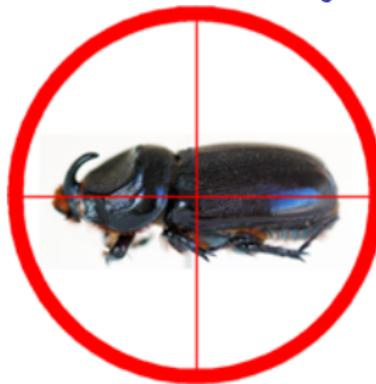


# Update on the Guam Coconut Rhinoceros Beetle Eradication Project



Workshop, Tamuning Senior Center, June 25 & 26, 2013

Aubrey Moore and Roland Quitugua  
University of Guam Cooperative Extension Service

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



# *Oryctes rhinoceros* Distribution













# Please Don't Do This



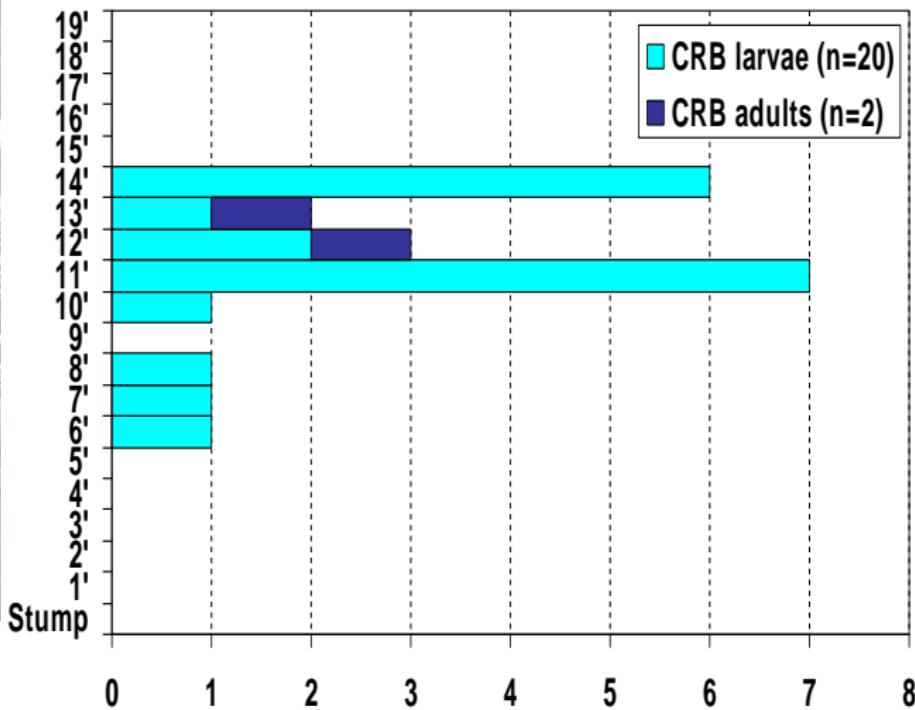
Or This







# Vertical Distribution of CRB Larvae & Adults in Standing Dead Coconut Trankilidat, Guam; 25 Oct 2007



# Novel CRB Behavior on Guam: Arboreal Development

CRB extracted from the crowns  
of 121 felled coconut palms



|                      |             |
|----------------------|-------------|
| Eggs                 | 99          |
| L1                   | 40          |
| L2                   | 72          |
| L3                   | 210         |
| Pupae                | 25          |
| Adult males          | 34          |
| Adult females        | 30          |
| <b>Total</b>         | <b>510</b>  |
| <b>Mean per tree</b> | <b>4.21</b> |

