



O'ahu  
Army  
Natural  
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Program



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# Evaluation of *Euglandina* spp. Barrier Effectiveness for Predator Exclusion Structures

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# Background on Hawaiian Snail Conservation

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- Over 750 species of native Hawaiian land snails; Approximately 60–90% gone extinct
- Rosy Wolfsnail (*Euglandina rosea*) introduced in 1955 to control the invasive Giant African Snail (*Lissachatina fulica*)
- *Euglandina* spp. prey on native snails, accelerating extinction rates.

(*A. mustelina*)



(*A. concavospira*)



(*L. fulica*)



(*E. rosea*)



# Introduction

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Predator Exclusion Structures constructed beginning in 1990's

Three barrier designs previously tested and incorporated on final structures

- Angle-flanged
- Copper Mesh
- Electrical Wire

Continued Assessment of Barrier Innovation and Design



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# Research Purpose & Objectives

**Evaluate and compare the effectiveness of five snail barrier designs for use on predator exclosure structures.**

**Inform future field applications and barrier installment**

**Improve protection strategies for endangered *Achatinella* tree snails on Oahu**



# Methods: Specimen Collection

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- 17 *Euglandina* spp. collected from Ko'olau and Wai'anae mountain ranges
  - Additional specimens collected during testing period
- Housed in enriched enclosures
- Routine feeding 3 times weekly
- Enclosure cleaning once a week

# Methods: **Procedural Layout**

## Trial Setup:

- Each barrier tested over 1 week, encompass 5-week period
- Two sample groups of 6 snails (12 per barrier), alternating day and night 12-hour trials
- Total: 10 trials per barrier = 60 observations per design
- Trials conducted outdoors in a covered area (garage carport)

## Barrier Designs Tested:

1. Angled flange
2. Double-angle flange
3. Upside-down copper mesh
4. Electrical barrier – 0.35” copper wire
5. Electrical barrier – 0.60” copper wire

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# Methods:

## Data Collection & Analysis



### Data collection:

- Escape attempts, snail positions (start, ground, crease, etc.)
- Behavioral observations ( egg-laying, cannibalism, mortality)

### Total Percentage Analysis:

- Individual observations in same position were compiled for each barrier
- The number of observations were divided by the sum of all recorded individuals and multiplied by 100

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# Results: Single Angle Barrier

## Barrier Description:

15 degrees plastic flange angled inward



## Key Findings:

0% escape rate across all 60 snail observations

57% (33/60) of snails found in the crease below the divider.

25% (15/60) remained at the starting position.

16% (11/60) found on the ground or in corners.

1 instance (2%) of cannibalism: a younger snail was consumed by a larger one

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# Results: Double Angle Barrier

## Barrier Description:

Two stacked 15-degree angled flanges



## Key Findings:

0% escape rate.

58% (35/60) found in crease between flange and wall.

20% (12/60) on the ground or near corners.

17% (10/60) at the starting position.

1 escape attempt noted: one snail reached the underside of the first divider (but did not escape).

2 mortalities recorded: one during a trial, another after. 1 instance of cannibalism recorded.

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# Results: 0.35" Wire Electrical Barrier

## Barrier Description:

Two pairs of thin (0.35") copper wires connected to a non-lethal power source (12 volts)



## Key Findings:

0% escape rate.

55% (33/60) attempted to climb to wall/crease below wires

37% (22/60) found on the ground

8% (5/60) remained at the starting position.

1 snail found with its shell opening facing upward—  
potential sign of stress.

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# Results: Copper Wire Mesh Barrier

## Barrier Description:

Fine-gauge copper mesh installed upside-down to limit surface grip



## Key Findings:

0% escape rate.

40% (24/60) found on the ground.

30% (18/60) on the vertical wall near the mesh.

13% (8/60) remained at the start.

17% (10/60) attempted to cross the mesh barrier but were unsuccessful.

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# Results: 0.60" Wire Electrical Barrier

## Barrier Description:

Thicker wire version (0.60") of the original electrical barrier

## Key Findings:

Only 3 trials completed due to sudden snail mortality.

0 escapes recorded during those trials.

39% (7/18) observed on the wall below wires.

33% (6/18) on the ground.

28% (5/18) at the starting position.

3 mortalities occurred outside of trial windows—likely stress-related.



# Discussion

- **All five barriers effectively contained *Euglandina* spp. from escape**
- **Physical barriers (single, double-angle flange and copper mesh) were highly effective and safer than electrical barriers.**
- **Cannibalism highlights importance of group composition in trials.**
- **Controlled environment limits real-world application; natural elements like rain, elevation, and terrain not tested**



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# Future Research

Test barriers in natural  
environmental conditions

Explore effects of snail size  
on barrier interaction

Refine barrier designs based  
on behavioral insights

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# Mahalo

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Questions?

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