

## APPENDIX 5-2

### MANAGEMENT ACTIONS TO PREVENT THE CONTINUED DECLINE OF *ACHATINELLA MUSTELINA* AT PUU KUMAKALII IN SCHOFIELD BARRACKS WEST RANGE

#### BACKGROUND

OANRP staff have been observing ESU-D *Achatinella mustelina* at Puu Kumakalii in Schofield Barracks West Range since performing rare plant surveys and weed control here in 1995 (Figure 1). For years there were only incidental observations of snails while hiking along the main ridge to access Puu Kalena and areas in the West Range of Schofield Barracks. No thorough snail surveys were conducted here until 2009. Puu Kumakalii is the first puu to the north of Kolekole Pass and Puu Hapapa is the first puu to the south. They lie 2.5 kilometers apart. There are four different sites where *A. mustelina* have been observed at Puu Kumakalii. There is a predator exclosure atop Puu Hapapa that contains ESU-D1 snails from Kaluaa and Waieli gulches and the Puu Hapapa area.

Map removed to protect rare resources

**Figure 1.** Locations of ESU-D and D1 *Achatinella mustelina* near Puu Kumakalii and Puu Hapapa.

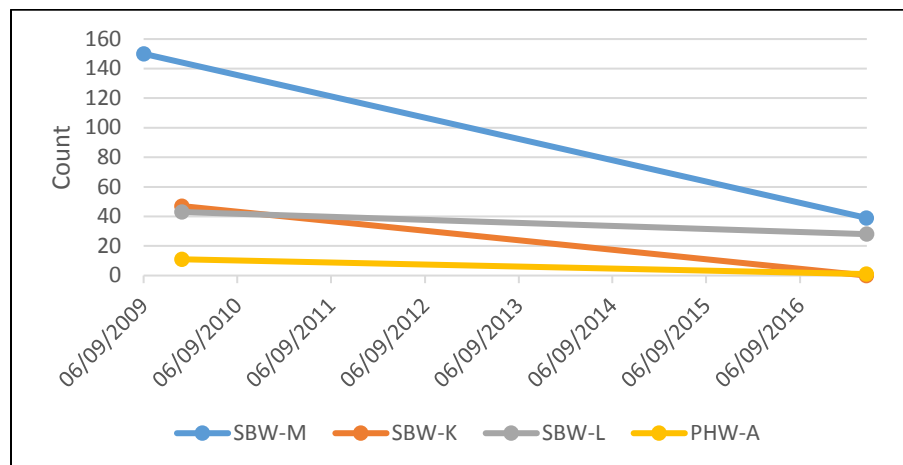
#### RECENT EFFORT AND CURRENT STATUS

At the snail IT meeting on December 13, 2016 OANRP discussed the possibility of translocating snails from declining populations of *A. mustelina* at Puu Kumakalii to the snail enclosure at Puu Hapapa.

When staff were collecting genetic samples at Puu Kumakalii on November 5, 2014, Dr. Melissa Price asked why these snails were not in the enclosure since they were found sharing trees with Jackson's chameleons. At the time OANRP did not have permission to move these snails. At the 2016 IT meeting it was agreed that these snails could be moved because they are found at similar elevation and moisture levels as the snails at Puu Hapapa. Other *A. mustelina* found closer to Mt. Kaala would be moving from wetter to drier areas and would not be acceptable to move, but these snails are thought to have comparable climate and moisture levels and thus could be translocated.

USFWS recommended that OANRP complete a current survey to better document population trends at Kumakalii using the same methods of prior surveys before translocating any snails. All of the surveys that were performed in 2017 consisted of the same amount of staff, search time, and geographic search area as the surveys from 2009. To the best of our ability all repeatable variables were identical. Four separate sub-populations were surveyed in 2009 and 2017: SBW-K, SBW-L, SBW-M, and PHW-A. It is unlikely that many more snails are in immediately adjacent areas given the extent of habitat degradation and unsuitability of drier areas at slightly lower elevations.