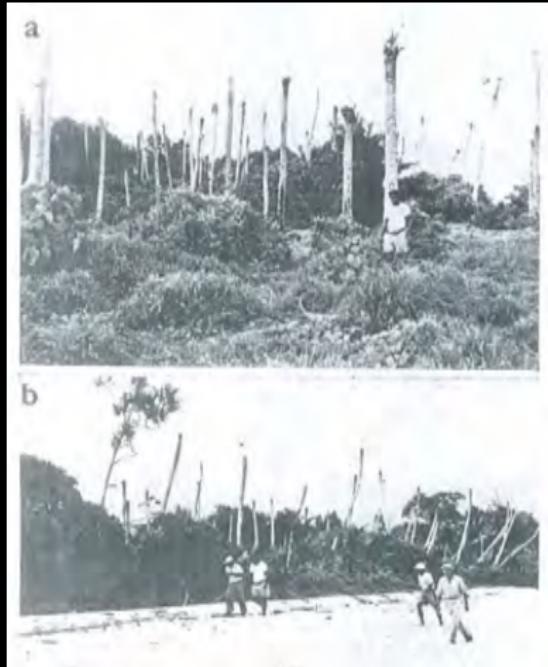


ADULTS KILL TREES

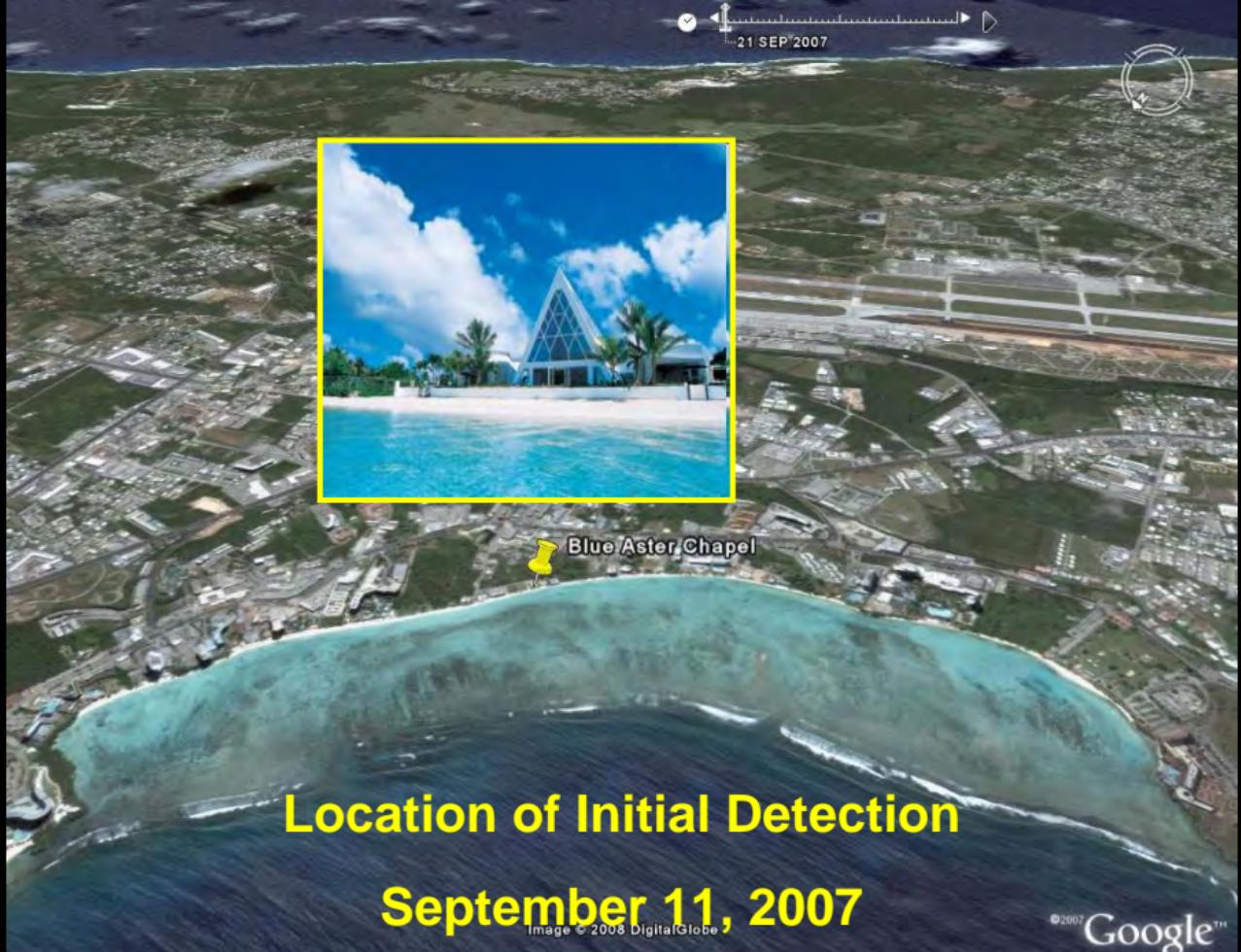
LARVAE FEED ON  
DEAD TREES



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

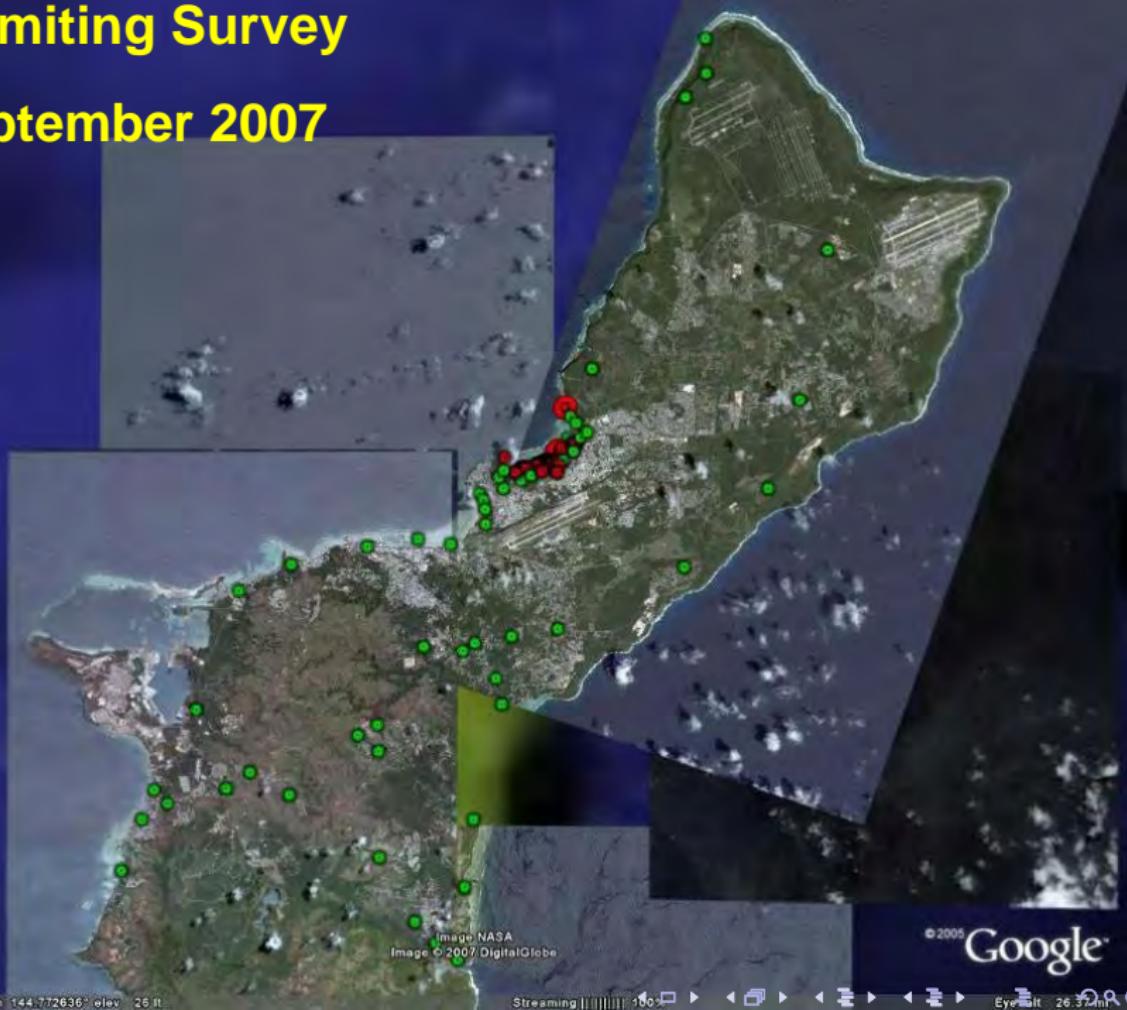
**September 11, 2007**

Image © 2008 DigitalGlobe

Digitized by Google

## Delimiting Survey

# September 2007



# Guam Coconut Rhinoceros Eradication Project

## ORGANIZATION

### **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



## Initial Quarantine Area

**September 2007**



Image © 2007 DigitalGlobe

Digitized by Google

# PHEROMONE TRAPS

- Mass trapping unsuccessful
- Traps useful for monitoring



# Trap Data Entry Form

Mozilla Firefox

File Edit View History Delicious Bookmarks Tools Help

http://guaminsects.net/orycles/upload\_site\_visit\_gpx\_3.php

New\_guinea\_sugarcane... Encyclopedia of Life F... webtip UOG mail Guam mail label printer weather Insect World Agriculture and Natural... We Are Guahan

