30th National Sunflower Association Sunflower Research Forum. January 10-11, 2008. Fargo, ND. NSA Website Online Forum (www.sunflowernsa.com

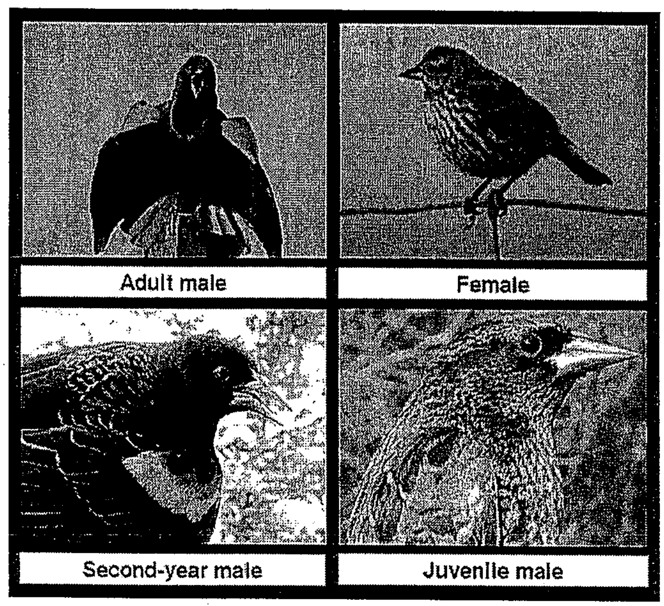
Breeding Red-winged Blackbird Response to Conspecific Models Placed in Pre-copulatory Position: Implications for Reproductive Control

Laurel L. Moulton[1], George M. Linz[2], and William J. Bleier[1]

1. North Dakota State University, Fargo, ND 58105
2. USDA NWRC Great Plains Field Station, Bismarck, ND 58501

Introduction

Sunflower producers in the northern Great Plains are annually plagued by feeding flocks of blackbirds, especially red-winged blackbirds (RWBL). Increased sunflower production and concomitant human-blackbird conflicts have prompted sunflower producers to demand that management strategies be developed to reduce the annual crop losses estimated at ≥ $10 million (Linz et al. 1996). Past techniques aimed at reducing blackbird damage have had varying degrees of success and the annual loss of sunflower remains the same (Peer et al. 2002). Thus, there is a need for new innovative approaches to managing blackbird damage.



One approach is to find non-lethal species-specific methods of lowering reproduction by discovering vulnerable behavioral tendencies in the reproductive cycle of RWBL. Male RWBL are a good candidate for reproductive control because of their territorial and polygynous reproductive behavior.

We have designed a study to assess the male RWBL response to a model placed in pre-copulatory position under different treatment scenarios. Our objective is to discover the conditions under which we can attract the largest numbers of males to the model. Because extra-pair copulation occurs frequently in this species, it may be possible to attract both neighboring males as well as non-territorial floater males to the models (Gibbs et al. 1990). The majority of floater males are second-year (SY) males that are out competed for territories by older males and have a duller plumage than breeding after-second year (ASY) males (Rohwer, 1978). Models could potentially be used as a delivery system for a reproductive inhibitor. This study is a first-step toward discovery of a new species-specific approach to potential reproductive control in RWBL.

Methods

This study was conducted in eastern North Dakota where cattail dominated wetlands and drainage ditches are abundant and contain large numbers of RWBL. In May 2007, we mapped the territories of 31 male RWBL at three wetlands. We captured the males using T-traps baited with a decoy male RWBL and marked them with unique color band combinations. We placed a decoy model female and juvenile male in pre-copulatory position within the territory of a male for at least 30 minutes every week from May 15 to July 1 and recorded all behavioral interactions. The models were made from the carcasses of female and juvenile male RWBL that were injected with formalin and dried in the pre-copulatory display (head and tail raised, wings held away from the body, and the body tipped forward at an angle). During the morning and evening, a female and juvenile male decoy were placed within a territory at a distance of 2 meters apart for a 30-minute interval. We randomized the order in which territorial males were presented with models. We followed published methods for studying and recording behavior. We recorded the number of mounts, the number of copulations, and other activity within the territory, noting the time each occurred. We also recorded interruptions and behaviors by neighboring males and floater males.

