

Comparative Demography of the Cerulean Warbler and the Blue-Gray Gnatcatcher

Taryn R. Cipra

Faculty: Dr. Christopher M. Rogers

Department of Biological Sciences, Fairmount College of Liberal Arts and Sciences

Abstract. The Neotropical-migratory Cerulean Warbler (*Setophaga cerulea*) is one of North America's strongly declining songbirds. The three hypotheses of alteration in breeding, wintering, and migration habitat, potentially explain declines. Distinction between these hypotheses could possibly reallocate resources of current conservation efforts. For the Cerulean, two studies show that annual adult migration survival reflects the range expected for non-declining species (0.4-0.6), whereas, annual reproductive output is very low throughout its breeding range. This suggests a strong influence for events on the breeding grounds affecting its population decline. As an independent test of this qualitative model, annual survival and reproduction are being measured in a non-declining, small-bodied, blue, insectivorous Neotropical migrant, the Blue-gray Gnatcatcher (*Poliophtila caerulea*).

1. Introduction

The Cerulean Warbler, CERW, is one of the most rapidly declining Neotropical-migratory songbirds in the U.S.

(-4.0%/year since 1966) [1]. Conservation biologists are attempting to understand what is causing the sharp decline of this beautiful songbird, focusing on three hypotheses. Breeding grounds hypothesis: events on the breeding grounds e.g. increased nest predation and/or brood parasitism, cause annual reproduction to be less than annual survival. Wintering grounds hypothesis states that events on the wintering grounds, such as habitat loss and degradation, cause annual survival to be less than annual reproduction. Migration hypothesis: habitat loss/degradation of habitat used during migration cause annual survival to be less than annual reproduction.

The Blue-Gray Gnatcatcher, BGGN, is a unique Neotropical migrating song bird that is increasing in population, as well as, expanding its range over the last two decades [1]. Our goal is to compare and contrast survivorship and fecundity of a decliner next to a non-decliner, elucidating where conservation efforts should be targeted. Right now there is a great

amount of effort being taken to preserve the wintering grounds in South America. However, if we can prove that the survivorship is the same between the decliner and the non-decliner, and that it is fecundity that is resulting in decline, then, we can justify more impetus on protecting the breeding grounds right here in the United States. There are many variables to consider when doing field research. In our evaluation of population decline vs. non-decline we will compare and contrast as many variables as we can adequately gather data on. With adequate comparison, we can draw sound scientific conclusions that will be of benefit to conservation efforts.

2. Experiment, Results, Discussion, and Significance

The WSU Field Station along the Ninnescah River provides adequate riparian habitat to study the Blue-gray Gnatcatcher, making it research site one for this study. Private land with permissions from Dr. Degner is study

site number two. Our materials and methods will mimic the established protocols of the Cerulean Warbler studies completed in Michigan [2]. We are using mist nets to color band the BGGN, resightings of banded birds are then used to recognize



territories and attribute nest ownership. Global Positioning System coordinates were determined for territory

centers and plotted on topographical maps. Territories were intensively searched throughout the breeding season every 2-3 days (0.5-2.0 hr/visit) for the presence of active nests or newly fledged young. Territories were observed from 0600-1200, with occasional evening visits from 1600-2130, to take advantage of late activity. Each territory check involved a complete traverse through the entire

Figure 1: CERW nestlings day nine.

territory, with stops in and near all forest gaps to search for active nests and adults giving contact calls while carrying out the nesting cycle. Located nests were monitored every 2-4 days early in the nesting cycle, and every day as fledging neared. Successful nests fledged BGGN young; failed nests fledged no BGGN young.

To minimize underestimation of BGGN reproduction, all begging fledglings and alarm-calling adults of all avian species (the latter suggesting the presence of fledglings) occurring in all forest foliage layers, in all territories, were identified to species and their locations thoroughly searched and made note of.

Table: 1
Demographic Comparison of BGGN and CERW

	BGGN		CERW		Statistical Analysis
Annual Survival	n=2	0.50	n=102	0.44	Aikaikae TBC
Mean # Fledglings/Successful Nest	2.33		2.33		t-value=.99 $\alpha=.05$ accept H_0
% Nest Success	n=32	18.75	n=104	46.15	$\chi^2=7.195$ $p<.01$ reject H_0
# Female Fledges/ Female/ Year	n=20	0.35	n=88	.61	t-value =.12 $\alpha=.05$ accept H_0
Song and Territorial Behavior	April-August		Mid-May to Early July		Observed

3. Conclusions

With the longer breeding season and the re-nesting persistence of the Blue-gray gnatcatcher we expected that reproductive success would be much higher in the gnatcatcher populations than in Ceruleans. However, as Table 1 shows the BGGN did not have significantly higher average fledglings per successful nest, nor higher numbers of female fledges per female per year. The Cerulean warbler, a declining species, had a significantly higher percentage of nest success than the Blue-gray gnatcatchers in the populations studied. A confounding factor contributing to this inability to see the expected dichotomy in demography between the two species is the extreme heat and drought of Summer 2011 in BGGN territories. The extreme heat wilted leaves and reduced shade and hiding cover for the BGGN,

making it a year of high predation risk. With temperatures above 100°F and reduced shade and low humidity it was difficult to keep incubating eggs below critical temperatures. Food sources were also greatly reduced as drought and heat decimated the insect populations as well. More energy and time went to finding food and keeping cool. This is the most prevalent reason we believe the “non-decliner” so closely mimics the declining species demographics.

This was also the first BGGN field season, which made it a trial and training period that produced many improvements in technique and more proficiency in recognition of blue-gray gnatcatcher song, behavior and daily rhythms. Lack of skill in nest finding and adequate grid-walking, potentially led to an equilateral underestimation of BGGN nest success in all territories. Adult survivorship will be measured in Spring, with the return of the banded adults. A second field season studying the Blue-gray Gnatcatcher, likely more temperate and definitely more skilled, may reflect a significantly higher breeding output than the Cerulean Warbler.

4. Acknowledgements

The Fairmount College of Liberal Arts and Sciences at Wichita State University is kindly acknowledged for the Faculty Summer Fellowship to CMR. A special thanks to all of the contributors, both public and private, of the Ninnescah Field Station. The field research of Kim Wadsworth was foundational to the ongoing research of the Blue-Gray Gnatcatchers, her work is highly applauded. Banding Assistant, Andy Spellmeyer has contributed his expertise to the banding of the BGGN. Tracy Harmon assistant bander and nest finder is also thanked for her kind contributions. Dr. Degner is applauded for graciously allowing the use of his private lands for BGGN research.

References Cited

- [1] Sauer, J.R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. *The North American Breeding Bird Survey Results and Analysis 1966 - 2009*. 2011 [cited 2012 March 1]; Version 3.23.2011:[Available from: <http://www.mbr-pwrc.usgs.gov/bbs/>]
- [2] Rogers, C.M., Nesting Success and Breeding Biology of Cerulean Warblers in Michigan. *The Wilson Journal of Ornithology*, 2006. **118**(2): p. 145-151.