

Factors that affect territory size in Mountain White-Crowned Sparrows (*Zonotrichia leucophrys oriantha*)

Student: Becca LaRitz

Mentor: Ross Conover

Part-Time Independent Research/ Research Training in Wildlife Biology Course

Summer 2017

Abstract:

Male songbirds sing on the edge of their territory to warn away competing males. The mountain white-crowned sparrow (*Zonotrichia leucophrys oriantha*) prefers to sing on the edge of willows and spruce trees. High quality territory is determined by the availability of food, water and shelter. Meanwhile, lower quality territory lacks these key resources and reduce the chances of the holding male's breeding success. I hypothesized that perimeter and area of a territory are directly correlated to elevation. However, due to unexpected restrictions in sample size, my analysis was strictly descriptive. For this study, I walked through the willows and recorded the GPS coordinates of the singing spots of each male. The median total territory area was 4047.2 meters squared and a total territory perimeter of 83.2 meters squared. I constructed four GIS maps which allowed the visualization of the variety of territory shapes.

Introduction:

When migratory passerines come back to summer breeding grounds in the late spring, males tend to go to a few select spots to sing, therefore creating a set territory that they will protect (Morton, 2002). Morton suggested that females pair up with males soon after arrival at these sites (2002). After a pair is established, the male exhibits guarding behavior and watches the female closely, while continuously protecting the borders of his territory. Breeding territories are a crucial aspect of avian reproductive ecology as they influence mate attraction, as well as represent potential nesting and foraging sites (Potter, 1972). Higher quality territories are associated with increased reproductive success and increased food availability (Stiles, 1980). Morton (2002) also suggested

that males tend to have territory disputes for a two to three week period until the snow melts and vegetation begins to develop.

Based upon studies of Edmund W. Stiles (1980), he determined that the territories of multiple species of birds in the forests of Washington depends partly on the type of vegetation available. Therefore, birds that live in dense forests with tall conifers had a more vertical territory than those with smaller vegetation which had a more horizontal sized territory. Intraspecific competition is decreased when these birds have specific territories (Odum and Kuenzler, 1955).

My goals for this project are to determine if differences exist in MWCS territory size or shape across an elevational gradient. The availability of resources, including food and possible nesting sites, may affect the size of individual territory. My hypothesis was that perimeter and area of a territory are directly correlated to elevation.

Methods:

Sites

For the project, I had two different low elevation sites within the upper East River Valley in Gunnison National Forest (see fig. 1). The vegetation at these sites includes mixed willow species (*Salix sp.*), bluebell (*Hyacinthoides non-scripta*), veratrum (*Veratrum nigrum*), larkspur (*Delphinium sp.*), and cinquefoil (*Potentilla sp.*). The high elevation site I used was Schofield. The vegetation at Schofield consisted also of mixed willow species with spruce trees on the edges of the meadow and road. These sites are suitable habitats for MWCS due to the availability of willows, cinquefoil, and spruce trees (Morton, 2002). Morton (2002) also suggested that males tend to have territory disputes for a two to three week period until the snow melts and vegetation begins to develop.

Trapping and Banding

I used seed baited Potter traps to catch male MWCS. These traps have to front doors that close when the sparrows step on the metal pressure plate. After trapping them, we banded the birds with one silver USGS band with a unique identification number and took life history measurements. All of the male MWCS had a silver band on their right leg, while females had a silver band on their left leg.

Resighting

I re-sighted male MWCS, by travelling quickly through the willows and flagging the exact spot on the bush where the male MWCS sang. I observed the male going to these places the same times and logged the coordinates the males flew into the GPS then I followed them to the edges of their territory. A critical component of this study was the ability to trap and band the sparrows. To tell if the bird was male or female, first I would observe if the bird was singing or not. Female MWCS do not sing, so if the bird was singing it would be a male. To identify which bird has what territory, I looked through binoculars at the bird's legs to look at color band combinations. The birds were identified individually based on the combination of their color bands.

Data Analysis

I found the area of each territory, then calculated the mean area, maximum area and minimum area based on the coordinates I marked in my GPS. I then did a five number summary based on the area and perimeter of all territories.

Results:

Due to the lack of a consistent sample size of singing and banded male territories, my results for this study are inconclusive. According to Ralph, C. John, and Carol A. Pearson, they observed fifteen male and female pairs then calculated the maximum and minimum area of all territories. According to figure 2, 3, and 4, the territories are in a rectangular shape. On the site four map, I had more singing spots so the territories were actually in polygons rather than rectangles. This is interesting to notice because these territories might be more accurate than the maps (figure 2 and figure 4) with less singing spots. According to table 2, my median total territory area was 4047.2 meters squared and a total territory perimeter of 83.1 meters squared.