Experimental Setup with Juvenile Male and Female Models

Results

While we had nearly no response from territorial males, we found that floater males readily copulate with conspecific models. The rate of copulation differed by site and phenology of the breeding season. Sites 1 and 2 had a significantly lower average rate of floater copulation attempts per territory ($\mu_1 = 0.7$, $\mu_2 = 1.2$) than Site 3 ($\mu_3 = 8.9$) (ANOVA: $F_{(2, 28)} = 6.634$, $p = 0.004$). Differences in floater copulation attempts were also found between territories within sites, with some males receiving zero intrusions and some receiving over 30. Reasons for these differences are unclear. We will explore this question further in 2008.

We also found that floater intrusion and copulation occurs more often in the early part of the breeding season and while females were building their nest. This period is when the RWBL females are most fertile. Aggression by territorial males towards floater males was also more pronounced during this time. It appears that floater males are more willing to risk injury by a territorial male during the period that they are most likely to fertilize a female. When presented with a female and juvenile male model, floater males did not have a preference (two sample t-test: t-stat = 0.524, p = 0602). The juvenile male was chosen 44% of the time indicating that floater males do not discern between females and juvenile males. This observation suggests that either would be appropriate as models. Territorial males did not exhibit aggressive behavior toward the male models, suggesting that they too were either unaware or did not care that these were males. Of the floater males that attempted to copulate with a model, 96% were SY males; sy males are considered "non-breeding." It is unclear how often SY males would get the opportunity to fertilize a female, but this population should not be dismissed as "non-breeding" when designing a method of reproductive control.

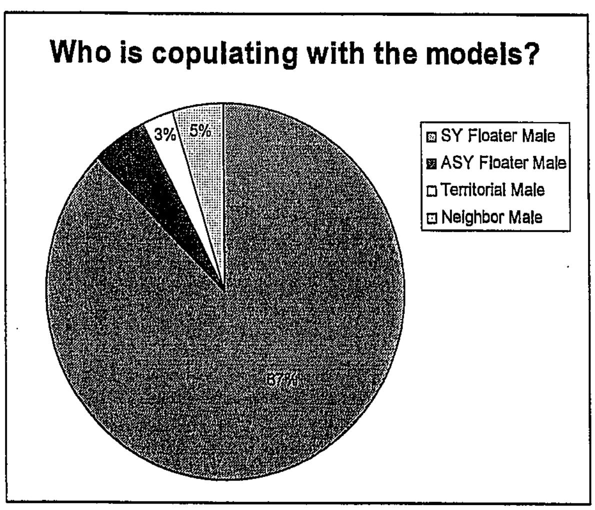


Figure 1. Percentage of males copulating with models based on status.

