Semiannual Report for CAPS Project

**Surveillance of the coconut rhinoceros beetle, *Oryctes rhinoceros*, on Guam**

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## Introduction

Coconut rhinoceros beetle (CRB, Coleoptera: Scarabaeidae), *Oryctes rhinoceros*, was detected on Guam on September 11, 2007. CRB is native to Southern Asia and now occurs throughout much of Asia and the Western Pacific. It was accidentally introduced and is now established on the Pacific Islands of Palau, Fiji and Samoa. It is a serious pest of coconut palm *Cocos nucifera*, betelnut, *Areca catechu*, and *Pandanus* species. It is also known to attack banana, taro, pineapple and sugar cane.

On Guam, adult beetles and larvae were initially collected from the Tumon Bay area; however, injured palms were found both at Tumon Bay (960 acres) and Faifai beach (15 acres). Detection and monitoring via ground surveys and attractive traps continue and the current eradication zone encompasses 1,360 acres. The quarantined area is much larger; Guam Department of Agriculture (GDA) initially quarantined an area of about 2,500 acres, but this has now been expanded to 5,830 acres, as CRB have been detected over a broader area.

Adults are the injurious stage of the insect. They are generally night-time fliers and when they alight on a host, they chew down into the folded, emerging fronds of coconut palms to feed on sap. V-shaped cuts in the fronds and holes through the midrib are visible when the leaves grow out and unfold. If the growing tip is injured, the palm may be killed or severe loss of leaf tissue may cause decreased nut set. Feeding wounds may also serve as an infection pathway for pathogens or other pests. The effects of adult boring may be more severe on younger palms where spears are narrower. Mortality of young palms has already been observed on Guam. Oviposition and larval development typically occurs in decaying coconut logs or stumps.

Control measures have been developed for CRB and the current strategy on Guam is to implement an integrated eradication program using pheromone-baited, attractive traps to capture adults, various methods to eliminate infested and susceptible host material, and pesticides to kill larvae and adults. Pesticides may also be applied to uninfested trees as a preventive treatment. Pheromone traps are deployed for two reasons: for population control by removal of adults by mass trapping within the infested area, and for detecting dispersal of adults into uninfested areas.

CAPS funding is being used to establish and service an island-wide network of CRB pheromone traps. These traps are locally made vaned bucket traps baited with a commercially available CRB aggregation pheromone which attracts both sexes. Two part-time trap inspectors have been hired and tasked with visiting and maintaining all CRB pheromone traps on Guam, except for 15 traps deployed on Navy property which are checked by naval biologists and 28 traps deployed at the Pacific Islands Club resort which are checked by the hotel grounds manager. The inspectors work as an integrated part of the Guam CRB Eradication Project which is managed as an integrated incident command system using personnel and material resources from the Guam Department of Agriculture, USDA-APHIS, and the University of Guam.

**Trap Construction**

Simple vaned bucket traps were built by a staff of the Agricultural Development Services, Guam Department of Agriculture (Figure 1). Trap components are:

1. 5 gallon paint bucket; holes drilled in bottom for drainage
2. vanes constructed from black or white Choroplast®
3. lure: Oryctalure (ethyl-4-methyloctanoate) purchased from Chemtica Internacional, Costa Rica


*Figure 1: Coconut rhinoceros beetle pheromone trap. Made by the Agricultural Development Service, Guam Department of Agriculture*

## Trap Deployment

Traps were deployed by the Guam CRB Eradication project staff. Traps were hung at a height of about nine feet from hooks attached to tree trunks. Target trap density for mass trapping within the infested area is one trap per acre. Detection traps outside the infested area were hung every mile along major roads. Additional traps were hung in neighborhoods in response to sightings of defoliation or bore holes in coconut palms. Each trap was given a unique serial number and its position was recorded using a GPS receiver.

## Trap Visits

Trap inspectors attempted to visit each trap every two weeks. However, time between visits was usually longer than two weeks due to vehicle breakdowns and other problems. The pheromone traps did not contain a toxin, so beetles were usually alive when removed. Trapped beetles were placed in a laboratory colony at the University of Guam. Trap inspectors used a printed field data sheet to record CRB collected from each trap, and also the identity and number of nontarget species.

## Data Management

To facilitate sharing of data among the Guam CRB Eradication Project participants, a MySQL database was designed and made available on the internet. Several web accessible output reports were designed including a display of trap positions using the Google Earth.
See http://www.guaminsects.net/uogces/kbwiki/index.php?title=Guam_Rhino_Beetle_Eradication_Project_Database

## Results

To date, a total of 1,457 traps have been deployed (Figure 2). A total of 276 CRB adults have been collected during 7,095 trap visits (Table 1). Beetles were caught in traps within a five mile stretch of the western coast of Guam which includes Tamuning Village in the south, extending northwards through Oka Point, Tumon Beach, Faifai Beach, and Tanguisson Beach in the north (Figure 3). A single, headless beetle was found in a trap at a plant nursery in Mangilao on xxxxxxx. However, intensive searches and subsequent monitoring has failed to detect further evidence of RCB infestation in Mangilao.