Discussion:

Throughout this study, it was difficult to get enough data at high elevations. In a study on Ecological speciation along an elevational gradient in a tropical passerine birds done by Caro et al. (2013), they suggest that multiple volunteers should be available to help collect territory border points. These scientists used spotting scopes over a specific amount of land and placed one person at each spot, so that they could observe the birds accurately. Their sample size was over one hundred territories of forest birds and they had forty coordinates for each singing male (Caro et al., 2013). My sample size includes five territories at low elevation and one territory at higher elevation. Even though I marked every place that the male sang, the number of coordinates for each territory varies from four points to seventeen points. During data collection, I had a difficult time being able to GPS enough singing males at each territory. As the only person working on this project during the time, I struggled with being able to find a singing, banded male MWCS and accurately follow him before he flew away. At higher elevations, banded male MWCS were in very low numbers and I could not find any territories to GPS. In

the study done by Edmund W Stile (1980), he used playbacks of song recordings to make different species of forest birds come to the edge of their territory.

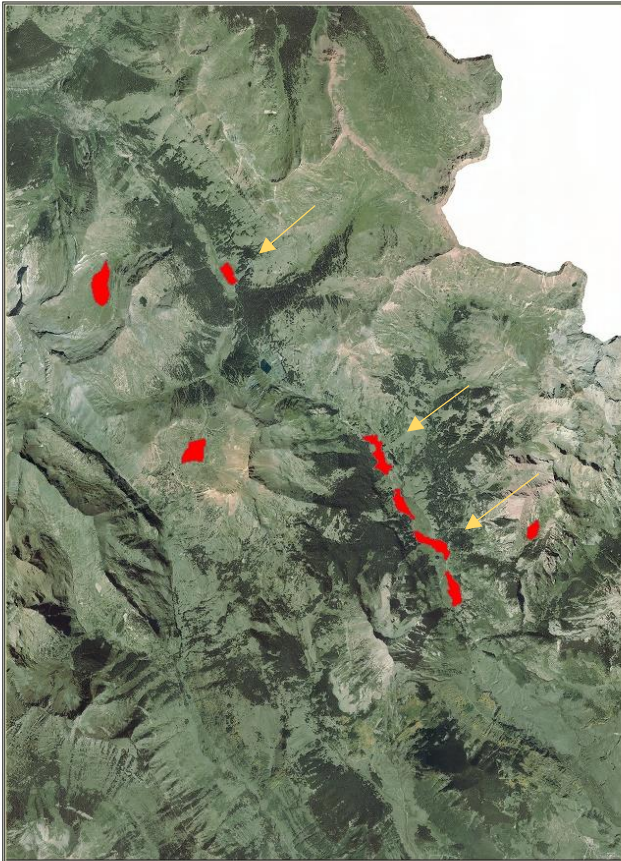
Studying territories of birds is important because of documenting community assemblage, population density, resource availability and even how male dominance affects a single species. Community assemblage is when multiple species interact together. Lincoln sparrows have very similar niches to MWCS and may have interspecific competition, which I witnessed. For example, I have seen male mountain white crowned sparrows collide with a male Lincoln sparrow to knock him off one of their favorite singing branches. Studying territory can determine how many males populate a certain area as well as possible mating pairs as well. The higher the population density of mountain white crowned sparrow, the greater the resources. In the future, it would be interesting to research the role of male MWCS dominance and how it changes with smaller or larger amounts of resources.

This study has limitations due to having a small sample size, and not using playbacks. Male MWCS are the most active in early morning and late evening, approximately 0600 and 1900 (Morton 2002). Male MWCS are the most territorial during mid-June to mid-July. The male's mate may have active nests during this time period, so they would have been more protective of their territory. These males are also the most territorial during mid-June to mid-July because of females having active nests. The amount of time the female MWCS is in incubation is only about ten to fourteen days. To properly GPS the territory of the male, it must happen in this time period. This means that it is critical to be out in the field observing these males sing. In the study done by Edmund W Stile (1980), he used playbacks of song recordings to make different species of forest birds come to the edge of their territory. With the use of playbacks, I could have more accurately determined the sizes of territory instead of just following the bird around as he sings.

Figures and Maps:

Figure #1:

Study Sites of banded male Mountain White-Crowned Sparrows



Yellow arrows indicate sites
used during data collection.

