito de machos y los llevan a sitios periféricos de sus rangos de acción, evitando el infanticidio del cual se tienen indicios en la población. No se tienen datos sobre la mortalidad infantil y se requiere adelantar un proceso de monitoreo de hembras para entender mejor las condiciones de la población, que parece estar pasando por problemas poblacionales dada la proporción de sexos encontrada.

EXTENSIÓN DE PRESENCIA Y ÁREA DE OCUPACIÓN DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN ECUADOR

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RESUMEN

El oso andino (*Tremarctos ornatus*) es considerado en el Ecuador una especie en peligro de extinción debido al pequeño tamaño poblacional. Su distribución geográfica ha sido cuantificada parcialmente y se desconocen tanto la efectividad de las áreas protegidas en la protección del hábitat como el impacto del cambio climático. Utilizamos modelos de nicho ecológico y modelos de ocupación de una temporada para estimar idoneidad de hábitat, probabilidad de ocupación, extensión de presencia (EOO) y área de ocupación (AOO) del oso andino en el Ecuador, y evaluamos la efectividad de las áreas protegidas y el impacto del cambio climático (escenario RCP 8.5) entre 1990 y 2070. Entre junio de 2015 y junio de 2016 implementamos un muestreo con 306 estaciones de trampa cámara en 2448 km2 de los Andes ecuatorianos entre los 600 y 4100 m de elevación. Nuestro muestreo realizó un esfuerzo de 12.672 trampas-noche y 355 detecciones. La idoneidad de hábitat, probabilidad de ocupación, EOO y AOO en 2017 fueron de 62% (IC 95%: 55-68), 37% (IC 95%: 35-39), 92.001 km2 y 32.426 km2, respectivamente. Hasta un 30% de la EOO y AOO están dentro del sistema de áreas protegidas de Ecuador. En teoría las áreas protegidas están asumiendo un papel efectivo en la protección de la distribución geográfica del oso andino en Ecuador; sin embargo, más del 50% de las áreas con mayor idoneidad de hábitat y probabilidad de ocupación se encuentran sin protección. El calentamiento global parece no tener un impacto significativo en el nicho climático del oso andino en Ecuador; entre 1990 y 2070 la idoneidad de hábitat, probabilidad de ocupación, EOO y AOO varió de 44% (IC 95%: 39-49) a 28% (IC 95%: 24-31), 38% (IC 95%: 35-41) a 37% (IC 95%: 35-39), 105.602 km2 a 90.303 km2 y 42.237 km2 a 34.550 km2, respectivamente. Nuestros resultados actualizan el conocimiento de la distribución geográfica de esta especie en el Ecuador, constituyen la primera evaluación cuantitativa del impacto del cambio climático sobre la especie en el país y sugieren una actualización del ordenamiento territorial para mejorar la gestión de áreas protegidas.

SPATIAL CO- OCCURRENCE OF ANDEAN BEARS WITH PUMA AND FERAL DOGS IN ECUADOR

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ABSTRACT

The Andean bear (*Tremarctos ornatus*) is threatened across its range in South America and endangered in Ecuador. Habitats for Andean bears are increasingly fragmented due to expanding development, grazing, and agriculture. The Andean bear is considered an umbrella species for conservation planning, although little is known about its ecology and distribution throughout Ecuador. We conducted a large- scale camera trap survey (101 cameras surveyed July- November 2016) within and outside of the Andean Bear Ecological Corridor in the Metropolitan District of Quito. We describe the spatial co- occurrence patterns between the Andean bear and two other species, puma (*Puma concolor*) and domestic/feral dogs (*Canis familiaris*), in an examination of how the Andean bear shares the landscape with native and non-native fauna in the area. Andean bears and pumas are two of the largest native mammal species in the cloud forest in Ecuador, both with large area requirements. Although their diets differ and therefore they are not likely to compete for resources, it is possible that these species practice avoidance of one another via spatial segregation. We examined co- occurrence between the two species using a two- species occupancy modeling framework to provide insights as to whether protecting habitat for Andean bear might also confer benefits to pumas. We also examined spatial co- occurrence between Andean bears and dogs, as we suspected that Andean bears may avoid dogs and be displaced when non-native domestic or feral dogs are present. We discuss how knowledge of these co- occurrence patterns can help inform conservation and management of Andean bears.

APLICACIÓN DEL ENFOQUE DE MANEJO DE PAISAJES PARA LA CONSERVACIÓN DEL OSO ANDINO (TREMARCTOS ORNATUS)

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RESUMEN

Tradicionalmente los esfuerzos de conservación de especies amenazadas como el oso andino (*Tremarctos ornatus*) se han concentrado dentro de los límites de áreas protegidas; sin embargo, estas son pequeñas y se encuentran aisladas unas de otras, lo cual no garantiza la supervivencia de la especie a largo plazo. A través del Proyecto Paisajes- Vida Silvestre, el Ministerio del Ambiente se encuentra implementando estrategias encaminadas a mejorar la efectividad en la conservación de esta especie mediante la gestión del paisaje. En este sentido, se han implementado acciones como: determinación de la línea base de abundancia relativa de osos andinos en tres paisajes, esfuerzos para incrementar la cobertura de vegetación bajo diferentes esquemas de conservación en zonas de amortiguamiento y corredores, vinculación de Gobiernos Autónomos Descentralizados (GAD) que incorporan estrategias de gestión de vida silvestre, apoyo a emprendimientos productivos sostenibles y otras alternativas para mitigar el conflicto gente- oso, atención veterinaria a especímenes cautivos, asistencia técnica en casos específicos de liberación, y apoyo a una mejor gestión de áreas protegidas. Utilizando trampas- cámaras y muestreos de huellas, se determinó la abundancia relativa en tres paisajes seleccionados: Cotacachi- Cayapas- El Ángel (2,4 registros/10 km y 1,1 registros/100 trampas- noche); Cofán Bermejo-Llanganates (1,3 registros/10 km y 0,6 registros/100 trampas- noches), y Podocarpus (1,1 registros/10 km y 0,5 registros/100 trampas- noche). Se incorporaron 206.209 hectáreas como áreas de conservación adicionales principalmente en los flancos orientales de la Cordillera de los Andes, lo que corresponde al área de distribución de la especie. Se ha trabajado con dos GAD provinciales y 11 GAD municipales en el fortalecimiento de iniciativas de conservación y gestión de vida silvestre. Se han implementado nueve iniciativas productivas sostenibles (frutales bajo cubierta, café, cuyes y cacao) que incluyen 270 familias, enfocadas a disminuir la presión de la frontera agrícola. Se atendieron cinco especímenes de osos cautivos y se apoyó en el proceso de liberación y monitoreo con telemetría de dos individuos. La gestión de paisajes representa una oportunidad para mejorar la efectividad de la conservación del oso andino y otras especies amenazadas, y aportar al bienestar humano.

MANEJO CLÍNICO, BIOLÓGICO DEL OSO ANDINO (*TREMARCTOS ORNATUS*) DEBIDO A CONTUSIONES, TRAUMATISMOS ANTRÓPICOS

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RESUMEN

El oso andino está amenazado por conflictos antrópicos. Presentamos el caso clínico de un oso andino de tres a cuatro años llamado Ajayu ("alma" en aimara), rescatado en enero 2016 por la Policía Forestal y de Medioambiente (POFOMA) en Tiraque, Cochabamba, Bolivia. El oso fue sometido a una golpiza por pobladores locales, que lo apedrearon y golpearon. Es muy probable que Ajayu fuera víctima de la posesión ilegal de fauna. En coordinación con las Autoridades Nacionales, Ajayu fue trasladado al Zoológico Vesty Pakos Sofro en La Paz para su atención inmediata. El análisis clínico, radiografías y tomografía revelaron lesiones con fractura oblicua del arco cigomático izquierdo, edema de la órbita ocular compatible con catarata traumática con cristalino subluxado, y presencia de coágulos en el ojo; el ojo derecho presentaba laceración de la córnea y el globo ocular, compatible con restos de esclera; a nivel somático se observaron emaciación y deshidratación marcadas. Conductualmente prevaleció el miedo relacionado con el comportamiento agonista al humano, confirmando los traumas y contusiones causados por los pobladores. Al objeto de controlar las alteraciones, se brindó una atención de manejo integral sanitario y biológico, con evaluaciones de diagnóstico y tratamiento permanente. Además, se emplearon estrategias de nutrición y enriquecimiento. Debido a las lesiones oculares, el 21 de febrero fue sometido a una cirugía de extracción de cataratas y reducción de glaucoma; sin embargo, no se recuperó la visión. El 10 de marzo se registró un descenso del apetito y anorexia marcada por lo que fue sometido a una terapia farmacológica, sin resultados de mejoría; en consecuencia, se decidió transferirlo al refugio de vida silvestre de La Senda Verde para complementar el tratamiento en condiciones ambientales acordes al hábitat de la especie. El 31 de marzo se forzó la ingesta de alimentos y calmantes, después de lo cual Ajayu comenzó a alimentarse y recuperarse. El manejo de Ajayu post-decomiso adquirió mucha importancia, sensibilizando a especialistas en oftalmología, imagenólogos, biólogos y veterinarios que apoyaron en el tratamiento, buscando el bienestar y salud de Ajayu. Un año más tarde, Ajayu está más recuperado, física y emocional mente.

CLINICAL AND BIOLOGICAL MANAGEMENT OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) DUE TO CONTUSIONS AND ANTHROPIC TRAUMATISMS

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ABSTRACT

The Andean bear is threatened by conflicts with human activities. The clinical case, refers to a 3 to 4 years old Andean bear later called Ajayu ("soul" in Aymara), which was rescued in January 2016 in Tiraque-Cochabamba by the environmental and forest Police (POFOMA). It is very probable that the presence of Ajayu in the region is due to the illegal possession of some locals. The bear was subjected to a brutal attack by local people, who stoned and beat the animal. In coordination with the National Authorities, Ajayu was transferred to the Municipal Zoo Vesty Pakos Sofro in La Paz for its immediate attention. Clinical analysis, X-rays, CTscan, showed lesions with oblique fracture of the left zygomatic arch, edema of the ocular orbit compatible with traumatic cataract with subluxated lens and presence of clots in the left eye; in the right eye, laceration of the cornea and eyeball was observed with remains of sclera; at the somatic level, there were marked emaciation and dehydration. Behaviorally, fear related to the agonist behavior to human presence prevailed, confirming that locals subjected it to trauma and contusions. To control the alterations, Ajayu underwent an integral sanitary, biological management attention with diagnostic evaluations and permanent treatment. In addition, nutritional and enrichment strategies were applied. Due to eye injuries, on February 21, Ajayu underwent to cataract removal surgery and glaucoma reduction, however, weeks later vision had not been recovered. On March 10, there was a decrease in appetite and marked anorexia; therefore, pharmacological therapy was carried out, without any improvement; consequently, it was decided to transfer it to the wildlife refuge of La Senda Verde to complement the treatment in environmental conditions according to the habitat of the species. On March 31, food and strong pain relievers were forced-fed. Right after this procedure Ajayu started eating and recovering. The post-confiscation management of Ajayu became very important, creating awareness among specialists in ophthalmology, imaging, biologists, and veterinarians who supported the treatment, seeking the health and well-being of Ajayu. A year later, Ajayu has recovered, both physically and emotionally.

PROMOVIENDO LA COEXISTENCIA OSO ANDINO-GENTE POR MEDIO DE LA EDUCACIÓN. EXPERIENCIAS DE UN TRABAJO A LARGO PLAZO EN LA PAZ-BOLIVIA

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RESUMEN

Entre las amenazas de conservación del oso andino está el creciente conflicto atribuido al daño de los cultivos o ataque al ganado, lo que termina en su persecución y muerte. En este trabajo presento las experiencias de más de nueve años en la conservación del Oso Andino en el departamento de La Paz, en zonas montañosas de bosque nublado, conformadas por comunidades indígenas aimaras, cuya actividad principal es la agricultura de subsistencia y en los últimos años la minería. Mi proyecto tiene tres componentes: investigación, etnozoología y conservación. El trabajo inició en Lambate con un análisis de la percepción de los pobladores sobre el oso andino, detectándose una percepción negativa, y la constante queja de perdida de cultivos y ganado, lo que había causado la muerte de dos a cuatro osos por año. Con base en la percepción de los pobladores se elaboró material, sin incidir o imponer cambios en su cultura o contradecir sus conocimientos, brindando información sobre biología, ecología, distribución del oso, amenazas y otros. Al mismo tiempo, empecé un programa de difusión y de educación ambiental a largo plazo dirigido a adultos y niños. Su objetivo fue sensibilizar a los niños de nueve a 11años en Unidades Educativas. La experiencia fue bien recibida por los niños; también se contó con la participación de maestros y posteriormente de la comunidad. También nos apoyó la radio emisora-comunitaria local "Qhana" difundiendo aspectos sobre la conservación y amenazas del oso. En respuesta a la percepción negativa y para identificar el tipo de conflicto causado por el oso, se realizó una evaluación in situ de los daños a los cultivos; los factores climáticos son la principal causa en la perdida de cultivos y no el oso. Todos estos resultados fueron socializados. En los últimos años no se han registrado muertes de oso, lo cual posiblemente podemos atribuir al trabajo de educación. Finalmente, puedo concluir que un importante componente para promover la coexistencia del oso andino con la gente es la educación. Conocer más sobre el oso y su función ecológica, y valorizar sus tradiciones positivas sobre la especie, tienen un buen efecto en su percepción e interés en conservarlo.

STATE OF KNOWLEDGE AND STRATEGIES OF CONSERVATION OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) IN THE NORTHEAST OF COLOMBIA

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ABSTRACT

For 37 months we carried out prolonged sampling in an area >216 km2 in the Tama National Natural Park in the northeast border of Colombia; we traced 24 quadrants of 9 km2 each, and 72 linear transects of 1.8 km each (3 by quadrant), and we made observations of 3061 indirect records, direct observation of specimens, interviewed 39 families, and performed 16,714 days of camera traps, which allowed us to assess the availability, use and preference of habitat, diet, density, distribution and occupation of *Tremarctos ornatus*. We determined the floristic composition and its relationship with the presence, use, and preference of habitat of the species through PLS, an analysis of variances of Fisher, and a test of Bonferroni. The presence and effect of threats was evaluated through a Heatmap and a PCA. Also, we used Presence 5.7 to estimate the percentage of occupation, the standard error, the standard deviation, the percentage of detectability, and the error of the test. According to the results the floristic composition and thereby the availability and abundance of resources of an area predicts significantly the presence and use of habitat of *T. ornatus*, as well as its quality; the HIS value was low (0.58) in the area of study due to some threats in the area. *Tremarctos ornatus* occupies 85% (183.6 km2) of the area, the standard error was 0.0961 with a standard deviation of 0.47; the rate of detectability was of the 59%, and the error of the test 0.0764. The density in the area is 0.04 ind/km2, information corroborated by cameras; it was observed that the population size is influenced by the presence and effect of some existing threats. Also, we obtained an approach to the state of conservation, patterns of activity, and use of habitat in the area. The results in our research and the non- existent actions focused on conservation in the northeastern Andes put in serious jeopardy the conservation and survival of the species in the NP and adjacent territories such as Tama NNP in Venezuela.

PATRONES DE ACTIVIDAD DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN LAS ESTRIBACIONES ORIENTALES DE LOS ANDES CENTRALES DEL ECUADOR

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RESUMEN

Los patrones de actividad de la fauna silvestre pueden reflejar indicadores temporales de gasto energético, esfuerzo en el forrajeo y exposición a riesgos (por ejemplo, relación presa- predador). Las investigaciones orientadas al conocimiento de los patrones de actividad del oso andino (*Tremarctos ornatus*) en el Ecuador son limitadas, por lo que en este estudio estimamos los patrones de actividad de la especie en tres bosques montanos de las estribaciones centro-orientales del Ecuador, e identificamos diferencias entre los niveles y patrones de actividad de cada localidad. Instalamos 26 estaciones de muestreo con trampas cámara en las provincias de Tungurahua y Napo: Reserva Natural Chamanapamba (8), Bosque Protector Cerro La Candelaria (6) y en las estribaciones orientales del valle del Río Quijos (12). Estimamos los patrones de actividad empleando el método de densidad de kernel y el coeficiente de superposición Δ entre las tres localidades por medio *bootstrap*; cuando $\Delta = 1$, la superposición entre dos patrones de actividad es total. Finalmente, comparamos los niveles de actividad entre las localidades con la prueba de Wald. Realizamos todas las estimaciones con los paquetes "overlap" y "activity" del software estadístico R. Documentamos un total de 35 registros independientes de oso andino en 3045 días de muestreo efectivo con trampas cámara. El patrón de actividad general del oso andino en el área de estudio muestra una tendencia diurna, principalmente entre las 06:00 h y 18:00 h. Adicionalmente, el nivel de actividad diaria del oso andino es cercano al 33% (SE = 5%). El $\Delta 1$ entre las estribaciones de Candelaria-Napo fue del 83%, entre Chamanapamba-Candelaria 0.78, y entre Chamanapamba-Napo 68%. Los patrones de actividad de Candelaria y Napo mostraron una tendencia bimodal con dos picos, uno antes de las 12:00 h y otro a las 15:00 h; mientras que Chamanapamba reflejó un aumento de actividad al medio día. Sin embargo, los niveles de actividad de cada localidad no fueron significativamente diferentes ($p>0.05$). Los escasos estudios sobre la actividad del oso andino concuerdan con el patrón descrito para Candelaria y Napo; sin embargo, el pico unimodal de Chamanapamba podría estar asociado a la topografía específica de la zona.

APROXIMACIÓN A LA DISTRIBUCIÓN Y ESTADO DE CONSERVACIÓN DEL OSO ANDINO EN BOYACÁ, COLOMBIA

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RESUMEN

Durante los años 2014 a 2016 se adelantaron estudios sobre distribución y estado de conservación del oso andino en jurisdicción de la Corporación Autónoma Regional de Boyacá (Corpoboyacá), determinándose que la especie se distribuye en tres sectores: Núcleo Mamapacha–Bijagual, Núcleo Ocetá–Pisba-Cocuy y Núcleo Serranía de las Quinchas. En el primer núcleo se realizó un foto-trampeo durante seis meses y se estudiaron la dieta y la distribución a través de un convenio CORPOBOYACÁ – CORPOCHIVOR, y se confirmó la presencia de oso en los municipios de Zetaquirá, Garagoa, Ramiriquí, Miraflores, Rondón y Chinavita, mostrando su preferencia por las zonas de hábitat de media y alta calidad. Se obtuvieron 107 registros de oso andino y se identificaron siete individuos, con su ficha ilustrada y detallada. Se registró la presencia de 14 mamíferos y seis aves asociados a su hábitat. En el segundo, ubicado entre las áreas protegidas Parque Natural Regional (PNR) Siscunsí-Ocetá, Parque Natural Nacional (PNN) de Pisba, PNN El Cocuy y sus zonas de influencia, se evidenció la presencia del oso en los municipios de Mongua, Aquitania, Socotá, Chita, Cocuy, Chiscas y Güicán; se realizaron estudios de distribución y estado actual del oso en el PNR Siscunsí-Ocetá, y con fototrampeo se registraron tres ejemplares en los municipios de Mongua y Aquitania. En articulación con el PNN Pisba, Fundación Wii y CORPOBOYACÁ adelantaron el diagnóstico participativo con las comunidades locales sobre las amenazas, presiones y vulnerabilidades del oso andino y especies acompañantes en los municipios de Chita y Socotá. Con la información obtenida se realizó un modelo de hábitat disponible para oso a escala del paisaje para Boyacá, resultando que existen 4527 km2 de hábitat, correspondiente al 19,42 % del departamento. El 54 % del hábitat disponible está dentro de áreas protegidas del orden nacional o regional que incluyen los PNN El Cocuy, con 1302 km2 (Boyacá) y Pisba con 450 km2, y los PNR Siscunsí-Ocetá, con 498 km2, y Serranía de las Quinchas con 212,2 km2. El 46 % de hábitat se encuentra sin ninguna categoría de protección y corresponde a áreas de conexión entre las áreas protegidas.

A MODEL OF POTENTIAL GEOGRAPHICAL DISTRIBUTION OF THE ANDEAN BEAR *TREMARCTOS ORNATUS* IN THE NORTH OF THE ANDES MOUNTAINS

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ABSTRACT

The spectacled bear (*Tremarctos ornatus*) is an endemic species of the tropical Andes associated with areas of humid forests, fog forests, and páramos, and plays an important role in the dispersion of seeds and in successional processes. It is currently categorized as vulnerable by the International Union for Conservation of Nature because of the loss and fragmentation of its habitat and by retaliatory hunting. To know the potential area of spectacled bear in the Andes, data on the presence of the species were collected from specimens in biological collections, reports from NGOs, and scientific articles for Colombia, Ecuador, Venezuela and Argentina, as well as records obtained by some Regional Autonomous Corporations of Colombia (CAR). Bioclimatic data were used to know the sectors in which the environmental conditions are potentially favorable for the presence of the species (available in Worldclim) and the Ecological Niche Factor Analysis tool was used to compare the climatic data present in the study area with the existing records to thus be able to select the uncorrelated variables that best explain the presence of the species under study. The model was generated in the MAXENT program and was constructed using 75% of the records as training points and the remaining 25% as validation points. A 10- 5 convergence threshold was used with 1000 iterations as the limit for each processing. There were 2587 records of which 53% of the registrations came from CARS, 41% from NGOs and the remaining (6%) from the scientific collections and publications records. Also, a model with a gain of 2042 was obtained and, through the analysis of test and training, it was evidenced that the obtained results were adjusted to the prediction rate. It is expected that the results of the prediction serve as inputs to prioritize areas in which it is necessary to develop research and awareness activities with communities in a way that strengthens the conservation of the species.

CONSERVATION GENETICS AND PHYLOGEOGRAPHY OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) IN NORTHERN ECUADOR BASED ON MITOCHONDRIAL D-LOOP SEQUENCE POLYMORPHISMS

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ABSTRACT

Few studies have explored the Andean bear genetic status in the northern Andes. As a result, there is a lack of mitochondrial DNA sequence analyses in Andean bear populations. It is reported that mtDNA D-loop hypervariable regions are some of the most variable spots in all the mitochondrial genome, and that studies of these regions are useful in the assessment of genetic diversity, ancestral lineages, and a population's demographic history. Accordingly, in the present study we evaluate the genetic status of an Andean bear population in northern Ecuador using D- loop mtDNA sequence polymorphisms. For this purpose, individuals from several localities were sampled using camera traps and wire corrals to obtain hair samples in a noninvasive way. DNA was obtained from these samples, and a fragment of the hypervariable D-loop region was amplified and sequenced. Our results show that Ecuadorian haplotypes display remarkably low levels of differentiation between them compared to other haplotypes from different geographic regions. Phylogenetic analyses suggest that these haplotypes are clustered into a single monophyletic group. Also, we report haplotype *(H)* and nucleotide *(π)* diversity indices of 0.6645 ± 0.0519 and 0.001783 ± 0.01465 respectively, and low pairwise genetic distances between haplotypes (0.002). These diversity indices are among the lowest reported for any bear population, revealing a need to establish or revise the current conservation strategies in the region.

ACTUALIZACIÓN DEL SÍNDROME DE ALOPECIA EN EL OSO ANDINO

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RESUMEN

Desde 1968, se han descrito 27 casos se síndrome de alopecia en oso andino en cautividad. La mayoría de los animales afectados son hembras (n=25). La edad media para el diagnóstico son los 11 años, pero el rango de edad oscila entre los tres y los 24 años. La detección temprana basada en la observación visual puede ser difícil debido a la baja densidad folicular en esta especie y la sutil apariencia de las lesiones, que pueden aparecer como ligeros cambios de color rojizo o grisáceo en los flancos o la zona lumbar. La presentación clínica se muestra como pérdida de pelo de forma progresiva en los flancos, la región peri orbital, el área lumbar y la parte medial de las extremidades. Se observa prurito en algunos casos. La pérdida de pelo puede suceder a lo largo de varios años, en algunos casos hasta 10 años. Se pueden observar mejoras transitorias durante la gestación o de forma estacional durante la primavera en países europeos. Aunque un patrón hereditario sencillo se ha desestimado a través del análisis de pedigrí de la población en cautividad, no puede descartarse completamente un componente hereditario. Un estudio longitudinal para evaluar los niveles fecales de cortisol y progesterona en animales sanos y animales afectados no ha mostrado ninguna diferencia entre los dos grupos. El examen histológico de muestras de piel obtenidas de múltiples localizaciones anatómicas en 16 animales sanos y 15 animales con signos clínicos mostró un infiltrado linfocítico y de células gigantes en torno al istmo folicular, lo que sugiere un proceso inmune mediado. Tres animales afectados por este síndrome han sido tratados con un inhibidor de la quinasa janus; oclacitinib (Apoquel, Zoetis), con una dosis inicial de 0.5 mg/kg dos veces al día durante 14 días, seguida por una dosis de mantenimiento de entre 0.1 y 0.4 mg/kg una vez al día, con la consiguiente resolución del prurito y el crecimiento de pelo en las zonas afectadas y sin efectos adversos aparentes. La rápida respuesta a esta opción terapéutica y la recidiva en el momento en que el tratamiento se detiene refuerza la hipótesis de un proceso inmune mediado.

ABORDAJE CLÍNICO QUIRÚRGICO DE NEOFORMACIÓN EN UN OSO DE ANTEOJOS (*TREMARCTOS ORNATUS*)

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RESUMEN

Los conceptos del manejo de heridas, donde la cantidad de "espacio muerto" presente debajo de piel es importante, han sido consideradas por mucho tiempo un reto ante la formación de higromas y complicaciones en su cicatrización; sin embargo, el uso de drenes activos o pasivos ha minimizado su complicación, fomentado el éxito de las intervenciones en mascotas, contrario a lo que sucede con la fauna silvestre donde no es posible colocar un dren expuesto sin que el animal se lo retire después de su recuperación tras la anestesia. El presente trabajo pretende demostrar con un caso clínico la eficiencia de la técnica quirúrgica, prescindiendo de la utilización de drenes, su manejo clínico y quirúrgico hasta su diagnóstico histopatológico y resolución. Se procede a sedar al paciente para su preparación prequirúrgica *in situ* (rasurado, y antisepsia primaria); posteriormente es trasladado a prequirófano para colocar una vía endovenosa, traqueotubo para mantener una vía aérea permeable, premedicación y antisepsia definitiva del área quirúrgica. Se realiza la incisión primaria respetando los márgenes de seguridad establecidos para oncología (tres centímetros entorno a la zona afectada), dejando un espacio de 41 x 19.6 x 6 cm; el cierre por capas permite minimizar la presencia de "espacio muerto". Según el estudio histopatológico se sabe que en la piel con pelo del dorso del cuello hay forunculosis piogranulomatosa grave multifocal a cuerpo extraño (queratina y pelo) con abundante tejido de granulación. Dermatitis perianexal y perivascular linfoplasmocítica discreta a moderada multifocal. hiperqueratosis epidérmica y folicular moderada multifocal con acantosis irregular moderada difusa. Dermatitis ulcerativa moderada multifocal. Se concluye que se trata de un proceso inflamatorio crónico activo a cuerpo extraño (queratina y pelo) con abundante tejido de granulación maduro, generalmente asociado a la ruptura repetida de folículos pilosos o quistes foliculares. La remoción quirúrgica total de la lesión sugiere un pronóstico favorable y el manejo quirúrgico de lesión ha permitido la cicatrización completa de la herida.

DENSIDAD POBLACIONAL DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN LA ZONA DE AMORTIGUAMIENTO DEL PARQUE NACIONAL NATURAL CHINGAZA (COLOMBIA)

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RESUMEN

Para evaluar la densidad poblacional del oso andino (*Tremarctos ornatus*) en la zona de amortiguamiento del PNN Chingaza se instalaron 120 cámaras trampa en los municipios de Choachí, El Calvario, Fómeque, Guasca, Junín, La Calera, San Juanito, Sesquilé y Ubaque. La instalación se realizó en cuadrículas de 13 cámaras trampa por municipio, con una distancia de 750 m entre cada equipo. El estudio se realizó desde septiembre de 2015 hasta mayo de 2016, con un esfuerzo de muestreo de 17.057 días-trampa, obteniendo un total de 13.265 capturas de fauna, de las cuales 176 fueron efectivas para oso andino. Los municipios con mayor número de registros e individuos fueron Junín y Choachí. Se reconocieron 46 individuos diferentes, entre adultos, juveniles y oseznos, con base en características externas clave identificadas sobre un modelo de tres ángulos de los ejemplares. La proporción de sexos fue de 3♂:2♀. El análisis de abundancia y densidad, bajo el supuesto de población cerrada, se realizó con 12 ejemplares individualizados y recapturados por lo menos una vez cada uno; cuatro individuos fueron recapturados en dos municipios diferentes a una distancia máxima de 17,2 km. La abundancia fue de 93 osos en un área estimada de 4215,15 km2 y la densidad de 2,2 osos por 100 km2. Los valores de abundancia relativa calculados para la población de estudio concuerdan con los valores de presencia de osos reportados para el PNN Chingaza (14 a 17 individuos en 766 km2). Los tipos de coberturas presentes en el área de muestreo señalan que la población cuenta solo con algunos parches de bosque que ocupan en total 63 km2, hecho que a futuro puede generar un declive genético y poblacional. Se presume que la presencia de fauna exótica (es decir, perros ferales) está ejerciendo presión por la reducción del hábitat disponible, lo que puede inducir cambios en los patrones de actividad de los ejemplares, generando mayor solapamiento de sus rangos de acción. Se sugiere continuar con el monitoreo y ampliarlo a otras áreas, implementando otras metodologías de seguimiento y monitoreo de poblaciones como la genética y la radio-telemetría.

EFECTO DE LAS ACCIONES DE LAS AUTORIDADES AMBIENTALES EN LA SOBREVIVENCIA DEL OSO ANDINO EN COLOMBIA

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RESUMEN

Las acciones adelantadas en Colombia en el marco del programa de conservación de oso andino del Minambiente por parte de las autoridades ambientales no han sido suficientes para asegurar la sobrevivencia del oso; se han limitado a impulsar la defensa de las áreas protegidas declaradas, descuidando el 78 % del hábitat natural, mientras que las políticas estatales de desarrollo van en contravía con las estrategias de conservación en uno de los territorios más biodiversos del planeta. Aunque se han establecido convenios entre instituciones ambientales estatales y empresas nacionales y multinacionales para implementar acciones de conservación mediante propuestas de responsabilidad social y ambiental, los resultados aún están lejos de impedir que el oso andino desparezca. Por otro lado, son las comunidades rurales las que soportan las consecuencias de los programas de conservación y de las limitaciones al uso del suelo establecidas en los planes de ordenamiento territorial, pero en ningún caso son consultadas ni participan en procesos de adquisición de información para la conservación o en la planificación de alternativas productivas, las cuales tampoco están incluidas en los planes de desarrollo regionales; sin embargo, políticas económicas como los TLC, donde los campesinos que conviven con el oso no encajan, ponen en peligro las poblaciones de especies silvestres, más allá de las que puedan ser contenidas en las áreas protegidas. Las muertes de osos conocidas en este último año ponen de manifiesto que las estrategias de conservación no están dando los resultados esperados, más aún cuando en el área de Corpoguavio –la organización ambiental estatal que más esfuerzos y tiempo le ha invertido a la conservación del oso– es donde se han presentado las últimas muertes conocidas. Finalmente, la implementación de recompensas para capturar a los culpables de la muerte de osos en el país aumenta el malestar entre las comunidades rurales que se sienten abandonadas, lo que dificulta los trabajos de sensibilización y educación hacia el beneficio de la especie. Se pierde el apoyo comunitario alcanzado ya que solo se sienten atropellados y sin apoyo en actividades económicas que disminuyan el conflicto con la fauna silvestre.

ÁREAS O CINTURONES DE PRESIÓN POR INTERACCIÓN NEGATIVA HOMBRE – OSO ANDINO Y FAUNA SILVESTRE ACOMPAÑANTE: FRONTERA DE RIESGO

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RESUMEN

Con el fin de definir una frontera de interacción, frontera de riesgo o cinturones de presión, que se definen como las zonas donde son más intensas y frecuentes las interacciones fauna silvestre-gente, se diseñó en sistema de modelamiento para obtener su representación cartográfica en el macizo Chingaza. En el caso del oso, el ejercicio para identificar la franja de mayor probabilidad de conflicto partió de la imagen de CLC del año 2007 (Ideam) a escala 1:100.000, que permitió obtener las zonas de las actividades agrícolas que se encuentran en la frontera ecotonal con coberturas naturales. Sobre estas coberturas se realizó un *shape* nuevo y se calculó un buffer de 250 metros al exterior tanto de coberturas naturales como de coberturas antrópicas de contacto con zonas naturales, dando por resultado dos franjas de 250 m cada una. Sobre estas dos franjas se aplicó, mediante la herramienta spatial analysis y la función merge, la disolución de los bordes de cada cálculo dando lugar a cinturones de vulnerabilidad que indican las posibles áreas de interacciones negativas. Estas áreas se distribuyeron en 28 unidades de coberturas de la tierra, según el mapa de Corin Land cover para la región. Las seis coberturas mejor representadas abarcan el 66,8% de estos cinturones y son principalmente coberturas antropizadas relacionadas con actividades agrícolas, conformadas por un mosaico de cultivos, pastos y espacios naturales (15,2%), bosque fragmentado (14,9%), mosaico de pastos y cultivos (13,9%), mosaico de pastos con espacios naturales (12,8) y bosque denso alto de tierra firme (10%). La información sobre intensidad del conflicto, definida como el número de interacciones negativas de carácter pecuario durante los últimos 15 años y levantada de primera mano con las comunidades, se utilizó como verificación del modelo y permitió obtener un gradiente de intensidad. Los cinturones sobrepuestos con los mapas prediales permiten definir las propiedades más vulnerables al ataque de osos y donde se deben adelantar propuestas directas de incentivos de conservación y sistemas de alertas temprana como monitoreo y sistemas de ahuyentamiento.

ANDEAN BEAR TOURISM: AN UNEXPECTED OUTCOME OF COMMUNITY-BASED CONSERVATION IN NORTHERN PERU'S TROPICAL ANDES

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ABSTRACT

In the Tropical Andes of Northeastern Peru lays Corosha, a Campesino community of 200 families that subsist below the poverty line. Since 2008 they have been involved in a conservation project that aimed to create a protected area and achieve the conservation of the endangered and endemic primates found here. As a result, since 2011 this community has designated 2282 ha as a Private Area of Conservation (ACP), legally recognized by the Peruvian Government. In the last decade the population of Corosha has grown by 30%, increasing the potential for anthropogenic pressure on pristine areas. Nonetheless, in 2015, after seven years of conservation practices (e.g. no burning of natural scrublands, no hunting of endangered species), Andean bears returned to an area less than 5 km away from the village and in unusually high numbers: seven individuals are seen regularly, including a golden colored bear. After the bear sightings were established as not being merely anecdotal occurrences by the monitoring of bear presence (83% of successful observation over a five-month period), together with the community we started a tourism project that involved the creation of associations for lodging and guiding services. Since then, 15% of the community is directly involved in the tourism activities and 68% of the community views this tourism initiative as positive. Between January 2016 and March 2017, 138 visitors have come to Corosha, spending around US$42 per visitor in a 2-day visit, providing support for at least three families per visitor, and for some of the management activities of the ACP. The presence of visitors has increased the positive view of Andean bears and demonstrates how the creation of the ACP and its underlying activities can offer new economic activities to a community. This unexpected outcome is also an unforeseen solution to the challenge of obtaining long-term financial sustainability for community-based protected areas without fostering dependence from outside actors. The next step is to develop a sound strategy for the sustainability of the bear population and tourism associated with it by the involvement of neighboring communities and an adequate market development plan.

REHABILITACIÓN DEL OSO ANDINO (*TREMARCTOS ORNATUS*) Y LAS ALIANZAS ESTRATÉGICAS CON LAS COMUNIDADES RURALES EN EL PROCESO DE LIBERACIÓN

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RESUMEN

En Venezuela el decomiso de osos andinos (*Tremarctos ornatus*), ya sea por situaciones de conflicto, comercio o tráfico ilegal, se aproxima a casi un ejemplar por año en la última década; más de la mitad de los ejemplares se mantienen en cautiverio, otros murieron durante o poco después del comiso, y solo dos han sido liberados. A pesar de los esfuerzos en los planes de conservación del oso andino, no se han logrado romper las barreras culturales y los prejuicios por parte de las comunidades rurales hacia la especie: todavía se considera una amenaza a sus prácticas de ganadería extensiva .El objetivo de este trabajo fue lograr una alianza estratégica con la comunidad de las Gonzales del páramo Los Conejos de la Sierra La Culata de La Cordillera de Mérida, para el monitoreo a través de radio-telemetría y rastreo canino de un ejemplar de osa rehabilitada y liberada en la zona, y el desarrollo de actividades multidisciplinarias como levantamiento de información gráfica y documentada de avistamiento de osos; registro de depredación de ganado; practicas responsables para el control de especies introducidas como los perros asilvestrados, registro y denuncia de delitos ambientales y civiles; control sanitario de semovientes y control reproductivo de animales de compañía con la finalidad no solo de incrementar las probabilidades de supervivencia del ejemplar liberado, sino también generar un cambio de actitud hacia el oso andino por parte de las comunidades y la concienciación hacia la tenencia responsable y control reproductivo y sanitario de animales domésticos. Esto contribuye a reducir el riesgo zoosanitario de las especies silvestres que se encuentran en contacto directo e indirecto con los semovientes, y al desarrollo de actividades agropecuarias sustentables con el ambiente.

OSO Y COMUNIDAD... UNA MIRADA DESDE LA REALIDAD CAMPESINA EN EL MUNICIPIO DE FOMEQUE, CUNDINAMARCA, COLOMBIA

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RESUMEN

Desde el 2005 se ha recogido información sobre oso y su actuación en el municipio de Fómeque. El 52% de este se encuentra dentro de PNN Chingaza, y antes de la conformación del PNN las tierras estaban destinadas a la ganadería. Se realizaron entrevistas semiestructuradas sobre la presencia y acciones del oso a los habitantes de las veredas, y mediante el uso de cartillas con figuras de los osos de la jurisdicción de Corpoguavio se ha logrado reconocer que hay por lo menos once osos distintos que se desplazan en esta zona. Las veredas Quebrada Blanca, Chinia, Hato Viejo y El Paval, ubicadas dentro de la zona de reserva forestal Rio Blanco Rio Negro son las que históricamente han registrado la presencia de osos, y donde se registran relatos sobre el oso desde hace un siglo. En toda esta región del macizo Chingaza se han reportado 21 eventos de ataque en los últimos 15 años, esto es 1,4 ataques por año en más o menos 13 distintos predios; por otro lado, la muerte de osos reportada no supera los tres animales, menos de uno por año. Esta información obtenida puede contribuir a la construcción de alternativas para las instituciones con el fin de que se adopten medidas de protección al oso sin desconocer el papel de uso por parte del campesino. Actualmente los programas de conservación no son muy claros con las acciones tanto del oso como de los campesinos; cuando se trata de proteger la especie se presiona el campesino y no hay un equilibrio en las responsabilidades, lo cual hace que no los habitantes no reconozcan que el oso es de este territorio y que las actividades de sustento humanas llegaron más tarde. Un programa que se diseñe para protección y conservación debe contemplar las dos partes, oso y comunidad, generando sistemas de producción sostenibles y rentables que ayuden al campesino en el mejoramiento de la calidad de vida y, a su vez, se conserven el medio ambiente y el hábitat del oso en la región.

IMPACTS OF FERAL DOGS ON ANDEAN BEAR POPULATIONS IN THE HIGH ANDES OF ECUADOR

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ABSTRACT

Domestic dogs are the most ubiquitous introduced carnivore species on the planet. Although most dogs are owned as pets, a large percentage of them range freely and many have become feral (individuals that are completely wild and independent of human sources of food). Even if the Ecuadorian Andes have long been occupied by people, and threats to biodiversity such as habitat loss and fragmentation are widely recognized and well documented, threats posed by exotic species like free-ranging and feral dogs have been overlooked. We evaluated the effects of dogs on Andean bears in the northern Ecuadorian Andes. Results suggest that the presence of dogs has detrimental effects on Andean bears. Occupancy rates of dogs were the most important predictors of Andean bear occupancy across a study area that spanned 800 km2. In Cayambe-Coca National Park, where human impacts are very low, Andean bears showed significantly reduced relative abundance in areas where feral dogs are abundant. Furthermore, the presence of dogs altered significantly the activity patterns of Andean bears. The increasing number of dogs in wilderness areas have varied and complex ecological effects, influencing community dynamics in innumerable ways, including direct and indirect effects that could cascade down several trophic levels. Dogs have become a conservation, animal welfare, and public health problem in vast areas of the Ecuadorian highlands, because of human population growth, poor waste management practices, absence of responsible dog ownership, and low awareness of zoonotic disease issues.

