Black Bear Denning Behavior in the Chisos Mountains of Big Bend National Park

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In early 2014, Borderlands Research Institute (BRI) initiated a project in Big Bend National Park (BBNP) to assess the distribution and abundance of mid- and large-sized mammals in the park. During the course of our study, we recorded many different species and were able to observe various patterns of behavior in addition to the aforementioned goals.

Of particular interest was the denning behavior of black bears that we observed in the Chisos Mountains of BBNP. Specifically, our objectives were to use remote trail cameras to determine the distribution and habitat use of black bears, the timing of den entrance and emergence, and the influence of temperature on denning timing and activity within the park. This research was conducted to provide BBNP biologists with reliable data that will benefit them in the management and conservation of black bears, as well as help minimize potential negative encounters between black bears and people within the park.

Black bear captured on remote trail camera in Big Bend National Park, Texas.

Historically, black bears were abundant throughout Texas. However, by the time the BBNP was established in 1944, black bears were rarely seen. By the 1950s, there was no evidence of black bears in the Trans-Pecos region other than transients crossing into the park's boundaries from Mexico. Some of the major factors leading to the black bear's decline in Texas were over-hunting and predator control. However, with new regulations and protection from hunting, black bears began to naturally recolonize the park. By the late 1980s breeding populations resided within the park. Today, it is estimated that roughly 30 black bears now reside permanently within the park, and the

population is still growing.

To determine the timing of den entrance and emergence by black bears, we used photos taken from remote trail cameras in the Chisos Mountains of BBNP. The Chisos Mountains are considered a "sky island" meaning they are high elevation mountains surrounded by desert lowlands. This area contains the largest concentration of bears in the park, because the combination of high elevations, cooler temperatures and increased moisture create excellent habitat for bears.

The remote trail cameras are motion activated, so they are triggered to take a photo whenever an animal walks by. Using remote trail cameras allowed us to simultaneously survey for multiple species in many locations throughout the park. We placed cameras roughly 2 km apart in a grid system that covered the Chisos Mountains. Cameras were placed in locations that would have the highest likelihood of capturing black bears and other wildlife walking through the area. Most cameras were placed on game trails, washes and drainages. Although over 50 cameras were placed throughout the park for the broader study, 17 cameras were located within the Chisos Mountains and were used for analysis of black bear behavior. Each camera was monitored every 4-8 weeks, when photos were downloaded and batteries were replaced.

We analyzed photos that were captured between the dates of April 1, 2014 and April 30, 2015. This time period was chosen so that we could compare den emergence between the two years. We renamed the photos based on the date they were taken.

All photos were sorted by species and by the number of animals in each photo. Photos that did not contain any visible animals were sorted as "unknown" and any with photos of an unidentifiable animal were sorted as "unidentifiable." After the photos were sorted, they were analyzed to determine the number of each species captured at each camera on each date. Photos that captured the same species of animal within one hour at the same site were considered the same individual animal and were not considered independent captures.

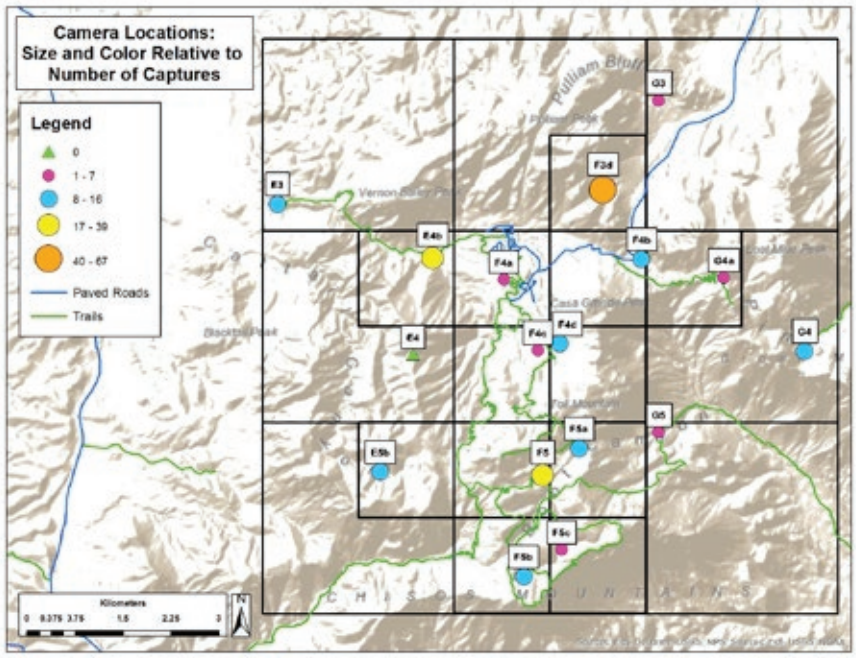
Using GIS software, we mapped camera locations and then combined the locations with the analyzed data to evaluate where black bear abundance was greatest and least. We estimated weekly capture rates as the number of black bear captures that were recorded each week divided by the number of active cameras.

