A Comparative Map of Seasonal Home Ranges of Pumas by Sex

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Abstract

The purpose of this study was to identify overall home range size, seasonality of home ranges, and overlapping home range patterns between male and female mountain lions. Data was collected for four GPS collared female and four male mountain lions (*Puma concolor)* from Dr. Perry's on going research on the Ladder Ranch in New Mexico. This research is extremely important because the literature states that male mountain lions normally do not have overlapping home ranges because of physical altercations and female mountain lions normally have a smaller home range; however this data does not fully support both of these hypotheses. I used the "pings" of data from each collar to map the overall home range for each mountain lion in GIS. After identifying the home ranges, I split the overall home range into a Spring and Summer home range (March-August) and a Fall and Winter home range (September-February) to illustrate patterns of food availability on home range size. I also mapped male home range overlapping to test the hypothesis that male home ranges do not normally overlap. This study has found that overall and seasonal female mountain lion ranges are indeed smaller than male mountain lion home ranges, but a large portion of male home ranges do interact. Overall this study is important for conservation strategies to know how large a mountain lion range is and how to develop different strategies for, if eventually necessary, re-releasing them into the wild.

Introduction / Lit Review

The Ladder Ranch is a 156,439 acre property located in the southwestern portion of New Mexico. The ranch has a diverse set of biomes from pine forests to desert grasslands which supports a large array of biodiversity (bison to mountain lions to wolves). Ted Turner, the owner of the ranch, largely supports the conservation of its biodiversity, especially mountain lions (Turner Enterprises Inc., 2012). In order to properly conserve this species, the scientific community must first understand what impacts this species. M.M Grigione et al (2002) found that sex, body mass, deer relative abundance, and study site all influence home range size for mountain lions. Females often have an overall lower home range due to cub raising. The closer the mountain lion stays to her offspring, the more likely they are to survive. Seasonal home ranges are normally mainly impacted by prey availability and density. Winter in New Mexico normally decreases available vegetation and therefore prey is not as easily accessible, by necessity winter home ranges normally increase. Home range interactions are normally dictated by the mountain lion's sex. Kerry L. Nicholson et al. (2011) conducted a three year long study on 29 radio-collared mountain lions in Arizona to determine the spatial and temporal interactions among individual members of mountain lion populations. This study found that male-male pairs were located within 1km of each other 0.04% of the time while female-male pairs were near each other 3.0% of the time. It is logical that male and female home ranges interact more for mating purposes and because male-female pairs do not as readily compete as male-male pairs. Through genotyping analysis this study found overall males were less related to other males than females were related to other females. This result could be the result of male mountain lion physical altercation as well as males being less likely to survive than females.

Dr. Perry, Megan Pitman, and other students After the first capture of LF3.

Methodology

Data Collection: Data for four female and male mountain lions (*Puma Concolor)* was collected from Dr. Perry's ongoing research with mountain lions on the Ladder Ranch in New Mexico. The Ladder Ranch is located just to the West of Truth or Consequences (Figure 2).

Radio Collar: GPS collars for mountain lions require a scientist to either use radio telemetry to pick up a signal transmitted from the collar. This however requires the scientist to be within a relatively close distance which can be difficult because mountain lions have home ranges that are several hundred square miles in area. Another option is to either recapture the mountain lion and switch out the collar or to wait until the collar falls off. The collar can either have a preset date to fall off or set it by battery power. The collar then emits a VHF (very high frequency) beacon in which the scientist can track. Some collars use satellites to calculate the latitude and longitude of their location and send out a ping a day to either a phone or an email. This collars are incredibly expensive however and are not widely used yet.

Data Mapping: The collars on the mountain lions are set to send a "ping" of information every two hours. This ping includes the identification of the lion, the collar ID, the latitude and longitude of the lion, the UTM coordinates, and the time of day. I mapped the latitude and longitude "pings" for each mountain lion and created a map of each's home range by tracing the outline of the points using the edit feature (Figure 2). After mapping the home range, I wanted to differentiate between winter/fall and summer/spring home ranges. For Winter/Fall I used the "select by attributes" tool and selected pings that occurred between September and February and for Spring/Summer I selected pings from March through August. This orientation was chosen because the month contains at least one of the seasons and it allows an even break of 6 months for each category. I therefore selected by month and mapped out the summer and winter pings (Figure 3). From here I created shape files to better illustrate the overall and seasonal home ranges. In order to illustrate the combined home ranges of each sex, I used the union tool to combine all of the home ranges

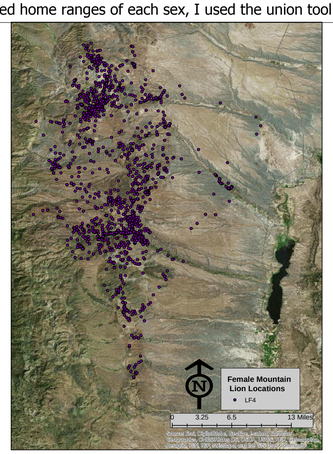


Figure 1: A map of the home range of the female mountain lion LF4

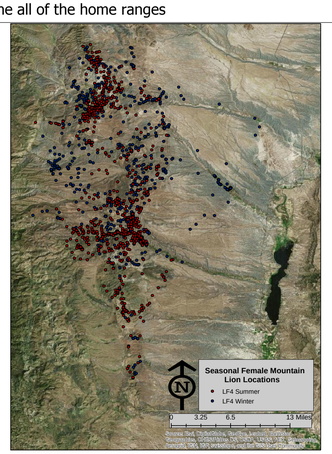
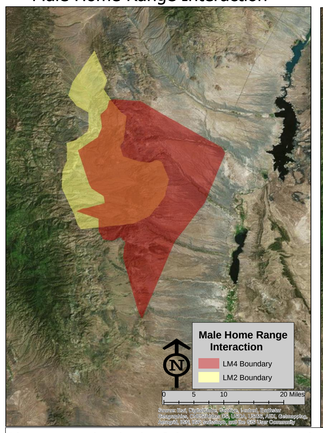