ÁREAS PRIORITARIAS PARA LA CONECTIVIDAD DE POBLACIONES DE OSO ANDINO EN TRES ÁREAS PROTEGIDAS DE LA CUENCA DEL RÍO QUIJOS

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RESUMEN

La fragmentación y destrucción del hábitat generan importantes efectos en los procesos ecológicos y las relaciones entre las especies y el ecosistema. La configuración de la cobertura vegetal del paisaje (esto es, la conectividad estructural) y la percepción de disponibilidad de recursos (esto es, la conectividad funcional) de cada especie influyen en el desplazamiento dentro del ecosistema. No obstante, el desarrollo vial y los cambios en el uso del suelo alteran las dinámicas de la matriz y afectan el desplazamiento de la fauna dentro del paisaje. Este estudio combina diferentes métodos para evaluar potenciales rutas de paso del oso andino en tres áreas protegidas del Ecuador (Parque Nacional Cayambe Coca, Reserva Ecológica Antisana y Parque Nacional Sumaco-Napo-Galeras). Los métodos incluyen fototrampeo, análisis cartográfico, modelos de ocupación de sitio y modelamiento de conectividad estructural. Se establecieron 118 puntos de fototrampeo en 18 franjas de muestreo de la red vial estatal, con un esfuerzo de 2528 días-cámara. Los modelos de ocupación de sitio indicaron que el oso andino presentó una relación positiva con la distancia a la carretera y con el incremento del área de cultivos y pastos en los tramos Cosanga y Papallacta, respectivamente. El análisis de conectividad estructural reveló que los puntos críticos para la conectividad están determinados por la disponibilidad de bosque maduro y la distancia entre las áreas protegidas, siendo Papallacta el tramo con mayor probabilidad de paso para el oso andino. El análisis de AUC indicó que la capacidad predictiva del modelo de conectividad de circuitos es buena, permitiendo identificar probables rutas de paso que garantizan el desplazamiento del oso andino en la zona. Este estudio es el primer acercamiento formal para identificar zonas importantes para la conectividad entre áreas protegidas del Ecuador. La ubicación geográfica, la configuración espacial, la extensión y la distancia entre las áreas protegidas en la zona de estudio determinan la formación de nodos de conectividad, contribuyen a la mitigación de los efectos del aislamiento geográfico y garantizan la conservación de la integridad biológica de las áreas protegidas.

ANÁLISIS DE LA DIETA DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN EL DISTRITO DE COROSHA, AMAZONAS

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RESUMEN

El análisis de la dieta de una especie animal permite conocer sus hábitos y distribución. El oso andino (*Tremarctos ornatus*) es una especie endémica sudamericana categorizada como Vulnerable (VU) por la UICN, que cuenta con el "Plan Nacional de Conservación del Oso Andino (*Tremarctos ornatus*) – Periodo 2016 – 2026" en Perú. Uno de los lugares que habita es el distrito de Corosha, Amazonas, en donde se encuentran las ecorregiones de jalca, pajonal y bosque montano nuboso. Conocer de la dieta de *T. ornatus* en esta región permitirá un manejo sostenible de la fauna y flora en Corosha, lo cual no solo promoverá la conservación del oso andino, sino que potenciará el ecoturismo, un beneficio para la gente del lugar. El análisis se realizó mediante la comparación de tejidos histológicos en heces de *T. ornatus* con la flora y fauna del lugar, así como con la identificación de la flora en los comederos. Los 134 comederos y 65 excretas halladas en la época de verano e invierno mostraron una dieta herbívora (99%), con preferencia en la familia Bromeliaceae y los frutos de la familia Ericaceae. También se hallaron insectos (<1%), en los que predominó la familia Formicidae. El análisis de la flora del lugar permitió reconocer dos géneros de bromelias e identificar el porcentaje consumido en bosque montano nuboso y jalca a través de la variación de tricomas escamosos. La caracterización de semillas permitió identificar los géneros de Ericaceae consumidos por los osos andinos.

HACIA EL SUR:
EL OSO MÁS AUSTRAL DEL MUNDO, EN UN
AMBIENTE DE CONTRASTES

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RESUMEN

El oso andino (*Tremarctos ornatus*) ingresó a Sudamérica durante el Holoceno temprano, hace 15-30 mil años antes del presente. La especie se ha dispersado a través de los Andes Tropicales, alcanzando probablemente una de sus últimas áreas de dispersión en el extremo noroccidental de la Argentina. Se ha comparado y cuantificado el uso de hábitat por estaciones climáticas en la especie y la respectiva interacción interespecífica con otros grandes carnívoros de la región. El área de estudio tuvo una extensión de 250 km2 y estuvo representada por las unidades ecosistémicas de selva tucumano-oranense, bosque montano y pastizales de niebla, a una altitud entre los 800 y los 3500 m.s.n.m. En el muestreo de campo se emplearon perros de rastreo y se establecieron diez estaciones de captura fotográficas con cámaras-trampa, y, por último, se constituyeron transectos de entre 5-8 km lineales para el relevamiento de indicios de actividad (huellas y heces, entre otros). Para la caracterización del ambiente se utilizaron imágenes satelitales. La fuente de datos y procesamiento de las imágenes se ha realizado a través del sensor Landsat 8. La preferencia de hábitat del oso se ha evaluado a partir de los registros de presencia obtenidos. Se ha aplicado la prueba de bondad de ajuste de Chi-cuadrado para comprobar si existen diferencias estadísticas significativas entre el número de registros encontrados en las diferentes unidades ecosistémicas. Al encontrar diferencias significativas, se ha aplicado una prueba de Bonferroni con intervalos de confianza del 95 % para determinar selección o rechazo de los tipos de cobertura. Se ha registrado el uso del pastizal de niebla por oso andino, jaguar, puma y zorro colorado durante el período estival, cuando las lluvias y crecientes de los ríos con deslizamientos de masas son intensas en el bosque. El oso ha aprovechado, debido a la humedad ambiente, la gran oferta de *Gunnera apiculata* y *Puya novarae* como recurso alimentario. También se ha registrado el consumo de carcasas de vacas en pastizales disturbados, incluso interactuando con el zorro colorado en el uso del recurso. Durante la época seca, el oso ha preferido el bosque por sobre el pastizal.

IS BEAR CONSERVATION ADVANCING?

CHALLENGES OF MANAGING A EUROPEAN BROWN BEAR POPULATION: LESSONS FROM SWEDEN, 1943-2013

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ABSTRACT

"Adaptive management", 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.

LINKING NATURE CONSERVATION AND ZOOS, AN INITIATIVE FOR LINKING EAZA ZOOS AND CONSERVATION NGO'S; LINCZ

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ABSTRACT

At the Annual Conference of the European Association (EAZA) in September 2017, a new initiative for linking zoos and conservation will be launched. The initiators, Angela Glatston and José Kok, will get the opportunity to test this web based platform for one year. The aim of LINCZ is to provide EAZA zoos with easy access to good projects, run by reliable organizations that guarantee regular feedback, for the (bear) species they would like to support with donations (financial, materials, expertise) they can afford. LINCZ will be a web based platform linking zoos to these conservation organizations and the projects they are working on. It will work like an online dating site allowing users to search specific types of projects e.g. based on taxon, geographical region, type of project etc. When a suitable project is found, the user will be put in touch with the organization running the project. LINCZ will have benefits for both zoos and the conservation projects; zoos will have links to reputable organizations and a guaranteed minimum level of feedback, and the NGO/conservation project will have financial support and find its workload reduced due to centralized reporting. To get started and in search of good conservation activities, all EAZA Taxon Advisory Groups (TAGs), including the Bear TAG, are invited to recommend their conservation contacts. These conservation contacts are invited to put information about their organizations/activities on the LINCZ website according to a fixed format. The same applies to organizations that are in the audience during the BSG session at the IBA conference in Quito.

SLOTH BEAR CONSERVATION IN INDIA: IS IT WORKING?

Kartick Satyanarayan

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ABSTRACT

I have been working on sloth bear conservation as a part of Wildlife SOS for over 20 years. Wildlife SOS works with the Indian Government and enforcement agencies to impose the law to combat poaching of sloth bears. I will present a review and my opinion as to what is being done regarding sloth bear conservation in India, highlight the conservation efforts and challenges, and call out examples and specific situations from states like Karnataka, Chattisgarh, etc. I will also talk about what is working, what is not working and why. I will touch upon the need of the hour and what is not being done to support sloth bear conservation. My talk will also cover problems with monitoring successes and failures, hopes for the future. I shall talk about the various ongoing research and conservation efforts such as the corridor project. The growing conservation challenge of increasing human-sloth bear conflict will also be discussed.

BROWN BEAR RESEARCH IN EUROPE: A REVIEW OF THE DATA COLLECTED AND THEIR VALUE FOR CONSERVATION

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ABSTRACT

Europe is a mosaic of landscapes shaped by human presence and activity; nevertheless, it still harbors ~18 000 brown bears clustered in 10 populations. Brown bear management and conservation in Europe is carried out by national/regional governmental agencies and through the involvement of universities and research institutions, NGOs, protected areas' administrations, and hunting associations. Due to their cultural and charismatic value, brown bears have been largely studied under various aspects of their biology, ecology, and management, and much of this knowledge has been gathered through the collaboration of these various agents. However, the data collected have been only partially used for research and published in the peer-reviewed literature and, therefore, may not be fully available to the scientific community and conservation practitioners. In addition, data collection and research efforts are often fragmented at an administrative level, and can be sparse and scattered, or even lacking, in some parts of the species range due to limited funding. Here we summarize the ecological data collected for the 10 brown bear populations in Europe, focusing primarily on movement, genetic, demographic, and diet data. We report the type of data collected, the methods as well as the geographic and temporal coverage of the data collection, the overall sample sizes, if the data were obtained at the population or country/regional level, what the data have been used for, and if results have been published. We use this information first to reveal the substantial amount of valuable data collected for the brown bear throughout Europe; second, we identify existing gaps in knowledge and data collection and prioritize future efforts needed as well as areas where research funding may be more urgent; third, we highlight the potentials for integrating the overall knowledge so far collected for improving understanding of brown bear ecology in the human- dominated European landscape and implementing more effective management and conservation planning.

WHEN POLITICAL COMMITMENT ON CONSERVING ENDANGERED BEARS IS LACKING, HOW CAN A SCIENTIST CONTRIBUTE TO BEAR CONSERVATION?

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ABSTRACT

Formosan black bears (*Ursus thibetanus formosanus*) were listed as an endangered subspecies of the Asiatic black bear in Taiwan in 1989. Country-wide sign surveys and predicted distribution maps showed that the population of bears in northern Taiwan was tenuously small and declining due to illegal hunting and habitat loss. A Conservation Action Plan for bears was created by multiple-stakeholders in 2012 and adopted by the national government. However, the government took little initiative to implement this plan. Here I review the research and conservation work that moved ahead independently. A PhD dissertation in 2003 revealed the impact of illegal hunting on the already-small bear population. Since then, 28 Master's theses on Formosan black bears have been completed, investigating their behavior, ecology, physiology, genetic, human dimensions and others, although only few were published in English. The filed research attracted enormous media attention on the animals and the scientists themselves. Although there are several constraints for using black bears as a focal species, the popularity of bears was fostered through hundreds of articles in popular magazines or newspapers, plus four documentary films and series of TV programs. The bear scientist played a critical role in disseminating such information. A major milestone was establishing the non-governmental organization Taiwan Black Bear Conservation Association (TBBCA). TBBCA is the first and only science-based NGO focusing on conserving wild Asiatic black bears. It is a platform for diverse stakeholders in bear conservation. The NGO has strived to contribute to conservation education and communication, including seven training courses with >300 volunteers trained and 300 interpretations conducted in schools, along with country-wide outreach programs and a bear-specific exhibition. A capstone was the establishment of a Formosan bear education center as a frontline for bear conservation. TBBCA also learned to customize our cooperation with different businesses, attracting them through respectfulness and meeting their needs as well as ours. Businesses thus became not just donors but also contributors to conservation. However, since the Conservation Action Plan there has been a disappointing lack of political commitment to conserving this endangered bear; bear scientists have spoken out through research, and involved stakeholders and communities to move society towards more effective conservation.

THE VALUE OF DATA SHARING FOR CONSERVATION. A STUDY CASE OF A LARGE-SCALE PROJECT OF SPECTACLED BEAR IN PERU

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ABSTRACT

Conservation information is expensive, particularly when conducting long-term studies of rare species in developing nations. Thus, spectacled bear (*Tremarctos ornatus*) studies are challenging due to the behavior and biology of the species as well as its distribution. For this reason, individual efforts may not be sufficient to develop an understanding of its conservation needs. Conservation strategies are constrained by an absence of information on the ecology, biogeography, and abundance of target species, thus, researchers' collaboration is essential (Costello et al. 2015). Wallace et al. (2014) developed the last estimate of spectacled bear distribution in Peru and identified large areas lacking information. We directed our focus on filling information gaps, but had to begin with the available information. We compiled existent information in published literature, and available oil and mining reports (19 and 180 respectively), and solicited additional information. We contacted 43 researchers and asked them to share their data. We also included opportunistic data from other projects where valuable records and observations of spectacled bear were attained. We obtained 488 records for the spectacled bear and we developed the first database for the species, using these data for our first analyses. Species distribution models have become very popular in recent years (Johnson and Gillingham 2005), but the performance of these models is related to the data used. With these limitations in mind, we are using the first approximation to design more efficient and focused field data collections, while taking advantage of previous work to prioritize the next steps. Data sharing is extremely valuable since the money and time invested can yield multiple benefits and feed new projects. Databases can inform policy makers, and lead to further inquiry by allowing comparative studies and studies in larger temporal and geographical scale. Open access databases can facilitate resources being directed towards gaining new knowledge, not duplicating prior efforts.

USE OF GEOSPATIAL TECHNIQUE IN SLOTH BEAR HABITAT MANAGEMENT WITH SPECIAL REFERENCE TO WATER SOURCES

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ABSTRACT

The sloth bear sanctuary of Jassore is located on the border of Gujarat and Rajasthan states, India, and harbors the highest sloth bear density in Gujarat state. The hills of Jassore, part of the western Arawali mountain range, harbor dry deciduous forest spread over an area of 180 km2. Due to dry climatic conditions, water sources are always a limiting factor for wildlife, including sloth bears, and became one of the reasons that sloth bears enter the villages in search of water, which may lead to human-sloth bear interactions. This study is an attempt to identify the channels of natural streams where water conservation structure can be created as a sloth bear habitat management component. We used satellite images of the sanctuary and identified watershed and stream channels through digital elevation models. The water channel network map of the sanctuary was generated using GIS and various land use data such as roads, villages, dams, and canals that were overlaid along with 103 locations of sloth bear-presence data collected through sign surveying. We also overlaid seven sloth bear attack locations during the dry seasons on the map, and found that sloth bear attacks in dry seasons occurred close to village, assuming that the water inside the sanctuary had dried up. The stream management map generated in this study will help managers to identify the points to conserve the stream drainage and avail water during the dry seasons, which may help in sloth bear habitat management and mitigating human-sloth bear conflicts.

ACCEPTANCE BY GIVING CONSUMPTIVE AND NON-CONSUMPTIVE VALUE TO BEARS

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ABSTRACT

Any large carnivore population has the realistic long-term survival chance only if accepted by local inhabitants. Arguments referring to ecological role, intrinsic value, ethics, and esthetics have limited strength even if backed up by educational campaigns and scientific facts. Tradition of many generations sharing the living space with carnivores derives certain respect and provides skills to minimize damage, as well as results in taking the situation as granted. With the life-style quickly changing everywhere, even this tradition is not a guarantee for upcoming generations, not to speak of areas where the large carnivores recently recolonized the former range or were reintroduced. The most promising acceptance tool seems to be the economic value. Brown bears are an excellent example about how economic value can buy acceptance. Trophy hunting is undoubtedly limited to strong and stable populations and requires careful monitoring and compliance with international and national legislations. Fees that grow with the trophy size of the hunted bears can provide staple income to hunting organizations, including the coverage of bear damage compensations. Source hunters will not let disappear such an income; on the contrary, the fear is that by artificial feeding they will boost the population above the natural habitat's carrying capacity. Bear-related ecotourism potential through "bear watching tourism", including "bear trails" and "bear-friendly products" is offering even larger opportunities to raise the value of bears. First, it has potential to bring in many more people who will individually pay less (than hunters), but will stay longer and use wider local resources like housing, food, and buy many local products. Of course, such operations also require high responsibility with strict regulations and careful monitoring. We will illustrate how both, hunting and ecotourism, can go together in the same area in the case of brown bear management in Croatia.

BEAR PARTS TRADE DEMAND REDUCTION IN SOUTHEAST ASIA

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ABSTRACT

The trade in bear parts for medicine and for status is a conservation challenge throughout Asia. It is particularly prevalent in Southeast 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 by 30-40% 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 for behavioral change in Southeast Asia. Accordingly, San Diego Zoo Global, Free the Bears, and the University of Bristol are conducting community-involved, mixed-method surveys in Laos, Cambodia, and Vietnam to understand the attitudes and beliefs individuals hold towards bears, as well as the key motivators for individuals to use bear parts. Results from Laos have shown that individuals want wild bears to persist in Laos, but the same individuals do not understand that the use of farmed bear bile directly harms wild bear populations. However, we also found significant variation in the responses, which appears to correlate with ethnic differences. In Cambodia, our preliminary results have shown that individuals also wish to keep wild bear populations in their country, but the use of bear parts is perhaps driven by social aspirations and their desire to emulate the Chinese. Overall, we have seen that spatial heterogeneity of wildlife value orientation is present in Southeast Asia, and that the beliefs and behaviors of one country, or even one ethnicity, can not necessarily be applied to other groups in the region. We hope that the knowledge gained from our work will inform monitored, precise, and ultimately successful demand-reduction campaigns.

CONSERVATION IS DYING. CAN WE TALK ABOUT IT?

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ABSTRACT

Conservation is dying. "World's governments are failing on protected areas", according to a recent study covering 12,000 sites, 1000 ecoregions and 25,000 species. Another comprehensive study, which synthesized 131 earlier studies, indicated that one in six of the planet's species may become extinct due to climate change if no action is taken. Without the added effect of climate change, twenty-nine percent (22,784 species) of the species included in the IUCN Red List are already threatened with extinction and recent mathematical models show that the number of species that are becoming extinct is underestimated. Except for few species (Giant panda, Tibetan antelope and Iberian lynx are examples), even the populations of "charismatic" species such as African elephant, Eastern gorilla and lion are declining. If this global outlook isn't depressing enough, let's consider the other factors that complicate this picture. Ignoring science has become a trend even in some western, educated, industrialized, rich, and democratic (WEIRD) societies. This makes the past achievements in the field of conservation more vulnerable to political, economic and intellectual crises. A review of 8000 publications has revealed that ecologists' terrestrial field study site selections are (hence the scientific literature is) geographically biased. Proposals involving high-tech solutions to conservation problems attract attention but techno-fixes such as de-extinction are trying to solve the wrong problem. Finally, conservation community is suffering from monoculture and relevant institutions do not accurately portray the diversity of cultures in which nature has been valued and conserved for centuries. The "future of bear conservation" is the elephant in the room. How does the conservation community make sure that conservation efforts continue to contribute to the goal of conserving bears? As a close observer of researchers, managers, policy makers, international NGOs and donors for 20 years, I will try to tackle this question in my talk. We need a new conservation system that is anchored in conservation practitioners and wildlife agencies rather than academia, international NGOs or funding providers. For a species that invented the wheel and made it to the moon, there is no reason to feel overwhelmed. This is the right time to feel optimistic about the future.

REFLECTIONS ON 20 YEARS OF SUN BEAR RESEARCH, AWARENESS AND CONSERVATION IN INDONESIA

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ABSTRACT

Approximately half of the remaining distribution range of sun bears lies in Indonesia [Kalimantan and Sumatra], and as such it is the most important country for conservation of this tropical bear species. I reflect on the 20 years [1997-2017] of my work on sun bear research, awareness, and conservation in Indonesia. Starting with the first ever field study on this species in its rainforest habitat in Kalimantan in 1997, to the sun bear becoming the local mascot, and ascending from obscurity to becoming a 'species of interest' by the Ministry of Forestry, I discuss what progress has been made regarding the conservation of sun bears at different administrative levels in Indonesia, and what still needs to be done to further advance conservation efforts for this bear species. Despite the loss of almost all lowland forest habitat, significant areas of forest remain in the less accessible mountains, where sun bears also thrive, making their conservation prospects still cautiously optimistic.

CORE CONSERVATION UNITS: AN OPERATIVE SPATIAL-INSTITUTIONAL TOOL FOR THE CONSERVATION OF LARGE CARNIVORES

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ABSTRACT

The conservation of large carnivore populations is a very difficult problem to solve due to the large areas required for a viable population, which usually surpass the average PA´s size, and the potential for coexistence conflicts with human activities. The state of the large carnivore populations in most of the developing world is critical due to expansion of the human populations and associated activities, reducing the wilderness areas and incrementing the overlap of human activities and carnivore presence, and hence the potential for conflict. In the last decade, large efforts have been made to define priority units for the conservation of large carnivore populations based on the delimitation of the remaining wilderness patches where it is assumed that a viable population of a given species can exist. Even though the patches defined as priority areas for the conservation could comply with the biological requirements of the populations for their long-term conservation, the operationalization of the conservation interventions within them is difficult to achieve due to the complexity of different types of property rights, legal jurisdictions, and protection schemes that such large areas can contain. To have operative landscapes for conservation interventions. Socio-economic and opportunity for conservation are additional criteria to consider when identifying conservation priority units. The core conservation units or "COCOUN" concept is based on national PA´s as the main component of the conservation unit, complementing it with actual wilderness areas as connections among them, and the management of neighbor human activities to avoid conflicts. The design follows a clear algorithm for the selection and delimitation of the prioritized areas. WCS Andean Bear Conservation Program presents the "COCOUN" concept and construction methodology in use to support conservation processes of Andean bear populations throughout its range.

THE NEED TO DO PROPER RESEARCH ON IRAN'S BROWN BEARS

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ABSTRACT

Reliable data about an animal population is essential to produce effective management and conservation strategies. Unfortunately, little is known about the brown bears (*Ursus arctos*) of Iran. Brown bears inhabit two great mountain ranges in Iran (the Zagros in the west and the Alborz Mountains in the north), but it remains unclear whether there are separate, isolated populations within these chains, or even if these chains are connected in the Iranian Caucasus. According to Iran Department of the Environment (DoE), the governmental organization in charge of preserving Iran's fauna and flora, the human-caused mortality rate of brown bears is high, but there are no reliable indications of whether the population is increasing or decreasing. In part due to international trade embargos, proper equipment and training for modern techniques (e.g., camera trapping, DNA analysis) to assess population size, trend, and connectivity are lacking. Moreover, many researchers who have worked on brown bears have switched to species of greater conservation attention (i.e., cheetahs). Here I review the currently available information, based on techniques such as direct observations of bears and administering questionnaires among local people or government officials, and show its inadequacy for prompting conservation. Iran's nature has already lost two large carnivore species (the Asiatic lion *Panthera leo persica* and the Caspian tiger *Panthera tigris virgata*). We need to be concerned that lack of proper research on brown bears will send them down that same path. Therefore, here I make recommendations for a way forward to determine distribution and connectivity of the Iranian brown bear populations.

BEAR ECOLOGY AND BEHAVIOR

DESIGNING ECOLOGICAL CORRIDORS NETWORK FOR BROWN BEARS IN ROMANIA

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ABSTRACT

Europe is characterized by a fragmented natural landscape, interspersed with high human population densities. In Romania, in 2016 highways occupied less than 1000 km, of which approximately 200 km crossed forested areas. While development of highway infrastructure is vital to the country's economic development and prosperity, long-term biodiversity conservation can be achieved only by implementing successful mitigation measures and by harmonizing the sectorial policies for development with conservation strategies. The brown bear requires the use of extensive habitats due to their large home ranges. Based on available data (at the national level) and the ecological needs of the species, we generated maps of potential habitats and resistance to movements maps for determining the location of potential corridors. We used six environmental variables for identifying the potentially suitable areas and six variables for quantifying the brown bear preferences/barriers for/to movement. The model identified around 42,000 km2 of suitable habitats for the brown bear in the Romanian Carpathians. Potential ranges were also compared with the existing network of protected areas; however, only 41% of the protected areas were found suitable for bears. We identified approximately 7000 km2 of suitable ecological corridors outside the suitable habitats; however, 61% of the network is located outside protected areas. Moreover, the conservation of brown bears will depend on managing ecological corridors based on supportive science outputs, deeper collaboration, and strong policy on connectivity together with plans and strategies that champion large landscape conservation via state, regional and local initiatives.

SHIFT IN MATERNAL CARE TACTIC: CONTRIBUTIONS FROM INTRINSIC FACTORS AND ARTIFICIAL SELECTION IN THE SCANDINAVIAN BROWN BEAR

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ABSTRACT

The duration of maternal care is an important life-history trait that affects female productivity and population growth rate. Understanding the causes of variation in this trait is thus crucial from both ecological and management standpoints. In the highly productive brown bear population in southern Sweden, a shift towards longer periods of maternal care has been observed, from a period where almost all litters (1987-2000: 95%) received only 1.5 years of maternal care ("1.5-year tactic"), to a period comprising an unprecedented high proportion (2001-2015: 30%) of litters being cared-for for 2.5 years ("2.5-year tactic"). To identify the drivers of this shift we evaluated the contributions of intrinsic factors, mostly temporal changes in female and offspring condition, as well as artificial selection for longer periods of maternal care induced by the legal protection of family groups from hunting. The duration of maternal care was determined for 166 litters born from 63 individual females. Both female (β=-6.29, P<0.001) and offspring (β=-3.21, P<0.001) spring mass showed a temporal decline, with the two being highly correlated (r=0.67, P<0.001). Litters of smaller average mass had a slightly higher probability of being weaned after 2.5 years compared to litters of higher average mass; however, the effect was marginal (β=-0.06, P=0.07) when controlling for year and maternal identity, suggesting that the temporal shift in the maternal care tactic could also be explained by other factors. For instance, the legal protection of family groups reduces annual hunting mortality rates of females with offspring by 10%. Thus, since the duration of maternal care is a repeatable trait (Repeatability = 0.33), females using the 2.5-year tactic benefit from an overall 6% increase in their average survival rate compared to females using the 1.5-year tactic. As a result, increase in hunting quotas and hunting pressure since the beginning of the study has very likely disproportionally removed fast-reproducing females, selectively leaving more females that provide longer periods of maternal care in the population. Our study shows that changes in individual condition combined with a demographic effect of hunting can promote slower life-histories in hunted wildlife populations.

MODELLING THE MOVEMENT OF EUROPEAN BROWN BEARS

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ABSTRACT

Understanding the movement of large carnivores is particularly interesting in Europe, where the landscape is strongly human-dominated, and where people have been expanding in most populations over the last decade. Modelling frameworks to analyze animal movement patterns mostly focus on resource selection, often ignoring individuals' different behavioral states. Using a formal Bayesian framework, we analyzed movement paths of brown bears to formulate movement models as mixtures of correlated random walks. We investigated the paths of 23 collared bears from the Carpathian population, one of the largest in Europe. We attempted to identify different movement states within the paths, as well as the factors influencing the movement decisions. Both local and dispersal movement paths were considered. Our analysis of relocation data from dispersing brown bears suggests a bimodal movement behavior: area-concentrated movements are interspersed with long, straight traversal movements. Local movement paths were strongly influenced by the presence of feeding sites.

HOW DO ACORN PRODUCTION LEVELS AFFECT THE ACTIVITY LEVEL OF ASIATIC BLACK BEAR AFTER HIBERNATION EMERGENCE?

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ABSTRACT

According to our previous results, Asiatic black bears (*Ursus thibetanus japonicus*) reserve their body fat in autumn (i.e., their hyperphagia period) feeding on acorns of *Fagus* spp. and *Quercus* spp.; however, the fat reserve levels will vary due to the annual fluctuations of production levels of acorns. Also, we found that the bears keep using the fat reserve until next year´s autumn. If the fat reserve is at a low level due to poor acorn production in autumn, the fat reserve will become lower than before their hyperphagia (i.e., in autumn) as of middle to late of next summer. Therefore, the bears show low activity level during spring to summer in occasional years, especially in the summer. On the other hand, assuming the bears can have enough fat reserve in autumn, they have a relatively good energy budget that allows to them to be more active even after coming out from hibernation. This may be a factor relating to bears causing more conflicts with human beings immediately after their hibernation emergence in such years. We evaluate this hypothesis using our satellite tracking data from plural bears and results of extensive survey on annual production level of the acorns in the Nikko-Ashio Mountains in central Japan.

IDENTIFYING AMERICAN BLACK BEAR (*URSUS AMERICANUS*) HIGHWAY CROSSING LOCATIONS IN CENTRAL GEORGIA, USA

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ABSTRACT

The Central Georgia Bear Population (CGBP), the smallest of Georgia's three populations of American black bear (*Ursus americanus*), is of special concern due to its size and isolation from other bear populations. Plans to widen Georgia State Route (SR) 96, which bisects the CGBP, has potential to negatively impact the population. Highway underpasses are being planned to mitigate these impacts. During 2012–2014 we used global-positioning-system (GPS)-tracking of 63 (33M:30F) bears and remote, infrared trail cameras to document bear crossings along SR 96. We evaluated landscape characteristics associated with 212 (210 by 11 GPS-collared bears plus 2 photographs) bear crossings using a resource-selection function approach and generalized linear mixed models. Closer distances between State Route 96 and forest edge were positively associated with bear crossings. Bear crossings were generally concentrated with 169 (79.7%) crossings generated by seven bears occurring within a 2.5-km segment of SR 96. We recommend placement of an underpass within this segment. Likewise, we recommend that vegetation management be used to connect underpass openings to forest edges along the highway rights-of-way.

INTERSPECIFIC INTERACTIONS:
AN OVERLOOKED SIDE-EFFECT OF BEAR MANAGEMENT

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ABSTRACT

Interspecific interactions are one of the key factors in the evolution and ecology of animal communities. However, managers, conservationists, and decision-makers rarely consider potential side-effects of bear management on other species. As the largest terrestrial scavengers with superb olfactory abilities, bears are one of the most important dominant scavengers and kleptoparasites in the Holarctic region. In this way, several bear species frequently interact with other predators and scavengers. Besides, bears perform several ecological roles ranging from seed dispersion to predation and directing nitrogen flow, thus affecting species ranges from various guilds and ecosystems. At the same time, bears are usually actively managed through culling, reintroductions, translocations, and provision of anthropogenic food. Until recently, it was poorly understood how bear management could affect their interactions with other species and, even more rarely, were these aspects considered in managerial decisions. An overview will be given on documented interspecific interactions involving bears and how various bear management measures could affect these interactions. As a study case, interactions between the brown bear and the Eurasian lynx in Slovenia will be presented, focusing on side-effects of intensive bear management on the endangered apex predator. Lynx are under strong pressure of kleptoparasitism by brown bears, resulting in a substantial loss of food for the lynx, which the predator is unable to compensate by increased hunting effort. This pressure is indirectly amplified by bear management measures, especially zone-specific culling and supplemental feeding of bears, which increased local bear densities and shortened bear denning period. Based on recent advances in the field, we call attention to the importance of considering interspecific interactions in bear-management decisions and generally in the management of strongly-interacting species.

RESTORATION OF DECLINING SLOTH BEAR POPULATION IN CENTRAL INDIA: A CONSERVATION INITIATIVE INVOLVING LOCAL COMMUNITIES

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ABSTRACT

In India, sloth bears are widely distributed but occur in fragmented forest patches. At present, sloth bears are found in 19 different states of India. In Madhya Pradesh and Chattishgarh states, central India, they occur in 11 national parks and 23 wildlife sanctuaries. The total area of these national parks and wildlife sanctuaries that hold sloth bear populations covers 15,414.34 km2. Everywhere, sloth bear populations are severely threatened due to poaching and habitat degradation by humans. Sloth bear habitats are severely affected due to anthropogenic pressures. There are frequent incidences of sloth bear attack on people and raiding of agricultural crop fields. There are reports of some retaliatory killing of problematic sloth bears. For the conservation of sloth bears, involvement of local people and their support are necessary. Through education and awareness programs, conservation ethics can be inculcated among these local people. Informal interviews of villagers living in and around protected areas were conducted to know about their participation in conservation efforts, protection of sloth bear populations and their habitats, and mitigation of human-bear conflicts. Out of 1915 respondents, 384, 266, 339, 272, 221, 245 and 188 respondents were from Bilaspur North, Raigarh, Raipur North, Korea, Balaghat North, Balaghat South and Chindwara West forest divisions, respectively. In all these forest divisions, 78% respondents were in favor of protection of wild animals, including sloth bear and their habitats. Among these, 73% were not supportive of mining activity in their areas. Out of all respondents, 67% were willing to accept regulation on cattle grazing and NTFD collection activities in sloth bear areas. Forty nine percent respondents supported plantation of fruiting trees in sloth bear areas. Most respondents (94%) were willing to accept strategies for mitigation of conflict with sloth bear. Only 26% respondents were not in favor of encroachment on forest areas. The rest of the respondents did not indicate anything.

THE SLOTH BEAR IN CENTRAL INDIA: A CONSERVATION INITIATIVE INVOLVING LOCAL COMMUNITIES

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ABSTRACT

In India, sloth bears are widely distributed but occur in fragmented forest patches. At present, sloth bears are found in 19 different states of India. In Madhya Pradesh and Chattishgarh states, central India, they occur in 11 national parks and 23 wildlife sanctuaries. The total area of these national parks and wildlife sanctuaries that hold sloth bear populations covers 15,414.34 km2. Everywhere, sloth bear populations are severely threatened due to poaching and habitat degradation by humans. Sloth bear habitats are severely affected due to anthropogenic pressures. There are frequent incidences of sloth bear attack on people and raiding of agricultural crop fields. There are reports of some retaliatory killing of problematic sloth bears. For the conservation of sloth bears, involvement of local people and their support are necessary. Through education and awareness programs, conservation ethics can be inculcated among these local people. Informal interviews of villagers living in and around protected areas were conducted to know about their participation in conservation efforts, protection of sloth bear populations and their habitats, and mitigation of human-bear conflicts. Out of 1915 respondents, 384, 266, 339, 272, 221, 245 and 188 respondents were from Bilaspur North, Raigarh, Raipur North, Korea, Balaghat North, Balaghat South and Chindwara West forest divisions, respectively. In all these forest divisions, 78% respondents were in favor of protection of wild animals, including sloth bear and their habitats. Among these, 73% were not supportive of mining activity in their areas. Out of all respondents, 67% were willing to accept regulation on cattle grazing and NTFD collection activities in sloth bear areas. Forty nine percent respondents supported plantation of fruiting trees in sloth bear areas. Most respondents (94%) were willing to accept strategies for mitigation of conflict with sloth bear. Only 26% respondents were not in favor of encroachment on forest areas. The rest of the respondents did not indicate anything.

"SLOTH BEARS GO HUNTING"
PRELIMINARY FINDINGS OF FEEDING HABITS
OF *MELURSUS URSINUS* IN EASTERN INDIA

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ABSTRACT

Among all the Ursids, sloth bear (*Melursus ursinus*) is the only species having myrmecophagous adaptations to feed on insects, especially termites and ants. Like other bears, but unlike other myrmecophagous mammals, sloth bears can adapt their diet to changing food conditions. Scarcity of food and destruction of foraging grounds of bear in the existing natural sloth bear habitat in Nilgiri wildlife range under Balasore Forest Division of Odisha state in India will lead to this hunting behavior being weird. They hunted goats grazing near the forests. They too destroyed chicken pens and coops near the forest edging villages. Fifty-one such cases were reported by the villagers. Such predatory behavior of sloth bear is indicative of menacing human sloth bear conflict (HBC) in the range. Mushrooming of pit mining in Nilgiri wildlife range is severely affecting the sloth bear habitat; this results in alarming levels of human-sloth bear conflicts, since sloth bears strayed out of the forests at night and invaded human settlements. A total number of 184 human attacks (including four deaths) have been recorded from June 2002 to July 2016. Four sloth bears were killed in retaliation. There are other factors also influencing the conflict situation, such as the collection of Non-timber Forest Produce (NTFP) like flowers, fruits, seeds, etc., gathering food resources from a forest that are also liked by bears, extensive cattle grazing, illegal encroachments of forest lands, and conversion of forest into agriculture fields. People participatory programs have initiated to spread awareness and education among the locals to minimize conflicts. Long term conservation of sloth bears in this human-dominated landscape is possible only if strategies for mitigating human-sloth bear conflicts are thoroughly implemented. Remedial measures are suggested.

PHYLOGENY AND SEASONAL DIET OF ASIATIC BLACK BEARS (*URSUS THIBETANUS*) IN ANNAPURNA CONSERVATION AREA, NEPAL

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ABSTRACT

Of Nepal´s three species of bears, the Asiatic black bear is one of the least studied species. The conservation and management efforts will only be successful when we have the information on this species. Habitat loss, illegal killing, and human-bear conflicts are reported throughout Asiatic black bear range countries. A sound understanding of Asiatic black bear food habits and population genetic structure is needed to develop effective conservation policies for the conservation of Asiatic black bears. Regarding the taxonomic identification of Asiatic black bears in Nepal, it is unknown whether it is the same as previously reported: Asiatic black bears (*Ursus thibetanus thibetanus*) from China, or the new Himalayan subspecies (*Ursus thibetanus laniger*). This research aimed at understanding the phylogenetic relationships and diet of isolated bear populations using non-invasive methods in the Annapurna conservation area of Nepal. Non- invasive sampling consisted of 126 fecal and 22 hair samples collected from eight sites in the Annapurna conservation area on ground walks through 27 grids of 5X5 km2 during the periods of October-December 2015 and July-December 2016. Similarly, 259 fecal samples were collected for diet analysis during the same period. Micro-satellite analysis was carried out first with three primer pairs. It showed that 97 samples (65%) were successful for genotyping and 64 individuals were identified. Control region (704 bp) of mitochondrial DNA was sequenced in 20 individuals, which identified three novel haplotypes. The phylogenetic relationships showed that bears of Nepal belong to a distinct clade than the reported *U. t. thibetanus* and other subspecies. Most fecal samples (n=191) were collected from the mountain forest in autumn and 68 fecal samples were collected in the rainy season, mostly from agricultural land and nearby. The maximum elevation of feces recorded was at 3582 m. The diet contained wild fruits (21 species), grasses (bamboo shoots, *Arisaema* sp. and unknown sp.), agricultural crops (four species), insect (three species) and mammal (hairs) in the feces. The percent frequency of occurrence showed that agricultural crops (84%) followed by grasses (37%) were major diet items in the rainy season whereas wild fruits (92%) followed by grasses (23%) were such in autumn. Small amount of sample contained wild fruits (6%) and mammal hairs (1%) in the rainy season. Similarly, agricultural crops (4%), insects (5%) and mammal hairs (6%) were recorded in autumn. Although bears were omnivores, fruits were the most preferred food items in autumn and maize in the rainy season, whereas bamboo shoots and *Arisaema* sp. were frequently consumed during both periods. Asiatic black bears consumed any available food source but they gave preference to larger fruits than smaller berries and grasses. Crop depredation, especially maize damage, was the major problem caused by the bears, which resulted in retaliatory killing of bears, whereas fear was raised by the occasional human casualties in the forest and nearby village.

BROWN BEAR DEN-SITE SELECTION AT MULTIPLE SCALES IN THE ROMANIAN CARPATHIANS

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ABSTRACT

The Romanian Carpathians provide one of the largest unfragmented areas suitable for large carnivores' conservation in Europe. The human access is restricted, particularly during the winter, due to a low density of paved roads and few recreation opportunities (e.g., skiing infrastructure) resulting in a low disturbance of the brown bears (*Ursus arctos*) denning. Yet, extensive logging is fragmenting the old-growth forests, assisted by poor legislation, may lead to loss of denning habitat even in protected areas. Scarce information is available on den-site selection for the Romanian population, a gap that is transferred into an ecological meaningless bear-forest management. We trained a spatially explicit model to map den habitat at landscape scale, described the habitat structure around dens and the characteristics of 86 used cavities; we measured in a 3-yr field study. The denning altitude ranged between 387 and 1326 m, average slope was 17.5% (± 8.6 sd), minimum distance to the nearest stream was 5 m and to the nearest logging road was 50 m. General aspect of the main slope was evenly distributed between SW (22% of the dens), E (20%), S (18%) and SE (15%), comparable with the exact aspect of the den's main entrance (18, 27, 26, respectively 10%). Rock cavities were dominant (68%) and had a maximum length (average ± sd over all dens) of 148.7 ± 50.7 cm, maximum width of 108.5 ± 43.5 cm, and maximum height of 114.0 ± 96.4 cm. At landscape scale, the generalized linear model with binomial function revealed that the probability of den selection is significantly higher with increasing slope and, to a lesser extent, with altitude, yet is lower in highly fragmented topography, and moderately decreases with the distance towards the clear-cuts of the previous eight years (and not with the clear-cuts of the study period). The most suitable habitat class for denning was the mixed forests of beech-fir or beech-fir-spruce. These findings can inform future forest management in a bear-friendly manner by regulating the disturbances and loss of the denning "hotspots", thus supporting the reproduction and survival of Romanian brown bears.

