Appendix IX: Proposed *Euglandina rosea* research

Project title: Feeding ecology, microhabitat utilization, population size estimates, and possible control of the introduced predatory snail *Euglandina rosea* on O‘ahu, Hawai‘i (Year 2)

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Proposed project period: 08/01/06 – 07/31/07

Project Description/Objectives:
The introduction of the predatory land snail *Euglandina rosea* has been implicated as a major factor influencing the decline of native Hawaiian and Pacific island land snail faunas. Despite its reputation of having a major effect on the land-snail fauna of the Pacific, relatively little attention has been focused on the biology of *E. rosea*. Instead, a large effort has been focused on studying the biology of the threatened/endangered land snail species of the Pacific, especially Partulidae and Achatinellidae species. There remains a need to understand the basic biology of *E. rosea* in order that managers can better design conservation strategies incorporating it.

With Year 2 funding, tracking technology will be used to elucidate the microhabitat preferences of *E. rosea*. Understanding how *E. rosea* utilizes microhabitats within its range will help managers determine which snail species are likely to be the most threatened. In addition, this information will help determine where traps or searches that aim to trap/catch *E. rosea* as part of a control effort should be focused.

Methods:
There are two phases to the Year 2 research: 1) testing the utility of three tracking methods, and 2) tracking *E. rosea* in the Wai‘anae Mountains.

Testing the Utility of Tracking Methods

The three tracking methods to be tested, the spool and line method, RFID technology, and harmonic radar technology, are described below. Each method will be tested on six individual *E. rosea* at the same time at Lyon Arboretum in the first two weeks of September 2006. The utility of each method will be addressed by comparing the distances moved and paths taken by individual snails tracked by each method, the ease of tracking and recapture, and the quality of data collected.

Spool and Line Method: The spool and line method uses the least complex technology of the three methods and has many advantages. A lightweight line is attached to the snail. The other end of the line is wound around a spool which will easily release line as the snail moves. This technique has advantages over the other methods because it leaves a trace of where the snail moves. Thus, total distance moved can be compared with a linear distance moved away from the initial starting point, and the habitat utilized between monitoring events can be determined. The only potential difficulty associated with this method is that the line could become caught and limit the movement of the snails. Although this method has been used elsewhere to track a range of species of snails, a pilot study suggests that it is likely that movement of *E. rosea* will be restricted by this method, as on many occasions the line was found wrapped multiple times around a plant or branch preventing the snail from moving further.

RFID Method: Radio Frequency Identification (RFID) technology has been used for many years to identify and monitor pets. RFID uses a small tag that can be attached to or incorporated into a product, animal, or person. RFID tags contain silicon chips and antennas to enable them to receive and respond to radio-frequency queries from an RFID transmitter. Recently the technology has been used by biologists to track wild animals, including small animals such as bees, and by golfers to find lost golf balls. The technology, appropriately modified for tracking snails, should allow a snail to be found within a 25 m radius. This method is considerably less expensive than the harmonic radar technique. However, it has never been used to track snails.

Harmonic Radar Method: Harmonic radar uses a diode attached to the animal that allows a receiver to locate it. Although this method has been used to track snails, the snails were either large or arboreal. Pilot studies in Hawai‘i suggest that this technique has difficulty locating snails close to the ground. This may be because the ground reflects the signal, and the receiver is thereby unable to distinguish the direct signal from the diode from the reflected signal from the ground.

Tracking *Euglandina rosea* in the Wai‘anae Mountains

Tracking will be undertaken at two field sites, one in the northern and one in the southern Wai‘anae Mountains. The locations of these sites have not yet been decided. The criteria for suitable sites include presence of *E. rosea*, presence of native snails, and the ability to get to and from the sites and monitor the snails in one day.

Six *E. rosea* will be tracked for two weeks at each site during two different times of the year (October 2006, March 2007) (total 24 snails, 56 days of observation) using the most suitable tracking method as determined in the experiments to be undertaken in September 2006. The northern site will be monitored for the first two weeks of the month and the southern site will be monitored for the second two weeks. The snails’ movements and habitat utilization will be recorded daily during the two week tracking period. Relative humidity and temperature will be recorded using Hobo data loggers during the experiment. Rainfall totals will be measured using a rain gauge. The precise daily location of each snail will be marked with wire and orange flagging and GPS coordinates will be determined. Each day the distance moved by each individual will be measured. Each site will be characterized according to the different microhabitat types present

(these microhabitat types are still to be determined), and on each day the microhabitat where the snail is found will be recorded. At the end of the experiment the number of times the snails were found in each microhabitat type will be compared to the proportion of that habitat available in order to determine microhabitat preferences. If a snail climbs a tree, the tree will be surveyed for native snails. It may then be possible to determine if *E. rosea* can detect whether there are native tree snails in a tree before it climbs a tree or if it is indiscriminately searching trees for prey.

Projected Time Line:
August 2006: Obtain and become familiar with all the equipment needed. The harmonic radar for the trials will be provided by another University of Hawai‘i graduate student (Kevin Hall).

September 2006: Perform experiments aimed at determining the utility of each method for tracking *E. rosea*.

October 2006: Undertake tracking experiments.

November 2006 – February 2007: Analyze data using spatial mapping programs and appropriate statistical packages. I will work directly with the Army Environmental GIS specialist to produce all the appropriate maps.

March 2007: Undertake the second set of tracking experiments.

April – June 2007: Analyze data using spatial mapping programs and appropriate statistical packages.

July 2007: Present results at Hawai‘i Conservation Conference.

August 2007: Write up the results in the form of two papers to be submitted to scientific journals. The first will describe the utility of the different tracking techniques. The second will examine the microhabitat utilization of *E. rosea*.