Alaska Department of Fish and Game
Wildlife Restoration Grant

GRANT NUMBER: AKW-B-R3-2020

PROJECT NUMBER: P7.01

PROJECT TITLE: Develop and evaluate indices for assessing marten population status and trend in Interior Alaska

PERIOD OF PERFORMANCE: July 1, 2019 - June 30, 2021

PERFORMANCE YEAR: July 1, 2020 - June 30, 2021; year 2 of a 2-year grant

REPORT DUE DATE:

PRINCIPAL INVESTIGATOR: Kerry L. Nicholson, Wildlife Research Biologist, ADF&G

COOPERATORS: NA

I.   PROGRESS ON PROJECT OBJECTIVES DURING PERFORMANCE YEAR

OBJECTIVE 1: Evaluate if fecundity based on pregnancy rates and blastocyst counts can be used as an indicators of marten population status and composition for subsequent trapping season(s).

ACCOMPLISHMENTS: Carcass collection was completed in the prior reporting years. We compiled and organized all the data to begin the analysis of the data. We had initial analysis nearly completed and had to begin all over when a new biometrician was brought onto the project. We redesigned the analysis and took a different approach. Draft version of a report is being finalized as of August. Federal funds were used to pay for salary to accomplish this analysis

OBJECTIVE 2: Test the hypothesis that total YOY/AdF ratios of >3:1 are adequate for marten population maintenance.

ACCOMPLISHMENTS: With the redesigning of the analysis, we compared sex and age ratios and total catch between years by trapper (trapper effort will remain comparable throughout the study). Draft version of a report is being finalized as of August. Federal funds were used to pay for salary to accomplish this analysis

OBJECTIVE 3: Assess how marten reproductive performance is related to diet and age by study area.

JOB/ACTIVITY 3A:
ACCOMPLISHMENTS: We finished collecting carcasses in RY17 and finalized all the stable isotope data from the claw and muscle tissues in FY18. We compiled and prepared the data to begin analysis. We have found an alternative collaborator, have begun deciding appropriate analysis to begin answering pertinent questions. To perform this analysis, we have compiled additional necessary data for SIBER and MixSIAR Bayesian modeling. Preliminary analysis indicated a distinct difference in diet profiles depending on geographic location and between seasons. We are discussing incorporating graduate students into the project as there are multiple questions that could be pursued with this data. Federal funds were used to pay for salary associated with this analysis.

JOB/ACTIVITY 3B:
ACCOMPLISHMENTS: Marten stomachs were sent to the Museum of Southwestern Biology. Since 2015, 300 stomachs were inspected for parasite presence. The past years difficulties put all efforts from MSB on hold, however efforts from Michigan increased. During the RY21 100 stomachs were sent to Northern Michigan University and students investigated American marten parasite loads and characterize American marten gut microbiomes. As a result of the collaboration with NMU, we engaged 6 undergraduate students from across multiple majors (C. Downing, J. Brown, T. Hinshaw, C. Jorgense, S. Mark, and Z. VanHuysen). These students were trained in gross necropsy, parasite identification, microbial DNA extraction, and museum tissue preservation. In these efforts, students learned a variety of laboratory techniques (e.g., pipetting, weighing, dilutions, dissection) and how to use diverse laboratory equipment (e.g., fume hood, autoclave etc.). C. Downing received 1st place honors for her research poster and C. Jorgense received honorable mention in a graphic design submission. We will continue to evolve this project as the samples are archived at both universities and questions arise. This is an ongoing analysis that has not been finalized by the time of this report. All samples at both universities have been inspected and samples taken. Federal funds were used to pay for salary associated with this analysis and contractual services provided to NMU to properly document, sample, and archive carcasses samples from this project.

OBJECTIVE 4: Assess marten nutritional status affects fecundity.
ACCOMPLISHMENTS: All tissue processing was finalized in 2019. No further data analysis has been accomplished. Until a new collaborator is identified, this objective is on hold.

OBJECTIVE 5: Assess marten reproductive and stress-related hormones
ACCOMPLISHMENTS: All data was collected and finalized processing. We prepared a manuscript with the physiologist and biometrician. We submitted for publication, and it is currently under review. Federal funds were used to pay for salary associated with this analysis

OBJECTIVE 6: Describe large scale population structure of Interior Alaskan marten
ACCOMPLISHMENTS: All lab work was finalized in 2019. Data has been cleaned; initial statistical processing began. Preliminary results indicated 2 population structures. This job/activity is on hold until a new geneticist can be identified who will conduct the genetics analyses. Federal funds were used to pay for salary associated with this analysis

OBJECTIVE 7: Analyze data and prepare reports and manuscripts.

