Poster Abstracts

October 11, 2022
(Alphabetical by Lead Author)

Mapping ungulate migration corridors, stopovers, and winter ranges across California

Evan Greenspan, California Department of Fish and Wildlife, Sacramento, CA
Julie Garcia, California Department of Fish and Wildlife, West Sacramento, CA
Melanie Gogol-Prokurat, California Department of Fish and Wildlife, Sacramento, CA
Jennifer Diamond, California Department of Fish and Wildlife, West Sacramento, CA

California is home to a number of ungulates, including mule deer, elk, pronghorn, and bighorn sheep. Many ungulate herds in California are migratory and inherently need large landscapes to persist, making them particularly vulnerable to habitat loss and fragmentation. Preserving connectivity between habitat patches is therefore crucial to conserve these charismatic species and to facilitate their movement across the landscape. California Department of Fish and Wildlife has engaged in planning efforts in recent years to identify and improve the quality of ungulate winter range habitats and migration corridors. GPS collars are deployed on ungulate herds to gather fine-scale movement data. Data is collected over years and Brownian bridge movement models are computed using GPS locations, date, time, and average location error to identify individual movement patterns per migratory season. These models are then combined at the population level to ascertain high-use corridors, stopover sites, and winter range for a herd. Mapping ungulate corridors aids managers in the identification of potential movement barriers and bottlenecks, which may prevent an individual from safely moving between habitat patches. Moreover, models help to inform conservation strategies, such as road crossing structures, that maintain connectivity. In ungulates, migration is a learned behavior, meaning it may be difficult to re-establish population level migration routes once they are lost, resulting in dramatic population declines. It is especially vital therefore, with California's growing human population and heavily used transportation infrastructure, that further decline due to habitat loss and fragmentation along movement corridors is prevented where possible.

Noninvasive genetic sampling with a Bayesian spatial capture-recapture analysis to estimate abundance of Roosevelt elk

Mackenzie Henk, California Department of Fish and Wildlife, Eureka, CA and Humboldt State University, Arcata, CA
Carrington Hilson, California Department of Fish and Wildlife Eureka, CA
Daniel Barton, Humboldt State University, Arcata, CA
William Bean, California Polytechnic State University, San Luis Obispo, CA
Micaela Szykman Gunter, Humboldt State University, Arcata, CA

Determining abundance of Roosevelt elk (*Cervus canadensis roosevelti*) in coastal northern California has

presented a unique challenge to wildlife managers due to the dense forest habitat and steep terrain. As the elk population has increased, so has human-wildlife conflict, and wildlife agencies need efficient and repeatable methods for determining local population abundance to inform management decisions. Traditional monitoring methods such as helicopter surveys are ineffective due to low sighting probability and strong behavioral responses to the aircraft. They also often lead to biased sex ratios when the distribution of males and females varies across the landscape. Non-invasive genetic sampling combined with spatial capture-recapture (SCR) is an alternative approach to monitoring populations that are difficult to observe directly. This study combined a SCR model with a binomial point process and an unstructured single survey search method to estimate elk abundance via Bayesian inference. We used a detection dog to search forested areas, and searched open grassy hillsides for cow-calf groups, likely increasing the number of detections of males and other solitary individuals. Over two seasons, we genotyped 436 unique individuals (326 females, 110 males) in the study area. For the SCR analysis, we used sex and survey effort as detection covariates, and used a ‘trap’-level random effect to account for the overdispersion in the count data from the herding behavior of elk. The population estimate in the study area was 618 ± 36.34 individuals (95% BCI 551–693) with a mean density of 1.09 ± 0.06 elk per km^2. This study demonstrated a reliable way to obtain a biologically reasonable population estimate for elk in an area that is not conducive to traditional monitoring methods.

Evaluating the use of statistical methods in detecting parturition in mule deer

Tabitha A. Hughes, Brigham Young University, Provo, UT 84602, USA
Randy T. Larsen, Brigham Young University, Provo, UT 84602, USA
Madelon van de Kerk, Western Colorado University, 600 N Adams Street, Gunnison, CO 81231, USA
Kent R. Hersey, Utah Division of Wildlife Resources, 1594 W North Temple, Salt Lake City, UT 84116, USA
Brock R. McMillan, Brigham Young University, Provo, UT 84602, USA

Determining the timing of parturition in wild ungulates is often expensive and time intensive. However, recent advancements in wildlife tracking technology allows for fine-scale location data to be obtained from collared animals, offering an opportunity to estimate parturition times based on movement patterns. Four statistical methods have been developed thus far to infer parturition timing from GPS data, but the ability of these methods to correctly predict the timing of parturition in mule deer is not well understood. The objective of this study was to optimize the estimation of parturition timing in mule deer by testing the accuracy of each previously developed method, as well as to develop and test a novel method for predicting the timing of parturition in mule deer. We met these objectives by testing the ability of each method to correctly predict parturition timing of collared deer with known fawning dates. Accuracy varied significantly between each method. The method with the highest accuracy at predicting parturition correctly within three days was our novel method at 83% accuracy. This was followed by the Rolling Minimum Convex Polygons method (77%), the Long method (71%), Behavioral Point Change Analysis (54%), and finally the Individual-Based Method (50%). Here, we present several statistical methods for predicting parturition timing in mule deer and their associated accuracy. We conclude that parturition in mule deer can be detected using statistical methods, thereby reducing the time and effort normally required to predict dates of fawning.