Figure #2:

Scofield Territory



Figure #3:

Site 4 Territories

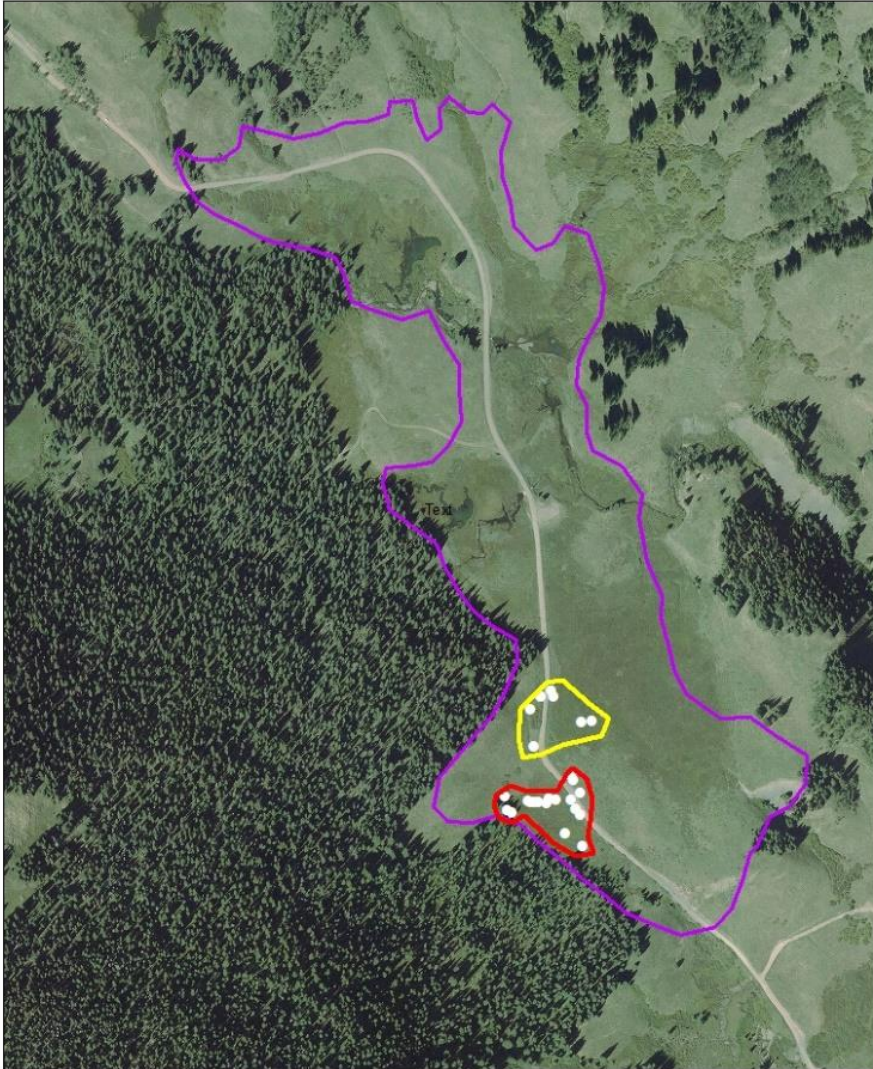


Figure #4:

Site 2: Territories



Table #1: Observational Descriptive Study

TL	BL	TR	BR	Site	Total territory area (meters squared)	Perimeter (meters squared)
G	W	R	S	4	5191.915649	103.3409858
O	B	Y	S	4	4908.835599	84.61031008
B	B	M	S	2	5305.055285	94.48959928
B	G	K	S	2	2993.606915	81.61035711
O	K	W	S	2	2130.961388	73.77856116
B	W	R	S	Schofield	3185.477501	79.82826796

Table #2: Five Number Summery

	Total Territory Area (meters)	Perimeter (meters)
Min	2131	73.8
Q1	3041.6	80.3
Med	4047.2	83.1
Q3	475.8	92.2
Max	5305.1	103.3
Range	294.9	29.5

Literature Cited:

Caro, L. M., Caycedo-Rosales, P. C., Bowie, R. C. K., Slabbekoorn, H. and Cadena, C. D.

(2013), Ecological speciation along an elevational gradient in a tropical passerine bird?.

J. Evol.

Biol., 26: 357–374

George V. N. Powell. "Structure and Dynamics of Interspecific Flocks in a Neotropical

MidElevation Forest." *The Auk* 96, no. 2 (1979): 375-90.

Morton, Martin L and Cooper Ornithological Society, *The mountain white-crowned sparrow:*

migration and reproduction at high altitude. Copper Ornithological Society, Camarillo,

Calif, 2002.

Odum, Eugene P., and Edward J. Kuenzler. "Measurement of Territory and Home Range Size in

Birds." *The Auk* 72, no. 2 (1955): 128-37.

Peter E. Potter. "Territorial Behavior in Savannah Sparrows in Southeastern Michigan." *The*

Wilson Bulletin, vol. 84, no. 1, 1972, pp. 48–59. *JSTOR*

Ralph, C. John, and Carol A. Pearson. "Correlation of Age, Size of Territory, Plumage, and

Breeding Success in White-Crowned Sparrows." *The Condor* 73, no. 1 (1971): 77-80.

Stiles, Edmund W. "Bird Community Structure in Alder Forests in Washington." *The*

Condor, vol. 82, no. 1, 1980, pp. 20–30.