



Northern Illinois  
University

## STUDENT ENGAGEMENT FUND SEF FINAL REPORT COVER SHEET

**Please Note:** If more than one individual worked on this project, each SEF student will need to submit a separate cover sheet.

### Student Information:

Project Title:	Impacts of invasive mice on Midway Atoll National Wildlife Refuge
Name of Student:	Kaylee Rosenberger
Major:	Biological Sciences
Minor:	Chemistry, Computer Science
Z-ID:	Z1816398
Current Address:	1509 Reserve Ln, Dekalb, IL 60115
Preferred Phone #:	3093104943
Preferred Email Address:	Z1816398@students.niu.edu

### Faculty Supervisor Information:

Name of Faculty Supervisor:	Holly Jones
Faculty Department:	Biological Sciences
Faculty Phone:	8157537527
Faculty Email:	hjones@niu.edu

Student Signature:

*Kaylee Rosenberger*

Date:

8 May 2020

Mentor Signature:

*HJ*

Date: 7 May 2020

## **Final Reflection**

SEF Spring 2020

### **Background and introduction**

Our project takes place on Midway Atoll National Wildlife Refuge, an isolated atoll system in the northwestern Hawaiian Islands. Midway is known for housing the largest Laysan albatross colony in the world. However, these seabirds are currently being threatened by house mouse predation. Mice have recently begun attacking adult nesting seabirds, as well as their eggs and chicks. In order to conserve this historic nesting site, an eradication of mice is planned for summer 2021.

The impacts of invasive mice on islands are largely unknown. Thus, the trophic shifts and environmental response following the eradication are also unknown. In order to fill this knowledge gap and inform future conservation work, we wanted to complete a diet analysis of mice. Understanding the diet of invasive mice on islands will allow us to predict what species they are directly impacting through predation, and what species they may be indirectly impacting, through competition or other means. Then, sensitive species can be monitored more closely following the eradication.

Diet analyses can be completed in many different manners. For my project, I focused specifically on stable isotope analysis. Stable isotopes generate a broad look into the diet of an organism over time. Organisms accumulate isotopes over time from the items they eat. Isotopes typically examined in a stable isotope diet analysis include  $\delta^{13}\text{C}$ , a carbon isotope, and  $\delta^{15}\text{N}$ , a nitrogen isotope.  $\delta^{13}\text{C}$  describes the type of carbon an organism consumes, while  $\delta^{15}\text{N}$  describes the trophic position of the organism, or where it falls on the food web.

## **Project goals and accomplishments**

This semester was a continuation of my work from the fall semester. Most of my lab work was completed then, where I prepped samples for the stable isotope analysis. At the start of this semester, I began data analysis in R and created a poster that I would present at the Midwest Ecology and Evolution Conference and NIU's Undergraduate Research and Artistry Day.

First, I formulated my hypotheses. I was interested in seeing whether  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  varied based on the habitat types around the island from which mice were sampled in and based on the season they were collected in. I predicted that both  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  would vary based on the seasons and habitat types due to changes in available food sources. Specifically, I stated that trophic position ( $\delta^{15}\text{N}$ ) would be greatest in the summer (due to increased arthropod abundance) and dietary carbon sources would vary based on habitat type (due to the different carbon sources available).

I then used R to analyze the data we obtained from the stable isotope lab on campus. I completed Kruskal-Wallis tests to determine significant differences between isotopes throughout seasons and habitats. Then, I completed multiple pairwise comparisons to determine differences between groups. I determined that  $\delta^{13}\text{C}$  was constant year-round, indicating that dietary carbon sources of mice are constant on the island; however, the sources vary based on the habitat. Next, I determined that the trophic position of mice is greatest in two habitat types (Wetland and Herbland). These habitat types are very abundant in arthropods; thus, this could indicate that mice are preying on nitrogen-enriched arthropods here. The trophic position of mice is greatest in the fall, which could be a result of increased arthropod abundance (and consumption) in the summer.