ARE BEARS CRUCIAL FOR BERRIES?

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ABSTRACT

Bilberry (*Vaccinium myrtillus*) is a keystone species in Eurasian forest ecosystems, and provides a critical food resource for brown bears (*Ursus arctos*). Bilberries reproduce almost exclusively vegetative. Despite being adapted for generative reproduction (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. Through a series of germination experiments, field validations, and spatiotemporal modeling, we demonstrate that brown bears are probably key to explaining this reproductive paradox. First, we found that brown bears disperse large amounts of viable bilberry seeds through endozoochory (up to >150 /g dry scat) during the berry- fruiting season (15 July – 15 September) in our study area in south-central Sweden, and that ingestion enhances the germination power of bilberry seeds. Second, we show that bears systematically create recruitment 'windows of opportunity' (RWO, ideal germination and establishment conditions) for bilberry through their bedding behavior (i.e. disturbance of plants and soil). Furthermore, bears enhance the ability of bilberry to seize these RWO by defecating bilberry seeds within or near (<5 m) RWOs. Indeed, in a pilot study, we systematically (50% detection rate) recorded bilberry seedlings in daybeds ≥1-year-old. Third, using cluster analysis on GPS relocation data and spatial modelling, we detected 15,861 potential RWOs during the berry seasons of 2008-2016 (131 bears). We paired each RWO with foraging locations, and used experimentally derived bear gut retention times for berry diets to estimate dispersal distances. Virtually all seed dispersal events (>95%) occurred over distances sufficiently large (>100 m) to exclude parental competition, and seed shadow curves had long tails (up to 30 km). Bilberry seeds were generally transported from good quality berry habitat to forest types low in bilberry abundance. Hence, endozoochoric dispersal appears to enhance generative reproduction in bilberry-poor habitat. The bears' avoidance of humans, however, negatively affected bear foraging and bedding, and thus inhibits their role as seed dispersers. Our research has important conservation implications, as it exemplifies how mammals can provide ecosystem services and how humans can mediate such mechanisms.

SEASONAL FEEDING BEHAVIOR OF THE ANDEAN BEAR IN PATCHES OF SECONDARY FORESTS OF AGUACATILLO (*NECTANDRA ACUTIFOLIA*)

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ABSTRACT

Since 2008, and every year after, a feeding behavior not reported before in the country or in the region for Andean bears was recorded in an area northwest of Quito, Ecuador. In that year, nine bears from different growing stages were observed while they were feeding from the fruit of wild *aguacatillo* trees (*Nectandra acutifolia*). These observations were surprisingly unusual considering that the Andean bear is one of the most elusive mammal of the tropical Andes, and few naturalists and researches have been able to watch or study wild bears. The area comprehends a mix landscape between agricultural and ranching activities with old growth secondary forests. After part of the area was bought 25 years ago by a conservation organization and other individual owners, the area was declared "protected forest" and began naturally to be colonized by the *aguacatillo* trees. This pioneer tree species dominates the landscape through patches of different structure and age. The trees produce a drupe of 2-3 cm, like a little avocado and with similar nutritious properties, especially high fat content. Most of the fruit is the seed surrounded by a little amount of flesh. The fruit is green in the beginning and becomes black when ripe. When the trees are in fructification a very strong odor is perceived. Bears were seen already seven years showing the same feeding behavior. They climb the trees all the way to the canopy to reach the fruit that grows at the end of the highest branches, building a type of nest so they can easily eat the fruit. Recently, phenology plots and landscape studies have been implemented within the corridor to try to understand the importance of this fruit in their diet, and find the conditions that probably triggered this feeding behavior. Now, there is no doubt that has become an important seasonal food resource for the bears and when the fruit is available, bears will show up. This seasonal agglomeration and habitat overlap of different bears at the same time has provided unique opportunities to study different aspects of the population dynamics of these bears.

SHIFTING CLIMATIC REGIMES OF BEAR SPECIES IN THE INDIAN HIMALAYAN REGION

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ABSTRACT

Climate change is a major driver of ecological patterns and processes across the globe, including species distribution and wildlife habitats. The effects of climate change are more pronounced in places such as the Himalaya, where a network of snow-clad mountains, ice-peaks, high intensity drainage and precipitation characterizes the bio-social landscape. The Himalaya is home to three out of four bear species that are known to occur in India, viz., Himalayan brown bear (*Ursus arctos isabelllinus*), Asiatic black bear (*Ursus thibetanus*), and Sun bear (*Helarctos malayanus*). Among these, Asiatic black bears are found throughout the Himalayan range while brown and Sun bears are restricted to the western and eastern parts respectively. Rule-based altitudinal ranges based on field surveys, questionnaire surveys, and expert opinion were generated for all the three species. Global climate models derived from WorldClim datasets on temperature and precipitation were used to assess the current range of climatic factors (temperature and precipitation) while the climate projections were used to evaluate the probable future distribution of these species. Assessment of the current scenario depicts that brown bears inhabit the lowest temperature range of -7.6°C to 17.8°C (annual mean temperature) while both Sun bears (3°C - 26°C) and Asiatic black bears (-0.8°C - 21.9°C) occur in higher temperature ranges. The Himalayan brown bear inhabits the areas with minimum annual precipitation (186 -1813mm) and Sun bear occurs in very high precipitation zones ranging from 919-11,401mm annual precipitation. Asiatic black bear distribution range coincides with the moderate precipitation (333-3706mm) zone of the Himalaya. The outputs of the species distribution models show that the habitat of theses bear species will be impacted by the shifting trends of temperature and precipitation in different climate change scenarios. The Himalayan brown bear will be the most affected as it occurs in very narrow limits of temperature and precipitation. The findings of this study have crucial implications for assessing the vulnerability of bear species to climate change effects in the Indian Himalayan Region.

A DOUBLE-EDGED SWORD: AMERICAN BLACK BEARS RELY ON HUNTERS' BAITS IN THE FACE OF DECLINING NATURAL FOODS

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ABSTRACT

Hunting and habitat alterations can influence bear populations in unexpected ways. Changing timber harvest practices on federal lands in northcentral Minnesota, USA have led to more mature, closed canopy forests resulting in a reduction in soft and hard mast foods for American black bears (*Ursus americanus*). Therefore, bears are faced with a late season caloric deficit. We hypothesized that during hyperphagia bears would either migrate south, to areas of more abundant natural mast and crops, enter developed areas where garbage or birdfeeders are available, or hibernate in poor physical condition. Using data from 16 GPS-collared bears (M=8; F=8), we rejected our hypothesis and discovered an alternate important food source. We checked bears in winter dens (Dec 2016 - Mar 2017) and found that most had gained significant weight since their summer capture, and had appreciable fat reserves (measured using BIA, skinfold thickness, and bone prominence). To explain this finding, we examined locations of bears during mid-August to mid-October to test whether: a) they were found in proximity to crop fields, developed areas, or bear hunters' baits (which were legal during this 2-month period); b) selection for anthropogenic food sources varied by sex; and c) bear use of anthropogenic foods varied by time-period of day (diurnal, nocturnal, crepuscular). We found evidence that bears in this population consistently sought out hunters' baits: 70% of individual bear–time period combinations exhibited a significant selection for proximity to bait piles. Both females (88%) and males (63%) selected for hunters' baits during at least one-time period, and there was no difference in selection by time of day. Only one bear demonstrated a significant selection for crops and none selected for developed areas. To determine whether this is a recent behavioral adaptation, we compared the relative contributions of corn-based products (i.e., high-fructose corn syrup in baits) to bears' diets in the 1980s and 2016 by measuring stable isotope compositions of hair samples collected from the population in both periods. It appears that baits used to attract and kill bears are a key food source that partially compensates for the reduction in natural foods.

TRENDS IN AGE OF PRIMIPARITY OF AMERICAN BLACK BEARS IN MINNESOTA OVER SIX DECADES: EFFECTS OF FOOD BUT NOT DENSITY

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ABSTRACT

Female American black bears begin to reproduce at 3–10 years old. When food availability is low, young bears grow more slowly and their age of primiparity is delayed. The Minnesota Department of Natural Resources collected teeth (1st premolar) from bears shot by hunters during 1975–2016, from which we ascertained age at death and age of primiparity by examining the number and spacing of cementum annuli. We could backdate ages of primiparity for up to two decades before the bear was killed, expanding the temporal breadth of the sample to the 1960s. This represents the largest sample of ages of primiparity ($n = 14{,}164$) for bears that we are aware of, enabling us to test two hypotheses: (1) ages of primiparity varied through time, commensurate with changes in bear density, and (2) ages of primiparity varied spatially across Minnesota, related to consistent differences in availability of foods. We calculated an unbiased mean age of primiparity using a Kaplan-Meier estimator for each decade from 1960s–2010s in each of Minnesota's 13 bear management units (BMU). Statewide age of primiparity for the entire dataset was 5.16 years (± 0.012 SE; range: 3–10). We found no support for our hypothesis that age of primiparity was affected by bear density. Reproductive age remained remarkably stable over nearly six decades, despite a doubling of the bear population, followed by a 50% decline. This lack of temporal pattern was reflected at the finer BMU scale as well. However, we found strong support for our second hypothesis: age of primiparity was youngest in BMUs along the periphery of bear range (4.54 ± 0.070 SE years) and increased northward, being delayed by 1.3 years along Minnesota's northern border with Canada (5.80 ± 0.129 SE years). This pattern corresponds with the gradient of bear foods – hard mast and agricultural crops are most abundant along the periphery of Minnesota's bear range, whereas crops and most mast-producing species decline northward. This kind of dataset, available to all agencies managing a hunted bear population, not only aids in management, but provides great insights into the population ecology of bears.

NUTRITIONAL ECOLOGY OF GRIZZLY BEARS IN A MULTIPLE-USE LANDSCAPE AND ITS EFFECTS ON DENSITY, SURVIVAL, AND RECOVERY

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ABSTRACT

Human factors threaten the persistence and long-term conservation of grizzly bears in Alberta's multiple use landscape. Empirical data suggests that roads compromise grizzly bear survival with local populations declining when road density increases. Management actions aimed at the recovery of grizzly bears have therefore focused mostly on limiting road development within core grizzly bear range. However, there is also evidence that grizzly bear populations are influenced by bottom up (food supply) processes. Research from North America suggests that bear densities vary at local and regional levels due to complex interactions between human factors that influence both human-caused mortality risk of bears and their food supply. In particular, forest harvesting has the potential to increase food supply and positively influence the health (body growth and condition) of grizzly bears, therefore contributing to the growth and maintenance of self-sustaining populations when human-caused mortality is kept low. Recent research in Alberta has linked available digestible energy of ungulates and fruit to the local abundance of grizzly bear. Areas of high relative bear density tend to be associated with forest disturbances from the energy and forestry sectors demonstrating an association with early seral habitats. The purpose of our paper is to highlight past research on the nutritional ecology of grizzly bears and contrast this to density, survival, and food supply. We then discuss potential linkages to industrial land use activity in relation to the management, recovery, and long-term conservation of this provincially threatened species.

BROWN BEAR DENS AT THE EXPANSION FRONT: SELECTION FOR EASY ACCESS TO UNGULATES IN SPRING

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ABSTRACT

As an adaptation to low temperatures and reduced food availability during the winter season, brown bears *(Ursus arctos)* spend up to 5-7 months of the year in winter dens. In addition to selecting a den site that maximizes energy preservation and minimizes disturbance, choosing a denning location that provides access to good post-hibernation foraging opportunities may be advantageous for quickly building up depleted energy reserves. Brown and grizzly bears are known to feed on ungulates during spring, yet, the value of access to meat upon den emergence has so far received little attention. We studied den site selection of 62 brown bear males on the male-biased, low-density western expansion front of the recolonizing Scandinavian brown bear population. Recognizing that habitat selection is scale-dependent, we first compared den locations to available habitat within the extent of the 27,397 km2 study area (large scale, representing the area of a large home range in areas of low bear density), and then to locally available habitat within a 25 km2 circle centering on each den (small scale, representing the denning area). We identified forest areas as the principal denning habitat for males in the western periphery of the Scandinavian brown bear population. On the large scale, males selected den sites away from main roads, in steep, rugged terrain, with low potential solar radiation at high elevation, relatively close to the tree line. This may be a heat preservation strategy, selecting for good drainage and temperatures consistently below freezing to avoid surface water inside the den. Furthermore, the bears selected their high-elevation den sites on hills near lower-elevation moose wintering areas, allowing quick access to areas of relatively high densities of prey and carrion. On the small scale, the bears selected den sites close to the tree line, on steep slopes and away from roads, but showed no selection for closeness to moose wintering areas. To our knowledge, this is the first study to identify access to meat upon den emergence as a significant factor in brown bear den site selection, and we show that the selection for access to meat is scale-dependent.

PRELIMINARY OBSERVATIONS ON THE BEHAVIOR OF A PECULIAR ANDEAN BEAR POPULATION IN THE TROPICAL ANDES OF NORTHEASTERN PERU

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ABSTRACT

Andean bears are known for their mostly solitary habits and use of large territories. In Northeastern Peru, within the territory of the campesino community of Corosha, an unexpected finding has been recorded since 2015. Here we report an unusual population of Andean bears in a montane scrubland area in Corosha. During a 4-month preliminary study, seven different Andean bears had been observed using an area of only 5 km2. In addition to six black Andean bears, one individual with a golden pelage coloration morph has been recorded on several occasions. Individuals were identified using a manual camera and a telephoto lens. Preliminary behavioral data was collected using scan-sampling, and distances between individuals, time feeding on items, and distance a single individual moved throughout the day were measured. We observed bears active between 06:10 and 18:15, with an activity pause during midday. During activity pauses and at night time, bears would retreat into remnant elfin forests. Up to four bears have been observed using the same landscape simultaneously, with distances of 100-400m between them. Four instances of aggressive behavior (chasing away) were observed when individuals were less than 100m from each other. This peculiar population of Andean bears offers an insight into the behavioral ecology of this species, which previously has only been studied indirectly through tracks, camera traps, or GPS collars. However, various questions remain to be answered: is this unusual behavior caused by deterioration of the landscape and human pressure? What are the drives for this shared used of the landscape for this species?

NATAL DISPERSAL PATTERN OF BROWN BEARS IN SHIRETOKO PENINSULA, EASTERN HOKKAIDO, JAPAN

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ABSTRACT

Shiretoko Peninsula, located in eastern Hokkaido, is one of the most populous areas for brown bears in Japan. An area from middle of the peninsula to its tip has been designated as a national park. In this study, two approaches have been used to clarify how age and sex affect the natal dispersal pattern of brown bears in Shiretoko Peninsula. The first approach was the large-scale genetic analysis. A total of 757 individual samples, collected from all regions of Shiretoko Peninsula during 1998-2016, were genotyped at 21 microsatellite loci and the parentage analysis was performed using the CERVUS software. To calculate natal dispersal distance, we considered the place where the mother has been identified as the birthplace of the offspring and the place where the offspring has been identified as their dispersed place. The dispersal distance was 17.1 ± 1.8 km and 9.5 ± 1.6 km for adult males and females, respectively. Regarding males, the distance increased from the age of 2 to 3 years. These results revealed that males dispersed to significantly longer distances than females and began to disperse after they reached three years of age. The second method was based on individual monitoring in the Rusha area, a special wildlife protection area in the national park. The breeding status of 11 adult females was monitored and the number of births was recorded from 2008 to 2012. We examined the number of bears that have been killed among the offspring that have survived for more than one year in the Rusha area. The result showed that 10 (58.8%) out of 17 males that have been born in Rusha area were killed for nuisance control and hunting in the residential area outside the national park. In addition, most of these bears were 2-3 years old males, which suggests that males were killed in a process of dispersal from Rusha. Our study revealed that bears exhibit male-biased natal dispersal and males begin dispersal at the age of 2-3 years old. Furthermore, this study suggests that bears that were born in the protection area have caused conflicts with people in the process of dispersal.

SAME, SAME BUT DIFFERENT - A CASE FOR CONSIDERING INDIVIDUAL BEHAVIORAL VARIATION AMONG BEARS

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ABSTRACT

There is a growing recognition of the role of individual variation in patterns emerging at higher levels of biological organization. Quantifying animal personality traits in elusive wildlife is challenging, because established personality tests are rarely possible, requiring ecologists to employ alternative methods for quantifying behavioral differences among individuals. We here summarize results of remotely quantifying behavioral differences from individual-based GPS monitoring data in a population of Scandinavian brown bears. Our goals were to: i) test for the existence of distinct activity tactics, and the extent of within-individual repeatability of activity tactics; ii) test for the degree of consistent individual variation among bears using five behaviors quantified for three 10-day periods – mean daily travel distance, selection for bogs, selection for clear-cuts, selection for roads, and diurnality; and iii) test whether these five behaviors are correlated and thus form a behavioral syndrome. We detected (i) four distinct diurnal activity tactics from strictly nocturnal to strictly diurnal, with a high degree of individual fidelity to a given tactic; (ii) while controlling for functional responses in habitat selection, bear age, and period, 31% of the variation in daily travel distance, 55% of the variation in diurnality, and 30%, 21%, and 26% of the variation in bog, clear-cut, and road selection, respectively, were explained by the individual; (iii) a behavioral syndrome emerged from the five behaviors analyzed, but not entirely in the direction predicted. Individuals that were more diurnal also selected more strongly for roads, but had a lower daily travel distance. We propose that bears that are more active during the day and use areas close to roads might reduce their risk of human encounter by reducing their daily travel distance. Clear-cut and bog selection were part of a different personality axis. We conclude that behavioral variation among bears may be more pronounced than currently acknowledged and deserves greater attention. Individual variation in activity tactic, for example, can facilitate within-population temporal niche partitioning. We encourage researchers to explore recent technological developments to define and quantify personality traits in elusive wildlife. Explicitly considering animal personality may aid the mitigation of human-wildlife conflicts, wildlife conservation, and population recovery efforts. Existence of individual differences in terms of personality is a documented fact nowadays in most mammalian species, including bears. But how personality develops at an early age is still obscure. We investigated the personality development of 71 bear cubs in the frame of a rehabilitation project in the Romanian Carpathians and recorded three life history elements: (1) Did the cub socialize with other cubs during the rearing process? (2) captivity period before arrival in the rehab center (more or less than five months of captivity); (3) was the cub of a problematically behaving mother? The target of the investigations was to find out whether the recorded life history elements are in relation with the development of the individual personality profiles. The results indicated that in the first year of their lives, treats related with "aggressiveness", "boldness", "playfulness", and "curiosity" are related with socialization and those related with "shyness", "greediness", and "laziness" are not. Longer captivity than five months alter traits related with "aggressiveness", "boldness", and "self-confidence". The cubs of problematic mothers were less "focused", "bold", "playful", and "curious" than those of females with no human-bear conflict causing behaviors. According with the results, there is a strong relation between life history of juvenile brown bears and their personality development.

MATERNAL BEHAVIOR OF ANDEAN BEAR MOTHERS

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ABSTRACT

The elusive Andean Spectacled Bear (*Tremarctos ornatus*), South America's only bear species, is under serious threat throughout its range due to widespread unrestricted habitat destruction and poaching. In Ecuador there are an estimated 3000 bears left in the wild and ecological data is extremely limited. Opportunities to study the phases of reproduction, gestation, nesting and cub rearing are extremely rare for this species, and Andean bear nesting sites and maternal behavior in montane habitats have never been scientifically documented. The paucity of research on this aspect of the species' life-cycle is a significant obstacle in developing appropriate conservation plans. In this study, we have extensively researched the behavior of a nesting Andean bear mother and have uncovered many previously undocumented behavior patterns. Our discoveries include new data on nest site selection, nest preparation and composition, gestation period, mother-cub interactions, nesting period including the use of satellite nests once the family group leave the original nesting site. This presentation will demonstrate our ongoing work and analysis, and will feature groundbreaking video material of previously undocumented maternal behavior patterns of Andean bears in the wild environment.

BROWN BEAR MATING: LINKING LOCAL (NORTHEASTERN CARPATHIANS) AND GLOBAL OBSERVATIONS

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ABSTRACT

Due to their low population densities and elusive behavior, many aspects of the reproductive biology of the brown bear are still unknown. Most studies on bear mating have been carried on a local scale in North America, Spain, and Scandinavia. There are no published data about the Carpathian population, despite being one of the largest in Europe. We collected information on brown bear mating behavior in the Northern Carpathian Mountains (Poland and Slovakia) between 2001 and 2016. All copulations registered ($n = 13$) occurred between May 7 and June 19, mostly during late May and late June (85%). Most observations occurred during daylight (92%) and under different weather conditions (i.e. rainy, cloudy, sunny). Copulation time varied from a few seconds to 34 minutes, with the majority (67%) lasting 10 minutes or less. In four out of 13 observations we registered more than two animals involved; in three of these multiple associations at least two of the bears were males. A minimum of five events took place close to an artificial feeding place, suggesting that supplementary feeding practices may influence bear behavior during the mating season. Three observations were recorded by photo trapping, which highlights the potential of non-invasive methods to study those behaviors hard to observe directly in field. We also compiled information from local studies to explore the phenology of mating behavior in brown bear populations worldwide. We found a maximum of 57 days difference in the start of the mating season among populations and a strong direct relationship between latitude and the date of the first mating observed in wild. This supports previous research concluding that photoperiod is the main factor influencing the status of reproductive hormones and, thus, acts as a mating trigger. More systematic reports about these field observations are needed to increase our knowledge about bear mating behavior and to implement related conservation measures, such as temporal restrictions on human access and the protection of mating areas.

GENERATING KNOWLEDGE FOR CONSERVATION OF ANDEAN BEARS THROUGH THEIR MARKING BEHAVIOR

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ABSTRACT

Marking behavior of Andean bears is not only a behavioral phenomenon: data collected from the marking sites and bear trails can be used to gain more knowledge about the general ecology and effective conservation of the species. Here we present our work and achievements regarding this topic. In our pilot study, we provided a first detailed description of Andean bear marking behavior using camera traps. From November 2012 to April 2013 we inspected 16 bear trails in the Napo province, Ecuador, and installed three camera traps at marking sites to record the behavior. We obtained 20 video recordings of Andean bears, all captured during the day. Scent marking was the main behavioral display, and consisted of (i) tree sniffing, (ii) rubbing the neck and/or the shoulders, (iii) rubbing the flanks, and (iv) rubbing the back. Only males scent-marked. Moreover, we suggest that Andean bears communicate intraspecifically through their marking behavior. This pilot study generated new research objectives, i.e. to find (1) the functional significance of Andean bear marking behavior, (2) habitat preferences and factors affecting these preferences, and (3) population densities. Focusing on objectives 1-3, we designed a bigger and more complex research project in 2016 and started working, except for the Napo province, also in the Zamora Chinchipe province. Until now we have installed 15 camera traps at six marking sites and obtained about 140 video recordings of Andean bears. Bears scent marked in 80% of the videos and followed the marking activities described in our pilot study (i-iv). Besides, bears also bit, licked, and climbed up and then rubbed the marked trees. Further preliminary results show that bears living in cloud forests prefer mountain ridges and avoid human activity, i.e. pastures and settlements. The habitat preferences will serve us to construct human-bear risk maps as a conservation tool for local governmental and non-governmental organizations and communities.

INTERTIDAL HABITAT USE BY BROWN BEARS REVEALED USING MAXIMUM ENTROPY SPECTRAL ANALYSIS (MESA) OF ACTIVITY

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HABITAT

Habitat use among terrestrial Ursids is highly flexible. In part, this reflects the dynamic (temporal) availability of food. Bears, like other mammals, are quite capable of timing their activity based on the availability of food resources. For example, bears can anticipate meal times and adjust their activity accordingly. For bears residing in coastal locations an additional habitat, the intertidal zone may be exploited. However, given the transient nature of tidal cycles, the benefits of foraging may be outweighed by the energetic costs required. Tidal cycles are 12.4h in length, with the timing of low (and high) tide varying from day to day. Whether coastal bears can recognize these complex tidal patterns by adopting a rhythmic behavior is not known. The present study used data collected from 11 female coastal bears of mixed ages and reproductive status in Katmai National Park, Alaska, USA over a two-year period. Bears were fitted with Telonics GPS collars and Actiwatch devices capable of recording light exposure and activity at 5-min intervals from May to October. Activity in aquatic habitats (intertidal, water) were compared to a purely terrestrial herbaceous mesic habitat. Activity data were analyzed using MESA to identify tidal frequencies (range: 12.2-12.5h). Location fixes confirmed that all 11 bears spent time in the three habitats. However, only seven of the 11 expressed tidal frequencies and rhythmic patterns over the 12.4h tidal period, revealing that they occupied the intertidal zone on a regular basis. The absence of a tidal signature in the other four bears suggests they did not use this area regularly. Average activity was highest within the two aquatic habitats compared with the terrestrial habitat. Light levels were also greatest in aquatic habitats indicating that the bears' activity was limited to the daytime niche, a finding confirmed by actogram analysis. Based on the expression of a regular tidal rhythm of activity in some coastal bears, we conclude that the intertidal zone may be an area where bears forage effectively.

DO LARGE CARNIVORES USE RIPARIAN ZONES?
ECOLOGICAL IMPLICATIONS FOR FOREST MANAGEMENT

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ABSTRACT

As part of forest management guidelines, most North American jurisdictions require the preservation of forested areas adjacent to streams and rivers (i.e. riparian zones). Forested buffer strips with restrictions on timber harvest and road-building (i.e. riparian buffer zones) were originally implemented to protect aquatic functions and resources. Riparian buffer zones now also target terrestrial habitats and wildlife. Even so, forestry managers who implement guidelines seldom consider the value of riparian zones (RZs) for large carnivores, partly due to a lack of data available. In the present study, our objective was to understand the role of riparian zones and riparian buffer zones for large carnivores in managed boreal forests. We used nine years of GPS telemetry data (2007-2015) from radio collared grizzly bears (*Ursus arctos*) in the Kakwa region of west-central Alberta, Canada to quantify both the use (i.e. the amount of time grizzly bears spend in RZs) and selection (i.e. use in relation to the available riparian habitat) of RZs. We examined the effects of season, sex, distance class (0-30 or 30-60 m from streams and rivers), and the surrounding forest (harvested versus non-harvested) on use and selection of RZs. We found grizzly bears spent 19.1% of their time within 60 meters from streams and rivers. Selection of RZs declined relative to the distance from streams and rivers (10.8% within 0-30 m and 8.4% within 30-60 m). During summer, grizzly bears selected RZs in harvested areas and avoided them in non-harvested areas. There was no difference in selection of RZs in harvested areas between males and females; however, in non-harvested areas, females avoided RZs and selected RZs less compared to males. These results, particularly the selection of RZs in harvested areas where RZs consist mostly of riparian buffer zones, suggest that riparian buffers provide valuable grizzly bear habitat in multiple-use landscapes. Forest management practices can support grizzly bear habitat conservation efforts by implementing riparian buffer zones in identified grizzly bear habitat and considering grizzly bear habitat use of RZs and riparian buffers as one component of riparian zone management.

AMERICAN BLACK BEAR MOVEMENTS IN RESPONSE TO WILDFIRE IN EASTERN TENNESSEE, USA

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ABSTRACT

Ursus americanus, the American black bear. has been studied extensively throughout its southeastern range in the United States. Studies have focused on various ecological aspects including population size and structure, home-range metrics, habitat selection, movement patterns, denning preferences, and occurrence of human-bear conflicts. However, there has been no evaluation of how wildfire may affect American black bears in this part of their range. Multiple wildfires developed and spread across much of Sevier County, Tennessee, from late November to early December 2016. Approximately 72 km2 were burned in the wildfires, including large areas in the city of Gatlinburg and in the Great Smoky Mountains National Park. Eight bears within the vicinity of the wildfire were equipped with Global Positioning System (GPS) wildlife tracking collars as part of two separate studies prior to the fire event. Collared bears included three yearling males, two adult males and three adult females. For analysis, we used a Before and After Control Impact (BACI) design to analyze three different response variables including kernel utilization distribution areas of activity, movement rates, and mean direction of travel. We looked at treatment by time interaction effects with treatment referring to bears in the fire or not (controls), and time periods consisting of before, during, and after fire 3-day periods. ANOVA tests were used to examine differences between response variables and the effects of treatment, time, origin, and sex. We found no significant differences between bears that were in the fire area and those that were not ($P>0.08$). Origin ($P<0.001$) and sex ($P<0.001$) effects significantly impacted the movement rate response variable. Future studies may examine longer-term effects of wildfire on the movements of these GPS-collared bears as more data is collected.

LONG-TERM 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 must 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 (vomiting, 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 shown thus far and can be safely recommended for captive bears.

UNIDOS POR LA CONSERVACIÓN DEL OSO ANDINO

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RESUMEN

El Parque Jaime Duque (Colombia) ha venido liderando programas de conservación de especies andinas dentro de las que se destaca el oso andino (*Tremarctos ornatus*); desde el Bioparque Wakatá estamos trabajando por la apropiación de la especie en el territorio y por el manejo integral de los individuos mantenidos *ex situ*. Manejamos la conservación integrada y el bienestar animal como los pilares que soportan nuestro proyecto hacia las comunidades, trabajando en conjunto la educación ambiental y la apropiación del territorio, con actividades en zonas de influencia del oso y con entes gubernamentales, desarrollando material didáctico y campañas con gran aceptación en la comunidad. También, como estrategia *in situ*, se trabaja en el apoyo a centros de rehabilitación y recuperación de la especie, mediante el desarrollo de protocolos de manejo para los osos y avances en estudios epidemiológicos de poblaciones naturales. Desde la estrategia *ex situ* lideramos el programa de bienestar animal para oso andino, evaluamos las condiciones de alojamiento de los ejemplares que se encuentran en el territorio colombiano, y proponemos protocolos médicos y nutricionales que permitan el pleno desarrollo físico y comportamental de los individuos. También nos involucramos en la iniciativa latinoamericana por la salud de oso andino (desarrollada por la Asociación Latinoamericana de Veterinarios de Fauna Silvestre, ALVEFAS) trabajando en nuevos protocolos de valoración médica de la especie para ser aplicada en condiciones de vida silvestre y manejando una amplia población de animales dentro de los estudios. Con esto, el Parque Jaime Duque, mediante el trabajo cooperativo, ratifica su compromiso por la conservación de tan importante especie.

EUROPEAN ENDANGERED SPECIES PROGRAM FOR ANDEAN BEARS: IS THERE AN INTERRELATIONSHIP BETWEEN HUSBANDRY AND POPULATION MANAGEMENT?

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ABSTRACT

The European Endangered Species Breeding Programs (EEP) have been established from 1985 onward to manage a species distributed over many locations according to the principles of population biology, aiming at building up long-term self-sustainable populations. In practice, annual breeding and transfer recommendations must be given based on genetic and demographic analyses of annually updated studbooks with the goal to maintain genetic diversity and reduce/prevent inbreeding under the given carrying capacity. Different roles are possible for captive species – to serve as reserve population, as ambassadors for their wild counterparts and/or for conservation research. Only single or all roles might apply. All require appropriate husbandry, thus informing on species biology and inferring on their needs and recommended keeping conditions, which end in husbandry guidelines being integral of EEPs since their beginning. The EEP for Andean bears was approved in 1987. The existing International Studbook for the species facilitated the start. Keeping conditions like dimensions and equipment of holding facilities as well as management routines had been surveyed first in 1992/93 and again 20 years later. Means of population variables like gene diversity and inbreeding coefficients from the decade before and after the EEP started reveal relatively small differences. This finding will be discussed with respect to the constraints imposed by a low carrying capacity. The considerable husbandry changes between the first and the second survey will be quantified and their effect on population development will be outlined, as well as interrelationship between specific recommendations for group composition and genetic parameters.

A WELFARE AUDIT FOR BEAR RESCUE CENTERS DESIGNED FOR MALAYAN SUN BEARS (*HELARCTOS MALAYANUS*) AND ASIATIC BLACK BEARS (*URSUS THIBETANUS*)

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ABSTRACT

Throughout Southeast Asia increasing numbers of bears are held in sanctuaries following their confiscation from bile extraction facilities or the illegal wildlife trade. To play an important role in conservation education and to ensure optimal welfare, captive animals should display a wide variety of functional species/typical behaviors and thus be kept under conditions that meet the species–specific needs. However, wildlife rescue centers are often under pressure due to unpredictable numbers of confiscated animals and budgetary restraints that might not allow for expansion. To assist captive bear managers to assess the requirements of animals in their care, a standardized welfare audit has been developed that can be used for regular monitoring of housing and husbandry conditions of Asiatic black bears and Malayan sun bears to ensure that high standards of husbandry are maintained and constantly optimized. The welfare audit consists of four sections or categories: Facility and Management; Housing and Husbandry; Individual welfare; and Operational Sustainability. For evaluation, each category is marked as a percent and given a grade ranging from A+ to Fail. The facility can be reassessed after a fixed period to gain an objective assessment of whether the welfare status is improving, declining, or remains the same. Comparison with previously completed surveys shows changes in scores and thus in quality over time. Efforts should be made following each audit to improve grades for each category until optimal welfare is attained. Based on the outcome on the welfare audit, recommendations can be made to improve standards for the accommodation and care of animals. Having each audit conducted by one member of staff, with input from others as required, and then reviewed by senior management once completed allows for clear lines of communication and helps guide the allocation of resources, ensuring shifts in welfare status are identified and addressed in a timely manner. Ultimately, the welfare audit has proven itself to be a valuable tool in assisting bear managers and husbandry staff to consistently improve animal welfare in the fast–changing and often unpredictable environment of wildlife law enforcement.

ASSESSING THE EFFECT OF DIFFERENT HUSBANDRY CONDITIONS ON BEHAVIORAL AND PHYSIOLOGICAL INDICATORS OF STRESS IN ASIATIC BLACK BEARS (*URSUS THIBETANUS*) AND MALAYAN SUN BEARS (*HELARCTOS MALAYANUS*)

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ABSTRACT

Throughout their range, Asiatic black bears and Malayan sun bears are threatened by habitat loss, illegal hunting, and trade. The purpose of the current study is to determine behavioral and physiological indicators of chronic stress in bears that were confiscated from bear bile extraction facilities or private households. To evaluate the effect of different husbandry conditions, they have been monitored in the current overcrowded rescue center prior to the transfer to a more spacious sanctuary, where a second phase of behavioral observations will take place. The study group consists of four adult male and 22 adult female Asiatic black bears and five adult male and four adult female sun bears. Behavioral data were collected by direct behavioral observations between 05:00 and 19:00 for a total of three days per bear, such that all day times would be equally represented in the final sample (total=1470 hours). Activities of all animals were recorded at 1-minute intervals by instantaneous scan sampling. Here we present preliminary results from the first phase of the project. Behavioral data were compared between groups of bears spending a great portion of the day in a semi-natural outdoor enclosure and groups of bears that are confined to their cages with limited access to a confined outdoor exhibit for just a few hours each day. Bears that were confined to cages for the major part of the day showed a significantly lower degree of explorative behaviors, a higher amount of abnormal behaviors, less socio-positive interactions and a lower diversity of explorative behaviors than those with access to the semi-natural outdoor enclosure. To assess hair cortisol concentrations for retrospective analysis of long term stress, hair samples from all bears have been collected during health checks after completion of behavioral data sampling and will be taken again during target training through positive reinforcement after transfer and acclimatization to the new sanctuary. The results of this study may have important implications for bears held in captivity, including zoos, rescue centers, and bile farms, and can be taken into consideration when designing and running facilities. Furthermore, the findings might be useful for future studies on behavioral and physiological indicators of stress in both captive and wild living bears.

ASSESSING THE EFFECT OF DIFFERENT HUSBANDRY CONDITIONS ON BEHAVIORAL AND PHYSIOLOGICAL INDICATORS OF STRESS IN ASIATIC BLACK BEARS (*URSUS THIBETANUS*) AND MALAYAN SUN BEARS (*HELARCTOS MALAYANUS*)

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Throughout their range, Asiatic black bears and Malayan sun bears are threatened by habitat loss, illegal hunting, and trade. The purpose of the current study is to determine behavioral and physiological indicators of chronic stress in bears that were confiscated from bear bile extraction facilities or private households. To evaluate the effect of different husbandry conditions, they have been monitored in the current overcrowded rescue center prior to the transfer to a more spacious sanctuary, where a second phase of behavioral observations will take place. The study group consists of four adult male and 22 adult female Asiatic black bears and five adult male and four adult female sun bears. Behavioral data were collected by direct behavioral observations between 05:00 and 19:00 for a total of three days per bear, such that all day times would be equally represented in the final sample (total=1470 hours). Activities of all animals were recorded at 1-minute intervals by instantaneous scan sampling. Here we present preliminary results from the first phase of the project. Behavioral data were compared between groups of bears spending a great portion of the day in a semi-natural outdoor enclosure and groups of bears that are confined to their cages with limited access to a confined outdoor exhibit for just a few hours each day. Bears that were confined to cages for the major part of the day showed a significantly lower degree of explorative behaviors, a higher amount of abnormal behaviors, less socio-positive interactions and a lower diversity of explorative behaviors than those with access to the semi-natural outdoor enclosure. To assess hair cortisol concentrations for retrospective analysis of long term stress, hair samples from all bears have been collected during health checks after completion of behavioral data sampling and will be taken again during target training through positive reinforcement after transfer and acclimatization to the new sanctuary. The results of this study may have important implications for bears held in captivity, including zoos, rescue centers, and bile farms, and can be taken into consideration when designing and running facilities. Furthermore, the findings might be useful for future studies on behavioral and physiological indicators of stress in both captive and wild living bears.

HOW TO DEAL WITH A COMPLEX PROBLEM: INTRODUCTION OF THE *EUROPEAN WORKING GROUP ON THE ANDEAN BEAR ALOPECIA SYNDROME*

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ABSTRACT

Alopecia has been recognized in Andean bears for decades. In Europe there are currently seven animals affected and 20 historical cases over the last 50 years. A Survey in 2002 revealed that classical treatments were ineffective. Subsequent research by single zoos keeping alopecic bears was unable to determine a potential cause or effective treatment. The need for interdisciplinary research became clear. Therefore, the European Working Group on the Andean Bear Alopecia Syndrome was founded during a meeting of the participants of the European Endangered Species Breeding Program (EEP) in 2009. The group consists of biologists and veterinarians from keeping facilities and scientists throughout Europe. Member recruitment, organizational aspects, and the role of the EEP coordinator, managing the European population of the Andean bears, will be discussed. The goal of the group is to find causative factors of the problem in the hope of preventing it in the future. It was acknowledged that this could only be achieved by many small steps in different fields and collaboration of many institutions. As the group also offers service and advice to zoos confronted with progressive hair loss in Andean bears, empirical knowledge on the disease is accumulating. Current research fields are pathology, histology, and endocrinology. Expansion of the group by including experts in immunology and eventually nutrition is planned. The Working Group initiated research projects to characterize the symptoms of the disease, identify the histopathological features of affected skin, monitor and test treatments, and analyze the role of husbandry and endocrinology. The results of the latter will be presented in more detail. As there is evidence from personal communication with field biologists that alopecia is also occurring in wild Andean bears, the group is interested in cooperation in terms of information exchange and sharing knowledge on the disease with field biologists from range countries.

CLINICAL PROTOCOL FOR MONITORING ANDEAN BEARS (*TREMARCTOS ORNATUS*) AT THE ZOOLÓGICO DE QUITO EN GUAYLLABAMBA

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ABSTRACT

To manage an optimal ex-situ plan for wild animals it is important to prevent diseases. This could be reached by means of a planned annual clinical monitoring procedure. Due to critical issues when handling big mammals, it is important to conduct this procedure as infrequently as possible and for a short time, thus minimizing risks but maximizing the amount of clinical information related to the health of the animal. Aiming to prevent diseases in the Andean bears kept under human care and to obtain physiological parameters (size, weight and blood chemistry values), I present a series of procedures to be considered by wild animals' researchers and veterinarians tending Andean bears. On early stages of an Andean bear managed by humans, it is important to start with anesthetic protocols conducted within the caring facilities at the animal enclosure with a remote injection of anesthetics, lasting approximately one hour. When the animal is anesthetized, the first set of data to be collected relates to physiological variables (heart and breath frequency, pulse, capillary filling test and temperature). Secondly, a sample of blood is taken from the femoral or cephalic vein to be analyzed on a blood chemistry lab. Deep dental procedures, claw clipping, elimination of hair excess, ophthalmic survey, echography, weight and morphometric measurements are also conducted to fulfill clinical history for each animal. Vitamins and anti-parasites are given parenterally. When these important information is gathered the animal is set up for recovery for approximately two hours. This procedure has been conducted for more than a decade in the Zoológico de Quito en Guayllabamba. One of the animals kept at the zoo is older than 20 years, overpassing lifetime reported for the species in the wild. The Zoo has faced no difficulties related to the health of the bears, currently the two bears are healthy and still with many years to live.

