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Effects of Geospatial Factors on Male Red-Winged Blackbird Territorial Behavior and Abundance

by Gabriella Zaffer

(Biology 1152)

Abstract - Male red-winged blackbirds are a territorial species that form a polygynous relationship with a harem of females. Territorial displays such as song-spread and chasing of other male red-winged blackbirds precipitate the chance of maintaining an abundant habitat in which females will want to mate. This study was conducted within the parameters of the greater DuPage area of Illinois. Observations were made at three separate wetlands within ten kilometers of the College of DuPage Campus. Territoriality and abundance of male Red-winged blackbirds in comparison to geospatial pressures, proximity to roads and percent coverage of vegetation, was determined to be inconclusive upon data analysis.

Key Words: Territoriality; Polygamous; Territory; Geospatial; Red-winged blackbirds

INTRODUCTION

The red-winged blackbird (*Agelaius phoeniceus*) is the subject of observational study in this experiment. This species of bird forms a polygynous relationship, in which one male mates with several females. The primary habitat types that these birds occupy are marshes in upland areas in the North American region. Male red-winged blackbirds are an aggressive species that defend their territory atop cattails and other habitat landmarks such as larger trees through song-spread and the display of their red and yellow epaulets (Smith 1976). Determining the abundance of territorial displays and number of individuals among male red-winged blackbirds, based upon specific geospatial pressures, is what this experiment entails.

The nesting sites for these birds consist of several males, each of which obtains a harem of up to fifteen female red-wing blackbirds (Lennington 1980). It is important to note that more prominent perches lead to a greater display of territorial defense among male red-wing blackbirds (Newhouse 1977). Since there is one male to many females, he must be able to present himself as an experienced territory owner, due to the female mating preference of a male territory owner over a non-territory owner (Searcy 1979). Avian stressors that are caused by humans include, but are not limited to: pollution, habitat destruction, and loud noises are connected to urban development. As the amount of human interference increases, a decrease in nest development can be observed, and thus lower reproductive success in the species (Tozer et al. 2010). In accordance with this, we hypothesize that male red-winged blackbirds, when occupying habitats in closer proximity (meters) to roads, will be present in lower abundance, due to a lower nesting potential which could affect female preference when choosing a mate.

During early spring, the marshy habitats consist only of male red-wing blackbirds, that will establish territories in anticipation of the mating season. When the female red-wing blackbirds arrive, studies show that they will select the male that presents the best physical characteristics and holds the most advantageous territory for reproductive success (Harrison 2003). Territorial behaviors among male red-wing blackbirds can be seen at a constant rate in areas with an abundance of male red-winged blackbirds. Male red-wing blackbirds use the song-spread as a territorial sign of aggression against other males that might encroach upon its territory in an attempt to mate with the harem of females within his territorial boundary (Yasukwa 1981). Population density and habitat quality are

negatively correlated due to the favorability of red-wing blackbird to habitats with greater cattail coverage (Vierling 1999). Population density in high quality habitats is lower than the population density of a lower quality site. This is the result of the non-territory holding male red-wing blackbirds being chased away from the dominant male's harem and taking territory in less favorable habitats (Holm 1973). Due to the increased competition for limited resources and abundance of males, we hypothesize that wetlands with a lower vegetative cover are areas in which territorial displays of aggression, specifically song-spread, is increased.

MATERIALS AND METHODS

This study was done at three locations in the greater DuPage area. The sites for observation included the Russell R. Kirt Prairie and East Campus Marsh, both of which are located on the College of DuPage Campus in Glen Ellyn Illinois, and a third location, Lincoln Marsh, is located in Wheaton Illinois. We separately collected observational data on red-wing blackbirds in the three aforementioned marshes, during a time frame of six to eight in the morning, on Thursday, April 5th, 2018. The weather was cold but sunny. The parameters for choosing an observational site was based on the site having at least three different male red-wing blackbirds. Each observer used both binoculars with a 7x30 range and the naked eye when bird watching. Observation at the Russell R. Kirt Prairie consisted of a habitat that was 1.23 hectares. The area of the body of water was 0.48 hectares. This location was 143.7 meters from the east road, 25.03 meters from the west road, and 143.8 meters from the nearest building. The north, south, east, and west areas of the marsh were observed during a thirty-minute time period, split equally among each directional point (ten minutes each). These were the chosen observational directions due to the east of access to all areas of this site. Both the Russell R. Kirt and East Campus sites were surrounded by both graminoid and woody vegetation such as: cattails, cottonwood trees, and dogwood shrubs. The East Campus pond was 1.04 hectares large and 34.41 meters away from the nearest road. The body area of the water was 0.25 hectares. The pond was situated 118.19 meters away from the Mac building on the College of DuPage campus. This study consisted of an observational period of thirty minutes with three points of observation at the north, south, and west corners split up equally in time (ten minutes each). Observations were not made at the east side of this prairie because the accessibility was not conducive to observation. The third observation area, Lincoln Marsh, is .93 hectares large, has a body of water that is .75 hectares, and 354.79 meters from a nearby road to the south of the pond. This area was observed from two docs in which we were able to visualize all areas of the marsh with a three-hundred and sixty-degree viewpoint. Lincoln marsh was surrounded by both graminoid and woody vegetation, specifically cattails, cottonwood trees, and oak trees. Data was collected based on the frequencies and the type of vegetation (woody vs. grassy) where territorial displays occurred. The category of territorial displays observed included the frequency male Red-winged blackbird song-spread at each observational point. Individual males were counted at each point of observation. The use of these two types of data collection allowed for further analysis of territorial behavior among the male red-wing blackbirds. We used the Chi-squared function to appropriate our data for statistical analysis. Significance was determined at $\alpha = 0.05$.

