Final Project Report – 2023-AUSTINPEAY-2350A

Executive Summary

Gila monsters (*Heloderma suspectum*) are among the rarest and most secretive animals in the Mojave Desert. As a result, we currently lack basic information to assess species status and how the species will be affected by changes in habitat (i.e. development, degradation, fragmentation) and climate. In the northern Mojave, Gila monsters are known to occupy much of eastern Clark County and southern Lincoln County in Nevada, and southwestern Washington County in Utah. Due to rarity and potentially low population densities, our knowledge of the extent of this species is likely incomplete. This project focused on collecting genetic samples from Gila monsters to assess how genetic diversity and genetic connectivity among populations may influence potential for species persistence.

Introduction

Description of the Project

This project surveyed sites across Clark County in an effort to collect genetic samples of Gila monsters. Previous projects aimed at assessing genetic diversity and landscape genetic connectivity of Gila monsters in Clark County had insufficient sampling and were not able to gather enough samples to rigorously estimate gene flow among populations or produce a genetically based estimate of population size for focal populations. This project increased the number of samples available to conduct genetic analysis and helps inform potential management activities.

Background and Need for the Project

Gila monsters (*Heloderma suspectum*) have been identified as a species of conservation concern that warrants status as a Covered Species under a proposed amendment to the Multiple Species Habitat Conservation Plan (MSHCP) and associated incidental take permit. Significant work has been completed to collect data on demography, to understand home ranges of the species, and to estimate how the species will be impacted by climate changes. However, due to rarity of the species, there remain gaps in genetic sampling data, which can negatively impact the effectiveness of conservation strategies and management actions.

This project addresses these gaps by conducting field surveys to obtain Gila monster genetic samples in areas not previously documented, those with low sampling rates, and populations in which previous sampling was insufficient. Samples will be used for landscape-level genetic analysis and improving confidence intervals on effective population size estimates across the species' geographic range in Clark County.

Goals and Objectives of the Project

The genetic data collected from this study is intended to improve data analyses regarding the geographic distribution and genetic diversity of Nevada Gila monsters. This will inform understanding of specific threats to species persistence and the identification of current and future critical management needs.

Methods and Materials

We sampled sites previously identified by the Nevada Department of Wildlife (NDOW) as having potentially viable populations of Gila Monsters (Appendix 1). Sampling priority was given to focal sites that would permit rigorous population size estimation (Priority 1, Appendix 1) in order to improve confidence intervals on previous genetically based population estimates. Gila monster populations in Nevada are largely confined to Clark County, although the species' range extends into small areas of Lincoln and Nye counties. Focus areas included (1) the region encompassing the Moapa Valley, Valley of Fire, Muddy Mountains and Gale Hills, as well as west of Interstate Highway 15

through the Dry Lake Range; and (2) the region encompassing and connecting Red Rock Canyon, Blue Diamond, Sloan, and the McCullough Range.

At each locality, we conducted time-constrained visual encounter surveys, with 2-4 surveys during morning hours and 2-4 surveys during afternoon hours (April-July 2025). Survey effort was standardized for reporting of encounters per unit of effort. Surveys consisted of 1-3 observers walking a 1 km transect over a period of 1.5 hours. GPS units were used to ensure a consistent pace; UTM coordinates were recorded at the start and end of the search transect. Along each transect observers visually scanned for Gila monsters active above-ground and checked burrows, caves, rocky crevices, etc. for sheltered individuals. Air temperature, ground temperature, and wind speed we recorded at the beginning and end of each transect.

Blood samples were taken from each encountered Gila monster following current Nevada Department of Wildlife (NDOW) protocols (Nevada Department of Wildlife 2020, 2023). Samples were stored using appropriate refrigeration and provided to the USGS Western Ecological Research Center, San Diego Field Station (the contracting agency DCP selected for genetic analysis).

Results

We surveyed 11 sites across Clark County where previous records indicated presence of Gila monsters (Table 1). Visual encounter transects totaled 391 km with 739 hours of search effort (average of 34 transects per site). Search transect length averaged 1.10 km, with an average search duration of 1.71 hours per transect. We had 14 encounters with live Gila monsters and were able to obtain eight genetic samples. Some encountered individuals were observed deep in underground refugia (burrows or rock crevices) and could not be captured for sampling. Across surveys air temperature varied from 14.8-40.5 C, ground temperature varied from 17.5-45.7 C, and wind speed varied from 0-18.3 km/h (Table 2).

Table 1. Summary of survey efforts for Gila monster genetic sample collection.

