

**Research in Support of the Guam Coconut Rhinoceros  
Beetle Eradication Project**

**Survey of Coconut Rhinoceros Beetle  
Damage at the Pacific Islands Club Resort,  
Tumon Bay, Guam**

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## **Abstract**

Thirteen percent (73 of 581) coconut palms on the property of the Pacific Islands Club Resort have been damaged by coconut rhinoceros beetle (CRB) adults within the 10 months since its detection in September 2007. The beetle is preferentially attacking mid-sized trees in the 20 to 30 foot range and trees growing near to the beach. The survey indicates that mass trapping with pheromone traps baited with oryzalure® is not intercepting CRB before significant damage is done to nearby trees. Expected economic loss the resort from CRB damage to date is between \$36,500 and \$146,000, but could be much higher if more trees are attacked.

## **Introduction**

The Pacific Island Club (PIC) Resort is a beach hotel complex in Tumon Bay, Guam, extending from the beach to San Vitores Road. It is next to a vacant lot to the west and the Marriot Hotel to the east. The resort encompasses about 8.5 ha, and about one-third of this is occupied by buildings, parking lots and water features. Hotel management has been very proactive in trying to prevent damage from the coconut rhinoceros beetle (CRB). PIC constructed 28 CRB pheromone traps and installed these on October 19, 2007. Trap density is about five traps per hectare of landscaped property (excluding buildings, parking lots and water features). This density is 10X the oryzalure® manufacturer's recommendation of one trap per two hectares for mass trapping to control RCB in plantations.

These vaned bucket traps were built using the same design as the one used by the Guam CRB Eradication Project. The PIC traps are baited with Oryctalure® and are checked daily. Trap check information is sent to Aubrey Moore for entry in the project database.

The survey was undertaken to assess the current level of and distribution of CRB in a representative tourist hotel landscape within the CRB infestation, which includes all of Guam's Tumon Beach area.

An infestation of the coconut rhinoceros beetle (CRB) was detected here on September 11, 2007. Adult

CRB kill coconuts and other palms when they bore into crowns to feed on sap. CRB grubs feed in decaying coconut logs which are very abundant on Guam in the form of palms killed by recent typhoons. Based on what happened when CRB arrived in the Palau Islands during the 1940s, it is expected that 50% or more of Guam's coconut palms will be killed in the absence of pest control.

After a delimiting survey showed that the infestation was localized, an eradication attempt was launched as a cooperative project involving USDA-APHIS, the Guam Department of Agriculture, and the University of Guam. The eradication project currently uses three pest control tactics:

1. Mass trapping of adults using vaned bucket traps baited with a commercially available aggregation pheromone which attracts both sexes
2. Physical removal and/or treatment of rotting coconut logs and other potential breeding sites and food supply for grubs
3. Spot treatment of palms and breeding sites with conventional and injectable insecticides

## **Methods**

A CRB damage survey was done at the PIC Resort during July 2 through July 11, 2008. Every coconut palm on PIC property was tagged with an aluminum disk stamped with a unique identification number. Geographical coordinates for each tree were stored as a waypoint in a GPS receiver (Garmin GPSmap 76CSx). Visual observations of damage to tree crowns were made with the aid of binoculars. Observation data were saved in the "Note" field of the waypoint using a simple alphanumeric code:

H followed by an integer	Tree height in feet; estimated by eye
V	V-shaped leaf defoliation (CRB damage)
B	Bore hole (CRB damage)
D	Leaf damage from other insects; mainly caused by coconut leaf beetle, <i>Brontispa</i> sp.

Waypoints were transferred to a Personal computer and converted into a spreadsheet using the EasyGPS freeware program. Spatial display of the data was done using the Quantum GIS freeware and statistical analysis was done with the R freeware (R Development Core Team, 2006).

## **Results**

CRB damage in the form of boreholes or v-shaped cuts in fronds was observed in 73 of the 581 trees found on PIC property (Table 1). Not all height classes of trees are being attacked equally (Figure 1). It appears that the beetle prefers to attack moderately sized trees. About 24% of 131 trees in the 21 to 30 foot height class were damaged.