CONTRIBUTION TO THE KNOWLEDGE OF THE REPRODUCTIVE BIOLOGY OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) IN CAPTIVITY IN VENEZUELA

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ABSTRACT

Considering that there is still a lack of information on the reproduction of the Andean bear, studying its reproductive behavior in captivity is of vital importance to fill the information gaps that allow reproductive strategies to contribute to the conservation plans of the species. The information found in internal reports and archives was compiled and revised. This information was taken from two Venezuelan zoological parks where some individuals of the species have had successful and well-documented reproductive events. At the same time, this information was compared with previously published observations, establishing minimum differences that determine normal or more frequent reproductive and breeding behaviors.

CONTRIBUCIÓN AL CONOCIMIENTO DE LA BIOLOGÍA REPRODUCTIVA DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN CAUTIVERIO EN VENEZUELA

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RESUMEN

Teniendo en cuenta que todavía falta información sobre la reproducción del oso andino, el estudio de su conducta reproductiva en cautiverio es de vital importancia para llenar los vacíos de información que permitan generar estrategias reproductivas que aporten a los planes de conservación de la especie. Se realizó una compilación y revisión de la información dispersa en los informes internos y archivos de dos parques zoológicos venezolanos donde algunos individuos de la especie han tenido eventos reproductivos exitosos y bien documentados. Paralelamente, esta información fue comparada con las observaciones publicadas anteriormente estableciéndose unas diferencias mínimas, pudiendo así determinar unas conductas reproductivas y de cría normales o más frecuentes.

REHABILITACIÓN DEL OSO ANDINO (*TREMARCTOS ORNATUS*) Y ALIANZAS ESTRATÉGICAS CON LAS COMUNIDADES RURALES EN EL PROCESO DE LIBERACIÓN

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RESUMEN

En Venezuela el decomiso de osos andinos (*Tremarctos ornatus*), ya sea por situaciones de conflicto, comercio o tráfico ilegal, se aproxima a casi un ejemplar por año en la última década; más de la mitad de los ejemplares se mantienen en cautiverio, otros murieron durante o poco después del comiso, y solo dos han sido liberados. A pesar de los esfuerzos en los planes de conservación del oso andino, no se han logrado romper las barreras culturales y los prejuicios por parte de las comunidades rurales hacia la especie, quienes todavía la consideran una amenaza a sus prácticas de ganadería extensiva. El objetivo de este trabajo fue lograr una alianza estratégica con la comunidad de las Gonzales del Páramo Los Conejos de la Sierra La Culata de La Cordillera de Mérida. El objetivo era el monitoreo a través de radio-telemetría y rastreo canino de una osa rehabilitada y liberada en la zona y el desarrollo de actividades multidisciplinarias como levantamiento de información gráfica y documentada de avistamiento de osos; registro de depredación de ganado; prácticas responsables para el control de especies introducidas como los perros asilvestrados, registro y denuncia de delitos ambientales y civiles; control sanitario de semovientes y control reproductivo de animales de compañía, con la finalidad no solo de incrementar las probabilidades de supervivencia del ejemplar liberado, sino también de generar un cambio de actitud hacia el oso andino por parte de las comunidades y la concientización hacia la tenencia responsable y control reproductivo y sanitario de animales domésticos para reducir el riesgo zoosanitario de las especies silvestres que se encuentran en contacto directo e indirecto con los semovientes, y el desarrollo de actividades agropecuarias sustentables con el ambiente.

PROTOCOLO DE MANEJO, REHABILITACIÓN Y CRIANZA PARA LA CONSERVACIÓN DEL OSO ANDINO (*TREMARCTOS ORNATUS*)

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*Bioparque Amaru y Comisión de Gestión Ambiental del
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RESUMEN

Hace unas tres décadas en el país el conocimiento de Osos Andinos era muy escaso y se limitaba a un número reducido de trabajos científicos que describían a la especie en vida libre. El conocimiento del manejo de osos en cautiverio se quedaba únicamente en la mente de aquellas personas que los alimentaban y cuidaban en los recintos de ese entonces. Con el avance de la frontera agrícola-ganadera, los ecosistemas fragmentados y la conformación de nuevas comunidades humanas, se generó una consecuente presión negativa sobre los individuos silvestres, lo cual conllevó el aparecimiento progresivo de varios especímenes, que, al no poder ser liberados inmediatamente, fueron destinados a los pocos albergues y a los zoológicos del país. No obstante, no había la cultura o la costumbre de documentar los conocimientos que su presencia *ex situ* podía generar. En la actualidad, con los avances de la tecnología y de la ciencia, aunados con una concienciación de la comunidad conservacionista del mundo, los centros que poseen individuos de osos en el país se ven en la necesidad de repensar sus objetivos y transformar las colecciones de animales silvestres en verdaderos centros de conservación de las especies. Ahí recae la importancia de este documento científico, pues establece las guías y las líneas transversales del cuidado de los especímenes, enmarcadas en principios modernos de cuidado animal y con fines hacia su conservación *in situ*. En esta obra, el lector podrá encontrar datos de insuperable valor respecto a las características biológicas, ambientales y veterinarias que requiere la especie durante su permanencia temporal o definitiva bajo el cuidado humano. La información documentada acerca de todo el proceso reproductivo de la pareja de osos adultos del Bioparque Amaru, así como el comportamiento de la osa madre durante la gestación y posteriormente el nacimiento de un osezno, le proporciona a la obra un elemento de verdad ineludible respecto al bienestar, manejo, alimentación y cuidado comportamental de la especie en condiciones artificiales. Quien lea la obra podrá obtener de una manera sencilla y sistemática todos los componentes y condiciones que se necesitan implementar para dotar del mayor bienestar posible a los osos de anteojos, que, por diferentes motivos, deban ser cuidados en cualquier centro de manejo nacional o internacional. No cabe duda de que esta publicación tendrá el impacto positivo sobre toda nuestra comunidad científica y conservacionista. Con seguridad, quien la lea la recomendará, pues desde su concepción fue pensada y realizada con la finalidad de ser una de las guías obligadas para todo técnico que tenga la responsabilidad de cuidar osos de anteojos en cualquier centro de conservación *ex situ* del país, y por qué no decirlo, del mundo entero. Su lectura sin duda será muy satisfactoria, educativa y esperanzadora para beneficio de la especie.

GENETICS AND PHYSIOLOGY

DEVELOPING EXPERIMENTAL METHODOLOGY FOR IDENTIFICATION AND APPLICATION OF CHEMICAL SIGNALING IN BEARS

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ABSTRACT

Like other bear species, giant pandas use chemical signals to communicate kinship, territory, and reproductive status to conspecifics. Giant pandas are well known to display scent marking behaviors that are thought to advertise identity and sexual receptivity. However, it is unknown what chemicals are used by giant pandas and to what capacity these chemicals can be detected. We hypothesized that the identification of volatile compounds in female urine combined with male behavioral and physiological responses would determine the presence of unique giant panda pheromones. Candidate pheromones were identified through (1) characterization of the volatile chemicals in urine of males and females during the breeding season, (2) determination of olfactory interest by males to estrus urine prior to ovulation, and (3) confirmation of pheromone candidates through behavioral bioassays. 146 compounds were identified based on their frequent occurrence (>10%) across all subjects (n=4 male and n=4 female) during each season. Octanoic acid, 9-cycloheptadecen-1-one, (z), decanoic acid, and 1H-pyrrole-2-carboxaldehyde were classified as candidate giant panda pheromones based on their correlated occurrence during the characteristic rise in urinary estrogen concentration in females prior to ovulation. These compounds were prevalent in the urine of female giant pandas on those days (day-13, day-3, and day0 of presumed ovulation) in which males (n=4) elicited the greatest olfactory response during behavioral choice tests. When male giant pandas (n=3) were exposed to synthetic urine treated with each compound individually in a simultaneous choice test, males displayed a greater olfactory investigative response towards 9-cycloheptadecen-1-one, (z) and decanoic acid than control synthetic urine treatments. The combination of analytical procedures and behavioral bioassays confirmed the presence of pheromones in giant panda urine. Managers can use this information to identify reproductive status of individuals and initiate sexual motivation in captive breeding programs. This study provides an example of an innovative technology that could be applied to identifying and tracking free-ranging bears through detection of their chemical signals to benefit both in situ and ex situ conservation of threatened and endangered species.

IS SEASONALITY IN SUN BEAR BODY MASS DRIVEN BY EXOGENOUS OR ENDOGENOUS FACTORS?

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ABSTRACT

Sun bears are unique among ursids for exhibiting the least predictable seasonality in parturition. However, it is unclear if this represents a broad trend of aseasonality in other physiological variables, such as body mass. We tracked monthly fluctuations in body mass of rescued and rehabilitated adult sun bear males (n = 63) and females (n = 104) at the Cambodian Bear Sanctuary supported by Free the Bears within Phnom Tamao Wildlife Rescue Centre, Cambodia. Mass of females varied little throughout the year. Male mass exhibited a pronounced decline of approximately 12% from March through May. These are the warmest months of the year, although the annual range of mean ambient temperatures is small (26–30°C). We hypothesized that mass loss during this period is caused by 1) food deprivation because of increased enclosure-raiding by habituated macaques (*Macaca fascicularis*); 2) stress caused by increased visual encounters between cohabiting males because of seasonal foliage reductions; or 3) a seasonal increase in metabolic rate. Preliminary data do not support (1). Results will be presented for ongoing testing of (2) via measurement of visual obscurity in enclosures in different seasons, and (3) via measurement of metabolic rate. Understanding the drivers of body mass changes is useful for husbandry of captive sun bears and conservation planning for wild populations.

TRANS FATTY ACIDS AS POTENTIAL ASSESSMENT TOOL FOR ANTHROPOGENIC FORAGING BY BROWN BEARS IN CROATIA

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ABSTRACT

In most animals trans fatty acids (tFA) originate from the diet. Two major dietary sources for tFA include partially hydrogenated vegetable oils in processed food products and ruminant's meat, dairy products and milk. Industrially processed food can contain up to 50% of *t*FA, with elaidic acid (*t*9-C18:1) as predominant. In contrast, ruminant fats generally have lower quantities of *t*FA (1–8%), with vaccenic acid (*t*11-C18:1) being the main isomer. The objective of this study was to determine the presence of C18:1t isomers in subcutaneous adipose tissue of brown bears in Croatia. The study was conducted on 103 animals (26 females, F; 77 males, M). Ninety-two samples were collected during the legal hunting season (March-May and September-December 2014), one after illegal hunting, and 12 s following interventional shooting or after vehicle collision. Tissue samples were homogenized and total lipids extracted. The FA composition was determined by gas chromatography. Results showed that lipids isolated from depot adipose tissues of brown bears were dominated by monounsaturated fatty acids (F, 50.35±7.65%; M, 50.93±8.34%; the most common FA in F was oleic acid, *c*9-C18:1 (19.59±6.33%), while the most common FA in M was elaidic acid, *t*9-C18:1, (19.36±11.96%). Saturated fatty acids constituted 28.93±10.05% in F and 30.37±8.34% in M. The ratio of polyunsaturated fatty acids was 20.72±12.50% (F) and 18.34±10.71% (M). A significantly higher percentage of *t*11-C18:1 was determined in samples from hunted bears and bears that died of vehicle collision (N=98) compared to bears that died after intervention shooting (N=5). A higher percentage of *t*9-C18:1 was found in bears that died after intervention shooting compared to hunted bears and bears that died of vehicle collision, although the difference was not significant. The predominant source of *t*9-C18:1 is processed human food, and such bear behavior can result in more frequent bear-human conflict. Further research should be focused on larger sample size of bears that died after intervention shooting. Those results could provide help in the development of bear management strategies.

ANALYSIS OF THE D-LOOP REGION OF THE MTDNA OF *TREMARCTOS ORNATUS* IN AN ECUADORIAN POPULATION OF NORTHWESTERN QUITO REVEALS REDUCED NUCLEOTIDE DIVERSITY

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ABSTRACT

The Ecuadorian Andean bear (*Tremarctos ornatus*) populations have suffered from extensive habitat loss and fragmentation. Their population sizes have been significantly reduced in recent years, and consequently the species has been classified as Vulnerable. A lack of information on the genetic diversity and population structure of these bears reduces the ability to establish adequate conservation programs to maximize the species´ future viability. For this purpose, the genetic diversity of an Ecuadorian bear population in northwestern Quito, located in the northern Andes, was assessed through the sequencing and analysis of a 456pb fragment within the D- loop region of the mitochondrial genome. A total of 31 different bears were unambiguously identified through camera trap images, and DNA was extracted from hair samples collected from these individuals via non-invasive methods. All samples were collected on both banks of the Guayllabamba river, which splits the population (six camera trap and sampling locations were set north of the river, and eight were set south of the river). The mitochondrial region under study was PCR amplified and sequenced for all samples to determine specific haplotypes for each individual. Our results show little sequence diversity in the D-loop region, with only two polymorphic sites revealing four haplotypes. Haplotype HTOQ1 occurs at a higher frequency, while the remaining haplotypes show lower and homogenous frequencies in all locations, where they appear to be equally distributed. However, based on the construction of a haplotype network through parsimony methods, HTOQ1 did not appear to be the haplotype most closely related to an outgroup. From these results, haplotype diversity was found to be moderate (0.6645), while nucleotide diversity (π) appears extremely low (0.001783) compared to other bear species. Because of the homogenous distribution of haplotypes, there is no evidence that suggests that the Guayllabamba river could represent a physical barrier for bear mobility in the area under study. Nonetheless, further studies are required to better understand the Andean bear populations of northwestern Quito, and to determine the most appropriate routes to establish efficient conservation programs.

SEASONAL TRANSCRIPTIONAL CHANGES IN BROWN BEARS (*URSUS ARCTOS*) PROVIDES NOVEL INSIGHTS INTO HIBERNATION PHYSIOLOGY

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ABSTRACT

Brown bears (*Ursus arctos*) are superbly adapted to live in cold, high latitude environments in which they experience an annual winter food shortage. To survive such conditions, they undergo seasonal shifts from maximizing energy gain and energy storage (summer/fall) to conserving energy in winter hibernation. During hibernation bears experience a mild decrease in body temperature but up to a 75% reduction in basal metabolic rate, as well as reduced heart rate, reduced respiration rate, and insulin resistance. Upon arousal from hibernation, the bears return to active season physiology, which includes a reversal of the insulin resistance. Fluctuations in weight and high overall adiposity, like those seen in bears, are contributing factors to cardiovascular disease and diabetes in humans. Using RNA-sequencing, we examine the transcriptional changes that occur in muscle, liver, and adipose tissues of captive brown bears in active, hyperphagic, and hibernation states. Our goal is to identify differentially expressed genes among the three metabolic states. Moreover, we identify genes that have significant changes in expression that could lead to improved treatment of diabetes and other human diseases. We find a significant differential expression between hibernation and the other seasons in all three tissues, with the highest number of changes occurring in adipose tissue. AKT2, a key regulator in the insulin signaling pathway, is downregulated in hibernation. Other genes associated with diabetes in humans, such as KLF11 and GNMT, show differential expression consistent with expectations in insulin resistance. The mechanisms underlying these seasonal changes in bears provide a unique biological model for studying and treating a variety of human diseases.

AMERICAN BLACK BEAR (*URSUS AMERICANUS*) POPULATION GENETICS IN GEORGIA, USA

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ABSTRACT

American black bears were once widely distributed throughout the southeastern United States. Habitat loss, fragmentation, and overexploitation of bear populations greatly reduced bear range in the Southeast, and reduced a once contiguous population into numerous isolated populations. There are three bear populations in the state of Georgia. We used multi-locus microsatellite genotypes derived from bear hair and tissue samples collected from the three Georgia bear populations to assess levels of genetic diversity within and between populations. We used population assignment clustering to evaluate whether there has been recent immigration into the smallest of the three bear populations, the Central Georgia Bear Population. Compared to other southeastern United States bear populations, the North Georgia Bear Population and the South Georgia Bear Population have relatively high rates of genetic diversity (Ho =0.72±0.02, A=6.68±0.32, and Ho =0.72±0.02, A=6.82±0.35, respectively). In contrast, the Central Georgia Bear Population has relatively low rates (Ho =0.46±0.03, and A=3.96±0.20). Fixation indices for pairings between Georgia bear populations indicated that the North Georgia Bear Population was more like the South Georgia Bear Population than either was to the Central Georgia Bear Population. Given the juxtaposition of the three populations, this finding provides evidence that the Central Georgia Bear population has experienced long-term genetic isolation and genetic drift. Out of a sample of 356 bears in Central Georgia, we detected one immigrant and no admixture. We recommend the development and implementation of plans to enhance genetic admixture of the Central Georgia Bear Population.

MATERNAL STRESS AND THE BODY MASS, LENGTH, AND CONDITION OF OFFSPRING: IMPLICATIONS FOR THE CONSERVATION OF BROW BEARS

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ABSTRACT

Maternal stress and its potentially harmful effects on offspring, through maternal stress axis programming (MSAP) have become an important topic in the human health literature in recent years. MSAP has also been recognized in the ecological literature, but with a focus toward its possible adaptive effects for offspring, and the potential for MSAP to affect population dynamics by influencing growth, reproduction, and survival in offspring. Despite this widespread attention, MSAP has not been recognized in the wildlife health and conservation literature. The assessment of potential effects caused by research activities is of paramount importance to fully understand the overall impact of anthropogenic activities on wildlife health. The primary goal of this study is to determine if MSAP occurs in brown bears as evidenced by associations between the maternal capture history (i.e., number of previous captures, captured during the year of pregnancy), the maternal hair cortisol concentration, and age-specific body mass, length, and condition of dependent offspring (1 and 2-year-old bears). We are using data collected during 476 captures of 432 unique individuals (208 males, 224 females) conducted by the Scandinavian Brown Bear Research Project from 1988 to 2014. Our preliminary results, using linear mixed models, suggest that maternal capture history may affect the offspring's body condition. MSAP could be a plausible explanation. Brown bears, as large carnivores of high conservation value, are routinely captured and handled for management and conservation purposes throughout their global range. This study will advance the health of brown bears by establishing the extent and nature of MSAP effects in relation to their capture and handling, and to help better inform decisions in relation to the use of capture and handling in their research, management, and conservation.

MARKED DIFFERENCES OF CIRCULATING LEVELS OF MAO, CHOLINE AND BETAINE IN WILD HIBERNATING BEARS VS ZOO BEARS

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ABSTRACT

Background: Feeding behaviors and type of nutrition impact the microbiota. In humans, circulating levels of the microbial metabolite Trimethylamine-N-oxide (TMAO) has been linked to adverse cardiovascular outcome, inflammation and mortality. Dietary sources of TMAO include meat, egg, dairy products, and salt-water fish. The principal physiologic role of betaine is as an osmolyte and methyl donor. Betaine is found in microorganisms, plants, and animals and is a significant component of many foods, including wheat, spinach, shellfish, and sugar beets. Betaine has been shown to protect internal organs, improve vascular risk factors, and enhance performance.

Methods: Levels of TMAO, choline, and betaine were quantified by a novel liquid chromatography/tandem mass spectrometry-based method in plasma samples from 44 Zoo brown bears (Berlin Zoo sampled at various seasons) and 20 free-ranging brown bears (summer + winter) from the Scandinavian Brown Bear project.

Results: Plasma TMAO levels were undetectable in free-ranging bears during hibernation and detected in only two of the free-ranging summer bears (4.3 and 7.4 µM, respectively). In contrast, all Zoo bears (median 0.5; range 0.1 - 33.8 µM) had detectable TMAO levels. Plasma choline levels were significantly ($p<0.001$) higher in Zoo bears (113.3; range 44.9 - 385.5 µM) compared to summer samples in free-ranging bears (32.7; range 20.4 - 44.8 µM). In contrast, plasma betaine levels were significantly ($p<0.001$) lower in Zoo bears (50.4; range 21.8 - 310.7 µM) compared to summer levels in free-ranging bears (102.3; range 46.5 - 613.5 µM). A marked increase in betaine levels was observed from summer to winter (102.3 vs. 404.7 µM; $p<0.001$) in free-ranging bears.

Discussion: Differences in TMAO, choline and betaine levels between free-ranging and Zoo brown bears may reflect differences in nutrition and feeding behaviors. The 4-fold increase in betaine levels from summer to winter may be protective since betaine is an osmolyte that protect cells, proteins, and enzymes from environmental stress. Betaine is a methyl donor and further studies should evaluate if high levels of betaine may promote hypermethylation and down-regulation of gene activity during hibernation.

CONNECTIVITY IN A FRAGMENTED LANDSCAPE: A TALE OF TWO SPECIES

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ABSTRACT

Habitat loss is the major cause of population decline in most mammals. Large area requirements and longer generation times make large mammals especially vulnerable to habitat fragmentation and isolation. We examined connectivity of two large mammals – tigers and sloth bears – in the central Indian landscape. Once considered a stronghold in terms of distribution and abundance of mammals, the central Indian landscape has been undergoing rapid land-use change over the last few decades due to anthropogenic development. We used microsatellite data from non-invasive samples (Tiger: 116 individuals, 12 markers. Sloth bears: 196 samples, 11 markers) to examine genetic differentiation and used this genetic data to infer the resistance-to-movement across different land-use types. We find that both tiger and sloth bear populations show sub-structuring in the landscape. However, sloth bear populations show lower genetic differentiation compared to tiger populations. Dense human settlements and high traffic roads were found to offer maximum resistance to tiger movement and other land-use types including low traffic roads and agricultural fields offer very low resistance. Sloth bears seem less impacted by landscape. However, they do show a mild but significant isolation by distance. We carried out spatially explicit genetic simulations to understand whether the differences in the landscape resistance alone can lead to the observed differences in the genetic differentiation between the species. Results suggest that the demographic history of the two species in recent past (timing and magnitude of population decline) also contributes to the observed genetic differentiation. Such research is essential in understanding how different species are impacted by fragmentation in the same landscape context. Our results can be used to prioritize conservation efforts in a rapidly developing landscape, providing a link between science and management.

A PILOT STUDY ON CORRELATION OF GENETIC VARIATION WITH GUT MICROBIOTA DIVERSITY IN THE GIANT PANDA

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ABSTRACT

The bamboo-eating giant panda, a highly vulnerable mammal, still retains a carnivore-like short gastrointestinal tract. Hence, it becomes extremely significant to examine its gut microbiota diversity for its health status and future survival. Gut microbiota composition and diversity vary within and among populations and several factors have been reported to play important roles in shaping the gut microbiota at different taxonomic scales. Therefore, to understand variations in gut microbial communities, we must determine how processes regulating microbial community assembly (colonization, persistence) differ among hosts and affect microbiota composition. We examine the correlation of structural composition of gut microbiota with genetic diversity in wild giant pandas. Eighty fecal samples of wild giant pandas were collected from Wolong National Nature Reserve, China. Further, we investigated the structural profile of the giant panda gut microbiome, comprehensively based on pyrosequencing of V4-V5 region of 16S rDNA, and assessed genetic diversity using primers for Cyt-b gene and D-loop region of mitochondrial DNA. The bacterial composition in the wild giant pandas was primarily dominated by *Proteobacteria, Bacteroidetes*, and *Firmicutes* (contributing 60.49%, 21.85% and 14.95%, respectively). We also found within-population differences in the gut microbiota of the Wolong pandas. Furthermore, we attempted to correlate within-population differences in gut microbiota with genetic variation in pandas. Here we discuss the first attempt to identify and partition the colonization and sorting process in a gut microbiota metapopulation of the wild giant panda with large sample-size. This study would help in developing effective future conservation plans.

NON-INVASIVE MONITORING OF REPRODUCTIVE HORMONES IN CAPTIVE FEMALE SLOTH BEARS

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ABSTRACT

Studies on the reproductive physiology of sloth bears (*Melursus ursinus*), including the timing and duration of estrous cycles in females, are limited. Normal levels and profiles of estrogen and progesterone in cycling sloth bear females remain largely unknown. A study has been initiated by Wildlife SOS, San Diego Zoo Global, and the Dayalbagh Educational Institute to develop a non-invasive method to monitor reproductive hormones in rescued captive female sloth bears under rehabilitation at the Agra Bear Rescue Facility, Uttar Pradesh, India. Urine samples of unmated study bears (n=31) are non-invasively collected throughout the year from specially designed collection trenches in den floors, and assayed for estradiol and progesterone metabolites (standardized to creatinine concentration) by quantitative enzyme immunoassays (EIAs). Urinary hormone profiles are generated for each individual bear studied. The physical changes in vulva appearance and visibility are also noted and tracked throughout the year. Vulva appearance is then correlated with the hormone levels and profiles. Preliminary results show that the levels of urinary estradiol metabolites in female sloth bears increase during mid-May to mid-July, and this increase occurs during a period of high vulva visibility. Urinary progesterone metabolite analysis so far has indicated a visible rise in the levels of urinary progesterone metabolites in one female bear beginning 70 days after the end of estrus. Sloth bears appear to have a single, seasonal estrous period like most other bear species. Urinary hormone assays and data on visible changes in the vulva are currently under study. Our goal is to profile the estrous cycle of the sloth bear and understand the reproductive biology of this iconic species.

POPULATION ESTIMATION AND SPATIAL ANALYSIS

CAN SUN BEARS PERSIST AS MODERN METAPOPULATIONS?

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ABSTRACT

In this modern era of rapid deforestation in a human-dominated landscape, habitat fragmentation is breaking up once continuous bear ranges into unnatural sub-populations, which must function as some form of metapopulation to maintain sustainable population dynamics. In much of the tropics, where habitat is changing most rapidly, we lack high-resolution genetics and telemetry data to inform management, and we must be willing to work with imperfect datasets in innovative ways. Here we present a novel technique, using camera trap and tree cover data, to investigate the extent of habitat fragmentation of global sun bear range, and to speculate on their future as modern metapopulations. We created a "habitat suitability index" by modelling the probability of sun bear occurrence, with catch rates from 2845 camera traps active in seven out of 11 sun bear range countries, and high-resolution tree cover data. We identified non-viable habitat (areas < 20% tree cover, and patches too small to support viable populations) and grouped the remaining habitat into a habitat-quality mosaic. We classified global sun bear range in terms of sub-populations and potential metapopulations, and identified priorities for conservation research and management. We identified seven potential sub-populations, two of which are fully isolated with no potential for inter-population movement, and in the remainder, inter and intra-population habitat fragmentation occurs in a continuum of severity. In modern times, sun bears cannot function as their once continuous population, and instead subpopulations may require inter-area movements (exchanges of individuals), be that naturally, via maintaining habitat connectivity, or human assisted through translocation. Therefore, we used our findings to list regional priorities for sun bear research and management. Researching sun bears in the context of modern metapopulations is a frontier for bear research and conservation in the tropics. Our findings advance our understanding of sun bear habitat fragmentation, using landscape-scale data to investigate spatial patterns and dynamics of population distribution and to highlight where populations are most vulnerable to isolation. This technique, reproducible through space and time, can be applied in other regions where bears and other species are dependent on forest for survival.

ESTIMATING ABUNDANCE OF THE SOUTHERN HUDSON BAY POLAR BEAR SUBPOPULATION BY AERIAL SURVEYS

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ABSTRACT

The status of the Southern Hudson Bay polar bear subpopulation is currently listed as stable but conflicting evidence lends uncertainty to that designation. Results of capture-recapture studies conducted 1984-86 and 2003-05 plus an intensive aerial survey conducted in 2011/12 suggest that abundance is unchanged since the mid-1980s. However, body condition and body size have both declined significantly since the mid-1980s, and duration of sea ice has decreased by more than 30 days. This latter evidence suggests that a decline in abundance is imminent. Due to the conflicting information on the status of the subpopulation and ongoing effects of climate change on sea ice distribution and duration in Hudson Bay, we conducted a second intensive aerial survey in 2016. Results of this survey suggest that abundance has changed little. Nevertheless, in a warming Arctic and sub-Arctic, duration of sea ice is predicted to continue to decline in Hudson Bay and further monitoring of the subpopulation is warranted. We recommend repeating the intensive aerial survey in 2021.

POPULATION ECOLOGY OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) IN THE NORTHWEST OF THE METROPOLITAN DISTRICT OF QUITO, ECUADOR

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ABSTRACT

The objectives of this research were: a) to estimate structure and size of a population of Andean bear in an area within the Metropolitan District of Quito (MDQ); b) to record movement patterns and preferences for habitat use; and c) to estimate density through a monitoring system with camera traps and capture-recapture analyses. Since 2008 a significant population of more than 40 wild Andean bears, representing all life stages, have been observed and recorded in an area within the MDQ, 70 km away from Quito, capital city of Ecuador, through direct observations and use of camera traps. For the first time, between February and March 2008 (and for the next years afterward), several bears were observed feeding from fruits from *Nectandra acutifolia*, a wild avocado species, family Lauraceae. From 2010 to 2013 a system of camera traps was deployed in an area of 25 thousand hectares capturing 27 bears, most of them observed at the trees, but also new bears. Ten bears where captured in more than two cameras allowing to infer some of their movement patterns and use of habitat within the study area and estimate density. Camera traps also recorded the presence of an important community of other 18 species of medium and big mammals, including five species of felines that share habitat with the Andean bear. This scientific information has been used to promote the creation of an ecological corridor for the species and guarantee their survival in the future.

SPECTACLED BEAR RESEARCH IN ANTISANILLA: A UNIQUE OPPORTUNITY FOR CONSERVATION PLANNING IN ECUADOR

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ABSTRACT

The Antisanilla reserve, managed by the Jocotoco Foundation, protects over 5000 hectares of important highland ecosystems and critical habitat for the spectacled bear (*Tremarctos ornatus*). Since 2015 multiple spectacled bears have been observed daily at several places in the Antisanilla reserve, particularly close to the Isco cliffs and along the road that limits with the private property of Huaytara. Up till now, seven different bears have been seen at the reserve, including a mother with cub, and four bears seen during the last five months. The ease of observing bears daily and the great accessibility provides a wonderful opportunity to monitor spectacled bears on the short and long term, focusing on their biology, behavior, habitat use, and reproduction. At several sectors in Antisanilla, several scientists will monitor the bears by direct observation since the bears are visible throughout the day, which contrasts with other localities where bears are elusive and difficult to observe. Antisanilla thus offers a unique scenario to study spectacled bears in detail on the long term and to plan conservation actions to protect this emblematic animal of the Andes in Ecuador.

IDENTIFYING CRITICAL KNOWLEDGE GAP AND CONSERVATION NEEDS OF ASIATIC BLACK BEAR IN CHINA THROUGH HIGH-RESOLUTION MAPPING

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ABSTRACT

The assessment of threatened status, as well as the development of conservation strategies, highly relies on the extent and accuracy of our knowledge on the target species' spatial distribution and pattern. How to integrate heterogeneous data of varied resolution from multiple resources and create reliable distributions for the threatened bear species, is a great challenge for conservationists, managers, and policy makers. China comprises more than half of the Asiatic black bear's total range area and the largest wild population; however, the China population is one of the least studied and known across its range. The knowledge gaps on its distribution and status have greatly hampered our attempt to determine the critical needs for conserving this threatened species and its habitat. In this study we used ABB as a representative of the large carnivore species in developing countries with limited and spatially biased information. We aimed to create a framework using data collected from diverse resources to map its accurate distribution, examine the spatial pattern across the country, and fill the critical knowledge gap on how to determine regional populations and management units. We developed a hierarchic-modeling approach using both presence and absence data at varied resolutions to map a high-resolution distribution of this species. The results showed that the total range of ABB in China was estimated at 624,000 km^2, 84% less than the most recent IUCN estimate. We identified two island and six mainland populations across China, and we suggested each should be considered as independent management unit in future conservation planning and assessments. Risk analysis indicated that the Hainan Population (on Hainan Island), Nanling Population (along Nanling Mts. in Southern China) and the Eastern China Population were the ones under highest risk, primarily due to heavy fragmentation and isolation. These results will provide us valuable insights and pragmatic guides to future conservation planning and activities of this species. The framework and approaches we developed during this study will provide examples and templates for the conservation on threatened large mammals of similar situation in developing countries elsewhere.

WHERE DO WE GO?
BEARINGS OF ADJUSTED CROATIAN BROWN
BEAR MANAGEMENT PRACTICE

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ABSTRACT

Managing large carnivores, particularly hunted brown bears, is a highly challenging task, not only because they are umbrella species and their large home ranges spreading across national borders, but also due to the various stakeholders involved in their management: authorities, hunting right owners, researchers, local inhabitants, and wider public. To make management practice sustainable and population viable throughout time, one must balance all biological and ecological characteristics of bears with international and national management demands. In 2005 the brown bear management plan was implemented in Croatia for the first time. After six years of implementation, according to population modelling results management practice has been adjusted. In 2012, the rule was introduced that the prescribed share of hunted bears in the same hunting ground must be below 100 kg to increase female ratio of hunted animals. Additionally, in 2013 the yearly quota was increased from 100 to 120. We compared brown bear mortality data from first six years 2005-2010 (scenario 1) and last five years 2012-2016 (scenario 2). We constructed a Leslie matrix model assuming that the Croatian bear population was closed. All compared results were significantly different (p<0.001). Average quota accomplishment for the first period was 74.7% and for the second 98.8%. On average, 89 bears were removed annually from 2005-2010 compared with 137 for the second period. Males represented 77% and 68% of hunted bears, respectively. The average age of bears shot in quota hunting decreased from 5.2 to 4.3 years, as well as survivorship for both sexes at the end of the 4th year from 0.52 to 0.41. By modelling a 10-year period in scenario 1 the female ratio would grow significantly to 57.3%, and in scenario 2 to 60.5% with a lack of older males (after 10 and eight years, respectively). Population growth was $\lambda=1.094\pm0.025$ (mean ± sd) over 10-year period in first scenario and 1.045 ± 0.029 in a second scenario. The adjusted practice brought about the desired alterations regarding sex and age structure of hunted animals but with even more pronounced lack of older males in the remaining population.

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, N_e. We used long-term genetic and demographic studies to evaluate the temporal stability of the relationship between N_e and demographic population size (N) for grizzly bears (*Ursus arctos*) at two spatial scales, mountain brushtail possum (*Trichosurus cunninghami*), and brown antechinus (*Antechinus stuartii*). These mammals are all continuously distributed, yet dispersal-limited within the spatial scale of the study. We estimated local, contemporary N_e with the linkage disequilibrium method and demographic abundance with mark-recapture estimates, catch per unit effort indices, or both. We found a high level of consistency between demographic and genetic estimates of population trends, despite high uncertainty in estimates of both N_e and N. Estimates of contemporary effective population size varied widely within populations depending on critical values used to restrict rare alleles and the mating behavior modelled (random mating or monogamy). We review what is known about the ways that bears violate assumptions of N_e calculations and considerations for the use of N_e for monitoring bear population size. These results suggest that contemporary effective population size could be a useful metric if the goal of a monitoring program is to detect temporal trends in either N_e or N. However, if the goal of a monitoring program requires accurate estimates of N_e, then caution must be used in interpreting the metric when there is uncertainty surrounding mating systems or allele frequencies.

INTEGRATING SIGN SURVEYS AND TELEMETRY DATA FOR 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 bear 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.

SPATIALLY EXPLICIT DENSITY ESTIMATION IN A LARGE-SCALE GRIZZLY BEAR STUDY USING SPATIAL CAPTURE-RECAPTURE MODELS

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ABSTRACT

Spatial capture-recapture (SCR) is a relatively new class of methods for inference about the spatial ecology of populations from capture-recapture data. We applied SCR models to a study of grizzly bears in the North Central Divide Ecosystem using non-invasive genetic identification of individuals from hair sampling using rub trees. During five years of sampling (2004, 2009-2012) between 4305-4946 rubs were sampled per year over a 33,300 km2 area. This is the largest capture-recapture study ever conducted on mammals. We fitted 171 SCR models using maximum likelihood in the R package oSCR. The top model by AIC allowed for year-specific density. Detection probability effects included year and sex structure, a behavioral response, and effects of date and duration of hair accumulation. The SCR spatial scale parameter was sex- and year-specific. Using the top model, the estimated geometric mean rate of growth was 5.6% per year (95% confidence interval: 3.3% - 7.0%). SCR permits estimation of explicit density maps providing spatially explicit estimates of population size in specific management units assisting in evaluation of the status of the species and its management.

LANDSCAPE MANAGEMENT AND CONNECTIVITY CONSERVATION FOR ANDEAN BEARS

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ABSTRACT

Many conservation efforts are focused on maintaining the connectivity of protected areas or reserves as a biodiversity or species conservation strategy. Often, corridors are designed as an outcome of a process that selects prioritized areas that provide regions of the landscape that facilitate movement of individuals. However, the effectiveness of these efforts depends on the quality of the models used to identify and prioritize areas that are most critical to target species. We present a model for corridor design in the Chocó-Andean region of Ecuador, home to the endangered Andean bear (*Tremarctos ornatus*) and numerous endemic and threatened birds. We use the ecological distance-based spatial capture-recapture model that simultaneously estimates species density and spatial aspects of animal population structure. The density-weighted connectivity metric is derived from encounter history data commonly collected in capture-recapture studies. We highlight how this metric can be used in reserve-design or landscape-management frameworks to inform conservation decision making. Importantly, we highlight the importance of estimating both density and landscape connectivity by demonstrating that reserve designs with the objective of maximizing the number of protected individuals are spatially different from those that also incorporate connectivity considerations.

UNCERTAINTY IN AMERICAN BLACK BEAR (*URSUS AMERICANUS*) MONITORING AND MANAGEMENT

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ABSTRACT

Wildlife managers are frequently required to make management decisions by the 'seat of their pants' with few data. One of the tenants of the North American model of wildlife conservation is that management is based on science, yet, monitoring can be costly and data for science-based decision making can be difficult to obtain. Such is the case for American black bears (*Ursus americanus*) in southwestern Alberta, Canada where there has never been an abundance or density estimate yet hunting is allowed. We used spatially explicit capture-recapture models of DNA from hair samples to estimate black bear density in southwestern Alberta. Based on our population estimates, post-season harvests indicated that 14.2% and 39.0% of the population was harvested during the licensed hunt in 2013 and 2014. These harvest rates are high, yet apparently sustainable because population densities are equal to or greater than adjacent black bear populations that are both hunted and un-hunted. Despite inadequate monitoring, sustainability is obtained by density-dependent demographic response, and harvest regulations protecting females with cubs. Monitoring has been based solely on harvest estimates that might allow government biologists to identify excessive harvests. This example illustrates a common pattern for harvested wildlife that population resilience, harvest regulations, and coarse monitoring have been adequate to ensure long-term viability of hunted populations of wildlife in North America.

WHERE THE RUBBER MEETS THE ROAD: THE INFLUENCE OF ROADS ON GRIZZLY BEAR DENSITY

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ABSTRACT

Human activities are having dramatic effects on the distribution and abundance of wildlife, including grizzly bears. As road densities increase so does human presence and associated habitat avoidance and human-caused mortality of bears. Management agencies frequently manage grizzly bears by managing road density, although the effectiveness of these actions is rarely assessed. We combined systematic, DNA-based mark-recapture techniques with spatially explicit capture recapture (SECR) models to estimate population size of a threatened grizzly bear population (Kettle-Granby) following management actions to recover this population. Specifically, we test the effect of roads on population density and assess road density thresholds and the success of current access management. We document a doubling of the population since 1997 due to increased landscape and species conservation. However, bear density was lower where road densities exceeded > 0.6 km/km^2 but bear density was higher where motorized vehicle access had been restricted. Our data demonstrate that population recovery is possible in a multi-use landscape when management actions target priority areas. Reducing roads will increase grizzly bear density but restricting vehicle access can also achieve this goal. We demonstrate that a policy target of reducing road density below 0.6 km/km^2, in areas where grizzly bear recovery is a goal, is a reasonable compromise between the need for road access for social and economic reasons and grizzly bear recovery goals.

FACTORS AFFECTING HOME RANGE SIZE OF BROWN BEARS IN THE DINARIC MOUNTAINS, SOUTHERN EUROPE

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ABSTRACT

Studying how animals interact with their environment is fundamental to address proper conservation and management actions, especially when dealing with space-demanding species living in human-affected landscapes. In this study, we explored ecological factors influencing home range size and movement patterns of 11 GPS-tracked brown bears (three females and eight males) inhabiting the Dinaric mountains in Croatia and Bosnia and Herzegovina from 2004 to 2016. We measured Net Squared Displacement (NSD) to discern between nomadic, home-range-like, and dispersal movement, and used Brownian bridge movement models (BBMM; R package *adehabitat*) to estimate seasonal home ranges. In addition, we measured seasonal site fidelity using Utilization Distribution Overlap Index (UDOI). We used a linear mixed-effect model framework (R package *lme4*) to investigate the effects of sex, age class, day-night period, season, and study area on individual home range size by comparing competitive models based on Akaike Information Criterion (AIC). We also depicted seasonal core areas and assessed within-home-range habitat selection for each study area by applying the Environmental Niche Factor Analysis (ENFA, R package *adehabitat*). Nocturnal ranges (males: 128.5 ± 76.8 km^2; females: 54.5 ± 23.0 km^2) were larger than diurnal ones (males: 77.5 ± 48.7 km^2; females: 35.6 ± 26.7 km^2), confirming that Dinaric bears tended to be more active during nighttime. Female home ranges were smaller in spring (33.6 ± 16.6 km^2) than in other seasons (from 56.7 ± 29.5 km2 in summer, to 44.7 ± 30.2 km^2 in fall), whereas home ranges were the largest for males during spring (145.8 ± 66.6 km^2) compared to the other seasons (from 92.2 ± 60.7 km^2 in summer, to 71.2 ± 69.8 km^2 in fall). We revealed facultative migration in seven males during autumn, with net displacements up to 70 km from spring-summer ranges. Core areas represented on average $0.70\pm0.02\%$ of the seasonal home range, and were generally characterized by higher altitudes, higher forest cover, and more rugged terrains. The results of our study revealed space use patterns (migration) never observed before among Dinaric bears, posing the basis for further studies on resource selection and landscape connectivity aimed at assessing bear-human interactions.