http://guaminsects.e\_visit\_gpx\_3.php

## Upload Trap Visit GPX file to Database

Trapper(s):

Trap Visit Date:

Choose a GPX file to upload:

# Online Trap Data Report



# Visualization of Trap Catch Data

Aubrey Moore

Guam Coconut Rhinoceros Beetle Eradication Project



Generated 2013-06-03 11:40:09

Path: C:/Documents and Settings/Administrator/My Documents/CRB monthly surveillance reports/map dev

R script: makeMaps.R

Brew file: makeBeamer.txt

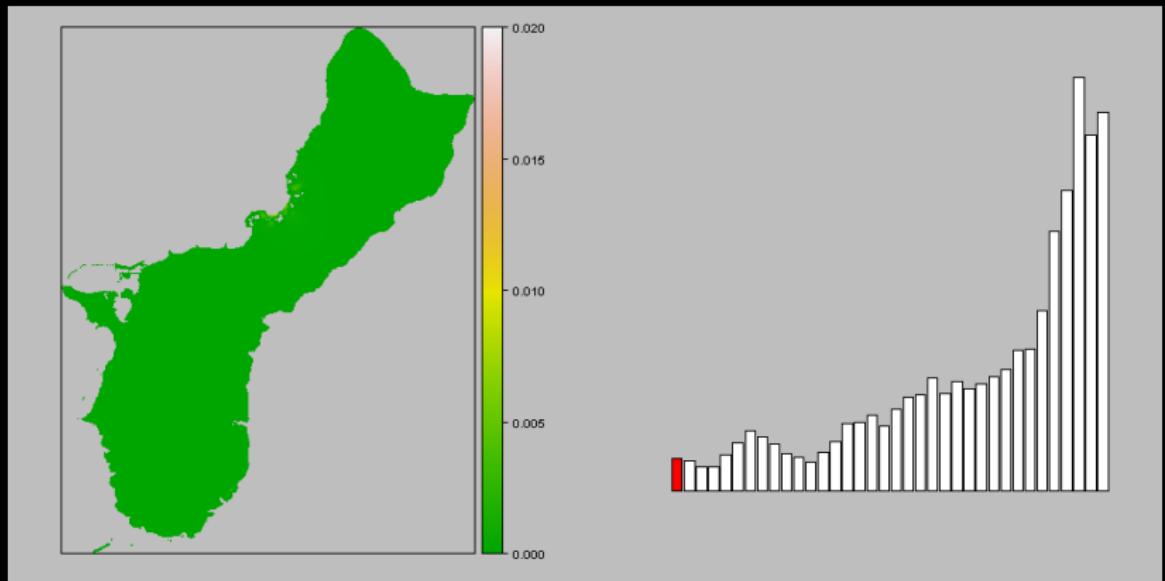
# Introduction

- ▶ 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

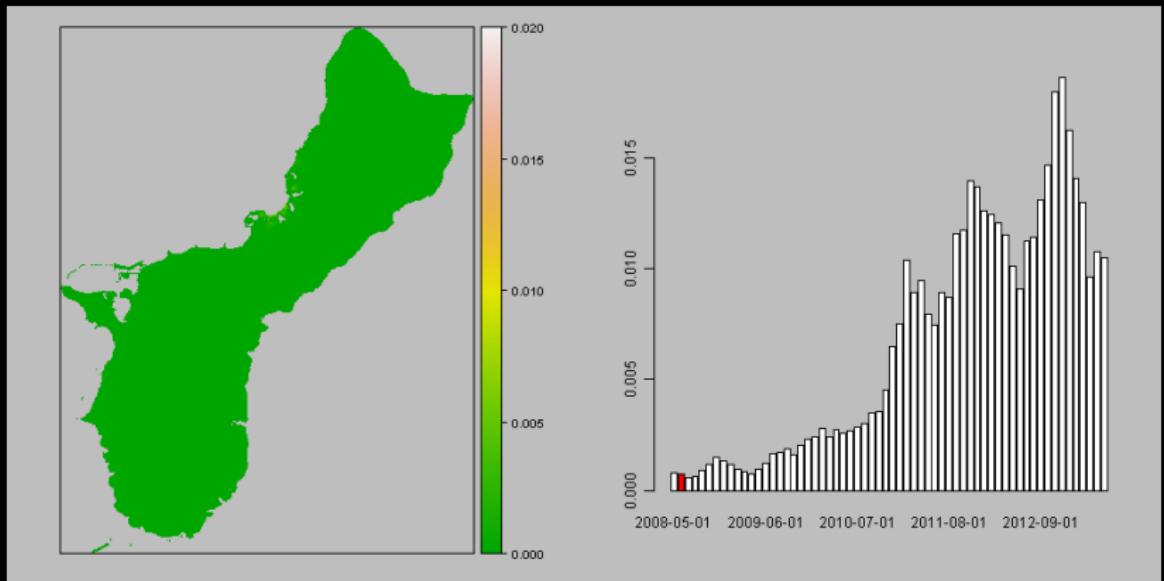
- ▶ Interpolated raster maps were made using an R script which:
  1. Accesses georeferenced data stored in the CRB project's online MySQL database.
  2. Processes the data using the GRASS6 GIS
  3. Writes the  $\text{\LaTeX}$  code which generated this PDF document.