RESULTS

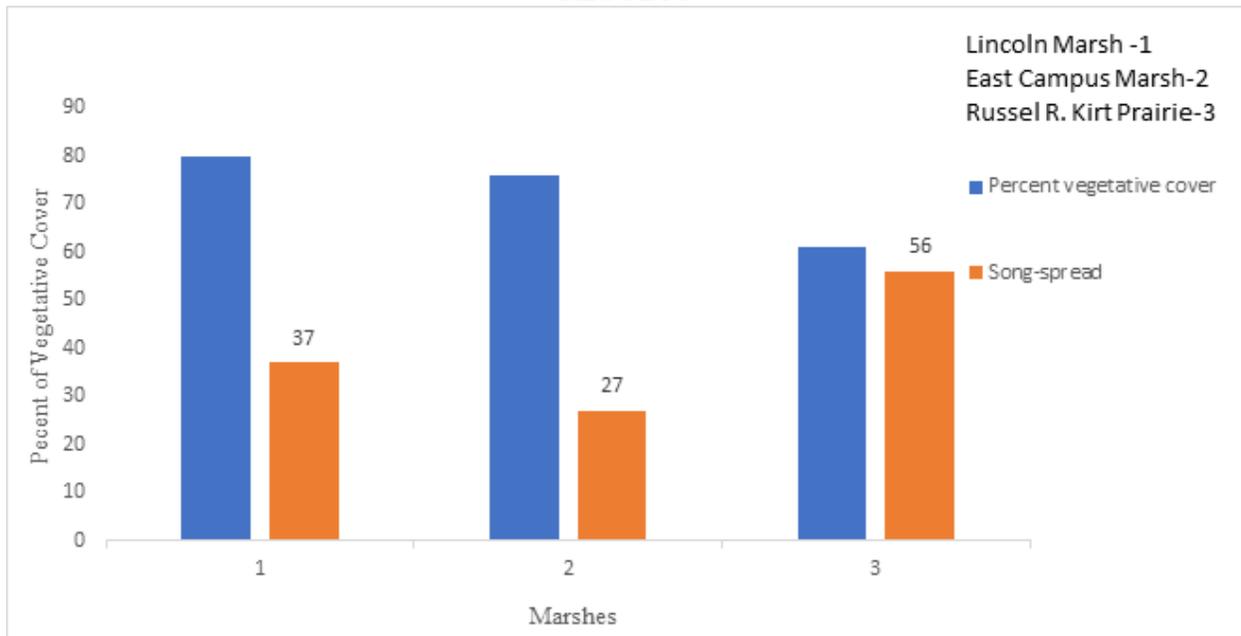


Figure 1. The effects of percent coverage of vegetation in accordance to the number of male red-winged blackbirds among the three wetlands. Percent Coverage was determined through mathematical ratio of the area of the entire wetland to the area of the wetland not occupied by water. Song-spread was calculated through the average frequency of male red-winged blackbird calls at each particular site.