POTENTIAL MOVEMENT PATHS FOR MALE-MEDIATED GENE FLOW TO AND FROM AN ISOLATED GRIZZLY BEAR POPULATION

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ABSTRACT

For several decades, grizzly bear populations in the Greater Yellowstone Ecosystem (GYE) and the Northern Continental Divide Ecosystem (NCDE) have increased in numbers and range extent. The GYE population remains isolated and although effective population size has increased since the early 1980s, genetic connectivity between these populations remains a long-term management goal. With only ~110 km distance separating current estimates of occupied range for these populations, the potential for gene flow is likely greater now than it has been for many decades. We sought to delineate potential movement paths that would provide the opportunity for male-mediated gene flow between the two populations. We first developed step-selection functions to generate conductance layers of bear movements for each population based on GPS locations for 124 male grizzly bears (199 bear-years) and covariates describing ecological, physical, and anthropogenic landscape features. We then used a randomized shortest path (RSP) algorithm to estimate the average number of net passages for all grid cells in the study region, when moving from an origin to a destination node. Given the conductance layer, movement paths follow certain grid cell sequences more than others and the resulting RSP values thus provide a measure of movement potential. Repeating this process for 100 pairs of random origin and destination nodes, we identified movement paths for three levels of random deviation (θ) from the least-cost path. We observed broad-scale concordance between model predictions for paths originating in the NCDE and those originating in the GYE for all three levels of movement exploration. Model predictions indicated that male grizzly bear movement between the ecosystems could involve a variety of routes, and verified observations of grizzly bears outside occupied range supported this finding. Where landscape features concentrated movement paths into corridors (e.g., because of anthropogenic influence), they typically followed neighboring mountain ranges, of which several could serve as pivotal stepping stones. The RSP layers provide detailed, spatially-explicit information for land managers and organizations working with land owners to identify and prioritize conservation measures that maintain or enhance the integrity of potential movement paths for grizzly bears.

AVOIDING THE BULLIES: SYMPATRIC URSID COMPETITION FOR FOOD AND SPACE

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ABSTRACT

Measuring population-level effects of competition is difficult for most large carnivores because the species typically occur at low densities, are long lived, and population-scale experiments are usually not possible. When ecologically similar species share the same niche, interference competition can result in resource partitioning by species across a variety of scales. Environmental heterogeneity and food resource partitioning can provide spatial and temporal refuges from interspecific interactions. We assessed occupancy patterns and diet of grizzly bears (*Ursus arctos*) and American black bears (*U. americanus*) in Glacier National Park, Montana. Because grizzly bears are generally more dominant than black bears, we predicted that grizzly bears would be better competitors for higher quality food patches. We conducted genetic (species, sex, and individual) and stable isotope ($\delta13C$ and $\delta15N$) analyses on hair samples collected between June and August 2004 from barbed wire hair traps setup within a 7x7 km grid. We developed regression models to identify environmental conditions associated with each species. Hierarchical Bayesian mixing models were used to estimate assimilated foods. We developed a set of a priori models to examine if species, sex, season, or co-occurrence of other species affected food resources consumed or lead to an increased trophic level. Although there has been no difference found in the ability grizzly and black bears to use nutrients found in the foods they eat, species densities and spatial distribution differ within the park with grizzly and black bear densities being inversely related to the point of apparent local exclusion which suggests some bears are using space and food differently. Black bears occurred significantly more frequently in treed areas at the grid cell (7x7 km) level but were closer to shrubland ($p<0.03$) at the localized site of around hair traps than forest. Hair samples collected from grizzlies were significantly enriched for $\delta15N$ compared to black bears ($p<0.04$), but were not enriched between where they occurred locally with black bears and where they occurred to the exclusion of black bears. However, black bears were significantly enriched for $\delta15N$ where they occurred to the exclusion of grizzly bears compared to where they occurred locally with grizzly bears ($p<0.05$). Grizzly bears were also more enriched for $\delta15N$ compared to black bears across the season. Areas of current (and future) grizzly bear expansion in northwest Montana are occupied by black bears and competition for habitat will likely affect the location and rate of grizzly bearer-colonization. Understanding how grizzly and black bears use food resources and are spatially distributed in an area in which they have long co-existed will inform conservation strategies for the northwest Montana grizzly bear population.

HUMAN-BEAR INTERACTIONS

PREDATOR-PREY DYNAMICS ON LINEAR FEATURES: A BROADLY APPLICABLE, NON-INVASIVE APPROACH TO UNDERSTAND MULTISPECIES BEHAVIORAL RESPONSES TO ANTHROPOGENIC LANDSCAPE FEATURES

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ABSTRACT

Predation is a key regulator of top-down effects on prey populations, and the ability of predators to find prey is influenced by landscape characteristics and anthropogenic development. Worldwide, anthropogenic development is altering predator-prey dynamics, and can have substantial implications on the efficacy of management actions aimed towards species conservation. In the boreal forest of Canada, early successional stands and linear features created by resource extraction activities has led to an increase in early seral habitats preferred by primary prey (i.e. moose, elk, and deer), and an associated increase in wolf numbers. With the goal of informing management towards effective restoration activities that can reduce primary prey and wolf numbers without negatively impacting other predators (i.e. bears), our objective was to identify characteristics of linear features that were attractive to primary prey, bears, and wolves in west-central Alberta, Canada. We first modelled the presence and abundance of vegetation preferred by bears and ungulate prey on linear features, and then assessed (1) bear, wolf, and primary prey use of linear features based on wildlife signs, and (2) the probability of occupancy and detection for bear, wolf, and primary prey based on camera traps installed along linear features. Based on wildlife signs, use of linear features by primary prey increased in areas with earlier seral stage habitats such as cut-blocks, young forests, and well sites. Bears were more likely to use linear features with more ground cover vegetation and more signs of moose, while wolves used seismic lines with less ground cover vegetation. Based on camera data, detection rates of primary prey on linear features were higher on linear features with less alder but more graminoids, and while bears occurred more on linear features with less alder, wolf detection rates were better explained by vegetation height on linear features. This research demonstrates the benefits and applications of an affordable, non-invasive, and multi-species approach to inform restoration activities and management actions focused on predator-prey dynamics in a human-dominated landscape while minimizing potential negative impacts on bear species; our approach has broad applications for a wide-range of environments, wildlife species, and systems.

THE EFFECTS OF LANDSCAPE FEATURES ON THE RATE OF BROWN BEARS ENCROACHMENTS IN URBAN AREAS: REFORESTATION AS AN OVERLOOKED FACTOR OF INCREASE OF HUMAN-BEAR CONFLICT IN EUROPE DURING LAST DECADES?

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ABSTRACT

Increasing frequency of brown bears approaching human settlements are generating strong conflicts in many regions worldwide and may represent one of the key challenges of the bear future conservation management. Several factors are generally considered as important generators for increase of such conflicts, including spatial expansion of bears and their population growth, bear habituation to human and increasing accessibility of anthropogenic food sources in urban areas. However, the importance and temporal changes of landscape structure and settlement placements within the bear habitat were so far poorly studied though their effects are warranted considering brown bear habitat selection patterns. In present study we focused on the effects of (a) landscape structure near settlements, e.g. forest cover, average and minimum distance of the settlement edge to the closest forest patch – bear habitat, (b) the shape of the settlement, e.g. the circumference, the ratio of circumference and surface and (c) the density of bears in different spatial scales on the frequency of bears entering urban areas. We used the locations of all bears that were removed as conflict bears in the settlements or their vicinity from the entire species range in Slovenia during 2006-2012 (n=87) as an indicator of bear visitation of urban areas. Our results show that the probability of bears entering settlements increases with a) higher bear densities in the wider settlement surrounding, b) higher ratio of the settlement circumference and surface area and c) shorter minimal distance between the settlement edge and the closest forest patch edge. In the past few decades, the forest cover in Slovenia and Europe has significantly increased. Historically, human settlements were typically surrounded with a buffer of open areas (agriculture), while today they are often bordering the forest. This changes most probably contributed to the increased frequency of bear-human conflicts. We also discuss the importance of considering these factors in spatial planning, either when planning new settlements or when implementing measures to reduce bear-human conflicts in the existing settlements in the bear core area.

CHARACTERIZATION OF HUMAN-ANDEAN BEAR CONFLICT IN NORTHWESTERN PICHINCHA, ECUADOR

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ABSTRACT

Bears' attacks on livestock are the most frequently reported type of human-wildlife conflict in Ecuador and illegal bear killing is one of the major threats to the species. The aim of my study was to characterize the conflict in six villages in the Northwestern Pichincha by (1) identifying and quantifying incidents of HBC in the study area; (2) unpacking stakeholder's perceptions of human-bear encounters, environmental authority, and the ecological corridor; and (3) identifying possible factors that could influence people's intentions to kill bears (using the Integrated Behavior Model as a base and focusing on the role of human emotions). Results based on 102 questionnaires and 4 semi-structured interviews with key decision-makers suggest that human-bear conflicts most often occurred in Jatumpamba and Mindo that do not form part of the 65,000-hectare Andean Bear Ecological Corridor, which was established to conserve the population of Andean bears in the Metropolitan District of Quito. These were also the only two communities included in the study where participants reported attacks on livestock. Most study participants were unable to identify the environmental authority that handles conflicts and the ones who could held a negative perception of it. These results varied across the villages and resulted in the lack of official reports made to the authorities. Furthermore, some participants were not familiar with the ecological corridor and, while seeing a positive side to its establishment, worried about its effects on their livelihoods. The results suggest lack of trust, communication, and cooperation that were expressed during the interviews. Lastly, the results show that experience with bears' attacks on livestock correlate with experiential attitude and fear, which together with worry, are strong predictors of participants' intention to kill bears. Immediate action is therefore recommended that would focus on communication interventions, land zoning, improved cooperation with the local governments, and compensation mechanism.

SOCIAL PERCEPTIONS AND KNOWLEDGE ABOUT BLACK BEARS IN NORTHEAST MEXICO: SEARCHING FOR THE BASES OF COEXISTENCE

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ABSTRACT

The coexistence between humans and wildlife depends greatly in the perception and knowledge that humans have of the particular species. In the case of large carnivores, understanding these dimensions is a first step towards mitigation and solutions to the conflict between our species and large animals. This research was conducted in rural communities in "Sierra de Arteaga" in the State of Coahuila, north-east of Mexico, which is part of the restricted distribution of the black bear in Mexico. The main economic activity in this region is the production of apple, but also there is production of corn and livestock at a low scale. It is very common that black bears enter the apple orchards and damages them, often detonating negative consequences to the bear population. The main objective was to understand the perceptions and knowledge that local people have about the black bear, with the purpose of supporting the construction of strategies and management actions that help to mitigate the conflict and contribute to the long-term conservation of this species in the region. We used a qualitative approach: we interviewed 49 people and also used participant observation. Most of the people interviewed considered the black bear as an inoffensive animal, and at least half of the interviewees considered that it plays a role in the ecosystems. The perception towards black bears seems to be influenced by the kind of economic activity that each person has and the magnitude of the damage that black bears do to their lands. These results, can be the base from which recommendations can be emitted in two different ways: i) To design and promote environmental education programs with adults and children, and ii) to start a process of construction of strategies with the local people for the protection of their farms with the objective of diminishing the damages caused by the black bear.

A LANDSCAPE OF PROSPERITY OR PERIL: THE INFLUENCE OF BOTTOM UP AND TOP DOWN FACTORS ON GRIZZLY BEAR FITNESS, DENSITY AND HABITAT USE

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ABSTRACT

Food resources underpin weight gain and reproduction in bears and ultimately set the upper bound of a population's carrying capacity. But where humans and bears overlap, human-caused mortality may limit bear populations from reaching their food-based carrying capacity. We investigated the interaction between bottom up and top down factors in structuring grizzly bear demography across the three fundamental scales: individual habitat selection, individual fitness, and finally population density. We address these questions using a combination of genetic (>300 bears) and GPS telemetry (>70 bears) data across 2 mountain ranges collected over several decades. Our bottom up layer was developed from site visits of clustered GPS telemetry locations during hyperphagia and has resulted a highly predictive layer of our region's most important food resource – huckleberries (*Vaccinium membranaceum*). Mortality risk is represented by backcountry forest road density that we found to be the most predictive variable among several tested. Within a series of multi-variable models developed with logistic regression and AIC model selection, we compared suites of variables to understand, and predict the relationship between bottom up and top down forces driving habitat use, density, reproduction and fitness across the landscape. Synthesizing our results, we found that bottom up drivers were the most influential across all three scales, while mortality risk (road density) was still highly influential but slightly less so than food. More importantly, bottom up and top down forces were additive, suggesting differential impacts of each on grizzly bear populations. We intend to use these results to inform management of broad landscapes within British Columbia for long-term persistence of grizzly bears. We recognize that it is very challenging to manage mountainous regions for ursid food resources, while it is relatively easier to manage mortality risk. Therefore, our results suggest that managing mortality risk through human access controls in locales with road access into high quality food resources would be the most effective strategy for bear conservation management in the near term. For the long-term we suggest that proactive management to prevent road building in high quality habitat and managing for food resources should be considered.

IDENTIFYING AND CHARACTERIZING POTENTIAL HUMAN-SLOTH BEAR CONFLICT ZONES IN GUJARAT, INDIA

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ABSTRACT

Sloth bear habitat is becoming increasingly more fragmented in its distribution range including Gujarat state in western India. At the same time, human-bear conflicts are increasing. Therefore, there is a need to identify strategies to facilitate human-bear coexistence. For effective conflict mitigation, it is important to first identify the areas and resources commonly shared by humans and bears. In this study, we identified human-bear conflict zones in Gujarat state to prioritize important areas for conflict mitigation. We collected past ten years data on human-bear conflicts state forest department and combined the locations of conflicts with bear distribution. To assess bear distribution, we conducted sign surveys in 2015 and 2016. The bear distribution was mapped using the presence-only models where bear signs were modelled as a function of landscape properties. To highlight the potential conflict zones, we modelled bear distribution and the frequency of conflicts in relation to land-use types and landscape properties to understand the characteristics of the conflict zones. The results show that the conflicts are prevailing more on the fringes of forests, close to human settlements and in agriculture fields. We discuss our findings in the context of conflict management and sloth bear conservation in the state.

PRELIMINARY DIAGNOSTIC OF HUMAN-ANDEAN BEAR (*TREMARCTOS ORNATUS*) RELATIONSHIP IN BORDER AREAS OF CHINGAZA NATIONAL PARK IN THE SAN JUANITO AND CALVARIO MUNICIPALITIES, DEPARTMENT OF META, COLOMBIA

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ABSTRACT

Even though the Department of Meta is in the llanos region, the north part of the Department is mountainous and limits with the Chingaza national park located in the Department of Cundinamarca, an iconic territory of the Andean bear in Colombia. Due to the country's internal social conflict, there have been very few studies on the presence and status of the species in this area, this study allowed the approach to the local communities to determine hunting events, sightings, knowledge about the biology of the species and the perception of the inhabitants about this carnivore. The information was taken through surveys. The study enables to know that the conflict with this ursid is deeply determined by hunting events in almost every sighting. The bear is accused of being a sheep's predator, the main cattle species produced in the region, and its sightings are almost always associated with the interior of the national park.

DIAGNÓSTICO PRELIMINAR DE LA RELACIÓN HUMANO-OSO ANDINO (*TREMARCTOS ORNATUS*) EN ZONAS LIMÍTROFES CON EL PARQUE NACIONAL CHINGAZA DE LOS MUNICIPIOS SAN JUANITO Y CALVARIO, DEPARTAMENTO DEL META, COLOMBIA

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RESUMEN

Aunque el Departamento del Meta es considerado una región llanera, el norte del mismo es montañoso y limita con el parque nacional Chingaza ubicado en el Departamento de Cundinamarca y territorio representativo del oso andino en Colombia. Debido al conflicto social interno del país, en esta zona ha habido muy escasos estudios sobre la presencia y situación de la especie por lo que se realizó un acercamiento a las comunidades campesinas de la zona para determinar mediante encuestas los eventos de cacería, los avistamientos, los conocimientos sobre la biología de la especie y la percepción que los habitantes tienen con respecto a este carnívoro. En general se determinó que el conflicto con el úrsido es profundo determinándose eventos de cacería en casi cada avistamiento. El oso es acusado de ser depredador de ovejas, principal especie pecuaria explotada en la región, y sus avistamientos están casi siempre asociados al interior del parque nacional.

MANAGEMENT OF HUMAN SLOTH BEAR CONFLICTS: A HOLISTIC APPROACH TOWARDS SLOTH BEAR CONSERVATION THROUGH COMMUNITY INVOLVEMENT

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ABSTRACT

The sloth bear has a widespread but fragmented distribution throughout the Indian subcontinent that often overlaps with Human settlements, this leads to human sloth bear conflicts resulting into human casualties and retaliatory actions by humans resulting in either injuring or killing of sloth bear, this is a serious and growing threat to sloth bear conservation in India that harbors approximately 80% of sloth bear population in its range. We conducted a study from 2006 to 2011 regarding Human wildlife conflict in Melghat Tiger Reserve Maharashtra, a core sloth bear habitat in central India. There was a total of 44 attacks by all wild animals on humans of which 81% were conducted by sloth bear out of which 25% resulted into human death. A participatory conflict mitigation plan was designed that involved local villagers and forest staff. The plan consisted of four measures to address this issue, 1) Identifying high conflict zones based on the number of incidences of human sloth bear conflicts in the study area and attempting to identifying reasons that attract bear towards the village. 2) Village specific action plans were prepared to mitigate the conflicts. 3) Awareness programs that included series of workshops for villagers and forest staff to teach them sloth behavior and how to deal with conflict situations were organized. 4) A Rapid Response Unit of selected forest staff specially trained in rescuing sloth bear and other wild animals was constituted. A follow up study was conducted and data analyzed for next 5 years (2011 to 2016) to evaluate the effectiveness of conflict mitigation measures which showed that there was a total of 17 attacks by all wild animals a notable decrease of 61%, of which 88% were by sloth bear a decrease of 58%, out of which no human death was recorded.

THE ECOLOGY OF HUMAN-BEAR CONFLICTS: ESTIMATING THE FRACTION OF THE POPULATION CAUSING DAMAGES IN THE POLISH EASTERN CARPATHIANS USING MOLECULAR TECHNIQUES

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ABSTRACT

Conflicts between wildlife and humans are a challenge for conservation biologists at the global scale. Essential for managing wildlife damages is to understand the mechanisms underlying these conflicts, which remain unclear. Nowadays, animal personality and individual behavior are increasingly recognized to play an important role in the ecology of species. Taking the Eastern segment of the brown bear population from the Polish Carpathians as the study population, we aimed to (1) identify bears involved in damage occurrence, and estimate their proportion in the population, (2) check whether the bears producing damages are kin-related, and (3) assess sex differences in bears responsible of the damages with respect to sex ratio in the population. We conducted noninvasive sampling in autumn 2014 and spring 2015 in the Polish Eastern Carpathians using a study design that allows for spatially-explicit capture mark recapture modelling. Genetic samples were collected systematically in 3700 km2 over five field sessions. Hairs were collected at 148 baited tree-traps distributed in the center of 5x5 km cells, and feces along walking routes through bear habitat. Additionally, we carried out an opportunistic sampling of hairs at natural rub trees and feces at feeding sites. In parallel, hair and fecal samples from individuals involved in damages were obtained during damage inspections in 2014 and 2015. Overall, we collected 191 bear feces and 412 hair samples. All the feces and 207 hair samples which contained follicles, were used for DNA extraction. Nine per cent of feces and 27% of analyzed hair samples were found at the damage sites. The identification of individuals was performed using 12 microsatellite loci and 1 sex identification locus. The estimation of the population size was done based on several capture mark recapture methods. We present results of our analyses and discuss the potential implications of individual aspects in damage occurrence.

SLOTH BEAR ATTACK MESSAGING

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ABSTRACT

Sloth bears (*Melursus ursinus*) are known for their aggressive behavior toward humans. The total number of sloth bear–inflicted deaths that occur in India is unknown, although the annual number of casualties likely approaches 1000. In India, human–sloth bear conflicts are rising, as are the negative effects they have on the conservation of this species. Wildlife SOS has been studying a behavioral approach to sloth bear safety by attempting to understand the motivations of an attacking sloth bear. We used a combination of four methods of studying sloth bear attack behavior: 1) extensive literature review, 2) interviews with people that were attacked by wild sloth bears, 3) video recording sloth bear behavior, and 4) comparing the findings to those of other well-studied ursids. Although all sloth bear attacks were determined to be defensive, the overall results of this study were both insightful and complex. The ultimate purpose of this research is to produce a messaging plan that will help people avoid sloth bear attacks and, if necessary, illustrate how to behave during an attack to minimize injuries. Our behavioral-based safety message will not only protect people but will reduce animosity toward this important species and, in turn, promote bear conservation. Though it is becoming clearer as to how to avoid sloth bear encounters, the messaging for what to do if attacked by a sloth bear is still evolving. Additionally, we compare sloth bear safety messaging to that disseminated for the American black bear, grizzly bear, and polar bear.

IMPLEMENTING AN EFFECTIVE COMMUNITY-SUPPORTED ORDINANCE TO SECURE TRASH FROM BLACK BEARS: A CASE STUDY FROM BOULDER, COLORADO

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ABSTRACT

Like many other communities, the City of Boulder (population 102,420) has experienced increased bear-trash conflicts. In 2014 four bears were killed in the city due to public safety concerns and community support increased for new laws requiring trash to be secure from bears. The three-year journey to establishing community-supported laws that require trash to be secured from bears consisted of stakeholder collaboration; increased community awareness about the association between unsecured trash and bears being killed; addressing obstacles such as increased costs; and a feasible enforcement strategy. Implementation of the new requirements was phased, and required approximately 6000 waste carts to be bear-resistant as of October 2014, and an additional 8700 carts and 460 dumpsters were required as of June 15, 2016. Implementation of the new ordinances has substantially decreased bears' ability to access trash in Boulder and brought a welcome increase in the cleanliness of the community.

WHO IS IN CONFLICT WITH WHOM?

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ABSTRACT

The instinctive human behavior of feeling threatened by a large carnivore can be considered the origin of the conflict between humans and large carnivores (Woodroffe, Thirgood et al. 2005) with some of the most high-profile "conflict" cases involving top predators such as lions, wolfs and bears. In many cases however, the damage caused by this group is not the problem but people's attitudes towards them. In 2011 a rapid assessment of the status and conservation of the Andean bear in the Department of Tarija (Bolivia) identified the Pilaya watershed (northern limit of the department), as a "human-bear conflict" region and in 2016 surveys were carried out, indicate that at least one bear is killed per community every two years. Here we present the first results of surveys carried out in four communities including perceptions, attitudes and tolerance of people towards carnivores. We stress the importance of the human dimensions perspective for effectively understanding and resolving HWC.

MANAGEMENT OF LARGE CARNIVORE DAMAGE IN EUROPE: MITIGATING OR SUBSIDIZING THE CONFLICTS?

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ABSTRACT

The mitigation of the conflicts associated to livestock predation and agriculture damage is pivotal for the conservation of large carnivores in Europe. Aiming to identify the management strategies that more efficiently mitigate these conflicts, we made a critical review of the current policies to manage damage made by brown bears, lynx, wolves and wolverines in Europe. First, we characterized the damage management policies and quantified damage compensation costs for these large carnivore species in 27 countries. In a second stage, we compiled data on the type and costs of the measures subsidized to prevent brown bear damage across 14 European countries and regions to (1) examine the effectiveness of prevention subsidies in reducing compensation costs and (2) assess whether the total compensation and prevention costs are related to the level of tolerance towards bears. We assessed the tolerance level through a qualitative survey based on European bear expert opinions. The cost of compensation per predator individual varied across countries, ranging from 0 to 9000 euros per year, being 65% of the total compensation costs in Europe due to predation of free-ranging sheep and reindeer in Fennoscandia. Despite the economic efforts invested to manage large carnivore damage, systematic and efficient prevention are not the norm in Europe. We found a positive relation between compensation and prevention costs per bear, meaning that the countries that invest more money in prevention were also the ones that spent more in compensation. Furthermore, high compensation and prevention expenditures per bear were associated to low levels of tolerance, being high levels of tolerance only associated to countries with low compensation and prevention costs. We discuss that, excessive compensations that are paid despite inefficient prevention and lack of damage verification can perpetuate a state of high damage incidence and low tolerance in which the conflicts are subsidized instead of mitigated. Damage management policies must be directed towards prevention programs that provide protective measures and systematic assistance to guarantee an effective reduction in the incidence of damage. Only this way it will be possible to build tolerance while reducing compensation costs in the long term.

UNDERSTANDING GRIZZLY BEAR RESPONSES TO HUMAN ACTIVITY IN CANADIAN PROVINCIAL PARKS: A FINE-SCALE APPROACH

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ABSTRACT

Some bears spend significant time in high human-use areas, and questions remain about whether and how these individuals modify their behavior to avoid people. We investigated the behavior of grizzly bears (*Ursus arctos*) that inhabit areas of high recreation intensity in two provincial parks in Alberta, Canada. We used Global Positioning System (GPS) radio-collars to obtain fine- scale locations on bears whenever they were within 500 meters of a trail, road, or facility, and we quantified spatial and temporal variation in numbers of people using these three types of human- use features. We calculated a human disturbance index for each bear GPS location, based on 1) the distance between the GPS location and nearby human-use features, and 2) the average daily human use level on those features. Although study bears overlapped broadly with human activity, analysis of disturbance indices suggested that bears made fine-scale behavioral adjustments to avoid the times and places of highest recreation intensity. Avoidance varied with type of human use. Bears responded to daily fluctuations in human activity on roads, weekly fluctuations in activity on trails, and seasonal fluctuations in activity in facilities. Bears also increased their selection for forest cover in high human-use areas. Our results suggest that continued coexistence between bears and people in the study area depends on preserving predictable recreation patterns and limiting intensity of human use. We submit that in cases of broad-scale overlap between people and bears, new insights into bear avoidance behavior may be obtained by studies that focus within the more limited spatial extent of high human-use areas, and that quantify variation in human activity at multiple spatial and temporal scales.

PUBLIC PERCEPTIONS ABOUT HUMAN-BEAR CONFLICTS AND POTENTIAL SOLUTIONS IN THE FOUR COUNTRIES SHARING THE SAME POPULATION

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ABSTRACT

We used structured survey to analyze public perceptions about human-bear conflicts and about potential solutions to human bear conflict on a randomly selected sample of inhabitants of bear areas in Italy, Austria, Slovenia and Croatia. Following a data quality screening, 2306 questionnaires were included in the analysis. We used GLM and information-theoretic approach to model selection and inference to model the data and enable interpretation of effects of otherwise confounded explanatory variables. We used the scores obtained by PCA variably as response or predictor variables, and explored their relation to other characteristics of the sample. Eight questions were designed to explore respondents' perceptions about human-bear conflict. The respondents were asked to assess how problematic (if at all) different situations with bears were for them personally. The scale ranged from "very problematic" to "I like the idea". PCA analysis has not identify any significant structure, so one PCA score was extracted and interpreted as "tolerance of bear conflicts". Additional nine questions were designed to investigate respondents' perceptions about the effectiveness of possible solutions to human-bear conflicts. The respondents were asked to assess how (if) effective different solutions to bear conflict were according to their opinion. The scale ranged from "measure is actually increasing the problem" to "very effective". PCA analysis of the solutions items has clearly structured the data into three logical interpretable components: "conflict mitigation and education", "culling and removal of problem bears", and "supplemental feeding of bears". According to our model, Italians can tolerate the most conflict situations although all groups showed tolerance of most of the presented situations. Younger generations, males, dog owners and knowledgeable about bear biology were more tolerant of conflicts with bears. Respondents in all regions acknowledged the effectiveness of "mitigation measures", while the effectiveness of "culling" and "supplemental feeding" was perceived differently in different regions. Livestock owners were less inclined to supporting mitigation measures as an effective solution, however they were still overall supportive. Familiarity with bear biology proved to be important in predicting support for mitigation measures.

DEFINICIÓN DE LA MATRIZ DE CONFLICTO HUMANO-OSO ANDINO EN EL PAISAJE PRODUCTOR DE AGUA MACIZO CHINGAZA

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RESUMEN

El presente estudio tuvo como objetivo principal la definición de la matriz del paisaje en donde se ubica geográficamente los conflictos comunidades –osos andinos, para los ecosistemas altoandinos del Macizo Chingaza, zona productora de agua en la cordillera central de los andes colombianos. Para el presente estudio se modelaron tres elementos que se consideraron clave para el conflicto: a) La distribución de la especie a través de la modelación de su nicho bioclimático, con la ayuda de el algoritmo de entropía máxima (*MaxEnt*) a partir de 290 georreferenciaciones limpiadas a 1km2 de: interacciones negativas con la especie, seguimiento de telemetría GPS , avistamientos y registros indirectos realizados por expertos los últimos 15 años; b) La intensidad del conflicto definido por el número de ataques en los últimos 15 años en los distintos municipios del macizo con el uso del algebra de mapas y levantamiento de información sobre número de conflictos mediante metodologías participativas con la comunidades locales y c) La permeabilidad y/o acceso para el macizo por parte de las comunidades locales y cazadores mediante la categorización multicriterio de vías disponibles y un DEM como superficie de resistencia y el uso del algebra de mapas. Los resultados de este estudio definieron un total de 10.377 km² ha de distribución de la especie, en la cual se presentan niveles altos y medios de acceso e intensidades medias y altas de conflicto y que coinciden con los puntos reportados y finalmente generan una información para la generación de un mapa de riesgos para la especie en la Región del macizo Chingaza, que servirá como instrumento de gestión del paisaje de conflicto en la Región.

PUBLIC OUTREACH

APPLICATION OF THE OPEN STANDARDS FOR THE PRACTICE OF CONSERVATION AS AN EVALUATION METHODOLOGY FOR CONSERVATION PLANS

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ABSTRACT

The main objective of this study was to evaluate the contribution of the "National Program for the Conservation and Recovery of Andean Bear (*Tremarctos ornatus*), a species threatened in the Colombian Andean ecosystems" applying the Open Standards for the practice of conservation principles (adaptive management) as an Evaluation methodology. The Open Standards for the practice of conservation has been developed to maximize the Conservation efforts at any scale providing the guidelines to formulate actions around conservation; in this case, the methodology was applied as an evaluation methodology. The evaluations could be directed to the results; however, this study leads and visualizes the "contribution" as the integration of the evaluation of different issues around conservation, looking forward to the success of the program, considering the management aspects that increase the bear populations. The application of the Open Standards for the practice of conservation is a methodology that could be developed in the Evaluation of Conservation Plans, no matter the species, because it helps to focus on the state of management of the Conservation Plans and lead to approach the management aspects leading to the benefits or challenges that would be technical support for decision makers and government policies for the conservation of endangered species.

SALA EDUCATIVA "QUITO TIERRA DE OSOS"

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En el Distrito Metropolitano de Quito se han logrado identificar cincuenta osos de anteojos (*Tremarctos ornatus*); todos ellos sin duda forman parte de una población mayor que habita en el actualmente declarado "Corredor del Oso Andino". Durante el año 2015 el Zoológico de Quito en Guayllabamba decide renovar las salas de interpretación, dedicadas a la biodiversidad nacional, para crear espacios lúdicos y educativos, haciendo un énfasis en la biodiversidad quiteña. Al ingresar a la sala "Osos de Quito" lo primero que vamos a notar es que nos encontramos en un hogar de arquitectura típica del Noroccidente de Quito. Su construcción en madera y el balcón (zaguán) frontal nos permite observar el bosque nublado, que es hogar de miles de especies de fauna y flora, y que a su vez contrasta con el bosque seco interandino, en el que se encuentra ubicado el Zoológico. Mientras caminamos por el balcón, el visitante entiende las diferentes costumbres que tienen los quiteños que viven en los bosques nublados, mientras se hace referencia a sus ancestros y al equilibrio que encontraban a través de la convivencia con la naturaleza. Antes de salir del balcón se habla de los esfuerzos de conservación *in situ* y *ex situ* que se realizan dentro del DMQ. Una impresión fotográfica de un oso, en tamaño real, nos espera al salir del balcón. Este oso que cruza la carretera "Calacalí – La Independencia" evidencia una realidad cotidiana de choferes que ocupan esta carretera cotidianamente y nos permite explicar cómo se debe actuar ante un encuentro similar. A través del estudio realizado con cámaras trampa, por el investigador Santiago Molina, se puede demostrar cómo se ha identificado a los osos que habitan el noroccidente quiteño. Las manchas blancas del rostro nos permiten observar patrones irrepetibles, que funcionan igual que la huella digital de los humanos para su identificación. Las cámaras trapa también fotografían otras especies con las que convive el Oso de Anteojos y lo mostramos a través de un video. Pablo, el oso del Zoológico, se encuentra junto a los visitantes en una posición fotogénica, al haber sido inmortalizado en una escultura de tamaño real. La escultura en fibra de vidrio permite cumplir el sueño de muchos visitantes, de poder ser fotografiado junto a un animal de gran tamaño y carisma. Finalmente, junto a una gigantografía del bosque nublado y con un paraguas del cual cuelgan fotografías de animales de climas tropicales, se puede explicar el concepto de "Especie Paraguas" y de la gran biodiversidad que albergan los bosques nublados, haciendo un énfasis en los bosques que rodean a los quiteños que diariamente olvidan que su ciudad está rodeada de vida silvestre.

UNDERSTANDING HUMAN PERCEPTIONS OF SLOTH BEAR USING A PHOTO-BASED Q-METHOD

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ABSTRACT

Human-sloth bear conflicts have increased in India due to enhanced pressure on the forest. Indigenous people often visit the forest as part of their livelihoods, where they share resources with the sloth bear. Most of sloth bear attacks happen during these visits. The damage caused by sloth bear attacks is often irreparable, intensifying peoples' hostility towards the sloth bear. Changing attitudes towards sloth bears can be an important factor hampering human-bear coexistence. In addition, peoples' perception of sloth bears could be altered if they are associated with perceived problems caused by other species. Thus, to mitigate human sloth-bear conflicts it is important to understand both people's perception of sloth bears in general, as well as their perception of sloth bears in relation to other wildlife. We used a photograph based Q-methodology study to understand people's perception of sloth bears relative to other wildlife. We interviewed 80 local people in four sloth bear dominated landscapes of Gujarat state; Photo-elicitation has proven its utility for participatory research, including the capacity to reveal underlying attitudes. Interviewees were asked to identify their most liked and disliked wildlife from a set of photographs and arrange them accordingly. Following the sorting, a fixed set of questions was asked to understand their principle intention behind the arranged set of photographs. We explain these perceptions by identifying groups of interviewees with similar preferences of wildlife in their surroundings. These preferences are then discussed in relation to sloth bear conservation and the facilitation of human-sloth bear coexistence.

BEARS IN MIND SUPPORTS RESEARCH TO PROTECT BEARS IN THE TROPICS

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ABSTRACT

Bears in Mind uses its knowledge, expertise, and financial assets to protect bears and their wild habitat and to help captive bears in need. Bears in Mind manages the Bear Forest in Ouwehand Zoo in the Netherlands, a home for abused and traumatized bears. After years of mistreatment, brown bears from around Europe begin a new life in the Bear Forest. The large, natural enclosure, the hands-off management, and the natural feeding program stimulate the bears' natural behaviors. And most likely for the first time since they are in the hands of humans, the bears can hibernate. Bears in Mind also supports projects that focus on nature conservation, welfare and awareness & education. Some of the bear projects in the tropics which have or still benefit from Bears in Mind's support include a 'Public awareness and community project to increase Sun bear conservation' in Indonesia, 'Protecting bears by improving environmental education and awareness' in Laos, and 'Marking behavior, population density and terrain use of Andean bears' in Ecuador. Bears in the tropics have not been studied much, so Bears in Mind encourages projects that focus on research and conservation of the different species. By addressing the problems at the source, we can create an environment where humans and bears can coexist in harmony.

BASELINE SURVEYS ON HUNTING ASSOCIATIONS AND PUBLIC OPINION WITH RECOMMENDATIONS FOR FURTHER ACTIONS ON BROWN BEAR (*URSUS ARCTOS*) MANAGEMENT IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Bosnia and Herzegovina is a country located in Southeastern Europe, in the western Balkans. It has borders with Croatia, Serbia, and Montenegro. It borders the Adriatic Sea along its 20-km coastline. The most striking features of the local terrain are valleys and mountains which measure up to 2386 m in height. The country is mostly mountainous, encompassing the central Dinaric Alps, which makes certain areas suitable habitats for brown bears. Bear population in Bosnia and Herzegovina is a quite significant part of the Dinaric Pindus population, with an estimated number of 1000 individual animals. There are no precise existing data on bear population and these are mainly based on hunter's estimations with questionable methodology. There is no existing Brown bear management plan with clear defined roles and responsibilities. Public involvement in bear management is non-existing or it is on a low level. One of the issues is illegal international trade of specimens of wild animals and plants, bears included, even after Bosnia and Herzegovina acceded to CITES in 2009. The responsible governing body has still not implemented CITES since the relevant office is not established due to political disagreements. In this paper we explain the activities initiated and the results so far to overcome existing issues, such as organizing workshops with all the relevant authorities, surveys about public involvement and opinion, as well as surveys and future collaboration with hunter's associations. Second, we bring conclusions and recommendations for future steps which will be taken to obtain knowledge and integrate the brown bear population of Bosnia and Herzegovina into the existing data of the Dinaric Pindus population.

BEARS AND
CLIMATE CHANGE

SELECTING THE BEST STABLE ISOTOPE MIXING MODEL TO ESTIMATE GRIZZLY BEAR DIETS IN THE GREATER YELLOWSTONE ECOSYSTEM

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ABSTRACT

Past research indicates that white-bark pine seeds are a critical food source for threatened grizzly bears (*Ursus arctos*) in the Greater Yellowstone Ecosystem (GYE). In recent decades, white-bark pine forests have declined markedly due to pine beetle infestation, invasive blister rust, and landscape-level fires. We used stable isotope ratios (expressed as $\delta^{13}C$, $\delta^{15}N$, and $\delta^{34}S$ values) measured in grizzly bear hair and their major food sources to estimate the diets of grizzlies sampled in Cooke City Basin, Montana. Estimates generated by our top model suggest that white-bark pine seeds (~35 ∓ 10%) and other plant foods (~56 ∓ 10%) were more important than meat (~9 ∓ 8%) to bears. We recommend that researchers consider model selection when estimating the diets of animals using stable isotope mixing models. We urge researchers to use the new statistical framework described here to estimate the dietary responses of grizzlies to declines in white-bark pine seeds and other important food sources through time in the GYE (e.g., cutthroat trout), as such information could be useful in predicting how the population will adapt to future environmental change.

CLIMATE-INDUCED BEHAVIORAL CHANGES INFLUENCE EXPOSURE OF AN ARCTIC APEX PREDATOR TO PATHOGENS AND CONTAMINANTS

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ABSTRACT

Polar bears (*Ursus maritimus*) may serve as sentinels for pathogens and contaminants, providing insight into changing Arctic ecosystems and health risks to wildlife and humans. Recent changes in the availability of sea ice habitat have coincided with increased use of land by polar bears from the southern Beaufort Sea (SB), which may alter exposure risks. We assayed blood samples from SB polar bears to assess prior exposure to the pathogens *Brucella* spp., *Toxoplasma gondii*, *Coxiella burnetii*, *Francisella tularensis*, and *Neospora caninum*, estimate concentrations of persistent organic pollutants (POPs), and evaluate risk factors associated with exposure to pathogens and POPs. We found that seroprevalence of *Brucella* spp. and *T. gondii* antibodies likely increased through time, and provide the first evidence of exposure of polar bears to *C. burnetii*, *N. caninum*, and *F. tularensis*. Additionally, the odds of exposure to T. gondii were greater for bears that used land than for bears that remained on the sea ice during summer and fall, while mean concentrations of the chlordane (ΣCHL) were lower for land-based bears. Changes in polar bear behavior brought about by climate-induced modifications to the Arctic marine ecosystem may increase exposure risk to certain pathogens and alter contaminant exposure pathways.