The main population over the past 15 years has been SBW-M, the area closest to the peak. Staff surveyed here in 2002 but the first thorough survey was done on June 9, 2009 when a total of 150 snails were counted (Figure 2 and Table 1). Only 39 snails were counted on the recent survey completed on February 22, 2017 (Table 2). Drastic habitat change in the past eight years is the most notable change at SBW-M. *Psidium cattleianum* has almost completely taken over this environment and the native trees have been squeezed out. All three major predators of *A. mustelina* are present here: *Euglandina rosea*, rats and Jackson's chameleons. No predator control has ever been conducted in this area. Rat control for elepaio takes place at significant distances away, and only a few chameleons have been removed opportunistically. Four Jackson's chameleons were found on the recent survey on February 22, 2017. No live *E. rosea* were seen recently but many shells were found on the ground.



**Figure 2.** Timed-counts of *Achatinella mustelina* PRS near Puu Kumakalii.

**Table 1.** SBW-M population and host taxa count on June 9, 2009. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Antidesma platyphyllum</i>	2	1
<i>Carex wahuensis</i>	1	1
<i>Coprosma longifolia</i>	1	1
<i>Metrosideros polymorpha</i>	6	6
<i>Myrsine lessertiana</i>	130	78
<i>Psidium cattleianum</i>	9	8
<i>Pittosporum glabrum</i>	1	1
Total snails counted: 150 (29 small, 31 medium, 90 large)		

**Table 2.** SBW-M population and host taxa count on February 22, 2017. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Myrsine lessertiana</i>	39	24
Total snails counted: 39 (3 small, 10 medium, 26 large)		

Approximately 400 meters further west is SBW-K. This area was surveyed on November 5, 2009, with 47 snails counted (Table 3). During the surveys conducted on February 22, 2017 no *A. mustelina* were seen at SBW-K. The habitat is extremely degraded with *P. cattleianum*, *Clidemia hirta* and *Rubus rosifolius*.

**Table 3.** SBW-K population and host taxa count on November 5, 2009. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Antidesma platyphylla</i>	12	1
<i>Myrsine lessertiana</i>	21	5
<i>Psidium cattleianum</i>	2	2
<i>Zanthoxylum dipetalum</i>	12	1
Total snails counted: 47 (8 small, 9 medium, 30 large)		

SBW-L lies one gulch to the east of SBW-K, between SBW-K and SBW-M. During the survey on November 4, 2009 a total of 43 snails were counted (Table 4). On the recent survey on February 23, 2017 only 28 snails were counted (Table 5).

**Table 4.** SBW-L population and host taxa count on November 4, 2009. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Antidesma platyphyllum</i>	1	1
<i>Metrosideros polymorpha</i>	2	2
<i>Myrsine lessertiana</i>	31	17
<i>Psidium cattleianum</i>	9	9
Total snails counted: 43 (11 small, 10 medium, 22 large)		

**Table 5.** SBW-L population and host taxa count on February 23, 2017. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Myrsine lessertiana</i>	28	13
Total snails counted: 28 (2 small, 10 medium, 16 large)		

On the Navy (south) side of the main ridge is Puhawai Gulch. The snails here are population PHW-A. When this area was last surveyed on November 5, 2009 a total of 11 snails were found (Table 6). Only one snail was found during the survey on February 22, 2017 (Table 7). The native trees throughout this area continue to decline and in some places even *P. cattleianum* is showing signs of a dieback.

**Table 6.** PHW-A population and host taxa count on November 5, 2009. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Myrsine lessertiana</i>	11	9
Total snails counted: 11 (1 small, 0 medium, 10 large)		

**Table 7.** PHW-A population and host taxa count on February 22, 2017. Native host taxa are in boldface.

Taxon	Snails	Host
<i>Myrsine lessertiana</i>	1	1
Total snails counted: 1 (0 small, 1 medium, 0 large)		

The total number of *A. mustelina* observed during timed-counts at Kumakalii declined from 251 to 68 snails between 2009 and 2017. This represents a population decline of 73% in 8 years.

## DISCUSSION AND RECOMMENDATIONS

**Given the substantial decline documented in 2017, OANRP propose to translocate all the *Achatinella mustelina* from each of the four sites around Puu Kumakalii found during one overnight trip into the Puu Hapapa snail enclosure as soon as possible.** Dr. Melissa Price provided her reasons to move snails in her presentation at the IT meeting in December. This proposed translocation falls into the following categories:

- **Predation.** Rats, *E. rosea*, and Jackson's chameleons are present at the Kumakalii sites. Predation pressures are likely adversely impacting the population, as standardized monitoring has documented a dramatic decrease in snails at the site (73% reduction).
- **Assisted evolution.** Kumakalii is the lowest elevation with extant snails in ESU-D within Schofield Barracks West Range, and representing these snails in the Hapapa predator exclosure is important for preserving genetic diversity that increases the likelihood of adaptation to climate change. In addition, these snails will be the only ones from ESU-D in Schofield Barracks that are represented in a predator free exclosure.
- **Assisted colonization.** Kumakalii is the lowest elevation with extant snails in ESU-D on Schofield Barracks, therefore snails from this site are more likely to survive warming temperatures and drying conditions.

