

2017 Annual Report

CRMO-2017-SCI-0007

Study Title: Genomic and Functional Basis of Parallel Local Adaptation to an Extreme Novel Environment

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Dates of Research in Craters of the Moon National Park: 8/15/17- 8/17/17

Funding Source: none

Specimens Collected: Ear clips were collected from 3 individual chipmunks, *Tamias amoenus cratericus*, in August 2017.

Research Findings: Adaptation to novel or changing environments is one of the central drivers of biological diversity and is crucial to the long-term persistence of most species. The harsh environments generated by volcanic lava flow systems provide powerful natural laboratories for understanding how plants and animals evolve to cope with challenging environmental conditions. Lava flows present a common set of stressors for colonizing animals. Perhaps the most striking of these stressors are the sudden shifts to black soils coupled with sparser vegetation and increased exposure to solar radiation. In many instances, animals living in harsh environments often exhibit novel adaptations which allow them to thrive in the face of these persistently harsh conditions. To study the underlying genetic and physiological responses of adaptation to extreme environments, we proposed a study using chipmunks, *Tamias minimus*, *T. amoenus* and great basin pocket mice, *Perognathus parvus*, that live across an ecological transect (on versus off lava flows) in Craters of the Moon National Monument (CROM). The central premise of our study was that previously described shifts towards darker pelage across multiple rodent species on CROM (Blossom 1937) would be accompanied by underlying changes in physiological and/or morphological traits to mitigate heat stress.

Our short-term goal during 2017 was to collect preliminary data to assess the feasibility of our proposed research and establish baseline physiological responses to heat stress from individuals captured on versus off lava flows. Our preliminary data resulted in low captures across our targeted gradient in CROM (n=3 *T. amoenus*; *P. parvus* were not targeted). Based on these collections, many more visual observations, and through additional analyses of museum collections we have found that the observed shifts towards darker pelage on CROM in yellow-pine chipmunks (*T. amoenus*) were less striking than originally proposed by Blossom. |

Research Status: After our first year of work in CROM, we did not find substantial pigmentation differences across *T. amoenus* chipmunks. Further consideration of color in other species (*T. minimus*; *P. parvus*) or of physiological shifts in heat tolerance will warrant further investigation. We are not currently planning on pursuing these additional studies in 2018.