PHENOTYPIC PLASTICITY ACROSS AND WITHIN FOUR ALASKAN BROWN BEAR STUDY AREAS: IMPLICATIONS FOR RESILIENCY TO CHANGE

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ABSTRACT

In 2014, we initiated studies of brown bears in four regions of Alaskan: Kodiak National Wildlife Refuge, Gates of the Arctic National Park, Lake Clark National Park, and Katmai National Park. These systems differ in the abundance and quality of nutritional resources available to brown bears. We assessed growth rates of male and female brown bears across systems and across sexes. Structural components such as skull size and body length generally reached asymptotes around 8-13 years of age across systems and sexes, while lean body mass continued to increase in males across systems and in females when resources were relatively abundant. Within populations, there was a wide range in adult male and female body size and lean mass. Allocation of resources to fat vs lean mass also varied across populations, suggesting both phenotypic plasticity and varying life history strategies within populations.

BEARS OF THE WORLD: DISTRIBUTION AND CONSERVATION STATUS

LIFE HISTORIES AND REPRODUCTIVE PARAMETERS OF EX SITU BEAR POPULATIONS: STUDBOOKS AS SOURCES FOR RELEVANT AND VALID BIOLOGICAL INFORMATION?

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ABSTRACT

Studbooks are the basis for proper management of captive populations and may be an untapped source of information to aid in in-situ conservation. Studbook keepers annually collect data on birth and parents, death, and transfers of each living individual. The pedigrees of living animals should track to wild-caught ancestors. International studbooks include data from the populations kept in acknowledged zoos around the world; regional studbooks just cover the population of a certain region. More than 850 Andean bears, more than 1100 sloth bears, and up to 3000 polar bears are registered in the respective international studbooks. Sun bears from regional studbooks in Europe, North America, and Japan sum up to almost 600 individuals, while Asiatic black bears´ European studbook alone contains data of more than 1000. This enormous wealth of information might be useful for demonstrating the potential of species on display in captivity, in many cases wider ranges for certain parameters than in the wild under natural selection pressures. The studbook software checks for inconsistencies and logical errors. It also allows for the setting of numerous filters, so that animals with incomplete datasets concerning dates or pedigrees can be removed to increase validity when analyzing genetic or demographic parameters. Here we discuss both the potential and limitations of using studbook datasets to provide information for understanding wild populations, including life history information like average age of first and last reproduction, longevity, duration of senescence or seasonality of birth. As these parameters are influenced by environmental conditions, the ex-situ data must be analyzed separately for the decades before and after the establishment of coordinated breeding programs and changes of husbandry standards.

BUILDING ON THE NATIONAL PLANS FOR THE CONSERVATION OF ANDEAN BEARS (*TREMARCTOS ORNATUS*)

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ABSTRACT

The Andean bear (*Tremarctos ornatus*) is considered Vulnerable to extinction globally; its recognized conservation status varies from Vulnerable to Endangered across the five primary range countries. In response to concerns for the future of this bear, four countries have established national plans or strategies for its conservation. It is thought that the Andean bear faces similar threats across its range and these plans share some recommendations and goals. However, the perceived relative magnitude of threats and the socio-political context of bear conservation vary among countries, so the plans also differ. Together, these plans present a framework for the conservation of most remaining Andean bears. Nevertheless, it is predicted that the species will continue declining in range and numbers for at least the near future. To address the apparent gap between the plans' goals and the bears' trajectory, we will review the implementation progress of these plans and ask: Can we improve the effectiveness of the national plans to better conserve the Andean bear?

ANDEAN BEARS AS CONSERVATION SURROGATES FOR ANDEAN MAMMALS

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ABSTRACT

Andean bears (*Tremarctos ornatus*) are a large-bodied, far-ranging species that require a variety of habitats and food sources to survive. They are an important cultural symbol, listed as Vulnerable by the IUCN, and designated as Endangered in Ecuador. Research shows they share their habitat with other at-risk species and are often mentioned as a surrogate species for the conservation of important, yet less charismatic, Andean mammals. Ratnayeke and van Manen (Ursus 2012) found evidence that sloth bears in protected areas in Sri Lanka could be used as surrogates for the conservation of at-risk carnivore species. We adapted their methods to empirically test this theory on Andean bears and co-occurring mammals in Ecuador. We used data from a 2012-2014 Andean bear-focused study on privately-owned lands in Ecuador's Sangay National Park. Our research area (40 km2) was a matrix of primary and secondary forests, shrublands, páramo (high-altitude grasslands), and pastures. Despite human presence, an expanding agricultural and ranching frontier, and rapid infrastructure development in our research area, camera traps detected rare species including the mountain tapir (*Tapirus pinchaque*), the margay (*Leopardus wiedii*), and the little-spotted cat (*Leopardus tigrinus*), as well as common species such as the puma (*Puma concolor*), the tayra (*Eira barbara*), and the Andean fox (*Lycalopex culpaeus*). We detected bears at 46% of our camera trap sites. We performed a negative binomial regression using three groupings of wildlife relevant to our site: (1) all carnivore species, (2) at-risk species - 2011 Ecuadorian Red Book, and (3) at-risk species - IUCN. Our models used combinations of Andean bear detections, season (wet, dry), and habitat (forest, shrub), and their interactions. We then used Akaike's information criteria to determine the best model for each group. Our results indicate that Andean bears had a slight, positive effect on the presence of carnivore species (1), but found that habitat type was more important than bear presence for at-risk species in the other groups (2, 3). The conservation implications for resource managers are complex: for some species, Andean bears can be important conservation surrogates while, for others, broader habitat conservation could be a more important focus.

THE STATUS OF THE ASIATIC BLACK BEAR IN BHUTAN

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ABSTRACT

Between 2014-2015, Bhutan undertook a nationwide scientific exploration to revalidate the status of Tiger (*Panthera tigris tigris*) by a team of national experts. In a total of 1129 survey grids sampled for reliably estimating tiger abundance and density in the country, among many species encountered, Black Bears (*Ursus thibetanus laniger*) were encountered as of now in 95 grids (and analyses are still going on). While the initial understanding of their distribution was confined from midlands to uplands of Bhutan, the survey seems to indicate their current distribution is further extended to the subtropical forested land which is also reported to be occupied by a similar looking bear, known as sloth bear (*Melursus ursinus*). The initial survey results indicated high congregation of Black Bears along the stretch starting from Royal Manas National Park through to upland parks like Jigme Singye Wangchuck National Park and Jigme Dorji National Park, and contrastingly, showed them scantly distributed in the Western and Eastern regions. No images were documented from the western and eastern parts of the Southern belt, although few cases of human bear conflicts were reported from those areas prior to commencing the survey, thus warranting further investigation. Both species are presently listed under Schedule I of Forest and Nature Conservation Act 1995, meaning totally protected species, and are further identified as being at great risk due to retaliatory killings to reduce conflicts by farmers, poaching for bear parts, and habitat loss due to degradation and fragmentation. Particularly, the removal of oak trees for firewood and lopping of their branches for cattle fodder affects Black Bears, as the acorns of oaks are a valuable food for the Asiatic Black Bear. To cope up with this emerging issue, the Royal Government is working to put in stringent conservation laws backed by Buddhist ethics for effective management. There is also regulation in cutting of oak trees and, at the same time, the Royal Government is promoting the restocking of many fodder species including oaks as par to a nationwide habitat enrichment for reducing human wildlife conflicts. Importantly, Bhutan – being at the crossroads of three great biological regimes: the Indo Malayan region, the Palearctic region and the Himalayan front, with 51.44 per cent of its area under protection as Protected Areas and Biological Corridors – provide home to a unique and diverse assemblage of species. More than 200 species of mammals have adapted to live in the diverse habitats in Bhutan.

LA RUTA DEL OSO, EL LADO ECOTURÍSTICO Y SOCIAL DE LA CONSERVACIÓN DEL OSO FRONTINO (*TREMARCTOS ORNATUS*) EN VENEZUELA

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RESUMEN

Desde el año 2014, tras la reactivación del Plan Integral para la Conservación del Oso Frontino en el estado Lara – PICOSO, se han diseñado acciones que promuevan la conservación de la especie en la zona alta del estado; dichas actividades están basadas dentro de los parámetros del desarrollo sustentable, tomando como temas principales la biología y conservación del *Tremarctos ornatus*, los Andes tropicales, la participación comunitaria a través de la formación de emprendimientos ecoturísticos, la conservación de los sistemas hidrográficos, la comunicación y educación ambiental. Para ello se ha diseñado La Ruta del Oso, que consiste en una estrategia metodológica donde son seleccionados lugares estratégicos de la zona alta de los estados Lara y Portuguesa, específicamente la Sierra de Portuguesa, para el desarrollo de las actividades. Se inicio con el levantamiento de información de la presencia de la especie en la Sierra de Portuguesa en las vertientes de los estados Lara y Portuguesa a través del levantamiento de una ruta ecoturística de interés para el fortalecimiento de la economía local a través del ecoturismo, con el apoyo de las corporaciones de turismo de ambos estados. Con la Ruta del Oso se han desarrollado seis talleres de capacitación, 10 salidas de campo (levantamiento de la ruta), 10 encuentros con las comunidades, una campaña comunicacional-educativa, un programa socioambiental comunitario y cinco visitas a medios de comunicación. La Ruta del Oso ha sido una herramienta para la integración de la comunidad, instituciones y ONG ambientales en la investigación, conservación y educación a favor del oso frontino en Venezuela.

HABITAT SUITABILITY AND BEAR POPULATION MANAGEMENT IN CARPATHIANS

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ABSTRACT

The Carpathians represent 2% of Europe's surface but contain 35% of the continent bear population. The history and the dynamic of this species is well known from the second half of the 20th. century. Habitat suitability analyses were performed for bears in the Carpathians more than 50 years ago. We start from bear distribution and densities to establish best bear-habitat characteristics. There were four categories of factors analyzed: abiotic, biotic, negative anthropic, and wildlife management. The abiotic ones were correlated with climatic conditions, altitude, slope, etc. The biotic factors consider vegetation cover of the area, food availability, other species, etc. The negative anthropic factors analyzed were competition with domestic livestock for food, killing of cubs by shepherd dogs, people acceptance of bears including poaching, etc. Wildlife management influence was analyzed considering measures against poaching, supplementary feeding, harvest, etc. The results of this analyses were correlated with natural densities and an "optimum" number of bears was calculated from ecological (population and habitat carrying capacity), and economic and social point of views. The evolution in time of bear distribution and densities shows the importance of wildlife management in bear populations. A drastic change was happening in wildlife management of bears in 2016. The effect of this change is still to be monitored in the next years. We should see what is happening and take the necessary measures to conserve one of the most important bear populations in the world.

STRATEGIC PLANNING FOR THE CONSERVATION OF BROWN BEARS (*URSUS ARCTOS*) IN IRAN: STATUS REVIEW, OBJECTIVES AND GOALS

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ABSTRACT

Here we report the first strategic planning for brown bear conservation in Iran (based on IUCN/Species Survival Commission 2008: Strategic Planning for Species Conservation) which has been compiled in collaboration with the Iranian Department of the Environment (DoE) in the last year (2016). The brown bear, as the largest carnivore of Iran, is distributed across mountainous forests of the northern and western regions of the country and is protected by national law; however, the current conservation status is not optimistic. To better understand the species' status and for more effectively protect this bear, a comprehensive national conservation plan was developed. The idea was to compile all scientific data gathered so far to be used by students, researchers or other stakeholders, and to identify knowledge gaps needed to be addressed in future to prioritize the needed conservation activities and allocate the limited resources. The main aims were: 1) to compile all the current information on brown bear population in Iran (a status review), 2) to set several goals (what needs to be achieved), 3) to define the main objectives and, finally, 4) to decide on the actions (detailed steps that lay out what needs to be done) to address each objective. In the status review section, relevant phylogenetic, behavioral, genetic, and ecological aspects of the species' biology along with historical account, current distribution and demography, habitat and resource assessment, threats and conservation and management were summarized. Range-wide goals were formulated and seven objectives addressing the main threats (identified in the status review process) were described. Finally, for all objective targets, 70 actions (including relevant target groups, methods, stakeholders, priority level, timing and evaluation index) were defined. We hope that the present document will help us to ensure the long-term survival of brown bears in Iran.

BROWN BEAR POPULATION IN BOSNIA AND HERZEGOVINA. STATUS, PROBLEMS AND MANAGEMENT

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ABSTRACT

Brown bears (*Ursus arctos* L., 1758) are the largest wild animals living in Bosnia and Herzegovina. Regarding Bosnia and Herzegovina territory, the brown bear is an autochthonous and widely distributed species. Unfortunately, due to lack of systematic ecological studies, the knowledge of its ecology, spatial distribution, and population density is poor. It is one of the most important representatives of biodiversity and as such it plays an important role in its maintenance. They are located at the top of the food chain and they are threatened only by humans and their activities. In Bosnia and Herzegovina, brown bears have been recorded on the north, north-western, western, central, eastern and south-eastern hills and mountainous areas. Research conducted from 2011 to 2016 shows that the brown bear in Bosnia and Herzegovina occupies about 17,600 square kilometers (the land area of Bosnia and Herzegovina being 51,197 square kilometers), so the brown bears inhabit 34.38% of the territory. In recent years, in the high hunting circles there have been assumptions that the number of bears in Bosnia and Herzegovina is approximately 1000 individuals. This might be the most realistic prediction of the abundance of brown bears in the country. Official data of culling shows that the culling is generally very small and that there is no overall data about losses (in traffic accidents, mines, diseases, reports of poaching). The species is protected by a closed season, but the care and management about it is at a very poor level, as appears from the absence of the mentioned data.

POSTER PRESENTATIONS

RESEARCH AND CONSERVATION OF THE ANDEAN BEAR

DIET ANALYSIS OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) IN COROSHA, AMAZONAS

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ABSTRACT

Analyzing the diet of an animal allows knowing its habits and distribution. The Andean bear (*Tremarctos ornatus*) is a South American endemic specie classified as Vulnerable (VU) by the IUCN, which now has the "National Conservation Plan of Andean Bear (*Tremarctos ornatus*) –Term 2016 – 2026" in Peru. One of the places it inhabits is the district of Corosha, Amazonas, which has three ecoregions: jalca, scrubland, and mountain cloud forest. To know *T. ornatus'* diet will allow a sustainable management of flora and fauna in Corosha, which will not only promote the Andean bear conservation, but strengthen ecotourism as a benefit for local people. The analysis was done by comparing histological plant tissues in feces of *T. ornatus* and the flora of the place, and by identifying the plants that had been eaten. The 134 plants and the 65 scats collected on summer and winter seasons of 2016 showed an herbivorous diet (99%), with preference in the family Bromeliaceae and the fruits of family Ericaceae. There were also insects (<1%), mainly of the family Formicidae. The flora analysis showed two bromeliad genera and the percentage consumed in the mountain cloud forest and jalca through characterization of trichomes; seed characterization allowed to identify Ericaceae genera consumed by Andean bears.

ADAPTACIONES AL MÉTODO DE FOTOTRAMPEO DE OSOS ANDINOS EN EL SUR DEL ECUADOR

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RESUMEN

El uso del fototrampeo se ha incremento en los últimos años para el estudio de la vida silvestre; sin embargo, el funcionamiento y eficiencia de las cámaras puede verse afectado por diferentes razones, como por ejemplo la manipulación o destrucción de las cámaras por parte de la misma fauna silvestre estudiada. El objetivo de este trabajo es dar a conocer las modificaciones realizadas al método de fototrampeo de oso andino para el estudio de su comportamiento de marcaje en la provincia de Zamora Chinchipe, sur de Ecuador. En este estudio se ubicaron estaciones de fototrampeo en sitios de marcaje de osos andinos (árboles con marcas de garras y frotamientos). Siguiendo lo sugerido por otros trabajos, cada estación contó con dos cámaras-trampa colocadas a una altura promedio de 1.5 m y separadas de 2 m a 3 m del árbol de marcaje. Sin embargo, esta metodología generó frecuentemente vídeos de mala calidad o cámaras arrancadas de los árboles por los osos. Como primera solución se cambió la posición de las cámaras; sin embargo, los ataques continuaron. La solución más efectiva ha sido colocar las cámaras sujetas a los árboles a un mínimo de 3 m sobre el suelo. Para poder instalar las cámaras en los árboles a esa altura se ha desarrollado un método sencillo de construcción de plataformas con troncos y cuerdas. Las plataformas se montan y desmontan cada vez que se revisan las cámaras. Esta estrategia ha permitido evitar los ataques sin que el cambio del campo visual afecte a la capacidad de identificar el comportamiento de marcaje bajo estudio.

FLAGSHIP ANDEAN BEAR PROMPTS BIODIVERSITY SURVEY AND COMMUNITY-BASED CONSERVATION OF CULTURE, SPECIES AND NATURAL HERITAGE

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ABSTRACT

The indigenous Queros Wachiperi of Southeast Peru strive "to protect our culture, our language and our natural heritage". Fifteen years ago, infrastructural advancement pulled members from the once uncontacted community into a nearby town; as they left their forest they also left their traditions at risk of extinction. The few Queros that remained behind established a conservation concession in hopes of developing ecotourism that would bring back their people and conserve their heritage. Inviting conservation research was part of that plan, however the 7000-hectare site, from 750 – 2300 masl, situated between two of the biggest biodiversity hotspots of Peru, has barely been studied. My interests intersected with those of the Queros when they confirmed sightings of Andean bear (*Tremarctos ornatus*) at low elevations (~800 m). Andean bears have been documented down to 250 m within their overall range, however little is known about their low elevation presence as they are thought to inhabit predominantly higher elevations. As a pilot study to confirm Andean bear presence in the concession, I set 13 camera traps loosely guided by a 3 km^2 grid with three cameras maximum per quadrant for a six-month period. In 180 camera-days, cameras registered 33 species of fauna and a paw print confirmed Andean bear presence. Results support the Queros' goals by increasing interest among local and research communities to maintain and study the conservation concession, providing tactile evidence to allow development of visual outreach materials encouraging ecotourism and further biodiversity research, and uniting the community to return and conserve their culture alongside their natural heritage. Lengthier research studies with more resources should examine if bears inhabit the area permanently or use it as a corridor, as well as determine bear occupancy across the altitudinal range of the concession. While this was not the original objective, by acting as a flagship species the charismatic Andean bear catalyzed the first widespread biodiversity survey of the concession.

EVALUACIÓN COMPORTAMENTAL DE UN OSO ANDINO (*TREMARCTOS ORNATUS*) DURANTE LAS PRIMERAS ETAPAS DE SU REHABILITACIÓN EN DOS CENTROS DE CUSTODIA DE DEPARTAMENTO DE LA PAZ, BOLIVIA

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RESUMEN

A inicios de 2016, un oso andino subadulto fue rescatado de una comunidad próxima al Parque Nacional Carrasco, Bolivia. Presentaba múltiples lesiones, una condición corporal pésima y daño psicológico, al haber posiblemente sido víctima de tenencia ilegal. Para determinar acciones oportunas que incidiesen en su bienestar, se evaluó la respuesta comportamental del oso hacia las condiciones de manejo otorgadas durante la primera etapa de su rehabilitación en el Zoológico Municipal Vesty Pakos (ZMVP) y posteriormente en el Refugio de Vida Silvestre La Senda Verde (LSV). Inicialmente se realizaron observaciones *ad libitum* durante dos días (total=600 min) para definir el etograma base, que constó de once categorías comportamentales. Para las observaciones posteriores en ZMVP y LSV se utilizó el método "muestreo instantáneo" minuto a minuto, durante treinta días no consecutivos (total=3863 min). Los comportamientos agonistas y filiativos sobre el cuidador fueron registrados cada vez que ocurrían ("muestreo continuo"). La frecuencia de ejecución de cada comportamiento por día fue calculada través de la Σ de cada categoría comportamental (min)/total tiempo de observación (min), y se la representó porcentualmente. Las variaciones conductuales se evidenciaron después de una cirugía ocular a la que el oso fue sometido, disminuyendo la frecuencia de comportamientos de descanso y agonistas (de 60-41%; 1-0%) e incrementando la frecuencia de comportamiento alimenticio exploratorio, desplazamiento y vocalizaciones (de 2-69%; 1,2-4,1%; 0,6-1,0%; 6,2-12,7%); aumentaron también los comportamientos filiativos y la interacción con objetos, denotando su restablecimiento psicológico, físico y sanitario. Nuevas variaciones comportamentales fueron registradas diecisiete días tras la cirugía; aumentaron el descanso y las conductas agonistas (de 6- 93%; 0-2%), declinaron la frecuencia y volumen de emisión de vocalizaciones y de los comportamientos exploratorios, desplazamiento e interacción con objetos (de 0,3-30%; 0-22%; 0- 5%; 0-5%); estas alteraciones estuvieron relacionadas con la pérdida súbita de apetito y desgano; este decaimiento posiblemente se debió a las secuelas de los daños en el rostro, que se atendieron exitosamente. Las destrezas adquiridas para su manejo en ZMVP, y la tolerancia que alcanzó el oso con sus cuidadores, además de las mejoras en su recinto dentro su hábitat natural en LSV, coadyuvaron para que el oso actualmente se encuentre rehabilitado.

EVALUACIÓN PRELIMINAR DEL ESTRÉS FISIOLÓGICO MEDIANTE LA PRUEBA DE MICRONÚCLEOS Y EL ANÁLISIS DE ANORMALIDADES NUCLEARES, EN OSOS ANDINOS (*TREMARCTOS ORNATUS*) DEL ZOOLÓGICO MUNICIPAL VESTY PAKOS, LA PAZ, BOLIVIA

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RESUMEN

El estrés puede ser entendido como un desbalance homeostático, como consecuencia de la presencia de distintos estresores ya sean estos físicos o psicosociales. Entre los métodos más conocidos para determinar los niveles de estrés esta la medición de concentraciones séricas de cortisol y catecolaminas en fluidos corporales o heces fecales, pero estos no pueden ayudar a comprender el efecto del estrés sobre el genoma, como es el caso de la prueba de micronúcleos y las anormalidades nucleares. El estrés continuo puede actuar directa o indirectamente a nivel genético, provocando no solo daño genómico, sino también una desregulación del ciclo celular, favoreciendo la aparición de micronúcleos y anormalidades nucleares. Actualmente existen datos sobre las frecuencias basales de estos parámetros para animales de laboratorio, sin embargo, no se tiene información para la mayoría de los mamíferos grandes presentes en zoológicos. El objetivo principal de este trabajo fue evaluar el estrés fisiológico de siete osos andinos adultos (machos=5; hembras=2) mediante la prueba de micronúcleos(MN) y anormalidades nucleares (AN). Aprovechando la facilidad de manejo de esta especie en el Zoológico Municipal *Vesty Pakos* (Centro de custodia de fauna silvestre), en una primera fase se llevó a cabo la toma de muestras de mucosa bucal de estos animales, se prepararon los frotis correspondientes y se analizaron las muestras en laboratorio. Se estandarizo la metodología utilizando como tejido blanco células de mucosa bucal (muestreo no invasivo), ya que la mayoría de estos estudios en animales utiliza como tejido blanco células sanguíneas, posteriormente se estableció la frecuencia basal de MN, datos que constituyen una línea base para futuras investigaciones con esta especie. Los resultados preliminares evidenciaron una mayor frecuencia ($p < 0,05$) de AN (5.82%) en comparación con la frecuencia de MN (2.50%), en todos los individuos muestreados, lo que nos indica la presencia de daño a nivel celular que puede estar relacionado con la presencia de algún factor de estrés, recomendándose evaluar rutinariamente variaciones y significancias en los niveles de MN y AN antes y después de realizar eventos de enriquecimiento.

DETERRENTS TO REDUCE MAIZE CONSUMPTION BY ANDEAN BEAR IN MANU BIOSPHERE RESERVE

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ABSTRACT

Maize production has several predators such as birds, rodents and the Andean bear, causing economic damage. Despite being a low-cost product with a lot of effort during its season, maize is a vulnerable main mean of subsistence with insufficient technical support. In the Manu Biosphere Reserve (Peru) that is one of the reasons for the conflict between the local farmers and the species because is blamed by local communities to be an animal which causes big economic losses to their small-scale farming. Since 2014 Manu National Park and Frankfurt Zoological Society Peru work a human-bear conflict reduction project in the valley of Mapacho of the Manu Biosphere Reserve. An important goal has been the decrease of maize consumption by this species. Since 2015 activities included identification and apply of deterrents such as fireworks, burned chili seeds and scare bear. May is a particularly critical month because the maize is almost ripe and seems to have a particularly good taste to the Bear. A monthly monitoring system was established to measure effectiveness of deterrents by counting maize consumption in 13 fields (2015) and 10 fields (2016). The first-year deterrents were provided to 16 residents, and 26 in the second year. Results show that maize consumption by bear was reduced to 2453 from 659 corn cobs. The deterrents have a dissuasive effect when was applying systematically. In 2017 the monitoring of maize damage and the delivery of deterrent is continuing, to identify the best strategy to reduce the maize consumption by the Andean Bear. As a pilot, substances likely to be olfactory bear deterrents according to tests with Andean Bear individuals in captivity, were field tested. These locally growing substances include garlic, chili and rue (*Ruta graveolens*) paste and finally eucalyptus essence which were marked by different colors in each corn. In 2016 it was applied in three fields, and monitored with camera traps. Preliminary results show that chili and garlic were more effective to avoid bear consumption because few were open and tested; whereas rue and eucalypt did not have any effect. In 2017 the effectiveness of garlic and chili will be further investigated.

DETERMINACIÓN DE LA PRESENCIA DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN EL PARQUE NACIONAL DINIRA

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ABSTRACT

El Oso Andino (*Tremarctos ornatus*, Cuvier 1825) es una figura emblemática de la conservación en Venezuela y en todos los Andes Suramericanos, que constituyen su área de distribución. Es el único representante de la familia Ursidae en Suramérica y la única especie sobreviviente de la Subfamilia Tremartinae (Mondolfi 1971). Es una especie catalogada como Vulnerable de Extinción a nivel global (IUCN 1996, 2015). En Venezuela, de acuerdo con el Libro Rojo de la Fauna Venezolana, se le considera en Peligro de Extinción (García-Rangel et al., 2015), es decir, en una categoría de mucho mayor riesgo que a nivel global. Se distribuye en los ecosistemas andinos del país y encuentra en los parques nacionales un relativo refugio ante las constantes y crecientes presiones antrópicas. Uno de los parques nacionales que se considera brinda una importante protección a las poblaciones de esta especie, es el Parque Nacional (PN) Dinira, debido al área natural relativamente grande que este parque resguarda y al buen estado de conservación de dicho parque (Aponte y Salas, 2004; Yerena Com. Pers. 2016). En esta investigación se plantea evaluar la presencia y patrones de ocupación del oso andino en el PN Dinira, el uso de hábitat por parte de la especie e identificar posibles áreas de conflicto hombre–oso y las causales asociadas a dichos conflictos. Teniendo como objetivos, evaluar la presencia del oso andino en áreas de bosque montano, ecotono páramo-bosque y páramos del Parque Nacional Dinira. Evaluar de forma preliminar patrones de ocupación del oso andino en áreas de bosque montano, ecotono páramo- bosque y páramos del Parque Nacional Dinira. Evaluar el uso de hábitat del oso andino dentro del Parque Nacional Dinira. Evaluar posibles áreas de conflicto hombre-oso en el Parque Nacional Dinira. El PN Dinira fue creado en 1988 con la finalidad de proteger las cuencas altas de los ríos Tocuyo, Chabasquén y Boconó, cuyas aguas son esenciales para el desarrollo de la región centro occidental de país (República de Venezuela 1988; Aponte y Salas 2004). Políticamente el parque comprende parte de los Municipios Morán y Torres del estado Lara; Boconó y Carache, del estado Trujillo y Monseñor José Vicente Unda, del estado Portuguesa. Su extensión total es de 43.328 ha, las cuales se distribuyen en 21.152 ha en el estado Lara, 21.824 ha en el estado Trujillo y 2352 ha en el estado Portuguesa (Figura 1). Ubicado en la Sierra de Barbacoas y parcialmente en la Sierra de Portuguesa, posee un relieve muy abrupto e irregular por comprender cuencas altas enmarcadas dentro de las estribaciones andinas, específicamente en la culminación de los Andes venezolanos (República de Venezuela 2008).

ANÁLISIS DEL HÁBITAT DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN EL BOSQUE SIEMPREVERDE MONTANO Y PERSPECTIVA COMUNITARIA DEL CONFLICTO HUMANO-OSO, PARQUE NACIONAL SANGAY, ECUADOR

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RESUMEN

Realicé un análisis del hábitat para el oso andino (*Tremarctos ornatus*) en el bosque siempreverde montano, al Suroeste del Parque Nacional Sangay, Ecuador, durante los meses de septiembre 2008 a enero 2009. Para ello instalé 30 parcelas rectangulares de 100 m x 90 m donde evalué el uso a través de registros indirectos (p.ej., huellas, heces, comederos de osos) y medí variables locales de hábitat como: cobertura del dosel, diámetro a la altura del pecho (DAP), clases diamétricas, frutos potencialmente consumidos por el oso, cantidad de bromelias epífitas y riqueza de morfo-especies. Analicé la selección del hábitat a través de modelos de ocurrencia y caractericé la vegetación arbórea en zonas habitadas por el oso. El oso seleccionó sitios con árboles de mayor DAP lo cual podría indicar la selección de bosques maduros y posiblemente relacionado a la búsqueda de bromelias epífitas (un recurso alimenticio importante). Aunque las bromelias epífitas no fueron una variable importante en el proceso de selección del hábitat, evidencias de campo mostraron que este recurso podría estar vinculado pues durante la época del estudio la disponibilidad de frutos para el oso fue baja y las bromelias estuvieron presentes mayormente en árboles de mayor talla, entre ellos el mollón (*Prumnopitys montana*) y el sarar (*Weinmannia* sp.) que fueron también los árboles de mayor uso por el oso. Recomiendo un mayor tamaño de muestra para mejorar la evidencia dentro del proceso de selección del hábitat. También realicé un análisis del conflicto ocasionado por la muerte de ganado vacuno debido al ataque del oso andino ocurrido en años pasados en la comunidad de Colepato. Para ello se emplearon técnicas cuantitativas y cualitativas con énfasis en el análisis de las percepciones, ideas e imaginarios de los pobladores de la comunidad. En los últimos 10 años murieron 40 cabezas de ganado y 1 resultó herida por el ataque del oso. Los ataques de oso se produjeron sobre ganado que pastaba aislado en las partes altas cercanas a zonas boscosas y a más de 12 km de distancia del centro poblado. Las percepciones negativas sobre el oso por parte de los entrevistados en Colepato estuvieron asociadas con personas que no asistieron a la escuela, así como a la experiencia por la pérdida del ganado atacado por el oso. Sin embargo, el oso genera un vínculo con la gente reflejado en el amplio conocimiento popular ecológico que poseen y que podría ser empleado en futuras estrategias de conservación del oso andino.

EVALUACIÓN DE LA CONTRIBUCIÓN DEL PROGRAMA NACIONAL DE OSO ANDINO PARA LA CONSERVACIÓN DE LA ESPECIE EN COLOMBIA

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RESUMEN

Se avalúa la contribución del "Programa Nacional para la Conservación y recuperación del Oso Andino (*Tremarctos ornatus*), especie amenazada de los ecosistemas andinos colombianos" mediante el análisis de los aspectos definidos en los Estándares abiertos para la práctica de la conservación (ciclo de manejo adaptativo), la evaluación sumativa y formativa. Si bien el enfoque de la evaluación se dirige generalmente a los resultados, la contribución se visualizó como la integración de los enfoques de la evaluación mencionada y el éxito del programa en cuanto a los elementos que favorezcan las poblaciones de oso andino, los aspectos rectores a la luz de la aplicación de los Estándares abiertos para la práctica de la conservación y la evaluación del proceso, diseño e implementación del mismo. Este estudio se realizó en un momento coyuntural, considerando que el horizonte de planeación fue de 15 años (2001–2016). Las técnicas utilizadas para la recolección de información y datos fueron búsqueda de bibliografía, y el aporte de expertos logrado a través de entrevistas semi-estructuradas y espacios de discusión en el marco del III Simposio Internacional de Oso andino en 2014. El análisis de los datos se realizó utilizando los paquetes informáticos Atlas ti y Miradi. Los resultados obtenidos permitieron conocer la contribución del programa alrededor de los aspectos exitosos que logran el aumento las poblaciones de oso andino, lecciones aprendidas, oportunidades de mejora y aspectos de gestión que permiten ensamblar las acciones adelantadas, buscando que este estudio sea soporte técnico para la toma de decisiones y la política pública que promueva la efectividad adecuada para el futuro del Programa Nacional de Oso andino en Colombia.

PROPUESTA DE CONSOLIDACIÓN DEL CORREDOR BIOLÓGICO DEL OSO ANDINO (*TREMARCTOS ORNATUS*) EN EL SUROESTE Y OCCIDENTE MEDIO DE ANTIOQUIA (COLOMBIA) COMO ESTRATEGIA PARA SU CONSERVACIÓN EN EL DEPARTAMENTO

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RESUMEN

El departamento de Antioquia está situado al noroeste de Colombia y cubre la porción más septentrional de las cordilleras Occidental y Central que atraviesan el país, en las cuales se localizan las subregiones del Suroeste y Occidente medio antioqueño. En esta esquina noroccidental de Colombia, se inicia el denominado "puente centroamericano" de alto significado zoogeográfico. Se estima que en estas subregiones se encuentran las mayores poblaciones de oso andino en el departamento, sin embargo, aún hay un enorme desconocimiento de la especie por parte de sus pobladores locales, así como muy pocos estudios y proyectos de conservación a largo plazo en el ámbito investigativo y académico. Desde los años 90, el biólogo y especialista en oso andino Héctor Restrepo, ha venido levantando y recopilando información sobre la especie y llevando a cabo acciones de socialización de la misma, en las comunidades rurales del Suroeste Antioqueño. En el año 2012, la estudiante Natalia Delgado en cabeza y acompañamiento del grupo de estudio "Oso Andino", observaron un individuo de la especie y registraron rastros de actividad, aportando conocimientos sobre su dieta para el departamento. Desde el año 2016, la Corporación GAIA y varias ONG sociales y ambientales del departamento, se han unido para afianzar una estrategia de corredor biológico del oso andino en el Suroeste y Occidente medio de Antioquia; la cual tiene como objetivos identificar, restaurar y reconectar los ecosistemas que han sido intervenidos, favoreciendo la recuperación de los bosques altoandinos y andinos. El corredor hará parte del Sistema Departamental de Áreas Protegidas de Antioquia y se abordará como una estrategia integral de articulación con los planes de manejo de las 8 áreas protegidas departamentales y nacionales que lo integran. a conservación del oso andino y la recuperación de su hábitat en Antioquia, traerían beneficios de particular importancia para la región Andina, entre ellos la conservación del agua, el incremento de la resiliencia frente al cambio climático y otros fenómenos naturales, la sostenibilidad ambiental y social de la economía cafetera, entre otros de gran importancia social, económica y política para el departamento y el país.

CATTLE-BEAR INTERACTION IN PAMPA HERMOSA NATIONAL SANCTUARY (PERU)

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ABSTRACT

Andean bear-cattle interactions are one of the reasons for the problematic coexistence of humans and bears. In rural areas, cattle vulnerability is higher because of extended livestock farming without any technical support. This species is seen as a threat to a main mean of subsistence that is reflected in hunting or poisoning seen as quick solutions. In 2015, the Peruvian National Service of Forestry and Wildlife (SERFOR) studied human-bear conflicts with the collaboration of the National Service of Natural Protected Areas (SERNANP). This was the first work by a national institution focused on this topic. Fieldwork was developed in San Pedro de Churcos, a community in the Junín region and buffer zone of Pampa Hermosa National Sanctuary. Activities included interviews to owners affected by death of cattle, characterization of cattle raising and in situ evaluation to identify the causes of death (looking for signs and other evidence). The results indicate that there is an overlap of bear habitat and cattle raising in forest and grassland areas, outside and inside Pampa Hermosa. In the field 13 dead cattle were inspected, but only three could be recognized as bear attacks. They have similar characteristics of attack: the animal back is open from the nape to the end of the ribs or sacrum, as well as some bites in the skull and marks on the extremities. This is the same description of local people about bear attacks. Also from interviews it was identified that local people think this is a learned attitude because 10 years ago bears did not attack frequently. It could be for two reasons: 1) reduced human presence due to terrorism, and 2) extermination of other predators by hunting. Finally, they ask for economic compensation but were also satisfied with receiving technical support to improve potato and livestock crops. Recommendations to work on conflict reduction in short periods focus on the use of visual and acoustic deterrents to recreate human presence. In medium and large periods, it is necessary to regulate livestock activity, bringing them closer to the houses, growing pastures, and surrounding the animals.

LIMITACIONES FÍSICAS EN MOVIMIENTO DE MARCHA EN DOS EJEMPLARES MACHOS DE OSO ANDINO (*TREMARCTOS ORNATUS*), REGISTRADOS EN LA POBLACIÓN DEL MACIZO CHINGAZA EN EL MUNICIPIO DE JUNÍN, CUNDINAMARCA, COLOMBIA

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RESUMEN

Entre 2011 y 2016 se recopilaron 4198 archivos visuales de osos andinos provenientes de cámaras trampa ubicadas en el municipio de Junín; de estas 1,76 % registraron a "Juancho" y 0,23% fueron registros de "Pepe". Juancho presenta una macha triangular y evidente en la frente, lo que permite identificarlo fácilmente en fotos, pero los registros de videos dejan ver una lesión en su pata izquierda (rigidez) muy evidente, lo que facilita su identificación en videos sin la necesidad de ver las manchas de cara y pecho; este animal se ha registrado desde 09-29-2011 hasta 03-08-2016. Pepe es un macho adulto y viejo, definido por la coloración blanquecina de su nariz, que se identifica en fotografía difícilmente; presenta manchas inconspicuas en el hocico, pero en los registros de videos se identifica por un movimiento circular en la articulación de la cadera cuando camina. Este macho se registra en el sector desde 20-04-2012 hasta 04-09-2016. Ambos ejemplares se han registrado de manera intermitente. Las limitaciones físicas de estos dos ejemplares han permitido identificarlos claramente en el monitoreo que se ha realizado en el municipio de Junín, evidenciando un periodo de cinco años de supervivencia en una zona donde la muerte de oso por retaliaciones es muy activa. Los estudios de hábitat realizados durante 2015 y 2016 muestran que los ambientes usados son de baja calidad y se presume que la restricción en sus movimientos limita sus desplazamientos y los hace residentes de esta zona. Ente septiembre de 2015 y mayo de 2016 se obtuvieron 12 registros de Juancho y cuatro de Pepe. Las afectaciones en movimientos de marcha son comunes en osos y en esta especie pueden deberse a que sus hábitos arborícolas conllevan accidentes de caída desde las alturas en diferentes edades, que eventualmente pueden afectar las articulaciones especialmente en la cintura pélvica, lo que se aprecia en animales adultos que han sobrevivido largo tiempo, pero también pueden ser enfermedades degenerativas articulares e incluso enfermedades de transmisión sexual.

CONTRIBUCIÓN AL CONOCIMIENTO DE LA BIOLOGÍA REPRODUCTIVA DEL OSO ANDINO (*TREMARCTOS ORNATUS*)

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RESUMEN

La biología básica del oso andino es aún poco conocida y no existe información sobre eventos reproductivos en Bolivia. Este trabajo describe eventos de estro en condiciones de semicautiverio y hace comparaciones con el mismo evento ocurrido en cautividad en un parque zoológico. Las observaciones en semicautiverio se realizaron en el refugio de vida silvestre La Senda Verde (LSV) ubicada al noreste de La Paz, en un bosque montano nublado de los Yungas, a 1200 msnm, delimitado por un río. LSV alberga tres osos, dos machos y una hembra saludable y activa, separados cada uno en exclusiones con bosque nativo. Las comparaciones se realizan con información secundaria, particularmente a partir de eventos de celo registrados en dos parejas reproductoras mantenidas en cautiverio fuera del rango natural de la especie en el Zoológico de Paraguaná, Venezuela, a 29 msnm, un área caracterizada por un clima semiárido y árido, bañado constantemente por vientos alisios. Se observa una diferencia marcada por el hecho de que la literatura reporta un celo anual en cautiverio, entre los meses de abril a septiembre en el hemisferio Norte, entre febrero y julio en el hemisferio Sur, y en vida silvestre durante la temporada de lluvias según algunos autores, mientras que en nuestras observaciones en semicautiverio en Bolivia se observan dos celos al año, uno entre diciembre-enero y otro entre junio-julio. Se requieren más investigaciones considerando otras variables, tales como la abundancia de alimentos, el espacio y las condiciones de manejo. Es necesario ampliar el tamaño muestral para obtener resultados definitivos.

