Update on the Guam Coconut Rhinoceros Beetle Eradication Project
For the Guam Invasive Species Council

Aubrey Moore
University of Guam

February 15, 2012
First Coconut Rhinoceros Beetle Collected on Guam 11-Sep-2007, Tumon Bay
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

Native Range
- Bangladesh
- Cambodia
- China
- Indonesia
- Laos
- Malaysia
- Myanmar
- Pakistan
- Philippines
- Sri Lanka
- Taiwan
- Thailand
- Vietnam

Interdictions
- Cook Islands 2002, 2007
- Saipan 2006
- Hawaii 2010
Vertical Distribution of CRB Larvae & Adults in Standing Dead Coconut Trankilidat, Guam; 25 Oct 2007

![Graph showing the vertical distribution of CRB larvae and adults in a standing dead coconut tree stump. The graph indicates a higher concentration of CRB larvae between 10' and 14' in the stump, with a notable absence of CRB adults.]
Novel CRB Behavior on Guam: Arboreal Development

CRB extracted from the crowns of 121 felled coconut palms

<table>
<thead>
<tr>
<th>Stage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>99</td>
</tr>
<tr>
<td>L1</td>
<td>40</td>
</tr>
<tr>
<td>L2</td>
<td>72</td>
</tr>
<tr>
<td>L3</td>
<td>210</td>
</tr>
<tr>
<td>Pupae</td>
<td>25</td>
</tr>
<tr>
<td>Adult males</td>
<td>34</td>
</tr>
<tr>
<td>Adult females</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>510</strong></td>
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<tr>
<td><strong>Mean per tree</strong></td>
<td><strong>4.21</strong></td>
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</tbody>
</table>
Coconut palms killed by *Oryctes rhinoceros*; Viti Levu Island, Fiji; 1973
Source: ?

Coconut palms killed by *Oryctes rhinoceros*; Peleliu Island, Palau 1951
Source: Gressitt 1953
Location of Initial Detection
September 11, 2007
Delimiting Survey
September 2007
Guam Coconut Rhinoceros Eradication Project

**Partners:**
USDA-APHIS
Guam Dept. of Agriculture
University of Guam

**Funding:**
USDA-APHIS
US Forest Service
GovGuam
Guam Coconut Rhinoceros Eradication Project

TACTICS

Quarantine
  Limit accidental transportation to uninfested parts of Guam.

Pheromone Traps
  Capture adults and detect spread of the beetle population

Sanitation
  Kill immatures and remove breeding sites

Detector Dogs
  Efficient discovery of breeding sites.

Chemical Control
  Injectable systemics for adults; spot treatments for breeding sites.

Biocontrol
  Autodissemination of *Oryctes* virus
PHEROMONE TRAPS

- Mass trapping unsuccessful
- Traps useful for monitoring
Upload Trap Visit GPX file to Database

Trapper(s): Taci Mary

Trap Visit Date: 12 December 2010

Choose a GPX file to upload: C:\My Documents from Toshiba on Aubreytaca\Orycte Browse...

Submit
Monthly Trap Catch - All Traps

<table>
<thead>
<tr>
<th>year</th>
<th>month</th>
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<td>2008</td>
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Visualization of Trap Catch Data

Aubrey Moore

Guam Coconut Rhinoceros Beetle Eradication Project

Generated 2012-02-01 19:28:20
Path: C:/Documents and Settings/Administrator/My Documents/CRB monthly surveillance reports/map dev
R script: makeMaps.R
Brew file: makeBeamer.txt
The following frames show spatial-temporal changes in numbers of CRB adults caught in pheromone traps.

Note that trap catches on Guam are very low: the scale runs from 0 to only 0.02 beetles per trap day, a trap rate of only one beetle every 50 days.
Methods

- Interpolated raster maps were made using an R script which:
  1. Accesses georeferenced data stored in the CRB project’s online MySQL database.
  2. Processes the data using the GRASS6 GIS
  3. Writes the \LaTeX\ code which generated this PDF document.
90 day trapping period ending on 01 May 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Jun 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Jul 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Aug 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Sep 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Oct 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Nov 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Dec 2008

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Jan 2009

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Feb 2009

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Mar 2009

Mean number of beetles caught per trap-day
Mean number of beetles caught per trap-day
90 day trapping period ending on 01 May 2009

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Jun 2009

Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Jul 2009

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90 day trapping period ending on 01 Dec 2011

Mean number of beetles caught per trap-day
Mean number of beetles caught per trap-day
90 day trapping period ending on 01 Feb 2012

Mean number of beetles caught per trap-day
Sanitation
DETECTOR DOGS
CHEMICAL CONTROL
Insecticides Being Evaluated

- CYPERMETHRIN: quick knockdown of all stages; not persistent
- PYRIPROXIFEN (NYGARD®): insect growth regulator; prevents production of adults
- SPLAT RB® + CYPERMETHRIN: experimental attracticide; adults only
Metarhizium for Biological Control

- a USDA import and release permit was obtained for Metarhizium which is being produced for biocontrol of CRB by the Philippines Coconut Authority
- 15 kg of spores were imported on September 10, 2011 and December 10, 2011
- following lab bioassays, field releases were started by incorporation into breeding sites and autodissemination by adult males
- Metarhizium appears to be working well: we are finding dead grubs with fungus even in areas where we did not apply spores
Biological Control of the Coconut Rhinoceros Beetle