*Table 1. Monthly trap catch and trap visits; Guam coconut rhinoceros beetle pheromone trap network.*

| Year | Month | Beetles Trapped | Trap Visits |
|---|---|---|---|
| 2007 | October | 10 | 408 |
| | November | 14 | 261 |
| | December | 55 | 239 |
| 2008 | January | 73 | 671 |
| | February | 26 | 911 |
| | March | 60 | 2260 |
| | April | 13 | 1130 |
| | May | 25 | 1215 |
| **Total** | | **276** | **7095** |

Trap results indicate that the Guam RCB infestation has not spread significantly, and that its population has not increased significantly since it was detected. Containment of the infestation is probably largely due to aggressive sanitation which has removed breading sites and immature stages.

## Additional Notes

As mentioned previously, our traps contain no toxins. Live CRB beetles cannot escape because there is not enough space in the traps for them to take off. To verify that CRB do not escape, we placed ten individuals in a trap placed inside a large walk-in cage. The beetles were all alive at the end of a week and none had escaped.

Observations indicate that the efficacy of the pheromone traps is quite low:

1. Within the mass trapping area, traps are not intercepting beetles which are attacking nearby coconut palms.
2. In a limited mark-release-recapture experiment, non of six marked beetles release in the middle of the mass trapping area where recovered.

We are currently trying to increase trapping efficacy by augmenting the pheromone with host plant volatiles.

