

Research in Support of the Guam Coconut Rhinoceros Beetle Eradication Project



# Improved Pheromone Traps for Coconut Rhinoceros Beetle

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November 6, 2013\*

A field trial was conducted to test increased attractiveness of standard CRB pheromone traps by addition of ultraviolet light emitting diodes (UVLEDs) and use of reduced release rate lures.

UVLEDs increased the trap catch rate by almost 3X when used in conjunction with pheromone lures. Only 2 CRB were caught in traps equipped with a UVLED but without a pheromone lure, indicating that the light sources act synergistically with pheromone lures. Our use of inexpensive solar powered UVLEDs is novel.

There was no significant difference in trap catch rate between traps equipped with standard and reduced release rate lures, even though the release rate was reduced by an average of 90%.

## 1 Methods

### 1.1 Traps

Linear trap lines, each with six traps, were established at six locations on Guam. Trap lines were set perpendicular to prevailing winds and the distance between adjacent traps was 20 to 50 m.

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\*Revised November 6, 2013

C:/Documents and Settings/Administrator/My Documents/CRB Tech Reports/improvedPheromoneTraps

Standard CRB pheromone traps ([1]) were suspended at 3 m above the ground from forked sticks. We tested six trap treatments at each location:

**T:** standard vaned-baffle bucket trap

**T+SL:** trap + standard lure

**T+RL:** trap + reduced release rate lure

**T+UV:** trap + UVLED

**T+SL+UV:** trap + standard lure + UVLED

**T+RL+UV:** trap + reduced release rate lure + UVLED

Traps were visited biweekly over a period of twelve weeks. During each trap visit pheromone lures were replaced and trapped CRB were counted and sexed. Treatments were assigned to traps using a randomization scheme which placed all treatments once at each trap site during the experiment.

## 1.2 Pheromone Lures

We used Oryctalure manufactured by Chemtica. These lures are bubble packs which use a plastic membrane to regulate the release rate of the CRB aggregation pheromone (ethyl 4-methyloctenate). In this experiment, we weighed lures before deployment and after pick up so that we could measure field release rates. Preliminary work showed that rain water entered Oryctalures making it impossible to accurately measure release rates. To solve this problem, we heat-sealed each Oryctalure into a thin polyethylene bag, reducing the release rate by about 10%. We made reduced-release rate lures by placing 200 microlitres of liquid removed from an Oryctalure into a 2 ml Eppendorf centrifuge tube with a 2 mm (5/64 inch) hole drilled in its top. The centrifuge tube was then placed in a pottle which acted as a rain and wind shield (Figure 1).

## 1.3 Ultraviolet Light Emitting Diodes

We attached two types ultraviolet light emitting diode (UVLED) devices to the baffles on our traps.

Type 1: The original prototype, manufactured by collaborators at USDA-ARS-PBARC, used a battery pack of eight AA batteries to power 4 UVLEDs. We added a 1 k ohm resistor to reduce current from 5.8 to 1.0 ma. with no apparent reduction in brightness. Thus the increasing battery life by at least 5 times..

Type 2: We converted solar powered lawn path lights by replacing the standard white LED with a single UVLED which had been sanded to make it diffuse and omnidirectional.

# 2 Results and Discussion

## 2.1 Release Rates

Mean release rates for the standard and reduced rate lures were 14.32 mg/day and 1.41 mg/day, respectively ( $p < 2E-16$ ; t-test)(Figure 2).



Figure 1: Reduced release rate lure.