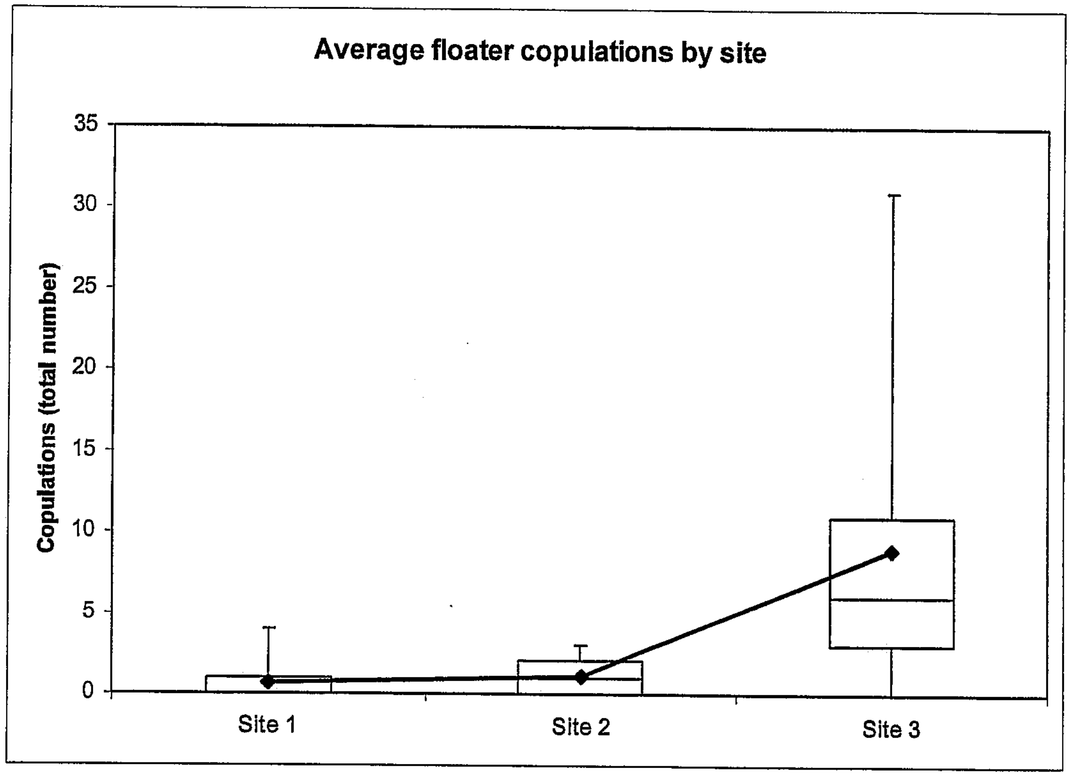


Figure 2. Average number of copulations by floater males per site. Box-plot shows 25th, 50th and 75th percentile as well as the minimum and maximum values.

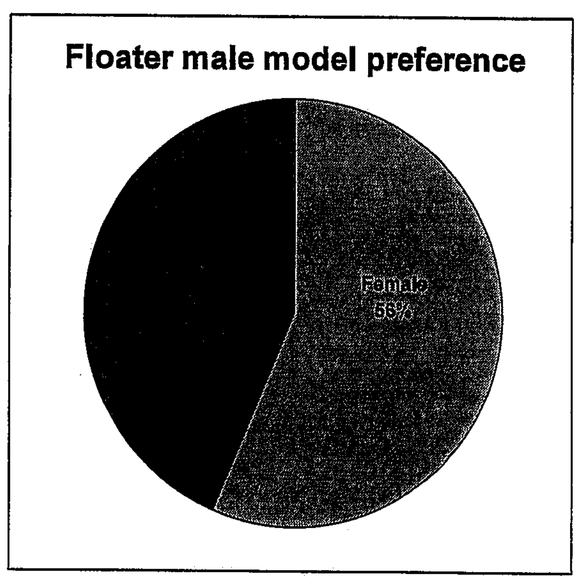


Figure 3. Percentage of time that a floater male chose to copulate with either the juvenile male or female model. There was no statistical difference in the choice made by floater males. (2-sample t-test: t-stat = -0.524, df = 60, P-value = 0.602)