The spatial distribution of attacks is not uniform (Figure 2,3). Attacks are more probable near the beach. There is a dense cluster of CRB-damaged trees in the northwest corner of the property in the vicinity of Jivana Spa.

Leaf damage by insects other than CRB was observed in all but one of the 581 trees. Almost all of this damage was from coconut leaf beetles, *Brontispa* sp. These small beetles feed on fronds before they unfurl, chewing slit-like holes in them. Unlike the CRB, these beetles do not kill coconut palms. But they reduce their quality as ornamental plants and the stress that they cause may make these plants more susceptible to damage from other pests.

## **Discussion**

The actual proportion of trees growing on PIC property is probably higher than the observed thirteen percent because new boreholes are difficult to detect from the ground on taller trees. Even in young trees where the crown is easily accessible, new boreholes may be hidden from view.

The survey indicates that mass trapping with pheromone traps baited with orytalure® is not intercepting CRB before significant damage is done to nearby trees. A trap near the center of the cluster of damaged palms at Giovanna's Spa has yet to catch a single beetle.

Low efficacy of orytalure traps has been reported elsewhere. Kalidas 2004, working with orytalure baited, vaned bucket traps in oil palm plantations in India, claimed that "The bucket trap using vanes was not effective in complete trapping of the attracted beetle allowing them to skip. These skipped beetles increased the per cent infestation on the surrounding palms of the trap." Allou et al. 2006, working with *Oryctes monoceros* attacking coconut in the Ivory Coast found that addition of rotting coconut material to orytalure-baited vaned bucket traps significantly increased trap catch by about 3X. They also found that vertical tube traps baited with orytalure plus rotting coconut material significantly outperformed similarly baited vaned bucket traps. Vertical tube traps baited with orytalure and rotting coconut sawdust are being used to trap *Oryctes rhinoceros* integrated pest management programs in the Philippines (ref needed). A pair of these traps deployed in ??? caught ??? beetles within ???.

The cluster of attacks of coconut palms around the spa is intriguing. A possible explanation for this cluster is attraction of adult rhinoceros beetles into the area by volatile compounds released from aromatherapy and lotions used by the spa. It may be worthwhile to screen some of these compounds as rhino beetle attractants in olfactometer bioassays.

Economic loss to the resort will be significant. Replacement of a mature coconut used as an ornamental plant in Guam's hotel landscapes costs between \$1,000 and \$2,000. A best-case scenario with half of the 73 damaged palms recovering, no further plants attacked, and a replacement cost of \$1,000 per tree totals \$36,500. A worse case scenario with 73 or more trees dying from CRB with a replacement cost of \$2,000 is at least \$146,000.

## **Acknowledgments**

Thanks to Mr. Bart Jackson, General Manager his staff at PIC for allowing us to survey their property. Thanks also to Roland Quitugua, Guam CRB Eradication project Operations chief for organizing the survey, and to the survey team: Rick Lizama and Ernie Aguan from the Guam Department of Agriculture and Richard Farrel and Richard Lazaro from the Tinian Island Branch of the Commonwealth of the Northern Mariana Islands PPQ Service.

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*Table 1: Results from a coconut rhinoceros beetle (CRB) survey at the Pacific Islands Club Resort, Tumon Bay, Guam conducted in July 2008.*

<b>Tree Height (ft.)</b>	<b>No. of Trees</b>	<b>V-cuts</b>	<b>Boreholes</b>	<b>CRB Damage<sup>1</sup></b>
1-10	98	3	4	4 (4%)
11-20	208	19	15	20 (10%)
21-30	131	30	19	32 (24%)
31-40	72	9	9	11 (15%)
41-50	57	2	3	5 (9%)
>50	15	1	0	1 (7%)
<b>ALL</b>	<b>581</b>	<b>64</b>	<b>50</b>	<b>73 (13%)</b>

<sup>1</sup>A palm tree is considered to be damaged by CRB if a v-shaped cut in a frond or a borehole in the trunk or petiole is observed.