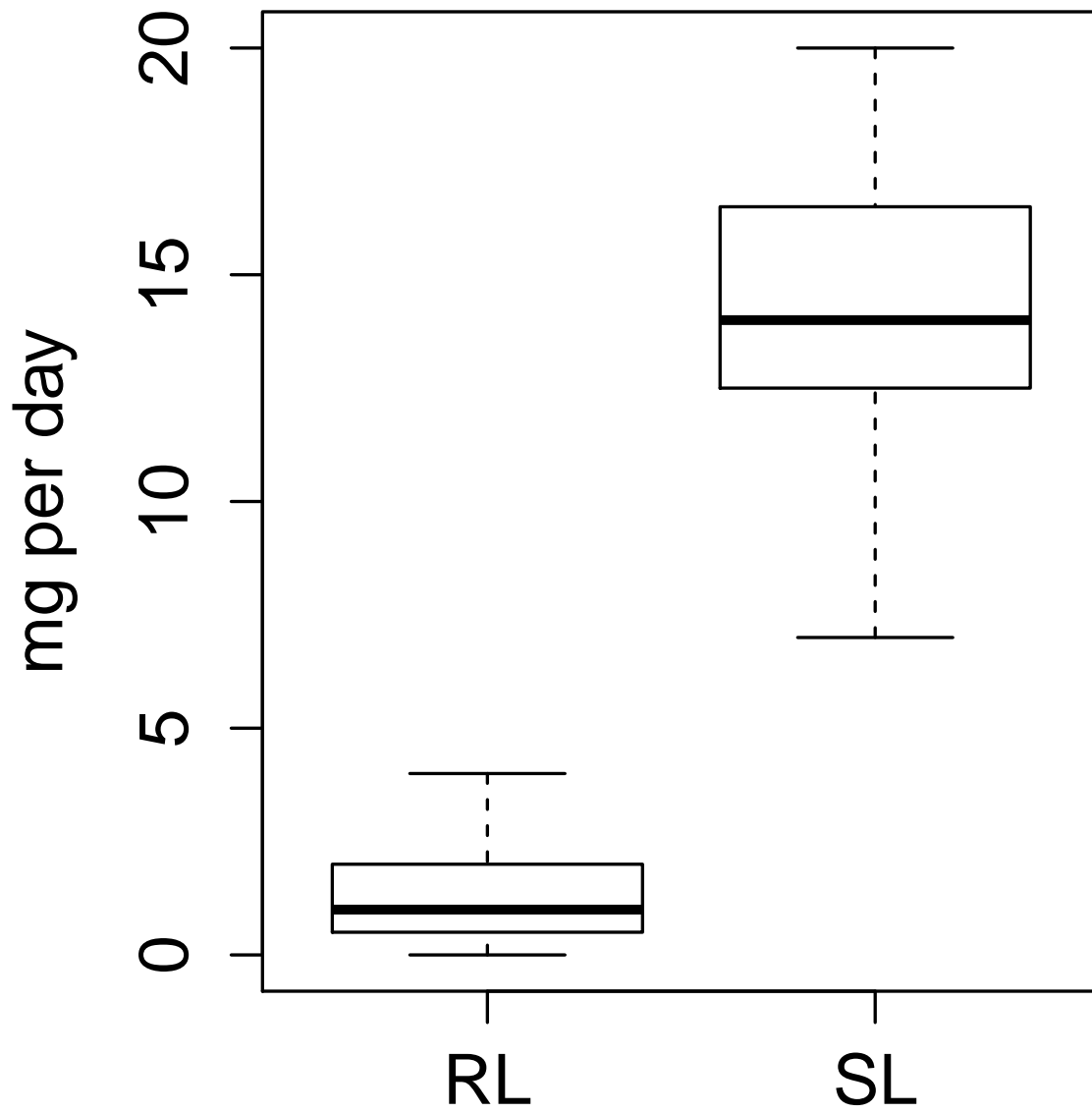


Figure 2: Release rates for standard and reduced rate lures.