Survey Statistic	Overall/Total	Valley of Fire	Red Rock	Sloan Canyon & McCullough Mountains	Muddy Mountains	Dry Lakes	Gale Hills	Blue Diamond	Moapa Valley	Gold Butte	Apex Range	Ave Kwa Ame
Number of Surveys	375	155	150	16	14	8	8	7	6	5	4	2
Average Survey Length (km)	1.10	1.01	1.00	1.45	1.28	1.46	2.23	1.47	1.39	1.46	1.29	0.80
Total Survey Distance (km)	391.6	150.3	138.1	23.1	17.9	11.7	17.8	10.3	8.4	7.3	5.2	1.6
Average Survey Time (hours)	1.71	1.72	1.78	1.56	1.58	1.61	1.54	1.53	1.56	1.43	1.51	2.00
Total Search Time (hours)	739.8	283.9	292.4	24.9	25.2	12.9	12.3	15.5	9.3	21.5	6.1	36.0
Tracks Identified	42	21	21	0	0	0	0	0	0	0	0	0
Live Captures	14	3	11	0	0	0	0	0	0	0	0	0
Blood Samples Collected	8	1	7	0	0	0	0	0	0	0	0	0

Table 2. Summary of air temperature, ground temperature, and wind speed during Gila monster genetic sample surveys.

Environmental Statistic	Valley of Fire	Red Rock	Sloan Canyon & McCullough Mountains	Muddy Mountains	Dry Lakes	Gale Hills	Blue Diamond	Moapa Valley	Gold Butte	Apex Range	Ave Kwa Ame
Number of Surveys	155	150	16	14	8	8	7	6	5	4	2
Air Temperature (C)	Min=20.6 Max=40.5 Avg=30.5	Min=14.8 Max=36.1 Avg=26.4	Min=20.6 Max=39.5 Avg=29.3	Min=22.3 Max=34.9 Avg=28.3	Min=24.1 Max=32.6 Avg=28.1	Min=26.7 Max=32.1 Avg=30.0	Min=18.9 Max=27.8 Avg=24.0	Min=31.1 Max=35.7 Avg=33.7	Min=17.7 Max=23.4 Avg=20.8	Min=37.2 Max=39.1 Avg=38.4	Min=21.2 Max=22.3 Avg=21.7
Ground Temperature (C)	Min=20.8 Max=45.7 Avg=33.0	Min=17.7 Max=42.8 Avg=28.9	Min=21.5 Max=42.3 Avg=30.5	Min=21.0 Max=37.5 Avg=27.3	Min=22.0 Max=33.0 Avg=27.1	Min=24.8 Max=35.3 Avg=29.3	Min=17.5 Max=30.0 Avg=25.0	Min=31.8 Max=38.5 Avg=34.3	Min=22.0 Max=25.5 Avg=23.8	Min=35.3 Max=40.5 Avg=38.2	Min=26.5 Max=29.0 Avg=27.8
Wind Speed (km/h)	Min=0.0 Max=18.3 Avg=3.9	Min=0.3 Max=16.4 Avg=4.5	Min=0.6 Max=9.6 Avg=6.1	Min=0.0 Max=10.6 Avg=4.3	Min=2.0 Max=5.2 Avg=3.3	Min=1.0 Max=10.9 Avg=5.3	Min=1.6 Max=3.0 Avg=2.4	Min=2.2 Max=6.4 Avg=3.5	Min=3.3 Max=5.7 Avg=4.4	Min=4.6 Max=6.6 Avg=5.9	Min=5.6 Max=7.2 Avg=6.4

Discussion

This project was successful in augmenting the available genetic information for Gila monsters, and the resulting genetic analyses should facilitate scientifically informed management decisions for the species in Clark County. Although surveying for Gila monsters is logistically difficult, our survey efforts suggest that persistence and repeated sampling at focal sites is necessary for successful observation of individuals active above-ground. Previous studies have indicated that many areas of Clark County should contain suitable habitat for Gila monsters (Hromada et al. 2025), especially those at mid-elevation with moderate topographic complexity. Our survey efforts suggest that coupling local field-survey efforts with predictive GIS models would yield a higher likelihood of success in determining Gila monster site occupancy.

Conclusion and Recommendations

There have been several recent studies that have helped establish an understanding of the distribution and basic ecology of Gila monsters in Clark County (Gehman and Gienger 2025, Gienger et al. 2025, Gienger et al. 2021, Hromada et al. 2025, Hughes et al. 2021, Stalker et al. 2023). We are now beginning to get an idea regarding the basic habitat requirements and factors that will limit persistence of existing populations in Nevada. The genetic information gathered in the current project will be important in determining how gene flow and genetic connectivity should be considered in future management efforts.

An important next step in the adaptive management of Gila monsters will be to develop a survey protocol and monitoring framework that allows the assessment of human impacts and activities on the distribution and abundance of the species. This monitoring framework could be implemented as a series of species detection and habitat occupancy studies. In the adaptive management context, data from field surveys could be leveraged to inform management activities and future conservation efforts.

Literature Cited

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