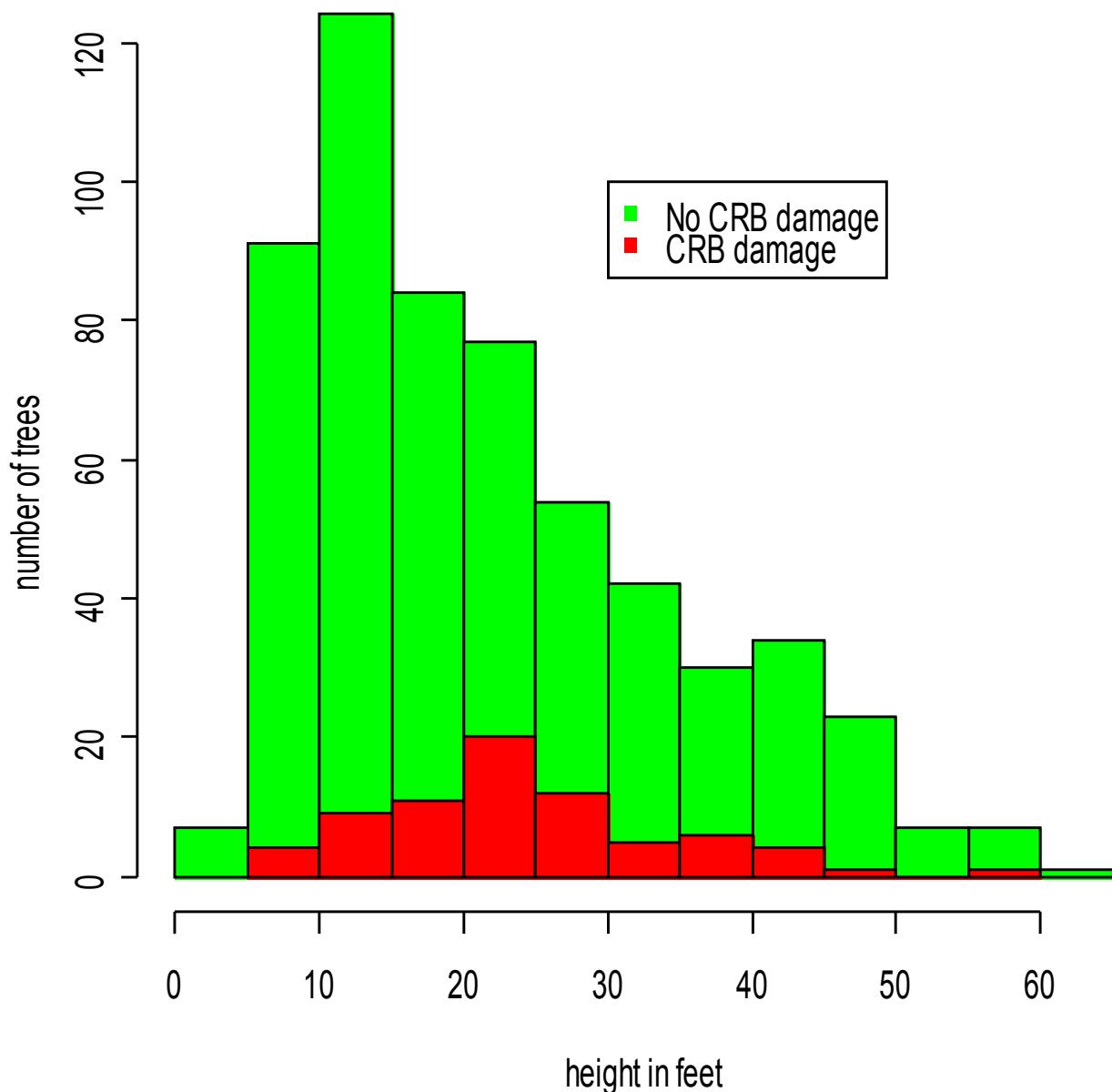


Figure 1: Height distribution of coconut palms with and without CRB damage. Height distribution of damaged palms is significantly different from the population distribution ( $P = 0.0027$ ; bootstrapped Kolmogorov-Smirnov test with 10,000 iterations).