ACCOMPLISHMENTS: Federal funds were used to cover salary when conducting literature reviews and manuscript preparation. Literature searches were conducted for information on marten population dynamics, productivity, and food habits, and on the use of harvest data to monitor furbearer populations and on stable isotope analyses to monitor dietary choice of carnivores. Refer to the various accomplishments for each progressed report.

II.   SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.

This project was initiated in 2010 and has undergone several revisions or iterations of the original objectives and has changed PIs. We collected marten carcasses from 2010-2018 and obtained samples from over 11,000 marten. For every proposed test, we have finished the lab procedures and analysis. The exception to this is archiving of the samples in the museum and the parasite examination of stomach content. We processed over 400 marten claws for stable isotope analysis, 200 samples for genetic analysis, 300 samples for proximate liver composition analysis, 300 stomachs for parasites, 100 samples for hormone analysis.

We were analyzing the capture data with the intent of preparing a manuscript evaluating the use of easily collected samples from harvested marten to forecast population status by trappers and managers. We were also analyzing the data to identify any variables trappers and managers can monitor within season to track marten population status. Each year after harvest was assessed, each trapper received individualized reports. The final 3 years of carcass collection, area biologists received reports summarizing all trappers in their areas of interest in addition to the individualized trapper report. During the reporting period we finalized and distributed throughout the trapping season a publication meant for the trapping community on how to assess age from carcasses. This publication has been subsequently used by public YouTube content creators to distribute video "how-to's" We have given public presentations at the Alaska Trappers Association meetings and various scientific conferences. We have also presented posters at several university functions and conferences. Since 2014, multiple universities and students have been engaged in utilizing the samples and data generated from this project. There are many ongoing side projects as this is a unique and rich dataset.

III.   SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS.

None

IV.   PUBLICATIONS

Appendix 1. Poster for objective 3

Appendix 2. Drawing for objective 3

Appendix 3. Submitted abstract for objective 5

V.   RECOMMENDATIONS FOR THIS PROJECT

This project is predominantly in the writing and data analysis phase. No additional tissues are being collected. Current progress has been slowed due primarily to the exodus of original

collaborators and the changing of ADF&G biometrician staff and the ongoing challenges resulting from COVID.

Objective 1 and 2 deal with the harvest data and the new biometrician overhauled the analysis done by the previous biometrician and reinterpretation of the new data was necessary. Draft revisions of a report have been generated and we are finalizing that initial draft now. We have gone through multiple iterations and continue to have scheduling challenges and complications resulting from COVID.

Objective 3a, 4 and 6 continue to have setbacks because the collaborators left the project due to their own job changes, medical needs, or duty requirements. Seeking other experts in the field of nutritional composition and heavy metal contamination is necessary and this has been the hardest task to date. The stable isotope data has been processed and I have learned how to do the statistical Bayesian analysis. I have found a collaborator who is available this FY and we hope to have products by next end of reporting season. For 3b the museum finished archiving the samples, and unfortunately COVID hit MSB hard. Our intent is this coming year to finalize the direction for the reporting of that data. NMU has involved several students and intends to continue using the data for their lab to experiment with.

Objective 5 is currently in review with Journal of Mammalogy and we are waiting to make revisions.