## 2.2 Trap Catch

Statistical analysis of data from this experiment is still preliminary and conclusions may change prior to publication. However, here is what analysis indicates to date:

- Traps equipped with a pheromone lure and UVLED had a significantly higher trap rate than those without a UVLED: 0.091 versus 0.033 beetles per trap-day, respectively ( $p = 0.008$ ; t-test).
- Difference in trap rate between standard rate lures and reduced rate lures was insignificant: 0.074 versus 0.050 beetles per trap-day, respectively ( $p = 0.291$ ; t-test).
- All traps equipped with pheromone lures trapped approximately equal numbers of males and females: 68 versus 57 beetles, respectively ( $p = 0.371$ ; binomial test for equal proportions).

## References

- [1] Rebecca H Hallett, A L Perez, G Gries, R Gries, Jr H. D. Pierce, Junming Yue, A C Oehlschlager, L M Gonzales, and John H. Borden. Hallett 1995 aggregation pheromone co-conut rhinoceros beetle oryctes.pdf. pages 1549–1570, 1995.

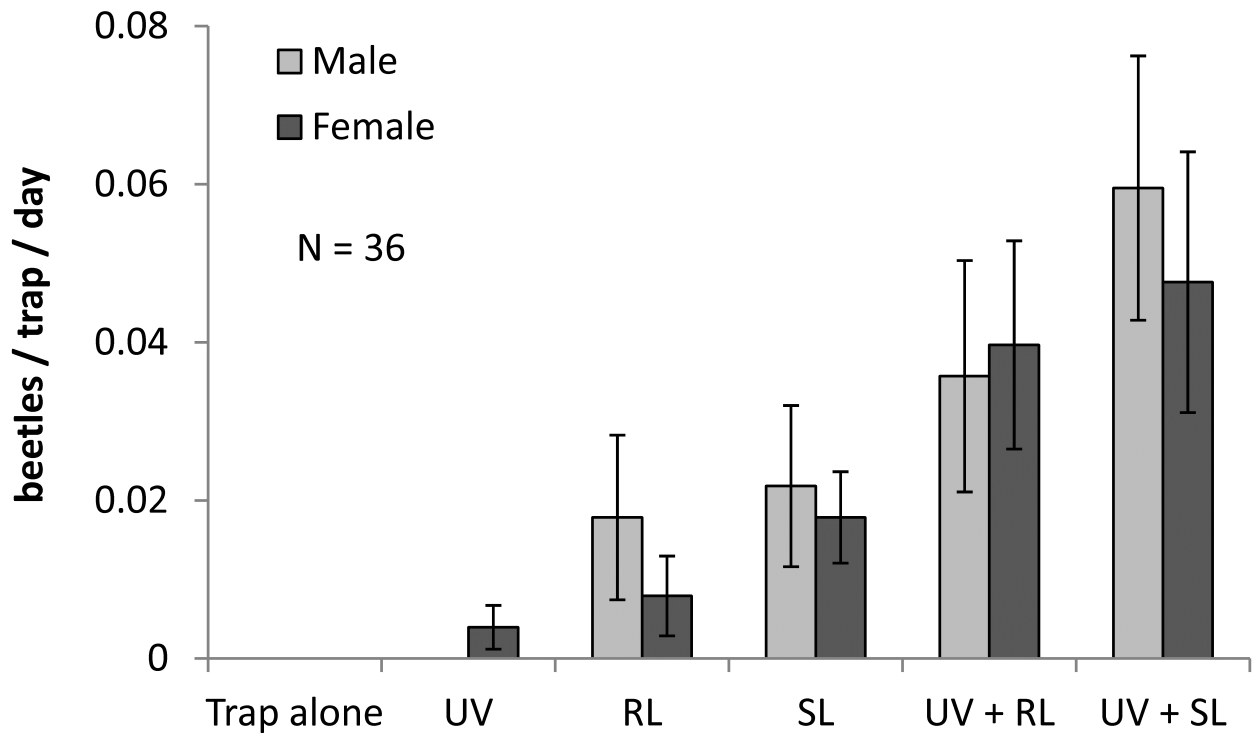


Figure 3: Mean daily trap catch for each trap type.