Figure 2: A map of the seasonal home ranges of LF4. Fall/Winter is from September to February and Spring/Summer is from March to August.

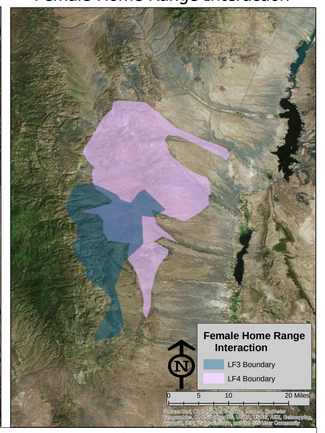
Figure 3: A topographic map of New Mexico and Ladder Ranch

IV. Results and Discussion

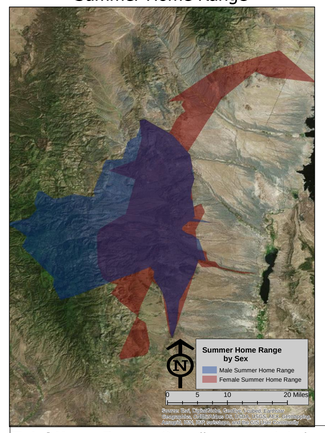
Male Home Range Interaction



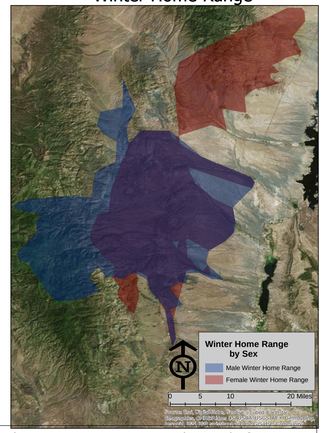
Female Home Range Interaction



Summer Home Range



Winter Home Range



Please note that both of these interactions only include a total of two mountain lions. I chose these mountain lions because these have the largest continual home range.

Male Home Range Interaction: More than half of the LM2 home range overlaps with LM4 home range. It is important to note that this does not mean that these two lions are constantly near each other. It is quite possible that these two lions are not often in the intersecting simultaneously. Regardless these two male mountain lions are competing for food and shelter within a relatively limited space. This competition might be overcome by an important resource in this area such as a large prey density, a water resource, or females for mating.

Female Home Range Interaction: LF3 and LF4 home ranges intersect less than 25% than the total of LF4's home range. Not only are these two mountain lions not necessarily in the intersecting area simultaneously, but it is even more likely than the male-male interaction that they are not in the same area.

Comparison: The literature states that males normally do not interact because of physical altercations, but that females are more likely to be near each other. This particular study shows that male home ranges intersect more than female home ranges.

Total Home Range: Overall our mountain lions home range encompassed a total of 2623.75 square miles. The female total home range was 1114.739 square miles and the male total home range 1509.75 square miles. This supports the standard hypothesis that males hold more territory in order to come in to contact with females and are more likely to travel farther to establish a home range with adequate resources.

Summer/Spring Home Range: The total Summer/Spring home ranges for males was 1013.684 square miles and females was 734.706 square miles. The top left figure above shows the Summer/Spring seasonal home ranges. Not surprisingly a large part of the male and female home ranges intersect. This also supports the hypothesis that interactions between male and female mountain lions do not normally result in physical altercations.

Winter/Fall Home Range: The total Winter/Fall home range for males was 1287.353 square miles and for females was 935.3348 square miles. The figure to the top right shows the Winter/Fall seasonal home range. Even in the winter when resources are more scarce, males and females still have a large home range intersection. The summer/spring home range is much smaller than the winter/fall home range because there is a higher abundance of resources. In the winter the mountain lions must extend their home range in order to find adequate food and water.

Conclusion

This study did not support all readily accepted hypotheses about mountain lion home ranges. This study did support the hypothesis that male mountain lions have a larger overall home range than female mountain lions. The hypothesis that male mountain lions also have a larger seasonal home range than female mountain lions was also supported. One hypothesis that was not supported however was that male mountain lion home ranges barely overlap and that female home ranges overlap much more. This study found the exact opposite. The male mountain lions in this study had a larger portion of overlapping home range than females. This could be result of an important resource, such as access to females, that makes this competition bearable.

Future Research

There is almost endless future research possibilities from this research. A larger sample size would allow more statistical tests to be conducted. If cub data could be included, then the hypothesis that females have a smaller home size because of offspring rearing could be tested. If given more time, this data could even be tested for how often males are within a certain distance of each other at any given time.

Acknowledgements

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References/ Data Sources

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Turner Enterprises Inc. Ladder Ranch. Web. 23 Nov 2014.