Overall, this following year I anticipate having the major report submitted for internal review to ensure its appropriate publication as a technical bulletin for our department. This past year I was able to learn how to conduct the statistical analysis appropriate for stable isotope studies and I anticipate making headway this reporting year.
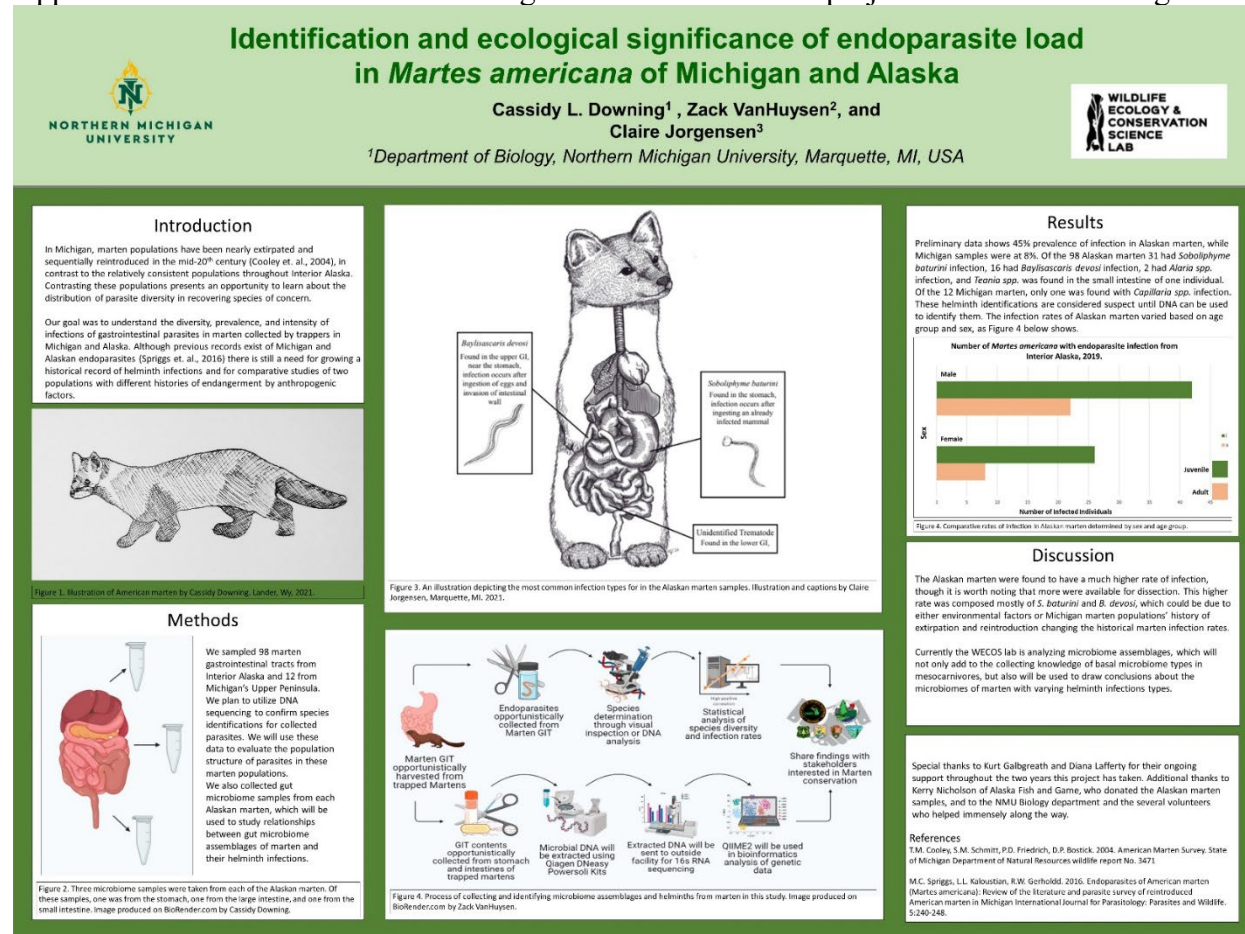