Denning entrance was determined by pinpointing the dates in the late fall/early winter of 2014, when cameras stopped capturing bear photographs, and denning emergence was determined by identifying the dates in the late winter/early spring of 2015 when cameras began capturing bear photographs again. We then graphed the results to show when black bear activity decreased as they first began denning and when activity increased as they began emerging from their dens. Finally, we combined this data with temperature data collected from the National Oceanic and Atmospheric Administration's website and compared 2014 to 2015 to see if temperature was having an effect on bear denning behavior.

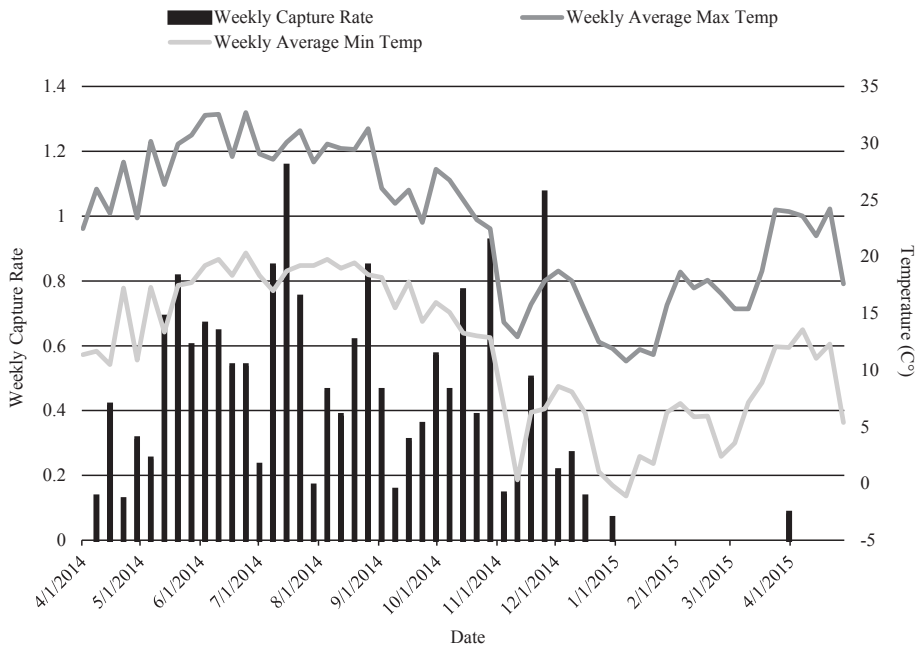
Our camera data revealed some interesting findings. First, our data revealed that the last photo of 2014 was recorded on Dec. 30, 2014 suggesting that black bears in 2014 entered dens in late December. We recorded no photos of black bears in the park until April 2, 2015. There was a three month time span between the last photo dates represent the denning period for black bears in the winter of 2014-2015. Because not all cameras recorded the same amount of black bear photos, we were also able to identify key areas of black bear habitat and travel corridors frequently used by bears in the park.

Aside from identifying the denning period of black bears, we were also able to evaluate some of their activities relative to temperatures. For example, black bear activity (represented by the mean number of black bear photos/week) consistently dropped as temperatures began dropping in late October 2014. Even in the heart of winter the Big Bend can experience unseasonably high temperatures. Based on our analysis, black bears responded to these spikes in temperature by emerging from their dens for short periods of time until the end of December.

Likewise, when the park experienced higher temperatures in early April of 2015, some bears were recorded by the cameras. But as temperature dropped, no more photos were recorded in April. We also observed some variability in den emergence between the two years of monitoring. In April 2014, we observed many more photos of bears compared to April of 2015. April 2015 was much cooler than April 2014, suggesting



Number of black bear photographs captured at camera sites in Big Bend National Park, Texas, April 1, 2014 – April 30, 2015.



Weekly capture rate for all locations and weekly average minimum temperature and weekly average maximum temperature in Big Bend National Park, Texas, April 1, 2014 – April 30, 2015.

park will vary annually.

Through this study, we were able to determine when black bears are entering and emerging from their dens, as well as the effect of temperature on black bear activity during the denning period. Based on our camera grid system, we were also able to determine which locations have higher and lower densities of black bears. Future research that could be useful to the management of this species would be to evaluate other climatic data such as precipitation to see how it correlates with denning behavior.

Black bears play an important role in the Chihuahuan Desert ecosystem in Texas. As black bear populations continue to grow and expand in Texas, it is important that resource managers have more information regarding their ecology so that we are better prepared to minimize human and black bear conflicts. Minimizing conflict is especially important in BBNP that is visited by more than 350,000 visitors each year.