Improved traps for the coconut rhinoceros beetle, *Oryctes rhinoceros*

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Overview

Introduction

Pheromone Traps
  Vaned bucket traps
  Ultraviolet light emitting diodes (UVLEDs)
  Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions
Improved traps for the coconut rhinoceros beetle

Moore, Quitugua, Siderhurst and Jang

Introduction

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Conclusions
Improved traps for the coconut rhinoceros beetle
Moore, Quitugua, Siderhurst and Jang

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Oryctes rhinoceros Distribution

Alien Range
Burma 1895
Samoa 1909
Keppel Island (Tonga) 1921
Wallis 1931
Palau ca. 1942
New Britain 1942
West Irian ca. 1942
Vavau (Tonga) 1952
New Ireland 1952
Viti Levu (Fiji) 1953
Pak & Manus (PNG) 1960
Tongatapu (Tonga) 1961
Tokelau 1963
Guam 2007

Interdictions
Cook Islands 2002, 2007
Saipan 2006
Hawaii 2010

Native Range
Bangladesh
Cambodia
China
Indonesia
Laos
Malaysia
Myanmar
Pakistan
Philippines
Sri Lanka
Taiwan
Thailand
Vietnam
Coconut rhinoceros beetle damage

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Mark-Release-Recapture

Conclusions
Coconut rhinoceros beetle grubs

Introduction

Pheromone Traps
- Vaned bucket traps
- Ultraviolet light emitting diodes (UVLEDs)
- Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions
Improved traps for the coconut rhinoceros beetle

Moore, Quitugua, Siderhurst and Jang

Introduction

Pheromone Traps

Vaned bucket traps

Ultraviolet light emitting diodes (UVLEDs)

Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions

Vaned bucket trap
Improved traps for the coconut rhinoceros beetle

Moore, Quitugua, Siderhurst and Jang

Introduction

Pheromone Traps

Vaned bucket traps
Ultraviolet light emitting diodes (UVLEDs)
Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions

Vaned bucket trap

90 day trapping period ending on 01 Jun 2014

Mean number of beetles caught per trap-day
Improved traps for the coconut rhinoceros beetle

Moore, Quitugua, Siderhurst and Jang

Introduction

Pheromone Traps

Vaned bucket traps
Ultraviolet light emitting diodes (UVLEDs)
Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions
Improved traps for the coconut rhinoceros beetle

Moore, Quitugua, Siderhurst and Jang

Introduction

Pheromone Traps

Vaned bucket traps

Ultraviolet light emitting diodes (UVLEDs)

Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions

Ultraviolet light emitting diodes (UVLEDs)
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Improved traps for the coconut rhinoceros beetle

Moore, Quitugua, Siderhurst and Jang

Introduction

Pheromone Traps

Vaned bucket traps
Ultraviolet light emitting diodes (UVLEDs)
Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions

Pan traps
Pan traps
Pan traps

Pan traps catch 16X as many rhino beetles as surrounding vaned bucket pheromone traps
Improved traps for the coconut rhinoceros beetle

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Introduction

Pheromone Traps

Vaned bucket traps
Ultraviolet light emitting diodes (UVLEDs)
Pan traps

Fish Net Traps

Mark-Release-Recapture

Conclusions

Pan traps - with/without substrate in barrel

Boxplot grouped by substrate

Number of beetles trapped

Breeding site material in barrel

Number of beetles caught per trap between 2014-07-22 and 2014-10-10.
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- Vaned bucket traps
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**Pan traps**

**Fish Net Traps**

**Mark-Release-Recapture**

**Conclusions**

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### Evolution of CRB Pheromone Traps

<table>
<thead>
<tr>
<th>Trap Type</th>
<th>Escape Rate</th>
<th>Relative Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>Standard Reduced Release Rate</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>Standard UVLED</td>
<td>0%</td>
<td>3X</td>
</tr>
<tr>
<td>SPC</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>AlphaScents</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>AlphaScents + UVLED</td>
<td>0%</td>
<td>3X</td>
</tr>
<tr>
<td>Tube</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>Barrel + Pan</td>
<td>35%</td>
<td>12X</td>
</tr>
<tr>
<td>Barrel + Minibucket</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>Barrel + Pan + Cone</td>
<td>0%</td>
<td>16X</td>
</tr>
<tr>
<td>Barrel + Pan + Cone + Substrate</td>
<td>0%</td>
<td>16X</td>
</tr>
<tr>
<td>SPC + UVLED</td>
<td>0%</td>
<td>3X</td>
</tr>
<tr>
<td>Tube + UVLED</td>
<td>0%</td>
<td>1X</td>
</tr>
<tr>
<td>Barrel + Pan + Cone + Substrate +</td>
<td>0%</td>
<td>16X</td>
</tr>
</tbody>
</table>

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Fish Net Traps

Chipped breeding site material: 0.52 CRB trapped per day
26X more attractive than standard pheromone traps

Fresh, unchipped green waste (pandan, bamboo, breadfruit): 0.57 CRB trapped per day
29X more attractive than standard pheromone traps
Fish Net Traps
Fish Net Traps
Fish Net Traps

- Green net 1
- No net
- Bird net
- Green net 2
- Fish net

Proportion of beetles contained

Conclusions
Mark-Release-Recapture

1. Trapped beetles are fed and allowed to rest for one week
2. Beetles which pass a laboratory flight test are marked with a number
3. Marked beetles are released at the center of 31 pan traps spaced 100m apart
4. About 20% of beetles have been recaptured
5. If wild beetles behave the same as marked beetles, we can infer that pan traps catch about 20% of the wild population
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- **Fish Net Traps**

- **Mark-Release-Recapture**

### Conclusions

<table>
<thead>
<tr>
<th>Trap</th>
<th>Relative attractiveness</th>
<th>Proportion of population trapped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard pheromone trap</td>
<td>1X</td>
<td>1%</td>
</tr>
<tr>
<td>Standard pheromone trap + UVLED</td>
<td>3X</td>
<td>4%</td>
</tr>
<tr>
<td>Pan trap</td>
<td>16X</td>
<td>20%</td>
</tr>
<tr>
<td>Fish net</td>
<td>26X</td>
<td>33%</td>
</tr>
</tbody>
</table>
Conclusions

1. Mass trapping using standard vaned-bucket pheromone traps did not result in population suppression. These traps catch only about 1% of the adult population.

2. Our best pheromone trap is a pan trap equipped with cone and UVLED. It catches about 16X more rhino beetles per day than our standard vaned bucket traps.

3. Addition of breeding site material to the barrels did not increase trap catch.

4. Covering breeding sites with fish netting may be effective for population suppression: traps adults attracted to the pile and prevents emergence of adults from within the pile. Netted piles catch more than 25X more rhino beetles per day than standard pheromone traps.