PRESENCIA DEL OSO ANDINO EN EL DISTRITO DEL ZONGO, MUNICIPIO DE LA PAZ, LA PAZ -BOLIVIA

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RESUMEN

El oso andino (*Tremarctos ornatus* Cuvier 1825) es la única especie de la familia Ursidae en Sudamérica. Se encuentra incluido dentro del apéndice I de CITES y es considerado por la IUCN como una especie Vulnerable. En Bolivia está presente en los departamentos de La Paz, Cochabamba, Santa Cruz, Sucre y Tarija, abarcando una gran diversidad de hábitats como ser yunga, pajonales andinos y bosques nublados subandinos de la Vertiente Oriental Andina. Los datos sobre la distribución del oso andino en el Departamento de La Paz registran presencia en el Área Natural de Manejo Integrado Nacional Apolobamba, el Parque Nacional y Área Natural de Manejo Integrado Madidi, el Parque Nacional y Área Natural de Manejo Integrado Cotapata y el Sub Municipio de Lambate. En este trabajo presentamos un nuevo registro de distribución del oso andino en la Zona denominada Zongo en el Municipio de La Paz y ampliamos su distribución. Para su registro, se realizaron transectos lineales elegidos aleatoriamente, cada transecto de 200 m, dispuestos sobre crestas y/o arroyos cuando fuera posible, para procurar obtener suficiente número de datos de presencia para los modelos de distribución. Cada transecto se recorrió una sola vez, buscando rastros (huellas, heces, etc.) del oso; se contó con un guía local con experiencia en reconocimiento de huellas y otros rastros. Nuestros resultados confirman la presencia del oso andino en una zona cercana a las Unidades de Conservación del Oso (UCO). Este es el primer registro confirmado con evidencia física de la presencia del oso andino en el área de Zongo, Municipio de La Paz, departamento de La Paz. Esta información permitirá mejorar las estrategias para la conservación de la especie en la región y es un argumento sólido para la creación de un área para la preservación de la fauna silvestre.

EL OSO ANDINO (*TREMARCTOS ORNATUS*) EN UN ESCENARIO DE CAMBIO CLIMÁTICO EN EL ÁREA NATURAL DE MANEJO INTEGRADO NACIONAL APOLOBAMBA, LA PAZ, BOLIVIA

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RESUMEN

Los procesos de cambio climático se están acelerando debido a variaciones significativas en las concentraciones atmosféricas de gases de efecto invernadero y los aerosoles, siendo las actividades humanas la principal causa de este incremento. La Cordillera de los Andes es de las regiones ecológicamente más vulnerables ante el cambio climático, así como lo son especies endémicas y/o de alto valor ecológico de esta región que depende de diversos ecosistemas, actualmente amenazados por este proceso global. El Área Natural de Manejo Integrado Nacional Apolobamba abarca dos tipos principales de hábitat: bosque nublado de ceja de yungas y páramo yungueño, ambos frágiles ante cualquier alteración o variación climática. Esta zona forma parte del hábitat del oso andino (*Tremarctos ornatus*), categorizado como Vulnerable; la reducción, pérdida y fragmentación de su hábitat son la principal amenaza para su conservación. Por este motivo, un posible impacto provocado por el cambio climático sobre su hábitat incrementa el riesgo de conservación del oso andino. Para evaluar el posible efecto del cambio climático sobre la idoneidad del hábitat de esta especie, se construyó un modelo de distribución de la especie utilizando el programa PRESENCE con base en datos climáticos y de cambios en la cobertura de la tierra. Adicionalmente, se evaluó el efecto de cambios en la densidad de la población humana local y el papel de los parques nacionales en la mitigación del efecto del cambio climático sobre la idoneidad del hábitat del oso andino. Los resultados preliminares sugieren una pérdida de la cobertura boscosa y cambios en el ciclo pluvial con un incremento de sequias, lo cual se traduce en cambios en la distribución del oso, registrándose su presencia en áreas donde antes no estuvo, lo que ha ocasionado mayor conflicto en áreas de agricultura tradicional. Este estudio resalta el efecto dramático que tiene el cambio climático particularmente sobre el oso andino en un área protegida, ocasionando el incremento del conflicto oso-gente. Este estudio brinda información para comprender estos fenómenos y promover la coexistencia con la especie.

PATRONES DE ACTIVIDAD Y RELACIONES ECOLÓGICAS DE OSO DE ANTEOJOS, CON TRAMPAS CÁMARA EN DOS FORMACIONES VEGETALES DEL PARQUE NACIONAL CAYAMBE COCA Y LA RESERVA ECOLÓGICA ANTISANA

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RESUMEN

Los bosques nublados y páramos del norte de Ecuador albergan al oso de anteojos, uno de los carnívoros más grandes amenazado por la pérdida de hábitat, fragmentación, cacería y el conflicto gente fauna silvestre. Los muestreos con cámaras están siendo usados para evaluar relaciones entre el patrón de actividad de depredadores, sus presas y sus potenciales competidores interespecíficos. Basados en una escala de 24 horas permite medir el grado de solapamiento entre especies, uso de recursos y competencia en el tiempo y el espacio. Con el objetivo de evaluar las relaciones entre el patrón de actividad del oso y sus presas, así como su principal competencia, el puma, realizamos entre los años 2012-2013 muestreos con trampas cámara en cuatro localidades del PNCC y la REA en dos formaciones vegetales, páramo y bosque montano alto. Se instalaron 40 cámaras al azar, distanciadas entre 2 y 2.5 km de longitud, las cuales permanecieron activas por 45 días en cada una de las parcelas. Con un esfuerzo de muestreo de 7200 cámaras/noche en 344 km2 aproximadamente, mediante curvas de densidad de Kernel (paquete Overlap R) se evaluaron los patrones de actividad para *Tremarctos ornatus*, *T. ornatus – Puma concolor* ($\Delta1=0.67$(IC95%0.71-0.42 BMA; $\Delta1=0.12$(IC95%0.38-0.23 Páramo); *T. ornatus – Silvilagus andinus* ($\Delta1=0.046$(IC95%0.25-0.06 Páramo); *T. ornatus – Cuniculus taczanowskii* ($\Delta1= 0.11$(IC95%0.22-0.07 BMA-Páramo); *T. ornatus – Tapirus pinchaque* ($\Delta1=0.53$(IC95%0.57-.034 BMA; $\Delta1= 0.32$(IC95%0.73-0.33 Páramo) y *Mazama rufina* ($\Delta1=0.36$(IC95%0.41-014 BMA; $\Delta1= 0,37$(IC95%0.53-0.29 BMA-Páramo) . Los resultados sugieren que el oso de anteojos es de hábitos diurnos, con picos de actividad entre las 11:00 y 15:00 horas. Evidenciamos también un fuerte efecto de hábitat entre páramo y bosque montano alto tanto para el oso, así como para sus presas y el puma. La presencia de osos y puma, temporal y espacialmente en el área de estudio, sugiere que no existe exclusión competitiva entre estas especies. La evaluación de los patrones de actividad son una buena herramienta que permiten evaluar el efecto del hábitat, disturbios y animales introducidos en las especies estudiadas.

GENETICS & PHYSIOLOGY

HOW MUCH DOES A FOLLICLE MATTER? TESTING THE EFFECT OF FOLLICLES ON HAIR CORTISOL LEVELS IN BROWN BEARS

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ABSTRACT

Hair is commonly used to study long-term stress in free-ranging wildlife. Cortisol is believed to be integrated into hair primarily during its active growth phase, known as anagen, for which the duration is species-specific but typically lasts weeks to months. Thus, cortisol levels in hair should represent hypothalamic-pituitary-adrenal axis activity occurring during this time. However, cortisol may also enter the growing hair via diffusion from the external environment, tissues surrounding actively growing hair, or as the results of glandular apocrine, sebaceous, and sweat secretions in and around the follicle. It has been also demonstrated that a parallel "cortisol-production system" within skin, including hair follicles, does exist. To our knowledge, the potential differences in cortisol levels between hair analyzed with follicles intact versus hair analyzed with follicles removed have not been investigated. However, this is important to understand for two reasons: (i) comparisons between studies may not be valid if both studies used identical cortisol extraction procedures except that one study extracted cortisol from hair including follicles whereas the other study extracted cortisol from hair shafts only, and (ii) the manual removal of follicles from plucked hair samples is extremely time-consuming. In this study we tested the hypothesis that cortisol present in follicles positively influences hair cortisol concentrations (HCC), by comparing subsamples of brown bear hair extracted with and without follicles. We observed greater cortisol concentrations in subsamples extracted with follicles compared to those extracted without follicles, thus supporting our hypothesis. These findings should help to unify hair collection and preparation methods for comparisons, and to optimize labor input in ecophysiological studies.

HELMINTH PARASITES OF FREE-RANGING EUROPEAN BROWN BEARS FROM THE WESTERN AND EASTERN POPULATION SEGMENTS IN THE POLISH CARPATHIANS

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ABSTRACT

Brown bears living in Poland represent a small part of the Carpathian population, which currently extends over the Czech Republic, Slovakia, Poland, Ukraine, Romania, and Serbia. Although bears can be found along the Carpathian range, the distribution of breeding females is discontinuous. The population in Poland consists of two main segments. The western segment covers the Tatra Mountains and Beskid Żywiecki, while the eastern segment inhabits the Bieszczady region. The bear population in the Polish Carpathians in 2010 was estimated at around 100 individuals (68-117). In the first survey of gastrointestinal parasite infection in brown bears in Poland, coproscopic examination of the two population segments (Tatra Mts. and Bieszczady Mts.) was carried out in 2006-2016. In total, 517 fresh samples of feces were collected during bear tracking, field visits to telemetry locations, and related fieldwork: 175 and 342 samples from Tatra and Bieszczady Mountains, respectively. Feces (approximately four grams) were analyzed using two parallel methods: modified McMaster's method (quantitative), and flotation method (qualitative). Eggs and larvae of eight helminth taxa were morphologically identified: flukes (*Alaria* spp.), tapeworms (Taenidae spp., *Mesocestoides* spp.) and nematodes (*Baylisascaris transfuga, Eucoleus* spp., hookworms: *Ancylostoma* spp./*Uncinaria* spp., *Toxocara* spp., and Strongylidae spp.). Among the parasites recorded, the most frequent were eggs of *B. transfuga* (found in 36% samples; 326.9 eggs per gram - EPG), tapeworms of the family Taenidae spp. (found in 6,6% samples, 598.8 EPG), and nematodes of the genus *Eucoleus* (found in 4,4% samples, 56.4 EPG). The comparison of the two studied population segments showed significant differences in the species richness, infection frequency, and intensity measured by the EPG index. The differences may result from the history of separation of the population segments, different characteristics of the two inhabited areas, and different climate, as well as fauna and flora species composition, and, consequently, bear diet.

COMPOSITION AND MICROBIAL DIVERSITY IN CAPTIVE AND FREE RANGING WILD SLOTH BEARS (*MELURSUS URSINUS URSINUS*) – A COMPARATIVE ANALYSIS

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ABSTRACT

Sloth bears are endemic to the Indian subcontinent. In India, sloth bears are found from the foothills of the Himalayas to the Western Ghats southern end. Most sloth bears are opportunistic omnivores. As such, their nutrition is governed by the availability of food items and dietary components within their habitat based on season. Nutrition plays an important role in the health and reproductive status of sloth bears. The diet, which is variable between captive and free ranging sloth bears, strongly influences the gut microbiota. The quality and the quantity of the DNA isolated from scat samples of captive and wild sloth bears were estimated before further downstream processing. Amplicons were generated targeting the V3-V4 region using specific primer sets. A library was then prepared using Nextera XT Index Kit, which was then sequenced on Illumima MiSeq using 2x300 bp chemistry. The mean of the library fragment size was 578 and 594 bp for the captive and wild sloth bears respectively. In captive bears we obtained 492,604 high-quality reads (~250Mb data corresponding to 1023 OTUs) while in wild bears 260,798 reads were obtained (~132 Mb corresponding to 1139 OTUs). The bioinformatic analysis of the sequences obtained from the samples was analyzed using QIIME and the results obtained are presented. In captive sloth bears at the phylum level, it was estimated that sequences affiliated to *Firmicutes* were the most abundant (82.81%) followed by Proteobacteria (15.7%). In the case of free-ranging wild sloth bears, it was evidenced that the most abundant phylum was Proteobacteria (66.49%) followed by *Firmicutes* (30.42%). In captive sloth bears, 0.71% of sequences corresponded with the phylum Fusobacterium while *Bacteroidetes* was the third most abundant phylum (1.77%) in wild sloth bears. A further analysis was conducted to obtain a deeper insight into the microbial community composition at the genus level. The analysis further revealed that in the captive sloth bears the genus *Sarcina* was predominant (35.35%) followed by *Streptococcus* (15.13%), unclassified genus from Clostridiaceae (11.96%) and unclassified Enterobacteriaceae (8.27%). However, in free-ranging wild sloth bears it was observed that the genus unclassified Enterobacteriaceae predominated (46.75%), followed by *Klebsiella* (11.17%), *Enterococcus* (5.58%), *Lactococcus* (3.92%), and unclassified Planococcaceae (3.17%). There was a clear difference in the microbial profile in the captive and free-ranging wild sloth bears, where the diversity was distinct and higher in wild sloth bears. The reason for this could be the specific dietary regimen provided to captive sloth bears whereas wild animals have access to a variable omnivorous diet.

PHYLOGEOGRAPHY OF BLACK BEARS IN THE NORTHEASTERN UNITED STATES

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ABSTRACT

American black bears (*Ursus americanus*) in the northeastern United States have been growing in population size and expanding in range since the mid-1900s. They have experienced a series of population bottlenecks and growth after expanding out of glacial refugia 1.8 million years ago. Understanding patterns of historical demography of black bears and the resulting geographical distributions of genetic lineages can aid management, especially as black bears are a game species in eight of the 11 northeastern states. We conducted a phylogeography study of black bears in the northeastern US to estimate contemporary levels of genetic diversity, structure, and gene flow. We collected genetic samples from n=348 harvested, nuisance, and research bears from Maine to West Virginia. We sequenced a ~450 base pair segment of mitochondrial DNA overlapping the control region and 15 nuclear microsatellite markers to characterize genetic diversity and structure. We identified mitochondrial diversity consistent with previous findings at coarser, continental-wide scales of investigation. Microsatellite analyses were used to test for non-equilibrium patterns of gene flow and range expansion. This study will provide targeted, high-resolution insight for the northeastern geographic range into factors that historically influenced bear movements and may still be reinforcing population structure. We discuss the implications of these findings for serving as a baseline for ongoing bear management and future assessments of population genetic structure in the northeastern United States.

PREDICTION OF ARTERIAL BLOOD GAS VALUES FROM VENOUS BLOOD GAS VALUES IN ASIATIC BLACK BEARS (*URSUS THIBETANUS*) ANESTHETIZED WITH INTRAMUSCULAR MEDETOMIDINE AND ZOLAZEPAM/TILETAMINE

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ABSTRACT

The objective of this study was to measure differences between arterial and venous blood gas parameters and to evaluate whether arterial blood gas values can be estimated from venous blood gas values in Asiatic black bears. Twelve healthy captive Asiatic black bears (8 male, four female; 8–16 years; 76.8–220 kg) were included in this study. The bears were immobilized with zolazepam/tiletamine and medetomidine using a dart gun. Arterial and venous samples were collected simultaneously by two veterinarians 5 and 35 min after recumbency (5- and 35-min points). Partial pressure of oxygen (PO_2), partial pressure of carbon dioxide (PCO_2), pH, bicarbonate (HCO_3^-), total carbon dioxide (TCO_2), oxygen saturation of hemoglobin (SO_2), and base excess (BEecf) were analyzed using a portable blood gas analyzer. There was no marked difference in measured and calculated variables over time in both venous and arterial blood except for PO_2. However, arterial PO_2, SO_2, and pH values were significantly higher, and arterial PCO_2, TCO_2, and HCO_3^- values were lower than those of venous samples at both the 5- and 35-min points. Between arteriovenous samples, BEecf showed good agreement. In the simple linear regression analysis to estimate arterial values from venous values, PCO_2, TCO_2, HCO_3, BEecf, and pH showed over 0.41 in coefficient of determination value (R^2) at both the 5- and 35-min points and they were statistically significant. Thus, arterial gas analysis values cannot be replaced by venous blood gas analysis values, except for BEecf. However, if we could not get the arterial blood, we suggest the use of estimated regression formulas for arterial blood values based on venous blood in this study, except for PO_2 and SO_2.

SERUM CHEMISTRY VALUES OF FREE-RANGING ASIATIC BLACK BEARS (*URSUS THIBETANUS*) IN SOUTH KOREA

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ABSTRACT

The objective of this study was to establish the reference values of serum chemistry for the free-ranging Asiatic black bears in both hibernating and active season, and to confirm the differences by sex and age. Reference values for 29 blood chemistry parameters were established based on total 156 blood samples from clinically healthy 49 free-ranging bears (25 males and 24 females, one to 11 years) in Jirisan National Park, South Korea, 2005–2016. The bears were chemically immobilized by darting with a combination of tiletamine- zolazepam and medetomidine. Females had higher levels of glucose (GLU) and albumin (ALB), and lower levels of triglycerides (TG) than males ($P < 0.05$) during hibernation periods. Females had higher level of blood urea nitrogen versus creatinine (U/C ratio) than males during active periods. During hibernating periods, the levels of creatinine (CRE), total cholesterol (TCHO), and TG were higher, and U/C ratio and lactate dehydrogenase (LDH) were lower than active periods in all age groups ($P < 0.05$). The values of aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT) and LDH were higher in active periods than those in hibernating periods ($P < 0.05$). There was a tendency for the level of hemoglobin to be higher in young bear groups during the hibernating periods. These differences among groups in serum chemistry values may be due to metabolic changes by seasons and growth. This is the first report of blood chemistry reference values for free-ranging Asiatic black bears during the active and hibernating seasons. Our study showed normal reference values by season, sex, and age, and it would be helpful for evaluating health condition in free-ranging Asiatic black bears.

SEASONAL ALOPECIA IN A POLAR BEAR (*URSUS MARITIMUS*) FEMALE

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ABSTRACT

A female polar bear presented recurrent seasonal alopecia from September to February. The first symptoms started in August with pruritus and stereotypies, and hypotrichosis developed in October. In January the hair loss reached a peak and was characterized by symmetrical alopecia with partly bald areas, which were most pronounced on legs, flanks, back, breast, and forehead. From February onwards, the hair started to regrow and the bear had a normal fur from April to August (observed from 2010 – 2017). Diagnostics included skin biopsies, exclusion of ectoparasites and fungi, hematology, serum biochemistry, hormone (progesterone, estrogen, testosterone, cortisone, triiodothyronine, thyroxin), vitamin, and heavy metal status. All parameters were within published references or negative. standard therapies, like repeated administration of ivermectin, Vitamin ADE and fish oil were given, without any benefits. Histological examination of skin biopsies from completely alopecic regions revealed a complete absence of hair follicles, a moderate perivascular, mainly lymphocytic and plasma cellular infiltrate, a partially parakeratotic and partially orthokeratotic 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, which is a big success for the animals' welfare. For the first time, she had a significantly better 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.

ASSESSING PHYSIOLOGICAL STATUS: A PRELIMINARY STUDY OF FATTY ACID COMPOSITION IN BROWN BEARS FROM CROATIA AND POLAND

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ABSTRACT

Serum fatty acids (FA) level provides an important measure of the physiological and immunological state and can provide a health assessment. The objective of this study was to determine the FA composition in serum of brown bears from Croatia and Poland. The study was conducted on 20 animals, 10 from Croatia (4 females, F; 6 males, M), and 10 from Poland (3 F, 7 M). Seven serum samples were collected during 2015 and 2016 from brown bears in Croatia, and seven samples during 2014, 2015, and 2016 from brown bears in Poland during capturing and radio-collaring. Six samples were collected from bears in captivity (three samples from both countries). Total lipids were extracted and the composition of FA methyl esters was determined by gas chromatography. Results showed that lipids isolated from serum of brown bears in Croatia were dominated by polyunsaturated fatty acids (PUFA) ($41.7\pm9.8\%$; the most common linoleic acid, C18:2; $24.7\pm8.4\%$). Serum of brown bears in Poland was dominated by saturated FA ($38.0\pm2.81\%$; the most common palmitic acid, C16:0, $16.9\pm2.3\%$). In bears from Croatia saturated FA constituted $36.4\pm6.2\%$ (the most common palmitic acid, $15.2\pm4.2\%$), while in bears from Poland PUFA constituted $32.8\pm5.3\%$ (the most common linoleic acid, $18.6\pm3.9\%$). In Croatian bears monounsaturated FA constituted $21.3\pm6.3\%$ vs. $28.8\pm6.7\%$ in bears from Poland (the most common oleic acid, C18:1c9; $15.5\pm4.1\%$ and $21.3\pm6.3\%$, respectively). Significantly higher percentages of C18:2, C20:5, PUFA as well as C20:5/C22:6 ratio (EPA/DHA) were found in Croatian bears. In contrast, a higher ratio of C16:1t, C18:0, C18:1c9 and MUFA was found in bears from Poland. Females from Croatia had a higher ratio of C18:2, while females from Poland had a higher ratio of C18:1c11. Male bears from Croatia had a higher percentage of C20:4n-6, C20:5, as well as of arachidonic acid/DHA and EPA/DHA ratios, while males from Poland had a higher percentage of C16:1t, C18:1c9 and C20:1. Fatty acids as C18:2, C20:4n-6, DHA and EPA are required for normal physiological functions linked to membrane integrity and regulatory cell signals. This is a preliminary study and future research should be focused on a larger sample size to provide better health assessments of the two bear populations. The results present valuable contributions to physiological studies of the European brown bear.

BODY CONDITION SCORING IN CAPTIVE SLOTH BEARS (*MELURSUS URSINUS*)

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ABSTRACT

The exaggerated size of sloth bears owing to their shaggy coat acts as a challenging factor in assessing body condition of captive sloth bears. A five-point scoring system from 1 to 5 of both visual and palpable body condition was developed at the Bannerghatta Bear Rescue Center of Wildlife SOS. The score system ranged from 1 for thin, 2o for underweight, 3 for ideal, 4 for overweight and 5 for obese. The primary parameter taken into consideration for visual scoring was the appearance of the neck, abdomen, limbs and rump, while the palpable score was based on the prominence of scapular spine, pelvis and ribs. Visual body condition scores were assigned to all 85 sloth bears housed at the center in autumn 2015 and 2016, and spring 2015. The population was divided into age groups: cubs (0-2), juveniles (3-4), adults (5-20) and geriatrics (21-25). The effect of season, age, and gender on body condition score was evaluated. Significant relationships were found between season and BCS, and between age and BCS. Gender had no effect on BCS. With the increased incidence of diseased, overweight, and obese sloth bears in captivity, a scoring system will allow veterinarians to keep a constant tab on their physical condition and welfare. Further studies should be carried out on the relationship of the score to diet, gender, season, disease conditions and various age groups.

FECAL PROGESTERONE LEVELS IN A REPRODUCTIVELY-ACTIVE FEMALE ANDEAN BEAR

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ABSTRACT

Longitudinal changes in fecal progesterone concentrations were monitored in a female Andean bear (*Tremarctos ornatus*) for a total of approximately 14 months. Fecal sampling began before breeding was observed, and monitored regularly after that up until the day of parturition. Fecal progesterone levels remained relatively stable for eight months, then spiked approximately eight weeks before parturition, with a gradual rise in fecal progesterone levels until the week of parturition, when another spike was observed. The results of this analysis are compared with progesterone levels observed in other studies of fecal progesterone in Ursids. This study supports the idea that fecal progesterone can be a useful indicator in determining reproductive state in female Andean bears, but a study with more females should be undertaken to determine the degree of variability of fecal progesterone levels in individuals. It is hoped that this wider study will shed new light on the reproductive physiology of female Andean bears.

AN ATTEMPT TO ESTABLISH BASELINE DATA OF FECAL GLUCOCORTICOID METABOLITES OF CAPTIVE SLOTH BEAR (*MELURSUS URSINUS URSINUS*) FOR PRACTICAL APPLICATIONS AND INTERPRETATION

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ABSTRACT

Fecal cortisol levels are considered as a reliable non-invasive biomarker to assess the physiological (endocrine) stressors in wildlife. Sloth Bear (*Melursus ursinus ursinus*) fecal samples at the Wildlife SOS, Bannerghatta Bear Rescue Centre, Bannerghatta Biological Park, Karnataka, India (12 degrees 48'N; 77 degrees 34'E) were analyzed using the ELISA technique to obtain a reference range for the species. The geographical location of the Bear Rescue Centre is within the natural habitat of free ranging wild sloth bears. All the captive sloth bears sampled were maintained under the same husbandry and nutrition practices. Sampling was done between 1100 hrs to 1300 hrs, post-feeding, considering the diurnal patterns of secretion of hormones. A methanol-based extraction was carried out followed by sample preservation at -20°C until ELISA. This study has kept in mind the difficulties faced in sampling and sample storage in field areas and has used field-friendly methods for both. The results of fecal cortisol levels were analyzed based on sex [10 (M):11 (F)] and estrus (n=5). The mean fecal cortisol level was 144.73 ng/g of feces in males, 156.34 ng/g feces in females not in estrus and 228.53 ng/g of feces in estrous females. We conclude that the fecal cortisol level was significantly higher in non-estrus females than in male sloth bears (p<0.05), whereas fecal cortisol levels in estrous females were 1.5 to 3 times higher than non-estrous female sloth bears(p<0.05), indicating increased stress during estrus. We further intend to study the effects of estrus, nutrition, age, disease, and environmental stress on fecal cortisol along with a comparison of captive to free-ranging wild sloth bear stress levels to conclude the sensitivity, specificity, precision, and accuracy of the protocol. With an increased focus on captive animal welfare and man-induced stress on free ranging wildlife populations, this baseline set for non-invasive monitoring of adrenocortical activity in sloth bears will be useful for a more efficient management of captive and rescued sloth bears.

CHANGES IN BODY TEMPERATURE AND HEART RATE DURING HIBERNATION IN CAPTIVE MALE AND FEMALE JAPANESE BLACK BEARS (*URSUS THIBETANUS JAPONICUS*)

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ABSTRACT

To investigate physiological changes during hibernation of male and female Japanese black bears (*Ursus thibetanus japonicus*), their subcutaneous body temperatures and heart rates were monitored from pre-hibernation to post-hibernation periods under captive condition by using implantable loggers. In the pre-hibernation period, body temperatures and heart rates drastically declined just after moving bears to denning rooms. In the early stage of hibernation, body temperatures of pregnant and pseudo-pregnant female bears were higher and more stable than those of non-pregnant female and male bears from December to early January ($P<0.05$), and then dropped to similar levels to those of non-pregnant female and male bears from late January to early February. From mid- to late-stages of hibernation, body temperatures and heart rates synchronously fluctuated with multi-day intervals. These findings suggest that moving bears into denning rooms may accelerate the physiological condition of hibernation, and that, in the first-term of hibernation, endocrine change such as progesterone increase would maintain high body temperatures without affecting heart rates in pregnant and pseudo-pregnant female bears. The parallel fluctuation between body temperature and heart rate suggests that the sympathetic nervous system is involved in the regulation of body temperatures and heart rates during hibernation in the Japanese black bear.

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

Out of five wildlife sanctuaries in the Chamba district, reasonable population of Himalayan brown bears have been recorded in three wildlife sanctuaries. Sechu-Tuan Nala Wildlife sanctuary (103) square kilometer is situated in the Pangi valley, the interior most tribal area in Himachal Pradesh of Northwest Himalayas. The present study documents and contributes significant information on food habits of brown bears which are important for manifestation of physiological activities of bears in their natural habitat. The information on food habits and activity pattern of Himalayan brown bears in the study area were collected from May to October 2016 by direct observation on nine brown bears. The food habits of Himalayan brown bears were investigated by analyzing 22 fresh scats, 18 feeding site investigation, four 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 two fruit trees, two shrubs, 24 herbs, two grasses and two 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 the Himalayan brown bear population in these harsh climatic conditions, information on its food habits, habitat use and activity pattern are necessary.

THE PREDICTION OF SEED SHADOWS OF WOODY PLANTS BY RELEASED ASIATIC BLACK BEAR (*URSUS THIBETANUS USSURICUS*) IN THE JIRISAN NATIONAL PARK

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ABSTRACT

We studied the traveling distance, seeds involved in scats of Asiatic black bears inhabiting Mt. Jiri and analyzed the excretion cycle of Asiatic black bears in the captive area to detect the relationship between movement of bears and dispersal of fruit trees by predicting the seed shadows of fruit trees in Jirisan national park using geographic information systems. As a result of the analysis of 52 pieces of feces, the feed consisted of 79.6% plants, 11.6% insects, 4.8% mammals and 4.1% others. The contents of each taxonomic group consisted of 91% plants, 4% mammals and others (beeswax) respectively, and 1% insects. The Asiatic black bear is an omnivore that prefers vegetables. The seeds excreted were from *Prunus* spp. and *Morus bombycis* in late spring, around May and June, and from *Actinidia arguta*, *Cornus controversa*, *Ilex macropoda* and *Lindera erythrocarpa* in autumn, between September and October. The Asiatic black bears' excretion cycle was tested by feeding them *Prunus yedoensis* fruit within a limited area, and the seeds were excreted three times with an average interval of 13.5, 19.5 and 27 hours. The seed content was 52% after 13.5 hours, 34.4% after 19.5 hours and 0.07% after 27 hours. The average traveling distance of Asiatic bears aged 2 ~ 6 years during the fruiting season between May and June showed the longest among 3-year-olds with 1051m, and the shortest among 6-year-olds with 601m. In September and October, 3-year-old bears showed the longest travel range of 1221m while 5-year-olds the shortest with 679m. These results showed the following seed shadows predictions: in the fruiting season between May and June 3-year-olds had the largest dispersal range and 6-year-olds had the smallest. Bears aged three and five years showed the largest and smallest dispersal range respectively, and the ones in between showed similar results. In the fruiting season, between September and October, 3-year-olds had the largest dispersal range and 5-year-olds had the smallest.

DAYBED SELECTION BY BROWN BEARS IN THE BIESZCZADY MOUNTAINS, POLAND

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ABSTRACT

We investigated daybed selection by brown bears (*Ursus arctos*) at the microhabitat and landscape scales in the Bieszczady Mountains in the northeastern Carpathians, Poland, from July 2008 to November 2015. We compared the habitat characteristics of resting sites used by GPS-collared individuals (n = 8) with non-resting sites, i.e. where the bears were but did not rest. Each control site corresponded to a given resting site for a specific bear located. We conducted field visits to the resting and non-resting sites on average five days after the bear left the site. We investigated 78 pairs of sites, each one including a daybed and a non-resting site of the same individual. Bear presence was recorded in paired sites within three-day time (less than one day on average). The distance between each daybed and its corresponding non-resting site was on average 1927m (SD ± 848m). We measured different variables characterizing forest structure and used a Wilcoxon signed-rank test to evaluate the most important factors determining daybed selection. We found that microhabitat selection was determined mainly by the bear's need of concealment. Sites with low visibility, dense canopy, high shrub cover, and difficult access were most frequently selected for resting. Bears showed clear preference for habitats with certain forest structure. Trees surrounding daybeds were much smaller in diameter and located at higher densities closer to the resting site. At the landscape scale, bear selected sites where human influence was lower than in non-resting sites. Daybeds were characterized by greater distance to the closest buildings and roads than non-resting sites. Preference for higher elevations was also noticeable. Surprisingly, slope steepness and aspect did not influence daybed selection. Bears seemed to avoid human activity particularly during resting. The fact that bears rested mainly in the daytime, when human activity is at its peak, may be a way of avoiding humans. Resting site selection is a complex process and limiting human disturbance in less accessible areas is recommended to minimize human-bear encounters.

COMBINING RESOURCE SELECTION FUNCTIONS AND SYSTEMATIC CONSERVATION PLANNING TO IDENTIFY CONSERVATION PRIORITIES FOR BROWN BEARS (*URSUS ARCTOS*) IN THE ROMANIAN CARPATHIANS

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ABSTRACT

The recovery of large carnivores in the human-dominated landscapes of Europe has sparked a debate regarding the optimal landscape conditions in which carnivores can thrive and coexist with humans, with conservation planning being a key component for broad scale management of large carnivore populations. Here, we use brown bears (*Ursus arctos*) in the Romanian Carpathians as a test case to develop a framework for identifying habitat conservation priorities based on a novel integration of resource selection functions, home range data, and systematic conservation planning. We used a comprehensive GPS telemetry dataset from 18 individuals in the Eastern Carpathians to (1) calculate seasonal home ranges using Brownian Bridge Movement Models, and (2) characterize seasonal population-level habitat selection using Manly's selection ratios. We then used systematic conservation planning software Zonation to identify habitat conservation priorities using Manly's selection ratios as weights for their respective habitat layers, and home range information as a smoothing parameter for habitat connectivity, and identified contiguous areas of high conservation value brown bear habitat seasonally and annually. Seasonal home ranges were smallest during winter (November-February: 18.5 ± 4.6 km2), and largest during the intense-feeding season (September-November: 102.5 ± 28.4 km2). Both males and females selected for mixed forest during winter and intense-feeding seasons, and for transitional woods and shrubs during the low-feeding/reproduction and wild-berries seasons. We identified large tracts of relatively undisturbed habitat selected across seasons as key habitats for brown bear conservation in the Carpathians (~15% of the landscape). Spatially, high-value winter habitat was the most dissimilar, suggesting that conservation actions should focus on protecting contiguous denning habitats. We developed a framework that integrates basic knowledge on habitat selection and movement ecology with systematic conservation planning to identify biologically meaningful spatial conservation priorities. Our novel approach can be readily applied in any management system, including those particularly characterized by low resource allocation for wildlife research. Lastly, our findings can enable transboundary management of the Carpathian brown bear population, and contribute to maintaining a "Favorable Conservation Status", an important target of European Union Strategy for Biodiversity.

THE FACTORS IN CREATING BEAR SHELVES BY THE ASIATIC BLACK BEAR TO FEED ON THE HARD MAST

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ABSTRACT

Among the field signs of the Asiatic black bear (*Ursus thibetanus*), bear shelf is a feeding sign when bears eat fruits, flowers, or leaves from a tree crown. A previous study indicated that bear shelves on soft masts were created when they were mature and had maximum nutritional value, whereas bear shelves on hard masts were created when they were immature. Additionally, bears bother to climb and feed on soft mast because dropped fleshy fruits decay into pulp quickly and become inedible on the ground. However, when fallen on the forest floor, hard masts do not decay and bears can consume it. It is unclear what factors influence creating bear shelves and why bears eat hard masts on the tree. Therefore, we set the following three hypotheses to determine these factors on three hard-mast species (*Quercus crispula*, *Quercus serrata*, and *Castanea crenata*): (1) Bear shelves are created on trees where individual mast production is bigger. (2) Bear shelves are more likely to be created in a poor-masting year. (3) Bear shelves are more likely to be created in a year when the abundance of previous food resources of hard mast (soft mast of *Prunus grayana* or *Cornus controversa* in summer) is low. We used data from field surveys conducted in 2008 and 2014 in the Ashio–Nikko Mountains, central Japan, and created a hierarchical Bayesian model to evaluate three influential factors: mast productivity of individuals, masting of hard-mast and soft-mast species, and the presence of bear shelves. The results showed that, for the three hard-mast species, bear shelves tend to be created on trees which produce more masts. We found that the proportion of bear shelves created on each hard-mast species was higher in the poor-masting years of these species. The probability of creating bear shelves on the three hard-mast species was higher in the poor-masting years of soft mast, i.e., the previous food resource of hard mast. These results may provide us with fundamental knowledge on the relationship between bears and bear shelves of hard masts.

EVALUATING SPATIAL ECOLOGY OF ASIATIC BLACK BEAR IN DACHIGAM LANDSCAPE, KASHMIR, INDIA

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ABSTRACT

The Dachigam landscape holds one of the best population of Asiatic black bear in India and is also a hot spot for bear-human conflict. To develop strategies to minimize bear-human conflicts in the landscape it is imperative to have basic information with respect to the bear´s spatial ecology. Hence, seven bears were radio-collared and tracked during 2009-2011 in the study area. Ranging pattern and habitat utilization pattern were studied using the GPS location recorded from radio-collared bears. The two-year tracking of collared bears, i.e., from autumn 2009 to autumn 2011, resulted in 1880 relocations, of which 497 were from ARGOS and 1383 from VHF tracking. The mean 100% MCP home range of black bears at Dachigam landscape was 44.9 km2 ± 17.0 and ranges from 8.4 km2 to 124.6 km2. Dachigam´s black bears possess smaller home ranges than bears studied elsewhere in Taiwan, China, and Japan. Considerable (>80%) yearly home-range overlap among two years 2010 and 2011 suggests site fidelity or stability. The average seasonal home ranges differed significantly during the study (F2,18 =0.58, P=0.56) and the average spring 95% kernel home range was largest (22.7 km^2 ± 8.2) followed by summer (16.6 km^2 ± 4.5), and was smallest for autumn (13.5 km^2 ± 4.8). However, the seasonal home range among the years does not differed significantly (P>0.05) also with no significant difference among the sexes (P>0.05). The overall habitat use by black bears was not random (λ = 0.0395, χ2= 22.62, df = 5, P < 0.001, n = 7). Riverine habitat type ranked highest among all the six different types of habitat associations followed by mixed forest type and it was lowest for the human habitation habitat type. Black bear use of different cover types was disproportional to availability within the composite home ranges or the area of analysis. Compositional analysis of second order selection resulted in ranking matrices that ordered habitats from most to least used during the study period. The simplified matrix ranks the habitat use in the order: Riverine> Mixed forest> Pine forest> Grassland & Scrubland> Cropland> Human habitation.

AN EXAMINATION OF BLACK BEAR BED SITES IN NORTHERN MINNESOTA

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ABSTRACT

In the summer of 2016, 100 black bear day bed sites were visited in the Minnesota North Woods based on GPS point data collected from 14 collared female black bears. Characteristics of each bed site and a corresponding random non-bed site were recorded for understanding black bear bed-site selectivity and preference. An independent one-sample t-test proved statistically significant that black bears prefer to bed next to a tree, and 71% of bed sites had a bed tree. The most common bed tree types were white cedars and white pines. The average diameter at breast height was 41 cm and the average clear bole height was 5.3 meters above the ground. Bear sign was sighted at 60% of bed sites, with claw and bite marks being the most prevalent bear sign. Vegetation was consistently found to be the largest percentage of ground cover (53%) at bed sites, while rock and bare ground had the smallest percentages (<2%). A Chi-Square test comparing the observed and expected canopy coverage values returned a high p- value (p=.99), concluding that for this data the differences between observed and expected over story values were not statistically significant. The results from the habitat type Chi-Square test (p<.0001) showed that the differences between observed and expected habitat types were statistically significant, inferring that black bears are selective of which habitat type they rest in. Data collected could not prove motives behind black bear bed site selectivity, which calls for further research on the topic.

OCCURRENCE RATE OF MULTIPLE PATERNITY AND INBREEDING IN THE BROWN BEAR POPULATION IN THE SHIRETOKO PENINSULA, HOKKAIDO, JAPAN

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ABSTRACT

The mating system of brown bears is generally classed as polygamous, but also as promiscuous from the fact that one female sometimes copulates with multiple males in the breeding season. This multiple mating occasionally leads to multiple paternity in a single litter, which may have a positive effect on genetic diversity of bear populations. In contrast, it has been reported that inbreeding, a possible factor for the decline of genetic diversity, occurs especially in isolated or re-introduced bear populations. However, only a few studies have reported how often these phenomena occur in stable brown bear populations. In this study, we investigated the occurrence rate of multiple paternity and inbreeding in the brown bear population of the Shiretoko Peninsula in Hokkaido, one of the most populous areas for brown bears in Japan. A total of 759 individuals, collected from 1998 to 2016, were genotyped at 21 microsatellite loci, and the parentage analysis was performed using the CERVUS and COLONY software. Out of 60–75 litters with ≥ 2 offspring, 9–11 litters (14.7–15.0%) were sired by different males, which was comparable to the occurrence rate of multiple paternity reported in the Scandinavian brown bear population (14.5%). Out of 168 litters, six litters (3.5%) resulted from mating between the daughter and her father, which was comparable to, but slightly higher, than the occurrence rate of inbreeding reported in the Scandinavian brown bear population (ca 2%). Additionally, two cases of mating between half-siblings with different mothers were observed; however, no cases of mating between mother and son, between full-siblings, or between half-siblings with different fathers, were observed. The results suggested that male biased natal dispersal avoids the mating between closely related individuals (except between father and daughter) in brown bears.

