

Warren J. Baker Endowment

for Excellence in Project-Based Learning

Robert D. Koob Endowment *for Student Success*

FINAL REPORT

Final reports will be published on the Cal Poly Digital Commons website(<http://digitalcommons.calpoly.edu>).

I. Project Title

Does the acorn barnacle *Balanus glandula* exhibit predictable gradients in metabolic performance across the intertidal zone?

II. Project Completion Date

2/2019

III. Student(s), Department(s), and Major(s)

(1) Kali Horn, Biological Sciences Department, M.S. Biological Sciences

IV. Faculty Advisor and Department

Kristin Hardy, Biological Sciences Department

V. Cooperating Industry, Agency, Non-Profit, or University Organization(s)

NA

VI. Executive Summary

Using funding from the Baker-Koob endowment, I successfully completed an experiment looking at metabolic variation in the common acorn barnacle, *Balanus glandula*, across tidal heights. We characterized the temperature profile across the zone as well to have data explicitly describing the abiotic variability from the upper intertidal zone to the low. Myself and many undergraduates collected barnacles from the top middle and bottom of the *B.glandula* distribution and ran the individuals through a suite of experiments to characterize the 'metabolic phenotype'. We defined the metabolic phenotype with a comprehensive suite of biochemical (e.g., citrate synthase and lactate dehydrogenase activity), physiological (VO_2 , aerobic scope) and behavioral (feeding rate) indices of metabolism. After removal from the intertidal zone, barnacles were placed in our intermittent respirometry system to calculate an average oxygen consumption rate over a 24h period. During the first two hours of the experiment, I conducted a behavioral observation to determine overall activity and feeding rate. After the intermittent respirometry, all barnacles were dissected and their whole animal tissues used to run enzymes assays for citrate synthase and lactate dehydrogenase, indicators of aerobic and anaerobic metabolism respectively. From these experiments we were able to determine that low intertidal barnacles have higher capacity for

anaerobic metabolism (as determined from LDH activity) and move less often but in general more quickly than individuals from the upper intertidal. This is leading us to our future work looking at lactate accumulation and oxygen consumption while in air.

VII. Major Accomplishments

(1) Successfully characterized the metabolic phenotype of *Balanus glandula* from across their vertical distribution and the temperature variability experienced by those across this zone.

(2) Poster presentation of research at the Western Society of Naturalist Conference

(3) Oral presentation of research at Society of Integrative and Comparative Biology Conference – received an Honorable Mention for talk from the Crustacean Society

VIII. Expenditure of Funds

This grant was used as expected to purchase some supplies such as iButtons and Acetyl CoA. It also paid for my registration and travel to two separate conferences - WSN in Tacoma Washington and SICB in Tampa Florida at which I presented my work the larger scientific community.

IX. Impact on Student Learning

This funding allowed me to complete a major portion of my master's thesis and share my work with a larger scientific community. The research would not have been possible without these funds and also allowed me to involve undergraduate researchers to help them gain research experience as well. It has allowed me to meet with other professionals in the field and gain experience in communicating science. I am very thankful for the Baker Koob Endowment for supporting this work and making it all possible.