Mule deer green wave surfing ability in the Sierra Nevada

Emily Leonhardt, California Department of Fish and Wildlife, West Sacramento, CA and University of California, Davis, 1 Shields Avenue, Davis, CA 95616, USA
Julie Garcia, California Department of Fish and Wildlife, Wildlife Branch, 1010 Riverside Parkway, West Sacramento, CA 95605, USA
David Casady, California Department of Fish and Wildlife, Wildlife Branch, 1010 Riverside Parkway, West Sacramento, CA 95605, USA
Justine Smith, University of California, Davis, 1 Shields Avenue, Davis, CA 95616, USA

The abundance of migratory ungulates and the prevalence of migration behavior within ungulate populations are declining globally. Consequently, conserving ungulate migration routes has become a widespread management goal. In order to effectively conserve migration routes, it is important to understand both potential threats and how a given ungulate population engages in migration. In some systems migration routes comprise important foraging habitat and ungulates are said to surf the green wave by tracking changes in plant phenology between seasonal ranges, while in other systems ungulates jump the green wave and migrate quickly from winter to summer ranges. While there has been considerable research on mule deer (*Odocoileus hemionus*) migration in the Intermountain West, less is known about mule deer migration in California where deer migrate up in elevation from winter ranges on both the western and eastern slopes of the Sierra Nevada. Understanding whether migrants are surfing or jumping the green wave and how spring green-up progresses across windward and leeward slopes of the Sierra Nevada can help identify effective migration route conservation strategies. Using time-varying productivity data derived from MODIS satellite imagery, we examined the variation in mule deer surfing ability from over 400 collared individuals along a latitudinal gradient in the Sierra Nevada. We expect surfing ability to vary among individuals and environmental contexts. Quantifying drivers and patterns of variability in migration behavior will support conservation of migration routes and therefore mule deer populations in the Sierra Nevada.

Optimizing methods for capturing neonate elk when using vaginal implant transmitters

Matthew Turnley, Brigham Young University, Provo, UT 84602, USA
Randy Larsen, Brigham Young University, Provo, UT 84602, USA
Kent Hersey, Utah Division of Wildlife Resources, 1594 W North Temple, Salt Lake City, UT 84116, USA
Daniel Sallee, Brigham Young University, Provo, UT 84602, USA
Morgan Hinton, Brigham Young University, Provo, UT 84602, USA
Brock McMillan, Brigham Young University, Provo, UT 84602, USA

Neonate survival is a valuable parameter of elk (*Cervus canadensis*) population growth, but effective methods for capturing and monitoring neonates are still being developed. We analyzed data from 55 attempted captures of neonate elk in Utah, USA during 2019–2020 to determine how soon after parturition searches for neonates should begin. Initiating searches approximately 4 hours post-parturition led to a maximal rate of capture success, zero maternal abandonment, minimal search time, and minimal distance traveled by neonates. This finding will improve methods for capturing neonates, thereby reducing animal welfare concerns, maximizing return on investment in captures, and increasing accuracy

of studies.

Comparison of endoparasite abundance and species richness in relation to body condition of two Roosevelt elk groups in northern California

Scarlett Stromer, California Department of Fish and Wildlife, Northern Region, 619 Second Street, Eureka, CA 95501, USA
Carrington Hilson, California Department of Fish and Wildlife, Northern Region, 619 Second Street, Eureka, CA 95501, USA
Richard Brown, Humboldt State University, 1 Harpst Street, Arcata, CA 95521, USA

Twenty-four Roosevelt elk (*Cervus canadensis roosevelti*) were translocated 132 mi from Gold Bluffs Beach to Sinkyone Wilderness State Park in 1982. In 2020, the Sinkyone elk have been observed to show signs of poor health (i.e., thin with poor coat condition). We collected twenty fecal samples per group and measured species richness and abundance of parasites through the identification of parasite eggs. We measured the body condition of individuals from each group and used this score to assess the effects of parasites on body condition using a Kruskal-Wallis test. We found a significant difference in species richness ($P \leq 0.0001$) and abundance of eggs ($P \leq 0.0001$), for each group in relation to body condition. Using a Mann-Whitney test we found that the Sinkyone elk had a lower body condition score ($P \leq 0.001$), higher species richness ($P = 0.033$), and higher egg abundance ($P = 0.001$) when compared to the Gold Bluffs Beach group. Our findings suggest that the Sinkyone group may have a lower body condition due to higher abomasum parasite abundance, and higher species richness.

Application of metabarcoding for deer diet analysis before and after a large wildfire

Carly White, California Department of Fish and Wildlife, North Central Region, 1701 Nimbus Road, Rancho Cordova, CA 95670, USA and University of California, Davis, 1 Shields Avenue, Davis, CA 95616, USA
Joshua Bush, California Department of Fish and Wildlife, North Central Region, 1701 Nimbus Road, Rancho Cordova, CA 95670, USA
Stevi Lee Vanderzwan, University of California, Davis, 1 Shields Avenue, Davis, CA 95616, USA
Benjamin Sacks, University of California, Davis, 1 Shields Avenue, Davis, CA 95616, USA

As wildfires continue to grow more frequent and severe in California, it is increasingly important to understand how deer herds respond to these large disturbances. Diet is an important component of herbivore life history that can be impacted by wildfire, potentially affecting behavior and survival of deer. This project aims to assess changes to deer diet before and after the Ranch Fire of 2018 in the Mendocino National Forest of Northern California using metabarcoding of fecal pellet samples. Dietary metabarcoding is a relatively new method that detects dietary items using trace amounts of DNA in fecal pellets or other forms of digesta. The process involves extraction of DNA from fecal pellets, followed by amplification via polymerase chain reaction of a targeted DNA marker, such as the trnL regions of the

chloroplast genome. The products are then sequenced on a high-throughput platform and sequences sorted bioinformatically to identify multiple taxa at once and determine the dietary content of a sample. Here we describe our study design, including sample collection sites before and after the fire, our metabarcoding process, preliminary findings, and discuss potential contributions to deer management strategies.