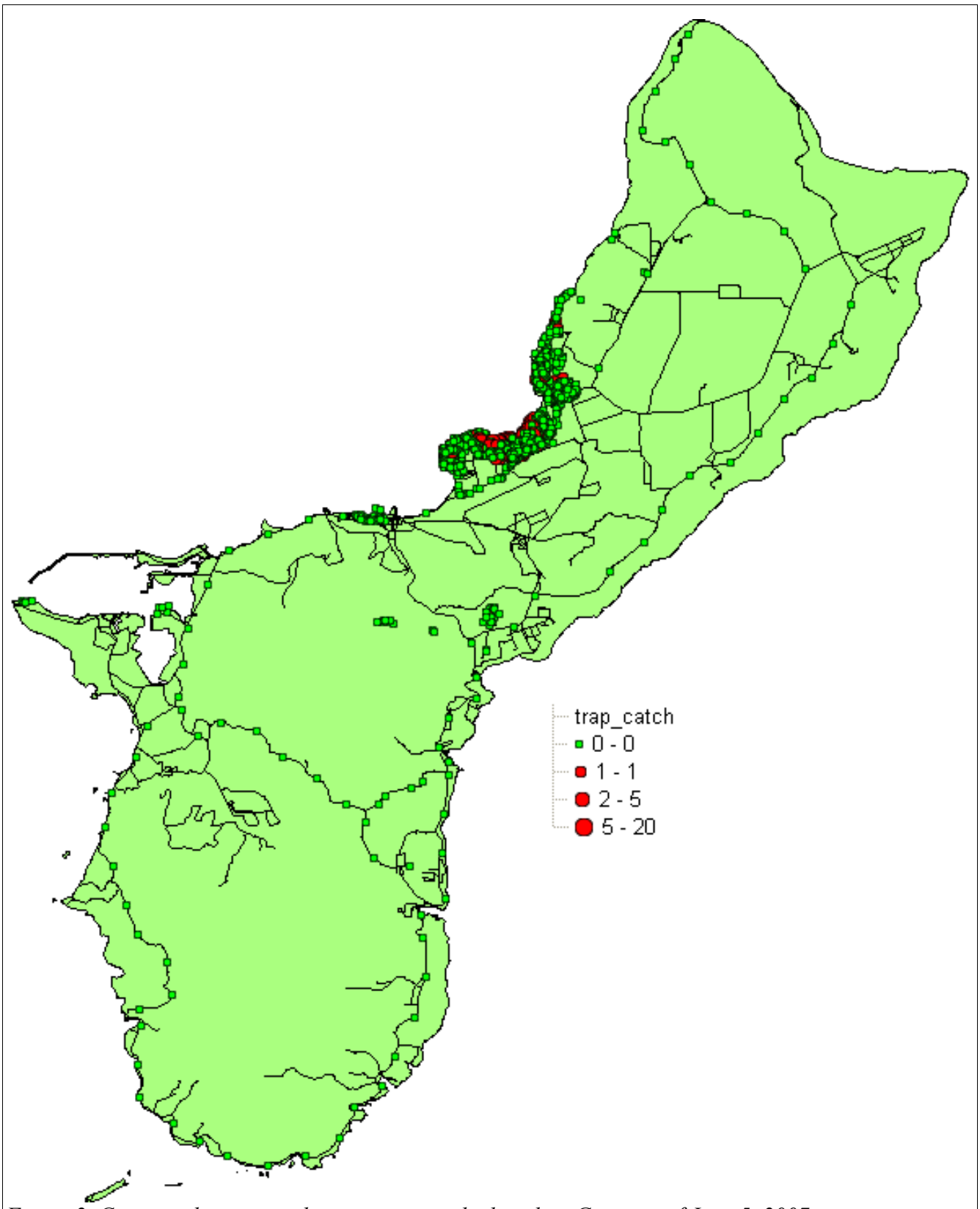


*Figure 2. Coconut rhinoceros pheromone traps deployed on Guam as of June 5, 2007.*

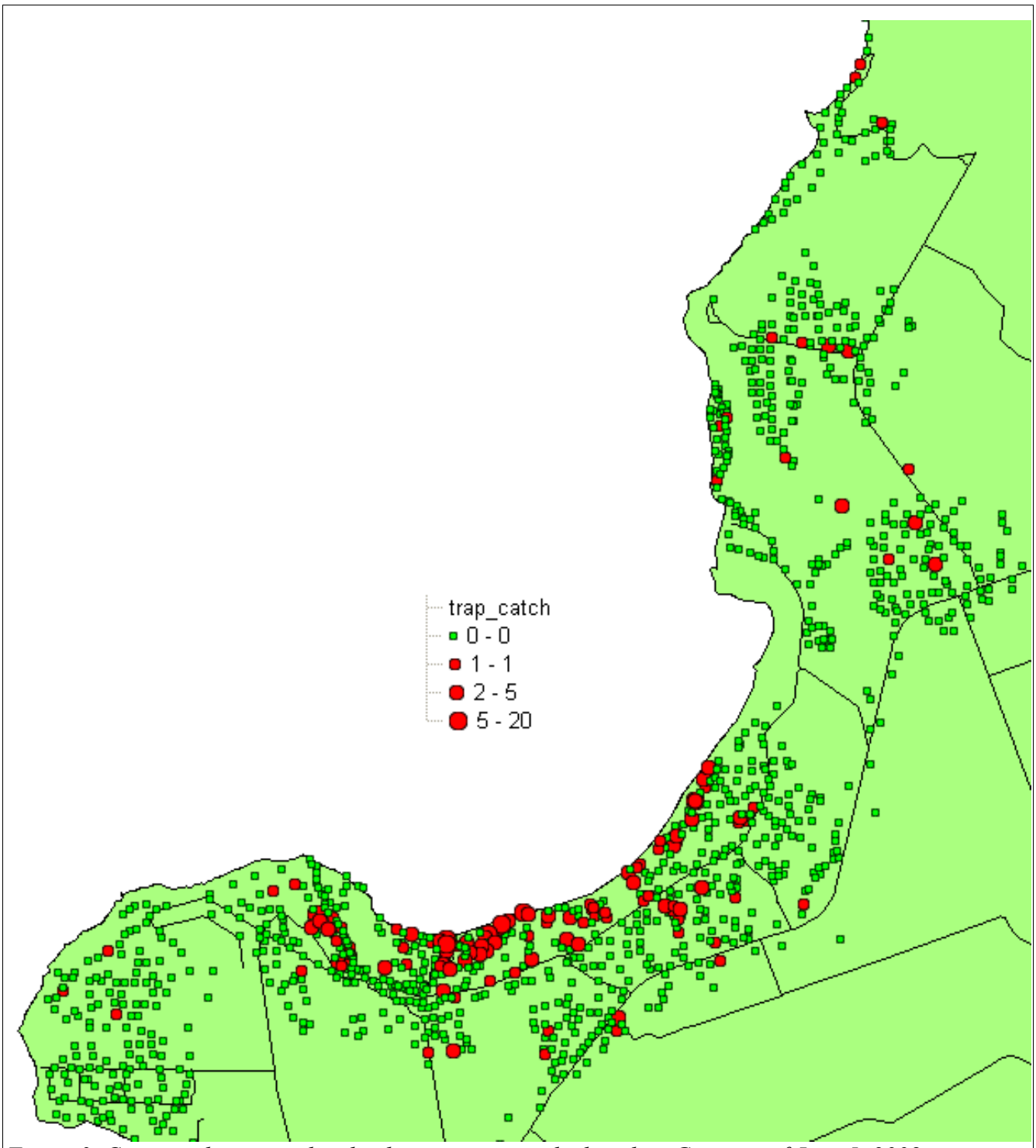

*Figure 3. Coconut rhinoceros beetle pheromone traps deployed on Guam as of June 5, 2008.*