

# Notes for Background, Methods, and Results Sections of the CRB Trap Improvement Article

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<sup>1</sup>The most recent version of this document can be downloaded from  
<https://github.com/aubreymoore/CRB-trap-improvement/blob/master/results.pdf>.

For computational details see the Jupyter notebook at:  
<https://github.com/aubreymoore/CRB-trap-improvement/blob/master/xtraps.ipynb>

# 1 Background

## 1.1 Depleted Lures

In the island-wide trapping program pheromone traps baited with ChemTica oryctalure bubble packs were visited about every 2 weeks. Depleted lures, those with no liquid visible in the bubble pack, were replaced and this was recorded in the trapping database. Traps with depleted lures caught significantly more beetles than those with non-depleted lures (0.220 vs. 0.092 beetles per trap-visit;  $p = 2.6E-16$  [Welch Two Sample t-test]) (For details see Moore 2012).

# 2 Methods

## 2.1 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 pheromone dispensers 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 (1).

For details see Moore 2013b.

I will replace the reduced release rate pheromone dispenser image with a better one which shows holes in bottom of pottle.

## 2.2 Ultraviolet Light Emitting Diodes

Moore 2013a

Moore 2014



Figure 1: Reduced release rate pheromone dispenser.

## 3 Results

### 3.1 Trap Catch Summary

Table 1: Capture summary by trap type.

Trap type	Description	Beetles trapped			Proportion of traps which caught one or more beetles during 2 week trapping periods	Beetles caught per trap-day (mean $\pm$ SEM)
		Male	Female	Total		
T	Trap with no lure and no UVLED	0	0	0	0/36	0.000 $\pm$ 0.000
T-UV	Trap with no lure and UVLED	0	2	2	2/36	0.003 $\pm$ 0.002
T-RL	Trap with reduced release rate lure	9	4	13	7/36	0.027 $\pm$ 0.012
T-SL	Trap with standard release rate lure	11	9	20	10/36	0.039 $\pm$ 0.014
T-UV-RL	Trap with reduced release rate lure and UVLED	18	20	38	12/36	0.073 $\pm$ 0.025
T-UV-SL	Trap with standard release rate lure and UVLED	30	24	54	15/36	0.109 $\pm$ 0.031

MATT: Can we put letters after the means to signify significant differences? Not sure which multiple comparison test is appropriate for our data. If you are willing to take on this challenge, the raw data are available at:

<https://github.com/aubreymoore/CRB-trap-improvement/blob/master/trapType-captureRate.csv>

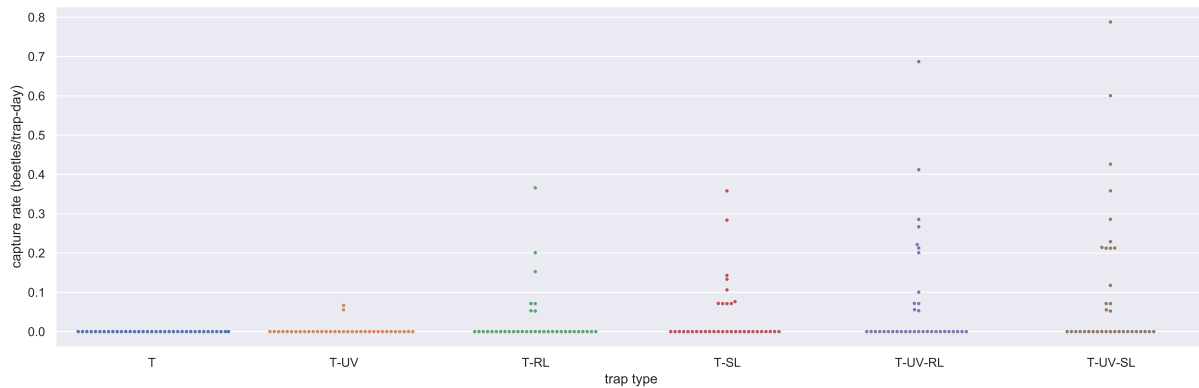


Figure 2: Capture rate by trap type. MATT: IMHO, this is the best way to display our data, see the Jupyter notebook for a couple of alternatives.

- For all trap types, sex ratio was not significantly different from 50:50 (binomial test).
- For all trap types, most traps contained no beetles at the end of each trap cycle, nominally 2 weeks.

## 3.2 Capture Rate as a Function of Pheromone Release Rate



Figure 3: Capture rate as a function of pheromone release rate for traps with and without ultraviolet light emitting diodes. Lines are ordinary least-squares fits. The equation for traps without UVLEDs is  $y = 0.0059 + 0.0015x$ ; slope is not significantly different from zero ( $p = 0.118$ ). The equation for traps with UVLEDs is  $y = 0.0182 + 0.0070x$ ; slope is significantly different from zero ( $p = 0.005$ ).

## 4 References

- Moore, Aubrey (2012). *Research in Support of the Guam Coconut Rhinoceros Beetle Eradication Project: Field Cage Experiment: New Lure vs Depleted Lure*, pp. 1–8. URL: <https://api.zotero.org/groups/511387/items/V3D3S7P7/file/view>.
- Moore, Aubrey (2013a). “Solar Powered Ultraviolet Light Emitting Diode for CRB Pheromone Traps Prepared By”. In: 29, pp. 1–5.
- Moore, Aubrey (2013b). *Technical Report: Improved Pheromone Traps for Coconut Rhinoceros Beetle*. URL: <https://api.zotero.org/groups/511387/items/SP5IDPFZ/file/view> (visited on 05/24/2020).
- Moore, Aubrey (2014). “Relative Attractiveness of White and Ultraviolet Light Emitting Diodes plus Oryctalure”. In: V, pp. 1–7. URL: [http://guaminsects.net/anr/sites/default/files/LEDcolor\\_0.pdf](http://guaminsects.net/anr/sites/default/files/LEDcolor_0.pdf).