A Comparative Map of Seasonal Home Ranges of Pumas by Sex

Jordan Ellington
Furman University

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A Comparative Map of Seasonal Home Ranges of Pumas by Sex

Jordan Ellingdon

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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 ongoing research on the ladder ranch in New Mexico. This research is extremely important because it is the first study that indicates male mountain lions normally do not have overlapping home ranges because of physical attractiveness and female mountain lions normally have a smaller home range; however this data does not fully support both of these hypotheses. I used the “ping”s 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 Summer and winter home range (March-August) and a Fall/Winter home range (September-February) to identify 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 to a small portion of male ranges do interact. Overall this study is important for conservation strategies to know how large a mountain lion home range is and how to develop different strategies for, if eventually necessary, to reconcile the home range.

Introduction / Lit Review

The ladder ranch is a 15,493 acre property located in the southwestern portion of New Mexico. The ranch has a diverse set of homes from private farms to desert grasslands which supports a large array of biodiversity (bird to mountain lions to wolves). Ted Turner, the owner of the ranch, largely supports the conservation of its biodiversity, especially mountain lions (Ted Turner Enterprises Inc., 2012). In order to properly conserve this species, the scientific community must first understand what impacts this species. MM Grigoriev et al (2002) found that sex, body mass, diet, seasonal abundance, and study site all influence home range size for mountain lions. Females often have an overall lower home range due to cub rearing. 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 ranges are normally diluted by the mountain lion’s sex. Perry 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 home ranges of each other 20% of the time while female-male pairs were near each other 30% of the time. It logical that male and female home ranges interact more for purposes and because female range pairs do not as readily move as male-male pair. Through genetic analysis this study found overall males were less related to other males than females were related to males and females. This result could be the result of the male mountain lion physical alterations as well as males being less likely to survive than females.

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 wait until the collar battery dies. The collar then either has a preset date to fail or sell its 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 that a scientist can receive. This is a expensive method and can only provide a rough location.

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 home range by tracing the outline of the home range. Dr. Perry conducted research on the interaction between winter/fall and spring/summer home ranges. For Winter/Fall I used the “select by attribute” tool and selected pings that occurred between September and February and for Spring/Summer I selected pings from March through August. This delineated one of the sequential steps in this process. For each category, I then selected the sites within the square mile of the home range. This was then inputted into a GIS program and the program was used to calculate the area of each range. This process was then repeated for each mountain lion. The summer range was then overlaid on the winter range. This process was repeated for all the mountain lions. I then used the GIS tools to calculate the area, perimeter and length of the home range for each mountain lion. From these data I was able to calculate the total home range for each mountain lion. This data was then used to calculate the area of each home range. From this I was able to see how the home ranges overlapped with each other. This data was then used to compare the results of the research to that of other researchers.

Conclusion

We did not apply all necessary accepted hypotheses about mountain lions home range size. We did however 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. Our hypothesis that was not supported was that males have smaller home range size because of spring raising being more critical. If given more time, this data could even be looked at because most are often made within a certain distance of each other at any given time.

Future Research

There is almost endless future research possibilities from this research. A larger sample size would allow for statistical tests to be conducted. If that data could be collected, then it is hypothesized that females have a smaller home size because of offspring raising could be tested. If given more time, this data could even be looked at because most are often made within a certain distance of each other at any given time.

I would like to take this time to thank Dr. Perry for allowing me to use his mountain lion data for this project. I would also like to thank Mike Wilmans for all his help.

References/ Data Sources


New Mexico

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  
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 LF4 home range overlapped with LM 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 interesting 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: LF4 and LM home ranges intersect less than 25% of the total LF4 home range. Not only are these two mountain lions not necessary to the interesting area simultaneously, but it is even more likely than the male-male interaction that they are not in the same area.

Mountain lion home ranges: Mountain lions that normally do not interact because of physical alterations, but that females are more likely to be near each other. This particular study shows that male ranges home ranges intersect more than female home ranges.

Total Home Range: Overall our mountain lions’ home range encompassed a total of 2032.75 square miles. The female total home range was 1114.75 square miles and the male total home range 1590.75 square miles. This supports the standard hypothesis that makes hold more territory in order to come in contact with females and are more likely to travel farther to establish a home range with adequate resources.

Summer/Winter Home Range: The total Summer/Winter home ranges for males was 1031.684 square miles and females was 734.706 square miles. The top left figure above shows the Summer/Winter seasonal home ranges. Not surprisingly a large part of the male and female home ranges intersect. This also supports the hypothesis that interactions between males and females does not normally result in physical alterations.

Winter/Fall Home Range: The total Winter/Fall home range for males was 1287.353 square miles and females was 935.348 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 interaction. 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.

Future Research

There is almost endless future research possibilities from this research. A larger sample size would allow for statistical tests to be conducted. If that data could be collected, then it is hypothesized that females have a smaller home size because of offspring raising could be tested. If given more time, this data could even be looked at because most are often made within a certain distance of each other at any given time.

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