90 day trapping period ending on 01 May 2008



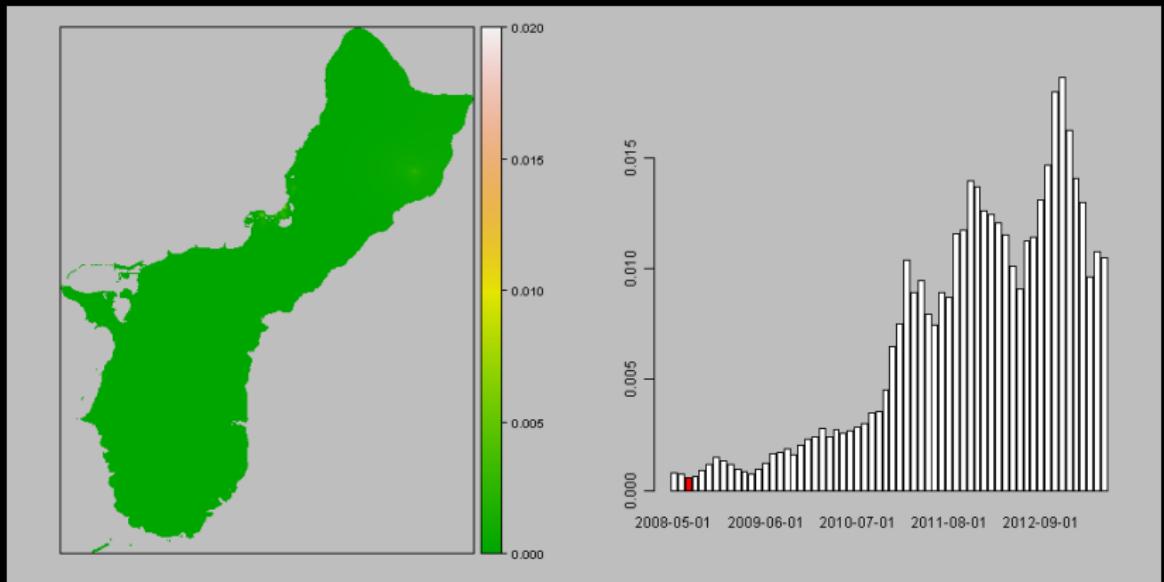
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jun 2008



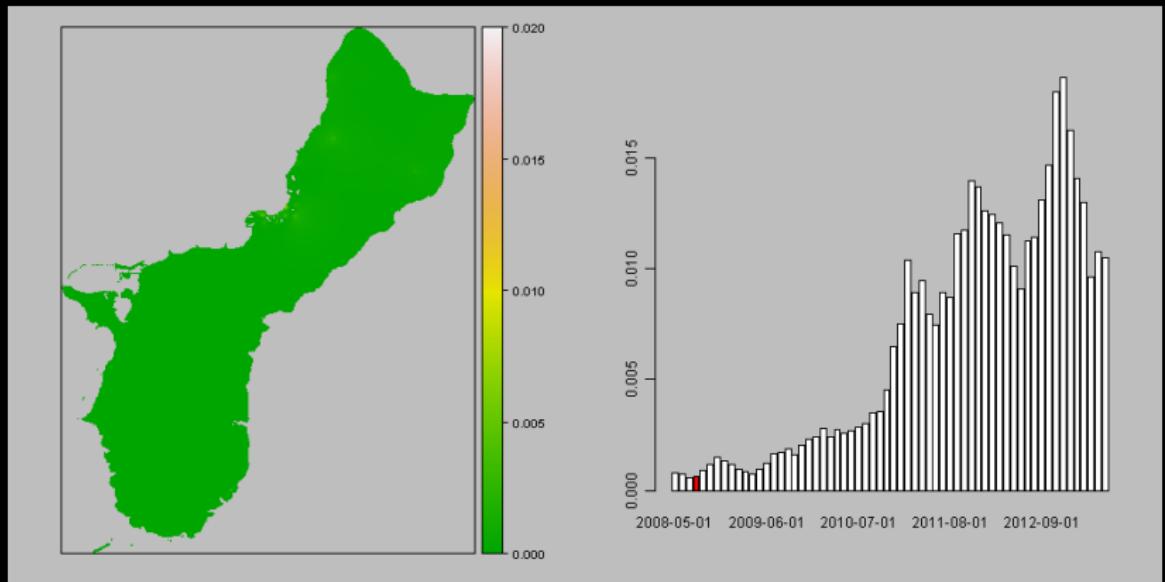
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jul 2008