CO-EXISTENCE AND HABITAT PREFERENCE OF BEAR SPECIES IN THE DAMPA TIGER RESERVE, MIZORAM, INDIA

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ABSTRACT

Co-existence of ecologically similar species is often governed by partitioning the use of habitats or resources. Such partitioning can occur through divergent or shared niches. Asiatic black bears (*Ursus thibetanus*) and Malayan sun bears (*Helarctos malayanus*) are ecologically similar and coexist extensively across different landscapes in Southeast Asia. The overlap in habitat use and spatial distribution of sympatric Asiatic black bears and Malayan sun bears was investigated in the Dampa Tiger Reserve between June 2014 and March 2016. Bear coexistence, distribution and habitat use patterns were determined based on their signs and camera trapping. Evidences in the form of claw marks was highest (60.23%), followed by scats (25.81%), nests (3.56%), cavity (6.23%) and footprints (4.15%) in different habitats. The photo-capture rate of *Ursus thibetanus* and *Helarctos malayanus* was found to be 15.02 days and 21.64 days, respectively. The relative abundance of *Ursus thibetanus* and *Helarctos malayanus* was estimated to be 6.65 and 4.62, respectively. Among all the blocks, the deserted villages within the reserve showed high faunal diversity. Distribution of the bear species was high in old Chikha (0.517), a deserted village, followed by Chikha road (0.33) and Malpui (0.07 km-1, respectively. The high density in the blocks can be attributed to the presence of large number of fruiting trees such as *Actocarpus heterophyllus*, *Trema orientalis*, *Syzygium cumini*, and *Ficus* species. The habitat use based on density of bear signs per hectare was highest in Bamboo forest (0.398), followed by Tropical semi-evergreen forest (0.174), Tropical wet-evergreen forest (0.165), Semi evergreen forest (0.114), Mix forest (0.085) and Temperate forest (0.064). Coexistence of bear species might be due to difference in activity pattern and food preference. The availability of fruiting plants might help sustain the smaller-sized sun bears in the face of competition over food with black bears.

CASE STUDY ON THE USE OF NATURAL AND ANTHROPOGENIC HABITATS OF BEAR SPECIMENS IN THE ROMANIAN CARPATHIANS

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ABSTRACT

The studied area is in the center of Romania, comprising a part of the eastern Meridional Carpathians and the southern Oriental Carpathians, with an area of approximately 300,000 hectares (3000 sq. km). The study method consists in capturing some bear specimens of different social categories and the installation of satellite radio-telemetry (GPS/GSM) surveying systems. From monitoring we determined the home range using the method "Smallest convex polygon" and the method "Bivariate density kernel" S (ha), and we have identified the use of natural and anthropogenic habitats, as well as the overlapping of their territories over a network of protected natural areas in the study area. During 2009-2017 in the study area we monitored with GPS/GSM systems 14 brown bear specimens from different social categories, males and females, aged 2-17 years. Throughout this monitoring interval, 50,000 valid locations were obtained (12 or 24 locations/day/bear specimen). The longest traveled distance per unit of time is represented by a 2-year-old male and is 1912 km in 391 days, and is also the highest daily average (4.9 km/day). This is because this bear cub was left by his mother and was in search of territory. The shortest traveled distance per unit of time is represented by a 17-year-old female and is 10 km in 33 days monitoring, representing the daily average of 0.3 km / day. This is because the specimen was captured a few days before she entered the winter sleep. She gave birth during the winter and the collar fell into the den. The largest area used is a 2-year-old male and is 127,358 ha determined by the "Smallest convex polygon" method and 38,165 hectares determined by the "Kernel with 95% bivariate density" method. This is because this specimen was recently left by his mother and is in search of territory. We noticed through the Kernel method that the average size of the territory for adult males is 7500 ha, for the sub-adult males is 29,600 ha, and for adult females 5100 ha. The GPS Collar Monitoring System is also equipped with activity sensors and a heat sensor. These sensors give data about daily and seasonal activity. In this respect, we have chosen two bear specimens, which have activity for at least a cycle of four seasons. These specimens are a dominant adult male and an adult female with cubs in the second year. Analyzing these diagrams, we found the following aspects: a) Daily activity is closely related to sunrise and sunset. Their activity begins about 1-2 hours before sunset and ends 2-3 hours after sunrise; an exception is made during autumn, before entering the winter sleep, and in spring as soon as it comes out of winter sleep, when the activity extends during the day. b) It is noted that during the winter sleep they also have activity occasionally, but short termed, which proves that the bear is not idle during the winter. c) It has been shown that, in case of the female (in the second year of study), when she had two cubs aged 3-5 months, in the first two months after she got out of the den she had preponderant activity during the day, until 2-3 hours after sunset. In recent years there has been a considerable expansion of the buildable intravilan areas in the Carpathians in central Romania, which overlap with the natural habitats of the brown bear, as well as continuous intensification of traffic (especially road traffic), which determined some bear specimens to get in direct contact with people's activities, so sometimes inevitably there are direct conflicts between humans and bears. At the end of the study, natural habitats fragmented by existing and potential infrastructure could be identified. For this, we considered the degree of overlap of the habitats used by the brown bear specimens marked with the GPS-GSM-Radio monitoring system of the LIFE FOR BEAR project (a project co-funded by the European Union's LIFE Nature Program) in relation to the protected natural areas network and the human activities areas in the studied area. So, in these areas, the LIFE FOR BEAR project is to propose concrete measures to preserve the natural habitats connectivity and to prevent direct human-bear conflicts.

FEEDING HISTORY OVER A LIFETIME OF AN ASIATIC BLACK BEAR ESTIMATED BY STABLE ISOTOPE ANALYSIS

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ABSTRACT

As the body tissues of animals are formed, bio-elemental stable isotopic composition of their food leaves signature in the tissue. In some tissues, constituent elements show relatively short turnover time (e.g. blood, hair), and in other tissues, they show relatively long turnover time (e.g. bones, teeth). Bio-elemental stable isotope analysis of multiple tissues, in different combination, would thus enable us to reconstruct a long-term feeding history of an animal. In this study, we examined carbon and nitrogen stable isotope ratios of various tissues to establish a method for estimating a whole-life feeding history of Asiatic black bears (*Ursus thibetanus*). Bears' hair reflects feeding history of the captured year or the previous year, while bone collagen reflects an average lifetime feeding habit. We further focused on bears' teeth; from the annual layers of teeth, we can estimate the feeding habit of cubs and sub adults. We used the dentin of canine because it contains relatively much collagen necessary for isotope analysis. The canine dentin is first formed when the bear is around two-years, and as the bear ages, the layers are formed inward to fill the pulp cavity. The outermost layer close to the cementum, therefore, should reflect the feeding habits of the bear at an age around two, and the most central layer near the pulp cavity is likely to reflect the feeding habits shortly before the capture. By stable isotope analysis of these three tissues, i.e. hair, bone collagen and dentine collagen of canine, we reconstructed lifetime feeding history of some bears, captured under suspicion of causing damages to fish farms.

MOVEMENT PATTERNS OF A LARGE SOLITARY CARNIVORE IN FLUCTUATING ENVIRONMENT VARIES WITH ENVIRONMENTAL AND INDIVIDUAL FACTORS

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ABSTRACT

Animal movements are the primary adaptive behavior to the fluctuating environment. The Lévy Flight Hypothesis (LFH) has recently received attention in a context of optimal movement strategy in response to change in resources availability. LFH predicts that when target resources are sparse and unpredictably distributed, a scale-free Lévy walk (LW)-pattern would be used to maximize foraging success. However, empirical studies showed that while a variety of species optimize their movement using LW pattern, large carnivores that largely rely on more rational use of information form the environment for searching resources might not optimize the search efficiency using LW pattern, even when the resource is sparse and unpredictable. Rather, such animals might use cue-driven, multi-scale Composite Brownian walk (CBW) when the resources encountered are systematically detected. Consequently, animal movements have been suggested to depend on internal and external factors, but often animal responses at the individual level have been neglected. In this study, movement paths of Asiatic black bears (*Ursus thibetanus*) were used to analyze movement patterns at the individual level. The aim of the study was to investigate whether LFH is applicable to bears, and how the internal state of the individual (i.e., sex) and external factors (i.e., change in food availability based on the hard-mast production during hyperphagia period i.e., good vs poor masting) affects the movement pattern of bears. The results showed substantial support to cue-driven multi-scale CBW patterns over scale-free LW pattern, and thus LFH was not consistent with the movement pattern of the bear. However, the searching effort that bears invested within the small scale searching mode varied between good masting and poor masting years, suggesting bears adjust their searching scale in response to different degree of food availability. Moreover, the number of movement scale/mode used by males and females tended to vary, with females showing higher consistency on the CBW2 pattern throughout the year. Males are more flexible in terms of the scales to use. These findings suggest that not only environmental conditions explain individuals' movement behavior but that also individual factors (e.g., sex differences in the motivation of the movement, perceptual range) could play an important role.

UNIQUE DICROCOELIUM DENDRITICUM GENOTYPES FROM CROATIAN BROWN BEARS

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ABSTRACT

The lancet liver fluke *Dicrocoelium dendriticum* occurs in various domestic (sheep, goats, cattle, horses, rabbits, dogs) and wild (deer, wild boar, buffalo, camels) mammals as well as humans around the globe. Since reports of *D. dendriticum* in large carnivores are limited, as in the brown bear (*Ursus arctos*), we performed a study to investigate the presence and the prevalence of *D. dendriticum* in free-ranging brown bears from different Croatian regions. Data on age, gender, location at the time of death, season, intensity of infection and pathohistological changes have been collected from infested animals. Parasites from bears, goats, and sheep were further genotyped to investigate possible genetic difference among *D. dendriticum* isolates. Between February 2014 and December 2016, we sampled the complete gall bladders and liver samples of 136, hunted and dead due to other causes, brown bears across their range in Croatia. Each gall bladder and content were washed through the sieve to detect and count each parasite. We found that 60% of the examined brown bears were infected, ranging from 1-103 parasites (mean=16.31, median=1) without differences in prevalence related to location, gender or age class. Seasonal distribution of *Dicrocoelium* infestation indicated a significantly higher percentage of infestation in autumn (mid-August-December, 72%) compared to spring (February-May 45%; p=0.00192). Sequencing of ITS-1 of individual *D. dendriticum* from 16 bears, five sheep and one goat did not show any heterogeneity. COX1 sequences were identical from all bears from various regions showing differences in seven nucleotide positions with similarity of 98% with small ruminant isolates. To evaluate possible genetic variability of D. dendriticum within single bear, COX1 was sequenced from 3-5 adult flukes from 10 bears without any SNP. Histopathology showed granulation of the surface of the liver and hepatomegaly in infested individuals, as well as enlarged gall bladders with firmer consistency of bile ducts surrounding the parenchyma. In the current survey we have presented evidence that bears could serve as final host of potential new "bear" genotype of *D. dendriticum*. This finding also suggests possible adaptation of *D. dendriticum* and unique life cycle of "bear" isolate.

INFLUENCE OF NATURAL AND ANTHROPOGENIC DISTURBANCES ON MULTI-SCALE BLACK BEAR HABITAT SELECTION

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ABSTRACT

The combined effects of long-term fire suppression, logging, and overgrazing have negatively impacted the condition of many southwestern forests, resulting in decreased habitat quality for wildlife and more frequent and severe wildfires. Degraded forest conditions have resulted in calls for restoration of the historic forest structure and fire regimes. Our research objectives included investigating local and landscape scale habitat selection of black bears (*Ursus americanus*) in the Jemez Mountains of north central New Mexico to assess the effects of landscape scale restoration and wildfires. We specifically aimed to 1) address changes in abundance of key forage species for black bears in response to forest restoration treatments and recent wildfires; 2) determine landscape-level habitat selection and space use patterns of black bears in relation to currently completed forest restoration treatments and wildfires occurring over the past 20 years; and 3) assess habitat characteristics at bed and den sites of black bears to determine whether wildfires and restoration treatments influenced selection on a microscale. From 2012-2016 we placed GPS radio-collars on 48 adult black bears. During 2015-2016 we documented 302 bed sites from 24 black bears, and 24 den sites for microhabitat analysis. Microhabitat analysis results indicated a positive trend between black bear habitat selection and low horizontal visibility, increased stand basal area, and increased hard mast cover. 33% of den sites were in areas impacted by wildfires.

THE DIET OF BROWN BEAR *URSUS ARCTOS* IN THE TATRA NATIONAL PARK, POLAND

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ABSTRACT

Tatra National Park, located in the highest part of the Carpathians, is one of the most popular place tourist destination in Poland. An area covering a bit more than 200 square kilometers is visited by approx. three million tourists every year. It is also the only place in this country where bears survived persecution lasting till the beginning of the 20th century. Bears often seek food near tourist hotels and trails, and human-bears encounters are common here. The aim of the study was to establish the diet of brown bears in Tatra National Park. In 2010-2011 more than 200 bear scats were collected during intensive surveys conducted from early spring till late autumn, through all the park area and its vicinity. Food composition was established using standard methods of predator scats analyses. Plant material (grasses, forbs and herbs, fruits of raspberry *Rubus* sp., bilberry *Vaccinium myrtillus*, lingonberry *Vaccinium vitis-idaea*, beechnuts, and sporadically also wheat and plums) was the dominant food category. Animal material (ants: *Myrmica ruginodis, Myrmica rubra, Manica rubida, Camponotus ligniperdus, Serviformica* sp., *Lasius* sp., Formica sp.; beetles Coleoptera: Carabidae, Elateridae; European honey bee *Apis mellifera*, common wasp *Vespula vulgaris*, European hornet *Vespa crabro*, and also deer, *Cervidae*, small mammals and juvenile birds) were found much less frequently. The mean seasonal frequency of occurrence of food categories varied between seasons. Despite the high availability and attractiveness of anthropogenic food, brown bear diet in the Tatra National Park seems to be not influenced by human presence. Preventive measures taken by national park staff to keep bears away from leftovers are highly effective.

THE EFFECTS ON THE DIETS OF ASIATIC BLACK BEAR (*URSUS THIBETANUS*) CAUSED BY POPULATION CHANGE OF SIKA DEER (*CERVUS NIPPON*)

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ABSTRACT

Feeding habits and foraging behavior provide basic information to understand the ecology of animals. Omnivores or generalists consume food at multiple trophic levels, and they also hold different trophic positions because of their ecological plasticity. Therefore, the foraging niche in their populations occupies a diverse area. Competition for animal food resources such as ungulates and salmon resulted in individual variation in bear diets. However, it is still unknown how the changing availability of these food resources influences the foraging variations in bear populations. In this study, we verify the effects of changing sika deer (*Cervus nippon*) populations on the diet of Asiatic black bears (*Ursus thibetanus*), regarding bears' sex and age. Asiatic black bears are known to be herbivorous omnivores and they are almost entirely dependent on plant materials, although they hunt on sika deer fawns opportunistically during early summer. Additionally, bears scavenge sika deer carcasses on occasion from spring to autumn. In the Okutama Mountains, central Japan, the population density of sika deer increased from the 1990s to the early 2000s. They decreased after the late 2000s because of a culling program organized by administrative institutions. Fecal analyses of the bears during the 1990s and 2010s showed that changing deer populations affected the bear diet at population level and the amount of deer in the diet of bears was proportionate to the size of the deer population. We measured the carbon and nitrogen stable isotope ratios in hair from Asiatic black bears captured during 1993 and 2014 in the Okutama Mountains. To confirm the yearly and monthly change of potential deer consumption from individual bears, we conducted a fine-scale stable isotope analysis using guard hair sectioned from root to tip. The monthly $\delta^{13}C$ and $\delta^{15}N$ values were measured, and used to estimate the relative resource contributions to the diets of individual bears. We investigated the differences between the $\delta15N$ values in terms of the sex and age, and how this related to deer consumption. These data enable us to discuss the individual variation in the diets of Asiatic black bears with changing sika deer populations.

STUDY OF BEHAVIORAL TRENDS IN CAPTIVE SLOTH BEARS USING KEEPERS' FEEDBACK

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ABSTRACT

Agra Bear Rescue Facility (ABRF) in Uttar Pradesh, India, is operated by Wildlife SOS, a non-profit organization dedicated to the protection and conservation of India's Wildlife. The facility currently houses 198 sloth bears, primarily rescued from "dancing" practices, in 14 large, separate enclosures. This large size of this captive population offers a unique opportunity to study the behavior of this little-known species. Knowledge gained from this population can be directly applied to the welfare of ABRF bears, as well as other captive sloth bears around the world. However, it is difficult for a small research team to collect consistent and reliable behavior data from such a large population of bears. Here we tested the efficacy of enlisting keeper staff at the ABRF to systematically record observations of key behaviors based a predefined ethogram. To maximize the number of bears from which data could be collected, we carried out a preliminary keeper feedback survey based on 44 female sloth bears at ABRF. The keepers, although experienced and knowledgeable about the bears in their charge, were not trained in scientific data-collection methods. Keepers were asked to score their bears for behaviors of interest on a Likert scale from 1 (least likely) to 5 (most likely). They were also encouraged to provide additional comments related to their scores. Concurrently, we conducted preliminary behavior observations of the study bears. We found good correlation between keeper scores and our observations on some behaviors (e.g., self-directed behavior exhibited an r^2 of 0.31) suggesting that the ABRF bear keepers, despite the lack of scientific training, contributed reliable data on captive sloth bear behavior from their experience with individual bears. This approach provides an opportunity to systematically monitor the behavior of a large number of bears without the need for a large dedicated scientific staff.

HUMAN-BEAR INTERACTIONS

POPULATION STATUS, ATTITUDE AND PERCEPTIONS OF LOCAL COMMUNITIES TOWARDS SUN BEARS AND THEIR CONSERVATION IN MIZORAM STATE, INDIA

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ABSTRACT

The Sun bear (*Helarctos malayanus*) is the smallest bear species and remains the least known bear species in the world. Reliable estimation of sun bear population and knowledge about its status and distribution are very important for the field managers to develop management plans. We conducted an informant-based survey in and around the Dampa tiger reserve, Mizoram, to investigate people's awareness of sun bear and their attitudes towards sun bear conservation. Field surveys, camera traps, and questionnaires were used for data collection. Northeast India is part of a global biodiversity hotspot and has the highest animal diversity in the country. The attitudes of people towards sun bears greatly impacts the latter's survival. This region is also home to over seven ethnic groups, whose customs and traditions critically affect wildlife conservation practices. A total of 352 individuals comprising of 238 males and 114 females were interviewed and their opinion on conservation of the Dampa tiger reserve´s sun bears were recorded. Educated and young people with access to information and awareness mostly supported the sun bear conservation. All respondents from all villages without any significant variation agree sun bear of the area is depleted. Increasing anthropogenic pressure, due to continuously expanding human settlements and increasing demands for farming and grazing land, is the main reason why relatively large wildlife areas have been subjected to over-exploitation, degradation, and destruction. We had a combined trapping effort of 647 trap-nights in the tiger reserve with a total of 47 photos of sun bear recorded between November 2015 and March 2016.The photo-capture rate of sun bears in Dampa was found to vary with different habitats. The variation was also influenced by the disturbance of human in the area and the presence of food trees for bears. The photo capture rate was lowest in Chikha road (12 trap nights) followed by the new Chikha deserted village (14 trap nights). The relative abundance index (RAI[1]) and block wise distribution index (RAI[2]) show that Chikha road has the highest index, 1.23, and the mean value of 5.26 in the Dampa tiger reserve.

ANDEAN BEAR PERCEPTION BY RURAL COMMUNITIES IN PERU'S NORTHEASTERN TROPICAL ANDES: THE IMPACT OF A CONSERVATION PROJECT

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ABSTRACT

Human-wildlife conflict is one of the most important threats to some large carnivores like Andean bears. Cattle consumption is the major cause of conflict between Andean bears and people, which triggers a negative perception on Andean bears and causes hunting by residents as a measure of control. In Peru's northeastern Tropical Andes occurs the private conservation area Hierba Buena-Allpayacu, which belongs to the Campesino Community of Corosha. This area protects 2282 ha of cloud forest and natural high- altitude grassland, and harbors endemic primate species such as the Yellow-tailed woolly monkey and the Andean night monkey. Since 2008 a conservation project was executed in Corosha focusing on both monkey species. Given the appearance of seven individuals of Andean bears near the community in 2015, in 2017 we carried a survey of the human–Andean bear conflict in Corosha. It showed that 75% of the community is aware of bear attacks on cattle and they expressed the following solutions to solve the attack problems: kill the "livestock–eating" bear (30%), scare the bear (10%) or move cattle (40%). Moreover, they indicated that the bear's attacks principally occur because the bear has lost its habitat and has difficulty finding food (50%). This is highly contrasting with the adjacent community, where no conservation project has been carried out; when a similar assessment was conducted, an overwhelming majority of the population (<80%) expressed misguided perceptions of Andean bears (i.e. the presence of two species, one that is "meat-eater" and other that is smaller and feeds on bromeliads) and believe in the uses of bears parts (fat and baculum) for medicinal purposes. Even though the conservation project in Corosha did not focus on Andean bears but primates, it is interesting to see how the residents have been able to translate their understanding about ecology and conservation of primates to express understanding towards animals such as Andean bears. In the absence of an adequate management plan for conflict between Andean bears and residents, the establishment and development of conservation programs could provide indirect support for future more catered initiatives.

BLACK BEAR'S ACTIVITY PATTERNS IN THE SOUTH OF NUEVO LEÓN, MEXICO: MANAGEMENT IMPLICATIONS

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ABSTRACT

In northeastern Mexico the black bear (*Ursus americanus*) is relatively abundant, but there are few published studies in the region. This lack of information complicates management and conservation decisions of the species, this is important because bear populations predates livestock and consume crops, generating conflicts with the human populations. The objective of this work was to obtain black bear activity patterns in the south of Nuevo León, Mexico. The aim of this study is to use the information to generate management actions to mitigate the conflict. Knowing the activity patterns of the species can design concrete measures according to the conflict with crops and predation of livestock. We worked from 2013 to 2016 with the installation of 25 trap cameras. Photographs of black bear, entrances to entries and databases were grouped into independent events. We found that the black bear is a species with activity along the day, with a peak activity between 2:00 am and 10:00 am.

VALORACIÓN DE LA FAUNA SILVESTRE EN LA ZONA DE AMORTIGUACIÓN SUR OCCIDENTAL DEL PNN CHINGAZA, COLOMBIA

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RESUMEN

El estudio se desarrolló en Fómeque, Choachí (Cundinamarca), y San Juanito y El Calvario (Meta), que son los municipios que conforman el PNN Chingaza. Se realizaron entrevistas semiestructuradas a tres campesinos que se han relacionado con cacería de fauna, un anciano conocedor del tema, la esposa de un ex cazador y un guía local involucrado en la conservación de la fauna silvestre; también se trabajó con estudiantes de 8º grado del colegio IDEMAG de Fómeque aplicando un ejercicio con plastilina; asimismo se sondeó la valoración que dan los estudiantes del colegio John F. Kennedy de San Juanito a través de un juego de roles que consistía en dar solución a un problema relacionado con la interacción entre el oso andino y un campesino. Todos estos ejercicios se realizaron con el fin de valorar la fauna silvestre. Las entrevistas indicaron que el valor más importante para la fauna es la cacería; también se la valora por consumo y belleza, valores que son los que más se reflejan en sus discursos; en menor medida se encontraron el valor intrínseco, el valor ecológico, el valor económico y el valor recreacional. Por su parte, los estudiantes permitieron evidenciar el valor intangible relacionado con las emociones que producen los animales, seguido por el valor educativo y el valor ecológico. Por otro lado, el juego de roles evidenció claramente que al momento de solucionar la problemática de convivencia campesinos-fauna, prima el valor económico y se dejan a un lado el valor relacionado con el conocimiento biológico del animal, su papel ecológico y cualquier aspecto recreacional o cultural que permita obtener ganancias por la presencia del animal en la zona. Es importante tener en cuenta los valores que tienen hacia la fauna silvestre las comunidades de viven en la zona de amortiguación del PNN Chingaza, ya que el sentir humano es el que garantiza la sostenibilidad de proyectos de conservación en el tiempo de manera autónoma, además de generar un cambio en la percepción a través de un proceso educativo constante.

DISEÑO DE UN SISTEMA DE ALERTAS TEMPRANAS MUNICIPALES PARA EL MANEJO DE INTERACCIONES CON FAUNA SILVESTRE (SATS-FAUNA) Y SISTEMA DE RECOPILACIÓN DE INFORMACIÓN REGIONAL

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La existencia de interacciones negativas oso-gente en el macizo Chingaza se ha hecho a través del registro en las comunidades locales desde la llegada de la ganadería a la región en el siglo XIX. Estas interacciones se han manejado mediante la muerte de osos que se aventuren por las áreas de pastoreo. Igualmente, la cobertura boscosa actual muestra una grave disminución, transformación y fragmentación, siendo estas las dos grandes amenazas a su sobrevivencia. La excusa más fuerte para buscar la desaparición del oso es la de los daños que supuestamente causa a las ganadería extensivas, desprotegidas y alejadas de las viviendas, y pese a que se ha logrado disminuir el uso de áreas de páramos para el pastoreo de vacas, las comunidades siguen quejándose de ataques en sus potreros, los cuales generan un paisaje adecuado para encuentros agonísticos oso-ganado, a la vez que el manejo descuidado de las reses favorece la muerte de los osos por retaliación. En este sentido, se propone diseñar y poner a funcionar un Sistema de Alertas Tempranas que pueda manejar la información de avistamientos, mediante el monitoreo participativo comunitario, y disminuir la muerte de vacas y ovejas, así como desarrollar medidas de manejo y estrategias de conservación eficientes en los puntos conflictivos. Las medidas de manejo endógeno al evento de "observación" son mecanismos de ahuyentamiento y manejo de pastoreo, mientras que las exógenas deben ser proporcionadas en apoyo a propuestas de sustitución de producción pecuaria. Se propone un sistema SAT-FS que incluye las autoridades ambientales del orden nacional (MADS) –ya que la problemática es nacional– las autoridades regionales (CARs respectivas) y las locales, (los municipios), como representantes del estado en su papel de protección de las riquezas naturales de la nación. Por su parte, las comunidades muestran disposición de trabajo en la dirección de detección del oso antes del ataque, y se requiere de la implementación de incentivos a la conservación que ayuden a ver a en la especie una oportunidad al mejoramiento de sus condiciones de vida y de producción económica, con la perspectiva del desarrollo sostenible y la conservación de los bienes y servicios ecosistémicos de la región, específicamente el agua.

RESTAURACIÓN ECOLÓGICA EN LA RESERVA FORESTAL PROTECTORA SANTA MARÍA DE LAS LAGUNAS – GUASCA, CUNDINAMARCA, HÁBITAT NATURAL DEGRADADO DE OSO ANDINO EN LA ZONA DE AMORTIGUACIÓN DEL PARQUE NACIONAL NATURAL CHINGAZA

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RESUMEN

Los osos andinos del macizo de Chingaza muestran una alta movilidad y suelen encontrarse en paisajes agropecuarios, cerca de bosques y en páramos. A partir del siglo XX se ha acelerado la fragmentación de su hábitat natural, proceso que hoy continúa. Este proceso de restauración busca incrementar la conectividad ecológica en la zona de amortiguación del Parque Nacional Natural Chingaza, en un potrero de 26 hectáreas dominado por gramíneas exóticas. Se espera aumentar el hábitat disponible para distintos grupos faunísticos, incluyendo grandes mamíferos como el oso andino (*Tremarctos ornatus*). El predio, que se localiza dentro del Núcleo de Población de Osos Chingaza, forma parte del área de distribución potencial e histórica, y además se encuentra dentro del *home range* del oso, estimado trazando un radio de 7 km a partir de un punto actual de avistamiento a 3 km de la zona de intervención. En un principio la selección de especies se hizo independientemente de las especies utilizadas por *T. ornatus*, pues en estos procesos deben priorizarse conceptos como ecosistema de referencia, así como entender las dinámicas operantes en la zona de intervención. Superados estos filtros, sí se tuvieron en cuenta las plantas que hacen parte de la dieta del oso, incluyendo la mayor cantidad posible de estas en los arreglos florísticos. Se sembraron 6342 individuos distribuidos en 36 especies, 14 de las cuales son utilizadas por *T. ornatus* (38.8%). Estas son *Berberis goudotiana, Clusia multiflora, Diplostephium rosmarinifolium* (tallos), *Escallonia myrtilloides, Hypericum goyanesii, Macleania rupestris* (frutos), *Miconia* sp*., Myrsine dependens, Retrophyllum rospigliosii* (marca la corteza), *Puya nitida* (médula), *Weinmannia tomentosa, Weinmannia balbisiana* (corteza), *Myrcianthes leucoxyla* y *Myrcianthes rophaloides*. Las siembras se hicieron en cuatro unidades de paisaje con características ambientales diferentes: pastizal expuesto, pastizal con parches de regeneración, pastizal protegido y cordón ripario-turbera. En cada unidad se sembró una matriz de la leguminosa *Lupinus bogotensis*, cuyo buen desempeño como planta niñera se evidencia en la presente propuesta. Adicionalmente se realizaron intervenciones en el ambiente físico relacionadas con infraestructuras protectoras, que buscan mitigar los efectos negativos de los estresores abióticos y la herbivoría (roedores), identificados como las principales barreras para esta restauración.

APPROXIMATION TO THE SOCIAL REPRESENTATION OF THE ANDEAN BEAR (*TREMARCTOS ORNATUS*) IN THE CHINGAZA MASSIF, COLOMBIA. AN ANALYSIS OF THE KNOWLEDGE, PERCEPTIONS, ATTITUDES, AND INTERACTIONS OF PEOPLE WITH THE SPECIES

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ABSTRACT

The overlapping of human activities with wild habitats, and the consequent competition for space and resources, have generated a long history of conflict between wildlife and human communities. In the Chingaza Massif the negative interaction between the Andean bear and people not only reflects disputes over space and resources, but also the tensions between the actors interested in the conservation of the environment and those who have built a social and cultural dynamic around páramos and Andean forests. In this scenario, different knowledge and social representations have been configured about this species, whose understanding is necessary to develop conservation strategies. In order to identify knowledge (Escobar, 2000), representations (Kellert, 1994) and interactions between people and the Andean bear (Treves and Karanth, 2013) in the Chingaza Massif, two methods of information capture were applied: 1) The survey called "Questionnaire on knowledge, perceptions and attitudes towards the Andean bear"; 2) a semi-structured interview aimed at obtaining qualitative information about the territorial dynamics, perceptions of wildlife – especially Andean bear – and the relationships between the actors present in the territory. As a result, we identify a series of representation about the Andean bear, like a negativistic perception that considerer this species dangerous and harmful. This perception is related to two factors: first, the lack of knowledge of its existence in the territory and, second, attacks on livestock; this implies economic and social losses for the inhabitants and generates feelings of rage towards the species. Other outstanding representations are naturalistic, ecologistic and utilitarian, configured by feelings of fear, curiosity, happiness, and respect. On the other hand, we researched the human factors that are involved in these representations. We noted that age is not a factor that determines the representation of people about bears; instead, it is the interaction and presence or absence of bear in the region that directly affects the construction of knowledge and social representations of the bear in the massif. This shows the need to promote actions that contribute to generate greater knowledge of the species and encourage the change of negative representations towards it.

ECOLOGICAL MODELLING OF THE *URSUS* GENUS: WHAT DOES THE NICHE TELLS US?

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ABSTRACT

Ecological niche modeling has proven to be an important research field for the study of patterns of species' distributions and the ecological forces responsible for such patterns. The analysis of this phenomena requires information about the fundamental and realized ecological niches, but this information is not available for most mammal species. The *Ursus* genus is the better studied group of the bear family and it includes four of the eight extant species in the planet (*Ursus thibetanus, Ursus americanus, Ursus arctos*, and *Ursus maritimus*), with a remarkable quantity of geographic, ecological, and fossil records available to analyze and get insights about their evolutionary and ecologic history. For this study we analyzed and filtered GBIF data and all the available coordinates in published studies from the last ten years for the four species of *Ursus*, as well as three statistically and biologically important variables for the four bears. In addition, we projected our results to past climate conditions to measure the possible changes in environmental availability for the bears applying different fossil-calibrated ecological niche modeling techniques based upon ecological isotopes, dynamic range boxes, and ellipsoid models. Our results show and measure the patterns of niche overlap between the species and the extent of ecological conditions available for them during the Pleistocene, which allows us to hypothesize about the possible implications of past environmental change in the geographic distribution of bears. We conclude that ecological niche modeling is a powerful set of techniques useful and highly applicable for better understanding the ecological patterns, evolutionary history, and even further investigate the implications of climate change for bear conservation strategies.

POPULATION ESTIMATION AND SPATIAL ANALYSIS

WHEN TRANSLOCATION IS NOT AN ANSWER TO THE RISING CONFLICTS – UNDERSTANDING HUMAN-BEAR INTERACTIONS IN THE DACHIGAM LANDSCAPE, INDIA

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ABSTRACT

The Dachigam landscape in Jammu and Kashmir harbors one of the highest density bear populations in India and managing bear-human interactions is not only challenging but also a serious threat to the survival of black bears due to the resultant retaliatory killings by locals. As a strategic plan to mitigate bear-human conflicts, the provincial wildlife department prefers translocating 'nuisance bears' (involved in conflicts) from different sites in Dachigam to Dachigam National Park. While it sounds positive, it is not always effective as all translocated bears do not just settle to their new home. Instead, most bears often return to their capture sites due to their sharp memory and homing tendency. We conducted genetic analysis of wild caught bears' hair samples to investigate the pragmatic fate of bear translocation in Dachigam National Park. We have identified 109 unique genotypes in an area of ca. 650 km2, and bear population was under panmixia. Molecular tracking of translocated bears revealed that mostly bears returned to their capture sites possibly due to homing instincts or habituation to the high-quality food available in horticulture croplands, while only four bears remained in the National Park after translocation. Results indicated that translocation success was most likely to be season dependent as bears translocated during spring and late autumn returned to their capture sites, perhaps due to the scarcity of food inside the National Park, while bears translocated in the summer remained there due to the availability of surplus food resources. Thus, the current management practices of translocating conflict bears, without considering spatio-temporal variability of food resources in the Dachigam landscape seemed to be ineffective in mitigating conflicts on a long-term basis. However, genetic tagging of translocated bears would be tempting to wildlife managers that want to monitor bear movements in tough terrains and understand their socio-biology in the landscape.

A TEST OF THREE HABITAT SUITABILITY INDEXES FOR BLACK BEARS IN NORTHEASTERN MINNESOTA, USA

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ABSTRACT

We tested three habitat suitability index models developed for black bears (*Ursus americanus*) living in northern forests: the southern Appalachian Region, the Upper Great Lakes Region, and the conifer deciduous forests of New England. Between 2010 and 2013 we followed 13 collared female black bears in northeastern Minnesota, amassing 6798 + 1770 GPS locations per bear per year (mean + SD). We constructed values for the variables included in each model from geographic information systems (GIS) data sets, in-situ measurements and a priori from the literature and tested the models in a geographic information system (GIS) at both the population and individual level. All three models predict habitat selection by the bears successfully and the New England model showed the strongest positive correlation between habitat selection and index values. The results suggest that our northeastern Minnesota study area offers poor habitat for black bears due to a lack of hard mast fall foods, an abundance of logging roads and few old growth stands.

SEASONAL DISTRIBUTION OF HIMALAYAN BROWN BEAR AND ASIATIC BLACK BEAR IN BHAGIRATHI BASIN, UTTARAKHAND, INDIA

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ABSTRACT

We assessed the distribution pattern of the Himalayan brown bear (*Ursus arctos isabellinus*) and the Asiatic black bear (*Ursus thibetanus*) in the Bhagirathi Basin, the upper catchment of Ganga in Uttarakhand State, India. The Bhagirathi basin (~6000 km2) located in the western Himalaya was divided into 38 grids (16km x 16km) which were further subdivided into grids of 4 km x 4km. We deployed camera traps (n= 143) in at least three of such 4km x 4km grids from October 2015 to September 2016 to record the species presence in different habitat types. The sampling effort covered a wide elevation range (500m to 5500m) that encompasses habitats ranging from trans-Himalayan cold and arid zones, glacial moraines, alpine scrub vegetation, moist alpine meadows, sub-alpine "tree-line" forest and upper temperate conifer forest, lower temperate mixed broadleaved forest, subtropical dry deciduous forests, and scrublands. The Himalayan brown bear and the Asiatic black bear have been photo-captured on 40 and 62 occasions respectively during the trapping period of 12 months. Naïve occupancy of both the species was low in winter (0.25 for Asiatic black bear and 0.12 for Himalayan brown bear) and slightly higher in summer (0.38 and 0.21 respectively). Photo-captures of Himalayan brown bears were recorded from 2687m to 4505m mostly in the alpine scrub or tree line vegetation (63%), alpine meadows (28%), and occasionally (10%) in the subalpine oak-rhododendron and conifer forests where their range overlaps with that of Asiatic black bears. Photo-captures of Asiatic black bears were recorded from 513m to 3096m mostly in the subalpine oak-rhododendron and conifer forests (53%), lower temperate broadleaved forest (24%) and occasional in low altitude dry deciduous subtropical forests (16%) in winter. The presence of Himalayan brown bears was recorded both inside and outside Protected Areas (PA) with moderate to high level of human use. On the contrary, all the photo-captures of Asiatic black bears were from areas outside PAs with high to very high intensity of human use.

URBAN BROWN BEAR MANAGEMENT IN SAPPORO, JAPAN

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ABSTRACT

Recently, brown bears have moved deeper inside urban areas in Sapporo, the fifth-largest city in Japan, with a population of 1.9 million. Brown bear invasions of the city center are likely caused by bear population increase and distribution expansion within the last decade. To manage urban brown bears in Sapporo, we need to know the number, sex-age classes, and the requirement of bears living in forest habitats near urban Sapporo. We deployed 25-30 camera-traps and recorded videos of brown bears in forest habitats within 4 km from the border of the urban area in Sapporo during 2015-2016. We identified individual bears and their sex-age class by their characteristic chest marks, body size, external organs, number of dependent young, and their location. We confirmed at least 21 bears in 2015 and 33 bears in 2016, including two FCOY and three COY in 2015, and seven FCOY and 11 COY in 2016. These indicate that forest habitat near urban Sapporo is a place with stable reproduction by multiple females every year. According to the approximate body size, we found no adult male bear (more than 2 m in head-tail length). Forest habitats near urban Sapporo are considered as the place where temporary incursions by socially subordinate sex- or age-class individuals, not because of their attachment to resources or conditions in the city center, but simply because of occasional straying. On the other hand, it is also the case that a number of FCOYs are in forests near urban Sapporo. Bears living near the borders would increase their chances of habituating to human presence and losing their fear of people through frequent contacts with humans, vehicles, and settlements. A change in the landscape in and near an urban area to an attractive habitat for bears would lead to an undesirable increase in human-bear conflicts. For both the security of urban residents and the conservation of bear populations near urban areas, it is important not to change the habitats in and near the urban areas such that they become attractive to bears.

REDUCING HUMAN IMPACTS ON ANDEAN BEARS IN NW PERU THROUGH COMMUNITY-BASED CONSERVATION

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ABSTRACT

Spectacled (Andean) bears (*Tremarctos ornatus*) are the only surviving bear in South America. In the mountain foothills of north coastal Peru, they inhabit equatorial dry forest, a biodiversity hotspot. This novel habitat type for spectacled bears is part of the Leche River watershed and connects to higher elevation montane forest and páramo. Here, the most serious threat to bear conservation is agriculture and free-range cattle, resulting in habitat destruction, alteration, and fragmentation. To preserve bears and build conservation capacity in the communities surrounding critical habitats, the Spectacled Bear Conservation Society and San Diego Zoo Global developed Forest Guardians, a community-based conservation program. We work collaboratively with locals to facilitate the adoption of sustainable behaviors through capacity building for sustainable activities, including Fuel Efficient Cookstoves (*Cocinas Mejoradas*), environmental education teacher and student engagement, economic development, and evaluation/adaptation. Results from long running program experiences and evaluations informed program expansion to further up the Leche River watershed, currently underway. A new focus will include forest fire prevention because of recent agricultural fires that destroyed important habitat within a protected area. To assess the effectiveness of environmental education activities, we surveyed participant teachers and non-participant teachers and found significant differences, with Forest Guardians teachers reporting a higher occurrence of environmentally positive attitudes, greater knowledge of conservation programs, increased conservation actions, and engagement of community outside the classroom. Forest Guardians teachers also reported changing classroom practices after training and teaching a larger breadth of environmental topics and activities. Students exposed to this exhibited more environmentally positive attitudes, greater knowledge of bears and conservation programs, and increased conservation oriented behaviors. To assess perceptions of change in Fuel Efficient Cookstove participants, 22 homes were engaged in pre/post focus groups and semi-structured interviews. Results indicated almost exclusively positive feelings towards the *Cocina Mejorada*, with benefits including a reduction in time and resources spent cooking, increases in health, improved convenience in the kitchen, and pride related to esthetics and social status.

SIMULATING CONNECTIVITY OF BROWN BEARS ACROSS CONTINENTAL EUROPE

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ABSTRACT

Large carnivores are often used as umbrella species to model connectivity and to prioritize conservation areas as they represent the needs of several other species. We used the brown bear (*Ursus arctos arctos*) to simulate connectivity at a continental scale across its range in Europe. Several studies have been conducted at a landscape scale, but there have been very few attempts to map connectivity at a continental scale. In this poster, we present the challenges, limitations, and data needs to map connectivity at this scale for the brown bear. Carefully selected wide-ranging species could be used to map connectivity and plan conservation efforts in other parts of the world. Such large-scale mapping efforts could help in the identification and prioritization of conservation efforts and efficient use of scarce resources.

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ABSTRACTS BOOK

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Björn	МедВедв
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熊	Shash
	Běruang
Bhalou	Karhu
Άρκτος	Bear