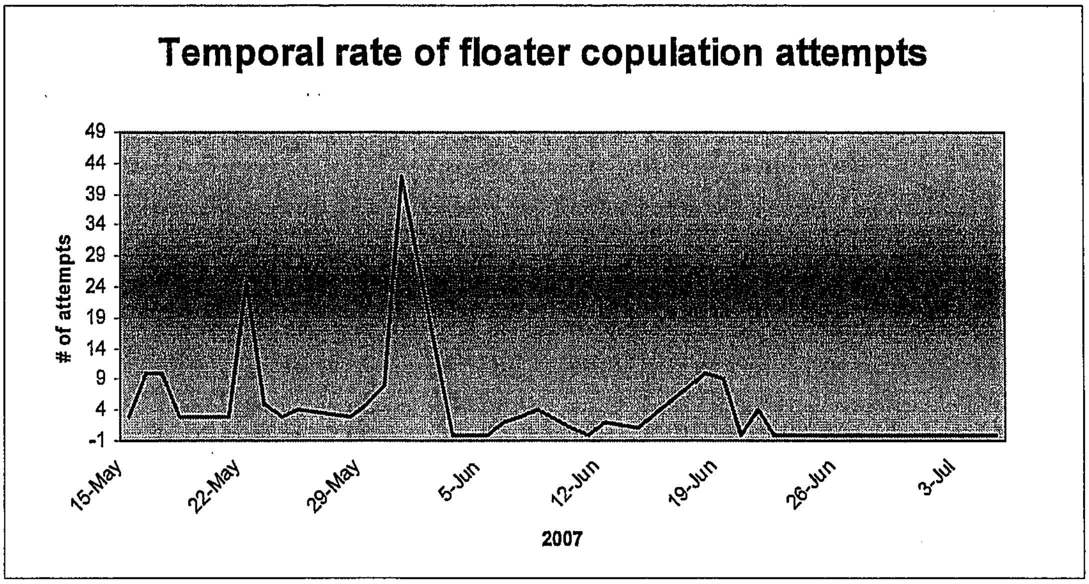


Figure 5. Variation in rate of copulation attempts by floaters through time.

Future Plans

Next field season, we plan to increase the attractiveness of the models to territorial males by making them look more realistic. We will also begin model presentations before the females arrive on site in the hopes that territorial males will be more inclined to interact with the models. We also will experiment with other methods of attracting territorial males, such as placing adult male models in an aggressive stance within a territory. To attract even more floater males, we will place models outside of territories so that aggression by territorial males towards floaters is not an issue.

Management Implications

This method appears more likely to attract floater male RWBL who otherwise have few chances to breed. Since the majority of floaters are SY males, it is likely that they will attain territories in future breeding seasons. This would require the use of a long-term sterilant to be successful. The attraction rate of floaters to models varies temporally and spatially, with higher success rates early in the breeding season. More research needs to be done to explain variation between sites. This method has the potential to target specific breeding populations, but more research is needed on movement patterns of floater males. Only RWBL responded to the models; therefore, there have been no non-target issues using this method.

Acknowledgements

We thank Lynne Stokes and David Westneat for their insight and suggestions with our study. Peter Oduor provided maps and GIS assistance. Curt Doetkett provided statistical help. Michelle Peterson and Shannon Gaukler provided help in the field. This research was funded jointly by the National Wildlife Research Center, a unit within the Wildlife Services program of the United States Department of Agriculture, Animal and Plant Health Inspection Service, and the Department of Biological Sciences at North Dakota State University.

Literature Cited

Gibbs, H.L. et al. 1990. Realized reproductive success of polygynous red-winged blackbirds revealed by DNA markers. Science 250: 1394-1397.

Linz, George M., R. A. Dolbeer, J. J. Hanzel, and L. E. Huffman. 1996. Controlling blackbird damage to sunflower and grain crops in the northern Great Plains. United States Department of Agriculture, Animal and Plant Health Inspection Service, Agriculture Information Bulletin No. 679. 15pp. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/blkbird/index.htm (Version 16JUL97).

Peer, B. D., H. J. Homan, G. M. Linz, and W. J. Bleier. 2003. Impact of blackbird damage to sunflowers: Bioenergetic and economic models. Ecological Applications 13: 248-256.

Rohwer, Sievert. 1978. Passerine subadult plumage and the deceptive acquisition of resources: Test of a critical assumption. The Condor 80: 173-179.