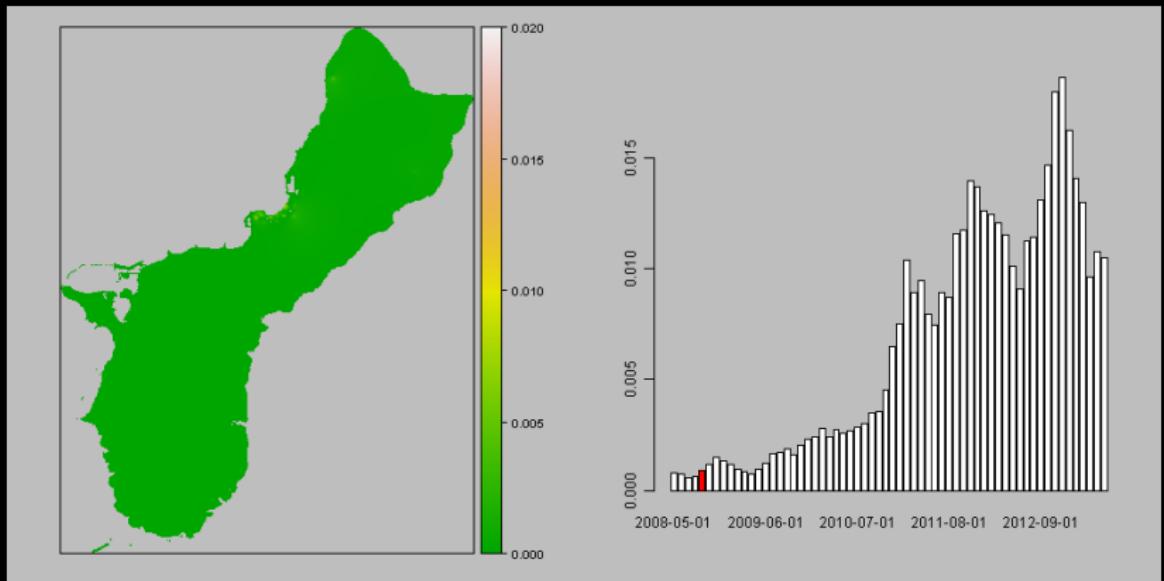
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Aug 2008



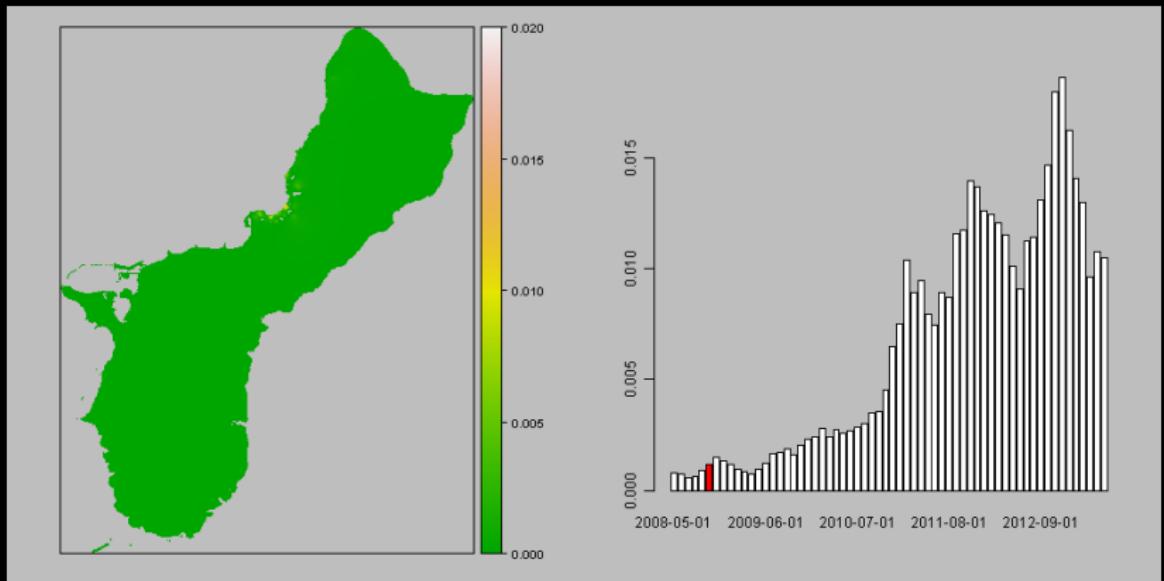
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Sep 2008



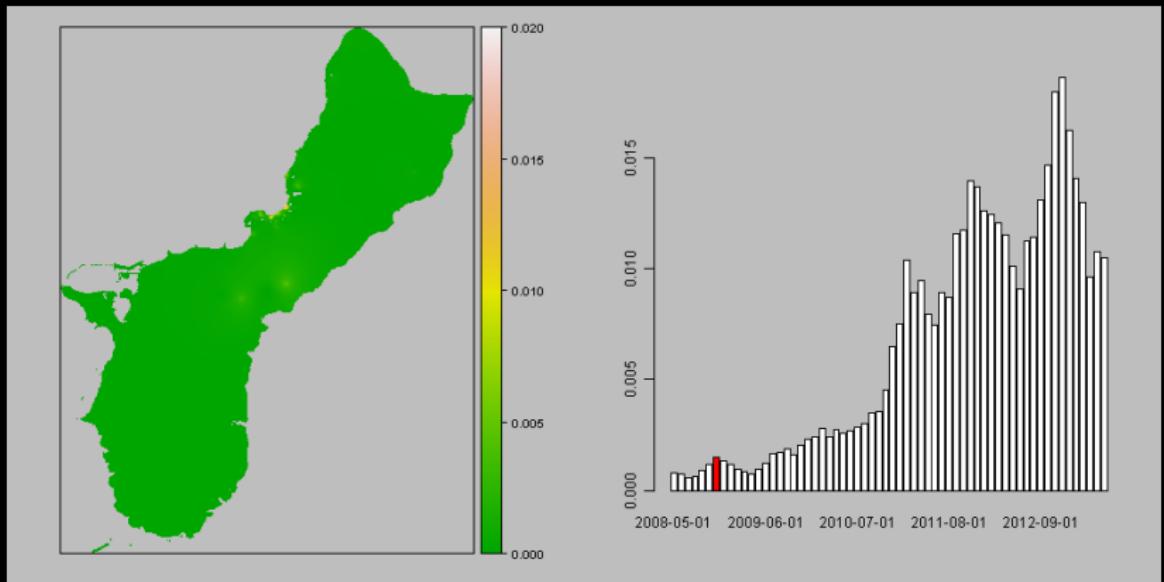
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Oct 2008