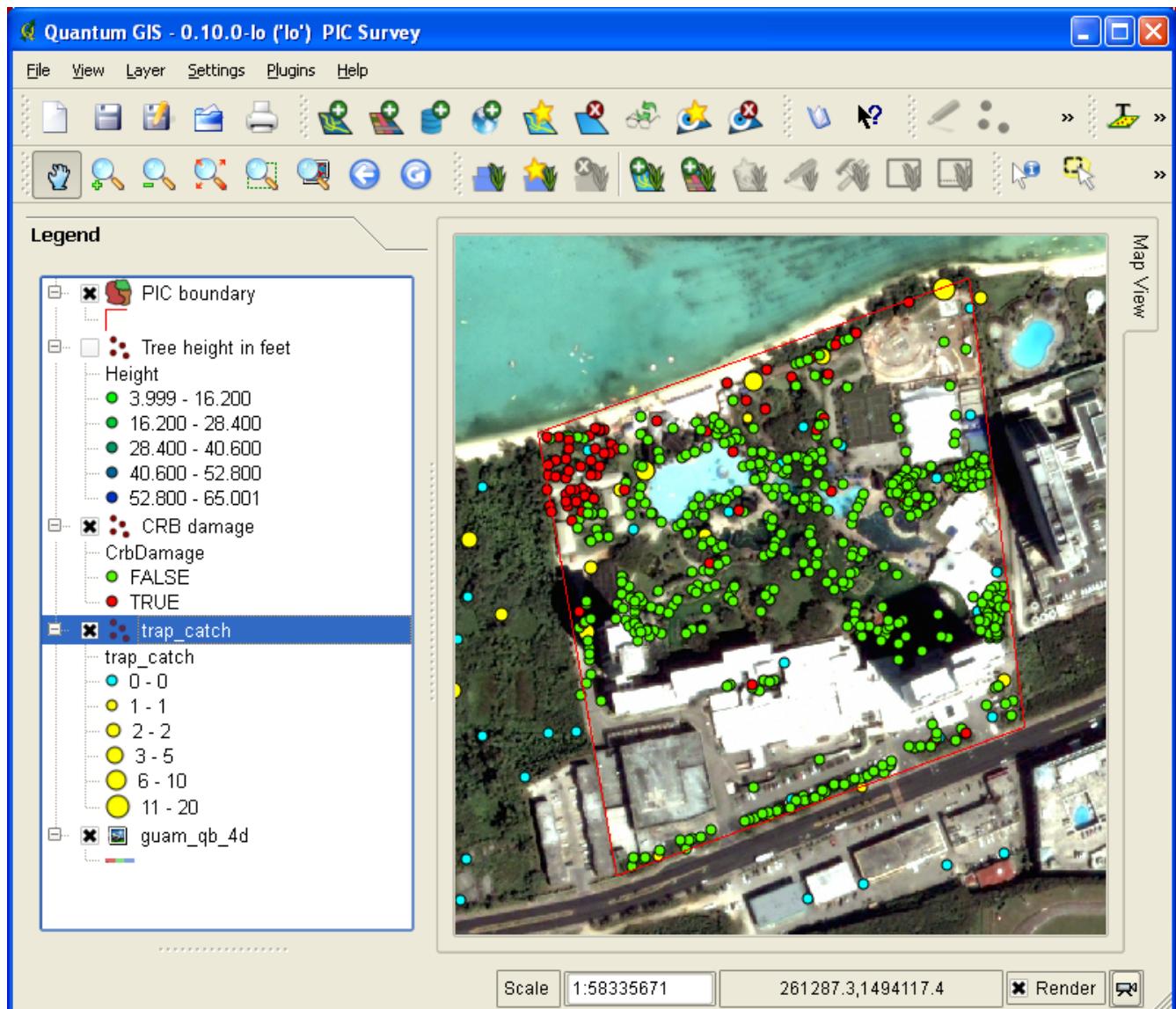


Figure 2: CRB-damaged coconut palms are represented by red dots, undamaged trees by green dots. Trap locations and number of beetles caught in each trap are represented by blue and yellow disks.