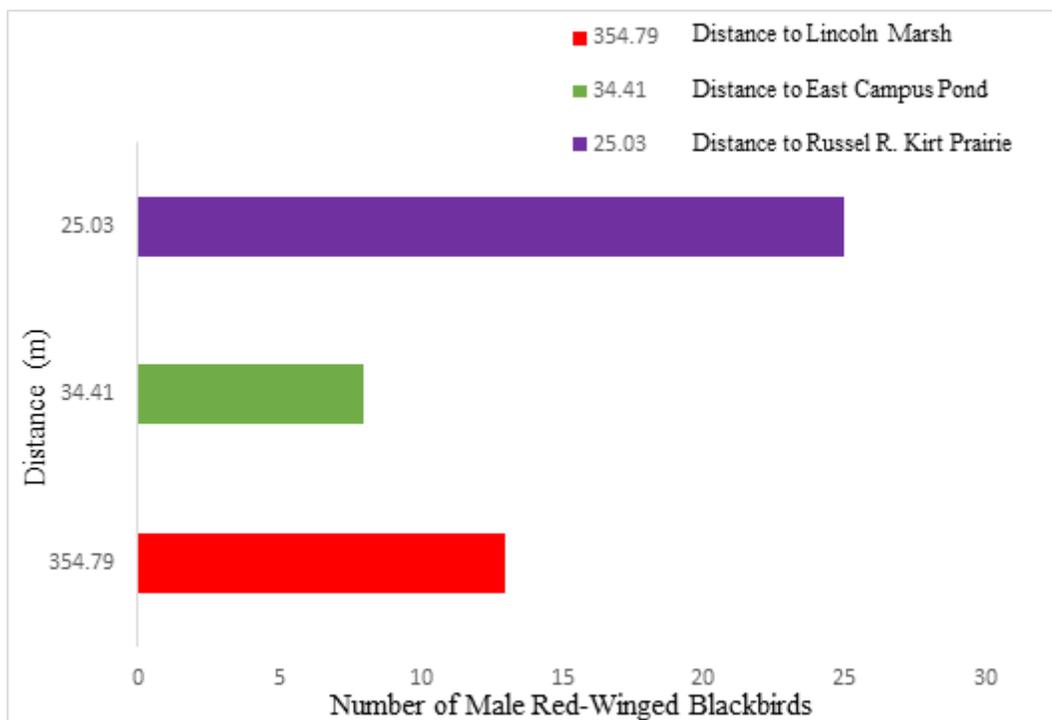


Figure 2. Effects of each wetland's distance from the closest road on the abundance of male

red-winged blackbirds at each observational site. The distance of the wetland to the nearest road was measured with the use of Google Earth Pro, and the abundance of territorial male red-winged blackbirds was obtained through visual observation.

Table 1. Red-winged blackbird habitat metrics, number of territorial males, and song-spread among wetlands in the greater DuPage area.

OBSERVATION SITE	SIZE (HECTARES)	AREA OF WATER (HECTARES)	PERCENT VEGETATION	TERRITORIAL MALES	SONG-SPREAD	DISTANCE FROM ROAD (METERS)
LINCOLN MARSH	.93	.75	80.6	13	37	354.79
EAST CAMPUS POND	1.04	.25	75.9	8	27	34.41
RUSSEL R. KIRT PRAIRIE	1.23	.48	60.9	25	56	25.03

The results from Figure 1 demonstrate that there are no correlations between the proximity to roads and the abundance of male Red-winged blackbirds. Lincoln Marsh was the greatest distance from the nearest road and was in the second in regard to the abundance of male Red-winged blackbirds (Table 1). The East Campus pond had the second farthest length from the nearest road with the lowest abundance of males, and the Russel R. Kirt Prairie had the closest proximity to the nearest road with the greatest amount of male Red-winged blackbirds (Table 1). The abundance of male Red-winged blackbirds was varied among the three wetlands and did not correlate with the proximity of their habitat to roads ($X^2=9.97$, $df= 2$, $P< .05$). Secondly, Figure 2 indicates that there are no correlations between the percent coverage of vegetation and the frequency of song-spread among male Red-winged blackbirds. This result is followed by the frequencies at Lincoln marsh which had the greatest percent coverage of vegetation, and the East Campus Prairie which had the intermediate percent coverage of vegetation (Table 1). The frequency of song-spread in comparison with the percent coverage of vegetation did not correlate ($X^2=10.79$, $df= 2$, $P< .05$).

DISCUSSION

We can conclude from this study that both of our hypotheses were not supported. The first hypothesis, that the wetlands with a lower percent vegetative coverage will be areas where territorial displays of aggression, specifically song-spread, is increased due to the limitation of resources was rejected. As seen in Figure 1, there is no correlation between the number of territorial calls of male red-winged blackbirds and the percent coverage of vegetation. This could be the result of several factors, mainly the burning of the Russel R. Kirt Prairie in February 2018. Accordingly, Red-winged blackbirds prefer shrubby areas with rich vegetative cover (Johnson 1997). Because the Russel R. Kirt Prairie was an outlier for the number of birds present, we concluded that the burning was a possible external force driving male red-wing blackbirds from the burned territory to inhabit the unburned portion of the Russel R. Kirt Prairie. This is because the unburned site, rich in resources, was able to provide the red-winged blackbirds with a territory to obtain nourishment and attract females.

The second hypothesis presented in this study expressed that male red-winged blackbirds, when occupying territories in closer proximity(m) to roads will be present in lower abundance due to

the increased disturbance from human development, leading to a lower female preference of that male. As seen from Figure 2, this hypothesis was refuted. The main cause of this was the presence of fourteen other bird species, such as tree swallows and the common grackle, at Lincoln Marsh. When exposed to grackles male Red-winged blackbirds aggressively defend their territory. Interspecific competition among these birds results in a lower nest success for that mating season (Wiens 1963). The male red-winged blackbirds at this specific location were found chasing other species from their territory at a more frequent rate than chasing males of its own species. Even though this site was the greatest distance from the nearest road, the presence of other bird species could be seen as increased competition for nesting and resources and could have directly correlated to the lower abundance of male red-wing blackbirds at this site. Also, as mentioned previously, the Russel R. Kirt Prairie (the site in closest proximity to roads) had a man-made the prairie fire, which drove more birds to the observation site. The abundance of male Red-winged blackbirds at the observed, unburned site, which was closer to the road had the most birds present. This could have resulted from the abundance of resources in comparison to the stripped habitat, that the immigrant birds were exposed to.

The study of multiple wetlands and a greater sample size of male Red-winged blackbirds over many observational days would be a route for further observational investigation on the abundance and territoriality of male Red-winged blackbirds when exposed to specific geospatial pressures.

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