Kennice Marriott

LAURE Essay

When I began my research project in BIO 320: Experiential Learning in Wildlife Disease Research, I was motivated by a question that connects scientific curiosity with my personal journey: How do co-infections affect physiological condition in migratory birds? Specifically, I examined whether co-infections by avian blood parasites such as *Plasmodium*, *Haemoproteus* and *Leucocytozoon* influence hemoglobin, hematocrit, blood glucose and fat reserves during migration. These parasites infect the blood of birds and are transmitted by insect vectors and they are widespread among wild bird populations. Understanding their effects is important because migration is one of the most energetically demanding periods in a bird's life.

As a first-generation international student, entering research meant learning the unwritten rules of academia on my own. I came to Miami University knowing I wanted to study wildlife disease and immunology, but without family experience in academia to model how research works. This project became more than a class assignment, it became an opportunity to understand how scientific knowledge is built and how I could participate in that process.

The question itself felt important because bird populations are declining globally and while habitat loss and climate change dominate public discussions, disease remains understudied. Many studies focus on single infections, yet wild birds often carry multiple pathogens that may influence migration, endurance or survival. Investigating these potential trade-offs allowed me to think more deeply about the hidden costs of infection in wildlife.

BIO 320 with Dr. Ryan Shannon allowed me to turn that curiosity into a formal investigation. The course was connected to the Avian Research and Education Institute (AREI) bird banding station, where researchers including Drs. David and Jill Russell were capturing and banding migratory birds in Ohio. During this work, Dr. Ashley Love's disease ecology lab collected blood samples and measured health metrics including hemoglobin, hematocrit, glucose levels and fat reserves, while also testing the samples for avian blood parasites. This collaboration created a dataset that linked parasite infection with physiological measurements in migrating birds. Working with this dataset allowed me to explore how disease might influence bird health during migration.

Although the data had already been collected, I was responsible for shaping my research question. I chose to focus on hemoglobin, hematocrit, blood glucose and fat score because these metrics are directly related to migration physiology. Hemoglobin and hematocrit reflect the blood's ability to carry oxygen, which affects endurance during long flights. Blood glucose provides a measure of short-term energy availability, while fat score estimates the amount of stored energy a bird has available for migration.

At the beginning of the project, library resources helped me understand key concepts and develop my research strategy. Early in developing my topic, I was unaware of foundational tools such as the Credo Reference guide. Using it clarified terminology related to parasite life cycles and blood health indicators, which made my later database searches more precise. Library tutorial videos and biology research guides also helped me refine my search strategies and manage citations.

Early searches using general phrases like “bird parasites and health” produced overwhelming results. With the use of the biology research guides, I refined my searches with targeted terms such as “haemosporidian co-infection,” “avian hematocrit malaria” and “migration physiology parasite load,” using filters to find both foundational and recent studies. I encountered conflicting findings, some reporting anemia in infected birds, while others found minimal physiological changes. I compared differences in study design, infection intensity and whether infections were acute or chronic. This comparative reading sharpened both my predictions and my eventual interpretation.

Citation management tools available through the library were essential as my list of sources grew. By categorizing articles into themes like oxygen transport and immune trade-offs, I was able to identify patterns, shaping my review into an analytical discussion. I began to see where my project fit within the broader field and where it could contribute rather than just repeating established findings.

After completing my analyses, I encountered the most challenging moment of the project. I had predicted that co-infected birds would have lower hemoglobin, hematocrit and glucose levels. Instead, most of these measures were not significantly different among infection groups. Only fat score varied significantly with uninfected and singly infected birds showing a wider range of fat reserves while co-infected birds were mostly concentrated at intermediate levels. Fat score estimates how much stored fat a bird has beneath its skin, which serves as a critical energy reserve during migration. This result suggested that birds carrying multiple infections may experience subtle energetic trade-offs during migration and may influence survival.

Initially, these unexpected results led to self-doubt. Instead of revising my conclusions immediately, I returned to the library databases and searched for studies on chronic or low-intensity infections. Some studies suggest that birds can tolerate low-intensity infections without major physiological disruption, while higher parasite loads may produce stronger effects. This helped me reinterpret my findings. The lack of strong differences in oxygen-carrying capacity may reflect relatively low parasite intensities rather than the absence of disease effects.

These findings also opened a new direction for my research. While the original project grouped birds as uninfected, singly infected or co-infected, I realized these categories may not capture differences in parasite load. As a result, I am now examining how parasite intensity affects bird health, a project I am continuing this semester with support from library resources.

Overall, this experience showed me how essential library resources are to the research process. Databases, research guides, tutorial videos and citation tools supported every stage of my work, from developing my question to interpreting unexpected results. As a first-generation international student, learning to navigate these academic resources has helped me become more confident and independent as a researcher. I am grateful for the opportunity to produce research with the support of the Miami University Libraries. I look forward to continuing this work and presenting my research at the Undergraduate Research Forum in April.