If the Kumakalii snails are never moved, they will likely blink out in a few years due to loss of habitat and high predation threat. Although there are already more than the required 300 snails at Puu Hapapa, the snails at Puu Kumakalii are important because they are on Army training lands and in imminent danger of becoming eliminated by predators. Additionally, there is a small increase in elevation for some of the snails from SBW-L, and this may contribute positively to the genetic composition of the Puu Hapapa ESU D snails in terms of assisted evolution. The Army is not proposing translocating snails from higher elevation sites at SBW (e.g. Puu Kalena) to the Hapapa enclosure.

OANRP contacted Cory Campora from the Navy and he is in support of translocating any snails that remain in Puhawai Gulch to the enclosure at Puu Hapapa. Our staff advised him that if the Navy can survey their area at night, they will likely find a few more survivors than the single snail found during this recent daytime operation.

## **ACTION PLAN**

### **Goals:**

- Genetic rescue of *A. mustelina* from the Puu Kumakalii area.
- Protect from immediate threat of predation.
- Encourage population growth given bottleneck of fragmented sub-populations.

### **Objectives:**

- In the next three months, find and safely translocate remaining individuals to the Puu Hapapa snail enclosure from the Puu Kumakalii area (SBW-K, L, M and PHW-A subpopulations).
- Release the snails into a *M. lessertiana* patch (since most Puu Kumakalii snails were found in *M. lessertiana*) where they can more readily intermix and increase genetic diversity.

### **Snail extraction and translocation protocol:**

**Extraction:** Snails will be collected during the day and night. They will be placed into plastic terraria with good ventilation and preferred vegetation. The collection trip will require two days and one night in the field. Multiple trips for this translocation effort are not being considered at this time.

**Transportation:** Staff plan to camp on Puu Kumakalii for one night and fly by helicopter to Puu Hapapa the following day. Snail terraria will be carefully carried in a backpack into the helicopter for the 5 minute ride across Kolekole Pass. The hike from the Hapapa LZ to the snail enclosure takes about 10 minutes. All measures will be taken to ensure snails are not exposed to high temperature and direct sunlight during transportation. Due to range access limitations (one designated week per month), it is difficult to schedule collection trips before any favorable (i.e., rainy) weather events.

**Monitoring:** Staff will continue to monitor snails in the Hapapa enclosure in accordance with the current protocol of quarterly timed-counts and ground shell plot monitoring.

**Long-term management:** The Puu Hapapa enclosure has been operational for five years now. Staff have outplanted numerous native plants and helped to improve the overall diversity and density of plants, as well as decrease surface soil temperatures and raise local microclimate humidity levels. A nearly continuous sub-canopy has been created to assist with snail movements across the enclosure for a functionally single population of *A. mustelina* snails. Predator control is performed quarterly involving setting rat snaps and tracking tunnels, *E. rosea* sweeps while weeding, and keeping a lookout for Jackson's chameleons during timed-count monitoring. This substantial amount of attention will continue into the future, and as time goes on the enclosure should continue to become an even better habitat for rare snails.

At Puu Kumakalii, management will continue to focus largely on ungulate control, fence maintenance, and rare plant management on the cliff areas. An experimental research effort to aerially broadcast rodenticide across the larger Lihue Management Unit is planned for 2018, pending permitting and environmental reviews. However, this rodent control effort is expected to only have a short-term benefit for Puu Kumakalii snails given their remote location. If the translocation effort is not approved, OANRP is not considering any expanded threat control efforts at Puu Kumakalii given that Jackson chameleons and *E. rosea* are primary threats and no control methods exist beyond intensive hand searching, the efficacy of which is insufficient. Also the habitat is too far degraded to consider any habitat restoration efforts beyond the more intact cliff areas for other managed plant taxa.