I compiled my results into a poster format and presented them at the Midwest Ecology and Evolution Conference at the end of February and at URAD. Additionally, I presented my results at the World Seabird Twitter Conference the first week of May. I have prior experience in poster presentations from URAD but presenting on Twitter was a unique experience.

Due to the disruption that occurred mid-semester, the project goals shifted. In lieu of completing more stable isotope lab work, I helped my graduate student mentor work on a literature review for the impacts of invasive species on islands. While our work pertains specifically to mice, understanding the impacts other invasive species have on islands is important. For example, invasive rats have been studied in greater depth than mice due to their known devastating impacts on island ecosystems. Impacts of mice haven't historically been emphasized in conservation work. However, current research has found that mice behave similar to rats in cases where mice are the only introduced mammal present. Therefore, knowing the impacts of rats can inform conservation work directed toward mice.

### **Impact on academic experience**

I have learned a lot throughout this project that I have been able to apply directly to my academics. For example, I gained more experience coding in R in order to solve statistical problems. R was used for data analysis and solving problems in a graduate class I took this semester, Biostatistical Analysis. From my prior experience in R, I was able to succeed on the homework for the class. Specifically, for my data analysis in this project, I used Kruskal-Wallis tests and pairwise comparisons. We learned about these topics later in the semester in Biostatistical Analysis, so having the prior knowledge allowed me to better understand the material.

In completing a literature review, I have been able to practice the skills required to do independent research on a topic. Throughout my courses, I haven't had to write many research papers or literature reviews. My mentor, who I helped on this project, started this literature review in order to understand her area of study better and keep current on new research publications pertaining to studies related to hers. In helping compile sources for this literature review, I have been able to practice this valuable skill that I might one day use in my graduate career. Additionally, I learned a lot throughout reading these articles. I don't typically read academic papers; however, it was interesting to read about studies related to my field of work, so it is something that I will make a conscious habit of doing now. Reading academic papers is a skill. Actively reading papers will benefit me in my future classes, as I will have more experience in reading and will hopefully be able to relate the readings to topics I've learned in classes.

### **Impact on career experience**

Throughout this experience, I was able to present my research at the Midwest Ecology and Evolution Conference, my first conference outside of the school. This event was beneficial for my professional development, as I was able to network with undergraduate and graduate students from other schools studying in the same fields as me. This presentation was a great opportunity to showcase my work and get valuable feedback from others in my field. Additionally, I was able to put this presentation on my resume and LinkedIn, allowing me to present my work. Finally, presenting is a great way to develop science communication skills. Throughout this experience, I learned how to present my research to a variety of different audiences in a clear and concise manner. I had never presented in an online format before this semester, but it was a great learning experience. I was still able to make connections and network

with other scientists in my field. I learned that Twitter is a highly accessible platform to share research results on. The format of a highly condensed tweet as opposed to a paper or presentation allows for practice in explaining results in a very concise manner.



*Poster presentation at MEEC 2020.*

In working on the literature review, I have been able to stay informed about research projects related to the one I work on. Also, reading academic papers allows me to familiarize myself with the format of publications in journals. As I plan on attending graduate school in the future, being familiar with academic papers is a requirement, as I will hopefully be publishing some by then. Furthermore, looking at the figures in these papers have allowed me to explore what can be done in software such as R, and what typical data analyses are for these projects. Finally, I have gained insight into what a scientific study is composed of. This will inform my project design in graduate school.

The cumulative research experience I've gained throughout my time at NIU through the various programs that OSEEL offers has allowed me to take further opportunities of research outside the university. I was accepted for the Morton Arboretum REU this summer; something that wouldn't have been possible without prior research experience. The work that I did in R this semester allowed me to stand out to the faculty at the arboretum, whose project relies heavily on the software. It was a competitive internship to apply for, but my experiences with research granted me this opportunity. My mentor at the Arboretum has assigned me readings to complete every week and to document them in an annotated bibliography. My work on the literature review throughout this semester prepared me for this.