Prepared by: K.L. Nicholson

Date: 15 August 2021

Wildlife Restoration OPERATING GRANT
FINAL PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
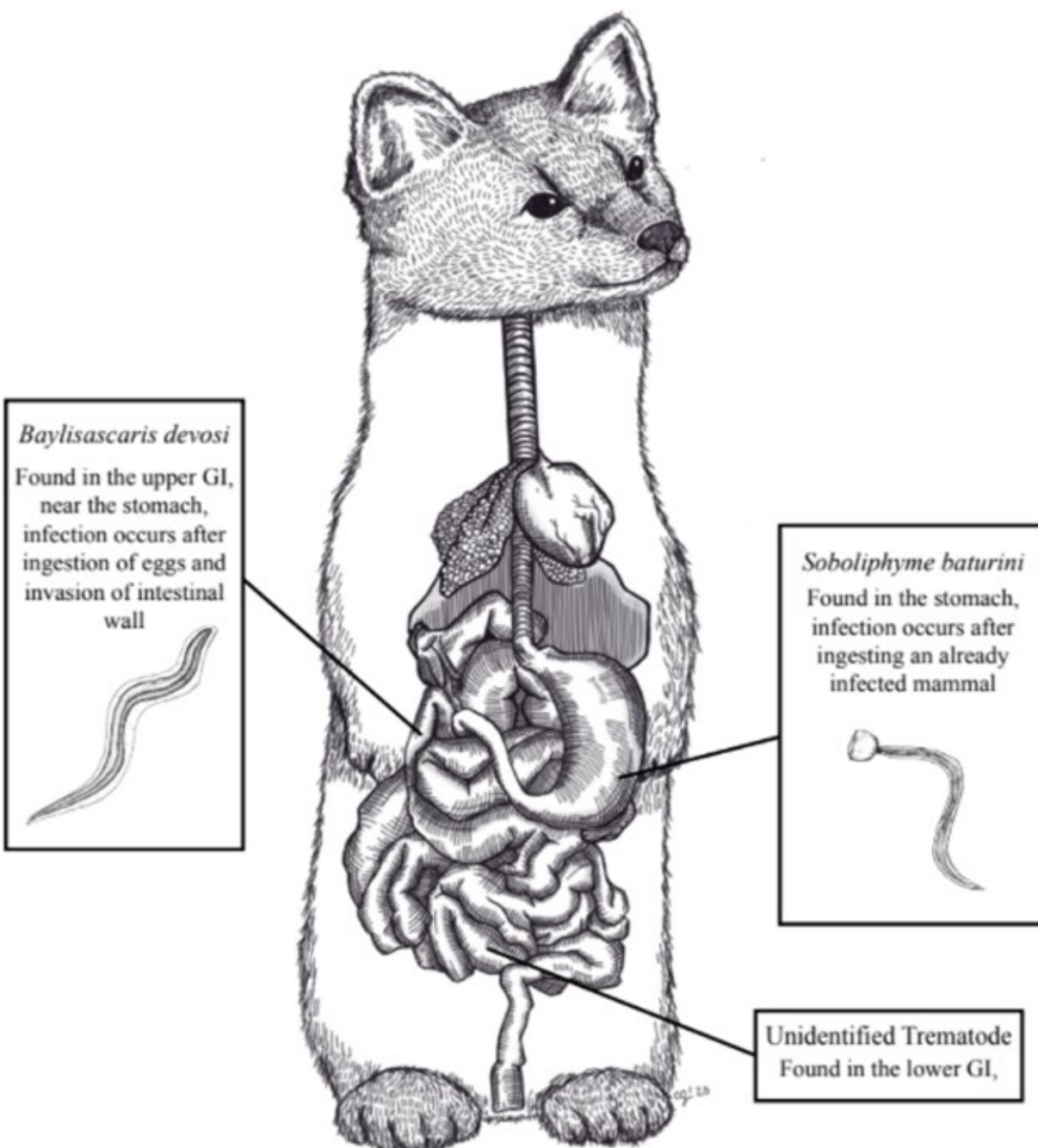DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Appendix 1. Poster submitted for undergraudate senior science project at Northern Michigan University

**Wildlife Restoration OPERATING GRANT
FINAL PERFORMANCE REPORT**

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Appendix 2. Drawing submitted by graphic design undergraduate project

Baylisascaris devosi
Found in the upper GI, near the stomach, infection occurs after ingestion of eggs and invasion of intestinal wall

Soboliphyme baturini
Found in the stomach, infection occurs after ingesting an already infected mammal

Unidentified Trematode
Found in the lower GI,

Appendix 3. Submitted abstract for journal publication for Objective 5

Diet and stress-related hormones influence early pregnancy in harvested American marten

Mandy J Keogh, Kerry L. Nicholson and John Skinner

American marten (Martes americana) are a highly valued and sought-after furbearer species in Alaska; however, there has been limited research identifying useful indices that trappers and managers can use for population assessment prior to, or during the trapping season. As part of a long-term study on reproductive rates of marten in Interior Alaska (2007-2017), carcasses were donated by trappers and we used female samples from two regions (Tok and Galena) in 2012, 2014, and 2016. We determined pregnancy by presence of blastocysts and removed fur from 122 paws. For 60 marten, we processed one nail whole and cut a second nail into two segments (n=40). We washed, pulverized, and extracted hormones from the fur and nails. We used standard methods for laboratory validations for cortisol, progesterone, and testosterone enzyme immunoassay kits. Need to add findings when stats are done. This study demonstrates the utility of trapper harvested tissues to measure multiple reproductive and stress-related hormones in marten. Future studies are needed to explore what factors might be contributing to the differences observed in these hormones between years and across locations.