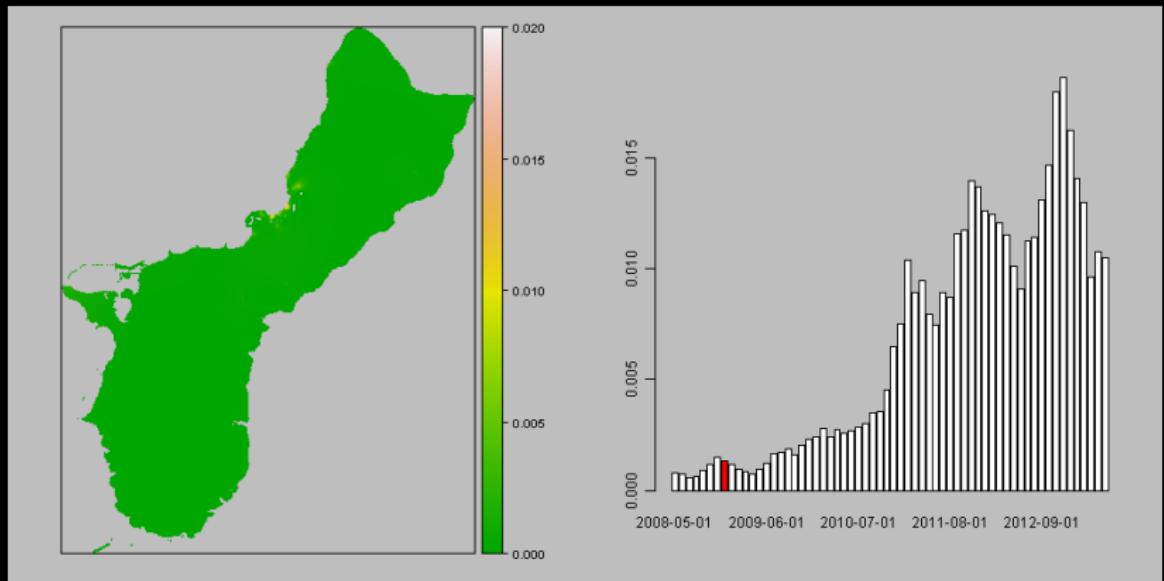
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Nov 2008



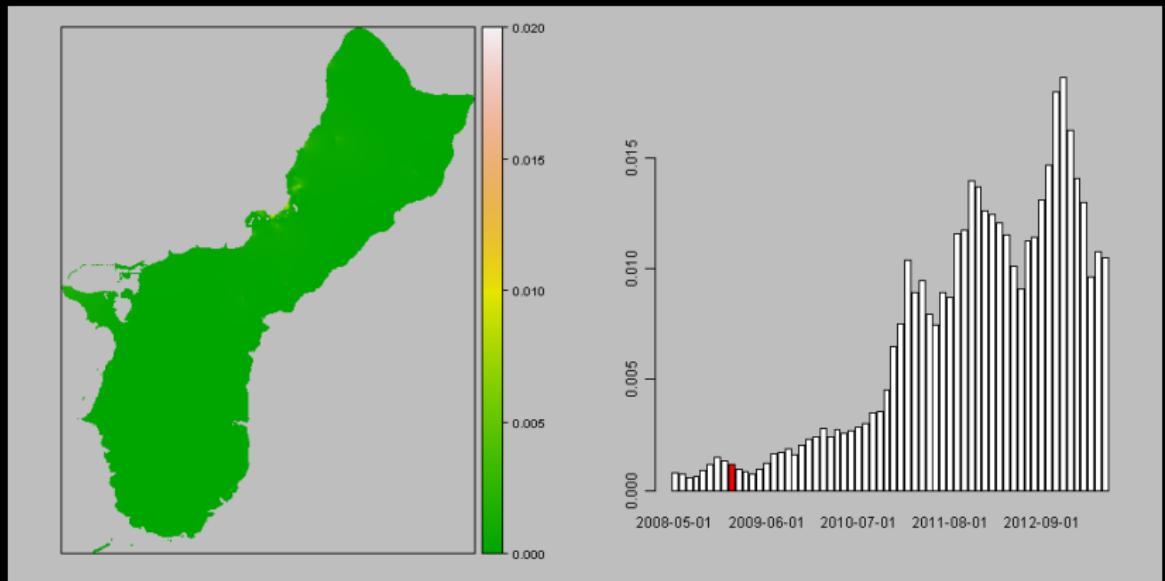
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Dec 2008



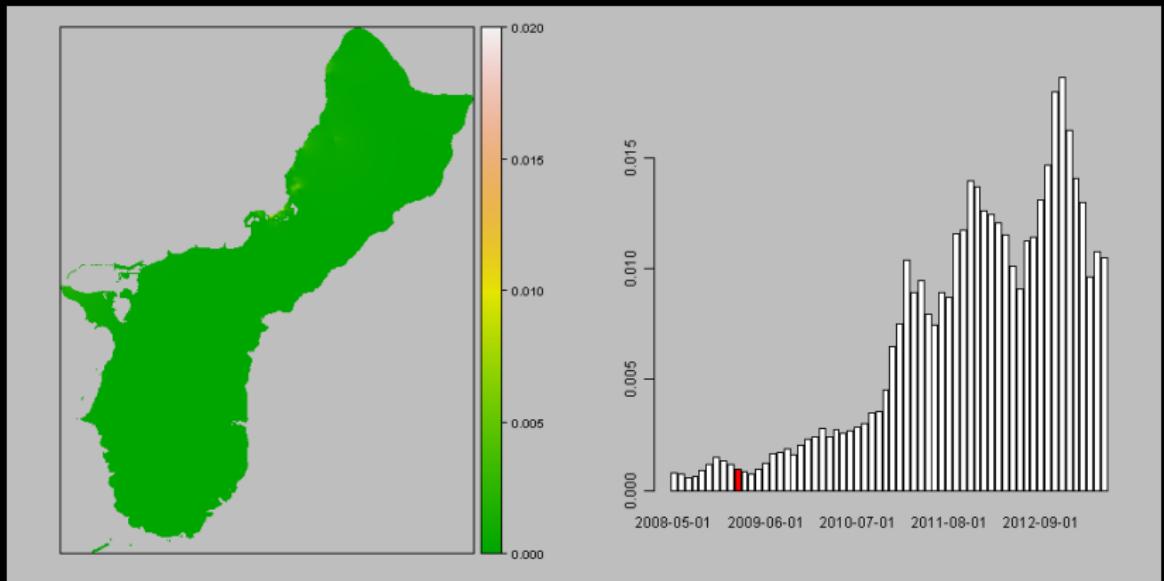
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jan 2009



