Prevalence of Blood Parasites in Seaside Sparrows

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Photo Credit: Carolyn Enloe

ABSTRACT

Mosquito borne blood parasites are widespread in avian populations and are associated with negative fitness. Chronic infections may be worsened due to environmental stressors which, collectively, could decimate populations. Also, the trade-off for fighting infections may lead to a reduction in reproductive success and immune system strength. Our investigation focuses on Seaside Sparrow communities, which are a species of concern, in Florida. We amplified the parasites *Plasmodium spp*. and *Haemoproteus spp*. with a nested-PCR approach. To analyze the data, we used a GLM to test the significance of age, body condition, sex, and year of capture on whether individuals were infected. Overall, we obtained a low prevalence rate among the populations which suggests that parasitism may be of low concern for this species.

INTRODUCTION

Parasitic infections are well studied in a variety of host pathogen systems. Infections can have negative impacts on the survival of populations, especially with added stressors such as habitat encroachment by humans. They are a coastal species in which some populations are at risk of extinction.

Plasmodium spp. and Haemoproteus spp. are some of the most common types of parasites found in avian species. The purpose of this study is to ascertain whether parasitism, along with other factors, may contribute to the decline of these populations.

Figure 1. Seaside Sparrow in grass. (Photo Credit: Jeanelle Brisbane)

RESULTS

This output reveals that model 1 and model 2 are the best set of models, as indicated by the lower AIC scores (Figure 2).

- Overall prevalence was 20.4%.
- Year of capture and sex were found to be significant. 2017 had the highest amount of infections and males were found to have higher parasite loads in that year.

Models Tested			
Factors Included in Model	Deviance	P-value	AIC Score
Model 1(All Variables): age, body condition, sex, year of capture, sex*age, year of capture*sex	-35.63	3.253E-06	212.66
Model 2: sex, year of capture, year of capture*sex	-32.609	3.895E-07	213.33
Model 3: body condition, sex, year of capture, year of capture*sex	-32.929	1.235E-06	215.01
Model 4: age, body condition, sex, year of capture	-27.333	1.705E-05	216.96
Model 5: age, sex, year of capture, age*sex	-27.03	1.961E-05	217.26

Figure 2. Summary of GLM output

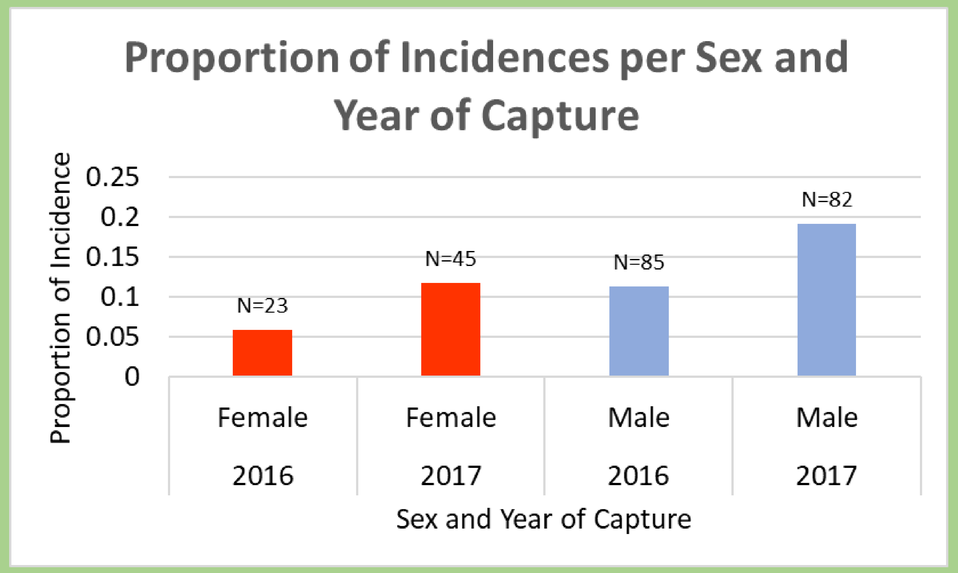

Figure 3. Graph of the proportions of incidence per sex and year of capture.

Figure 4. Bird collecting in the salt marsh. (Photo credit: Eric Fortman)

METHODS

Lab Methods

We isolated the cytochrome b region of Plasmodium spp. and Haemoproteus spp. In the initial PCR, we used HaemNF and HaemNR3 primers (Hellgren et al. 2004). Then we performed a second PCR with the primers HaemF and HaemR2 (Bensch et al. 2000). Since we used primers that can amplify both Plasmodium and Haemoproteus, we did not distinguish the presence of either.

Statistical Methods

Using R Studio, we conducted tests for significance and developed a general linearized model for all 235 samples. Our significance value was set at $\alpha=0.05$. We analyzed various models beginning with one that included all the variables, then we subsequently removed variables that were not significant and examined sub models that we felt were more likely based on the literature. In order to choose the best fit model, we compared AIC scores and chose the model with the smallest value.

CONCLUSIONS

- Since the overall prevalence is low, parasitism may not be as large of a concern in terms of conservation.
- Yearly variation indicates that environmental and climate factors, such as precipitation and temperature may have an influence on parasitism. This also includes mosquito population variations.
- Males may have more exposure to mosquito vectors through defense of territory and foraging.