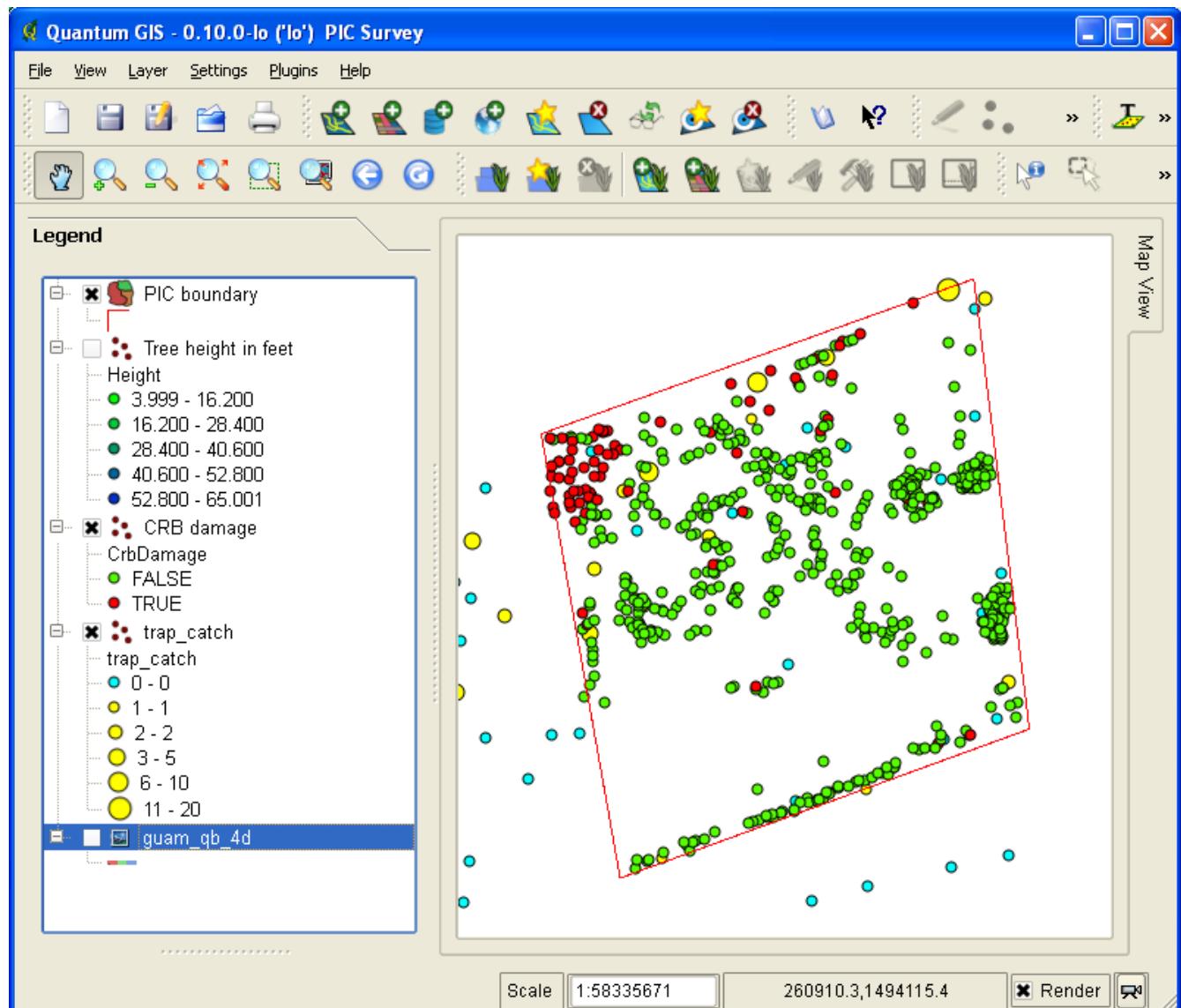


Figure 3: Same as Figure 2, but with background image removed.