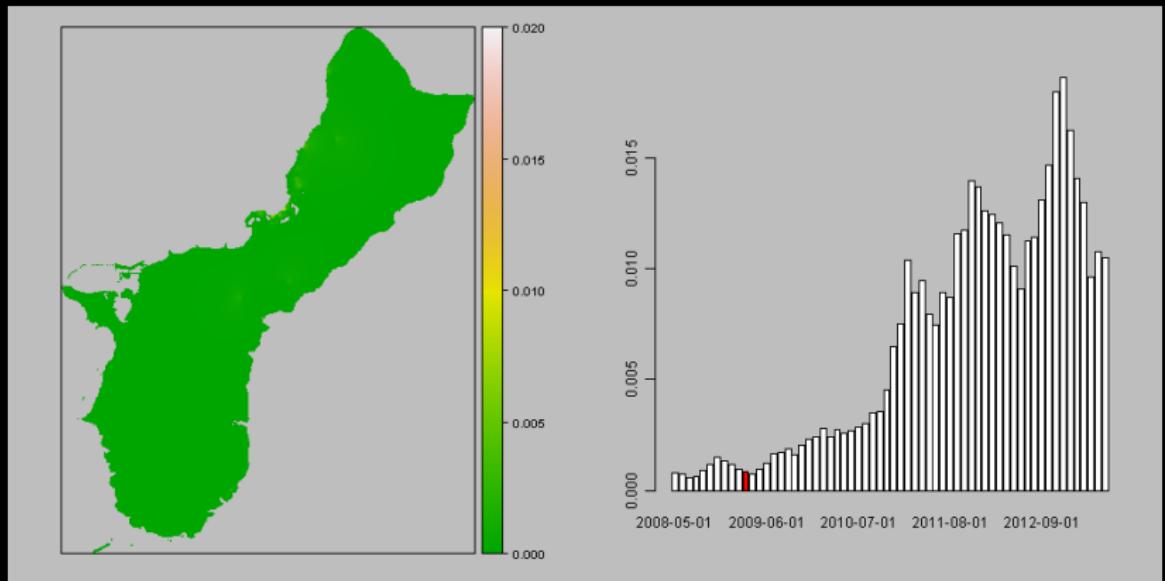
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Feb 2009



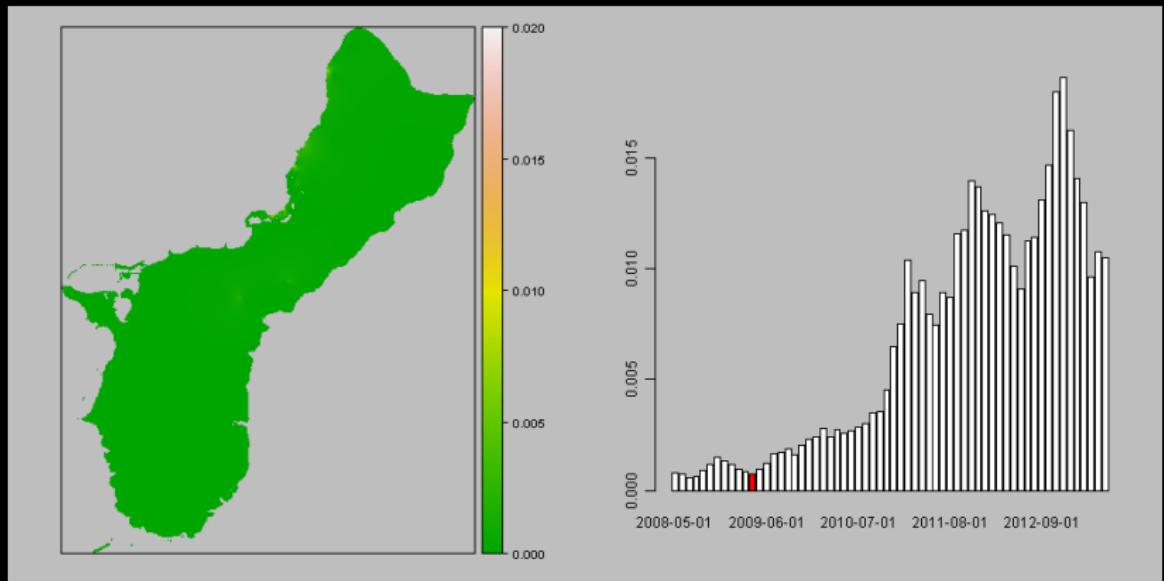
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Mar 2009



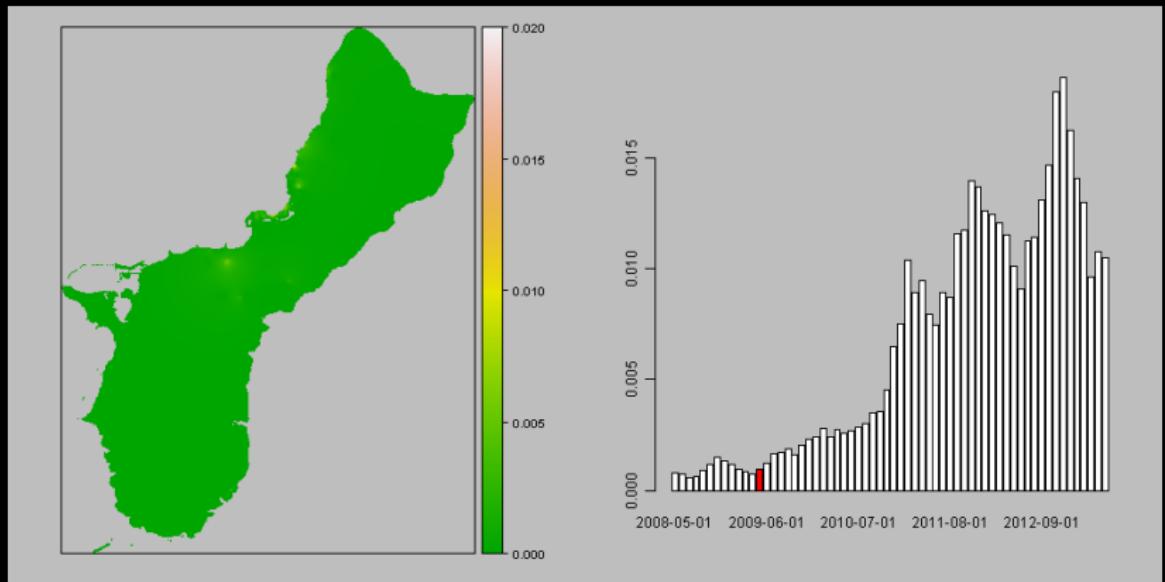
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Apr 2009



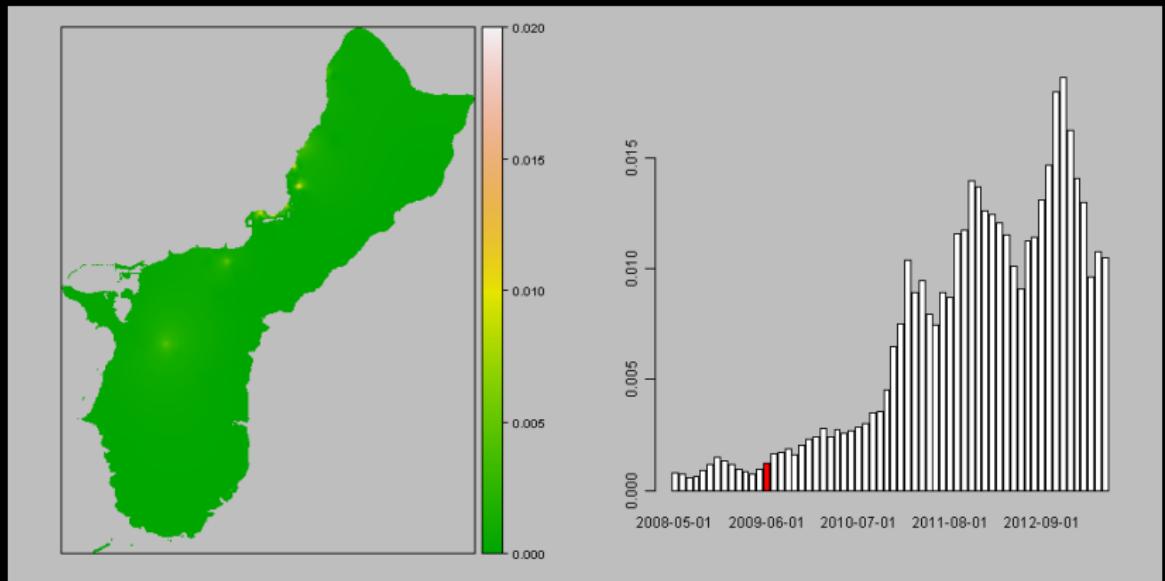
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 May 2009



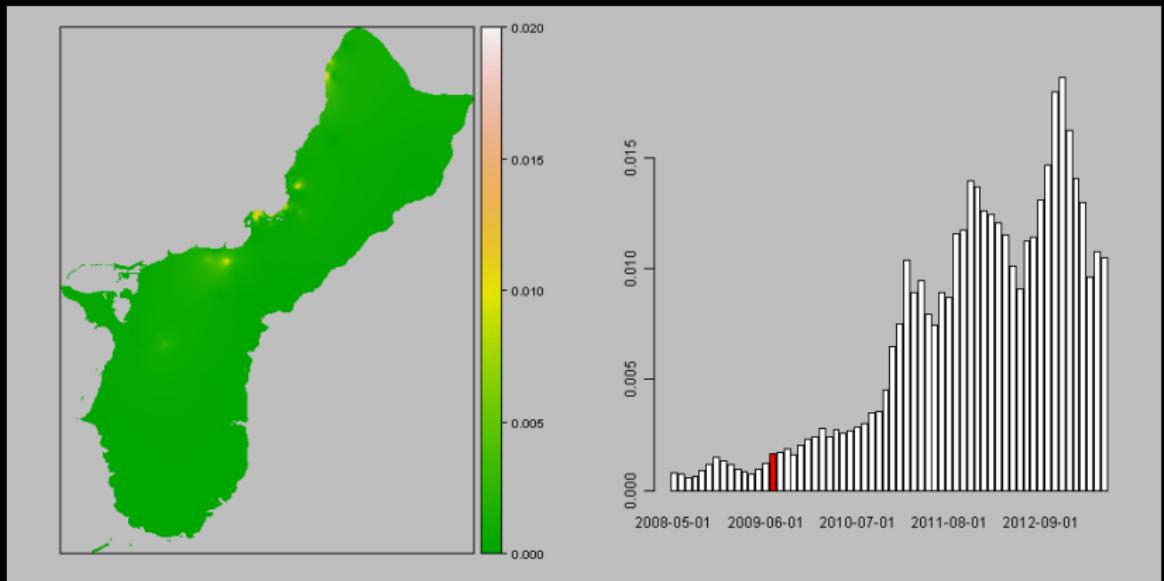
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jun 2009



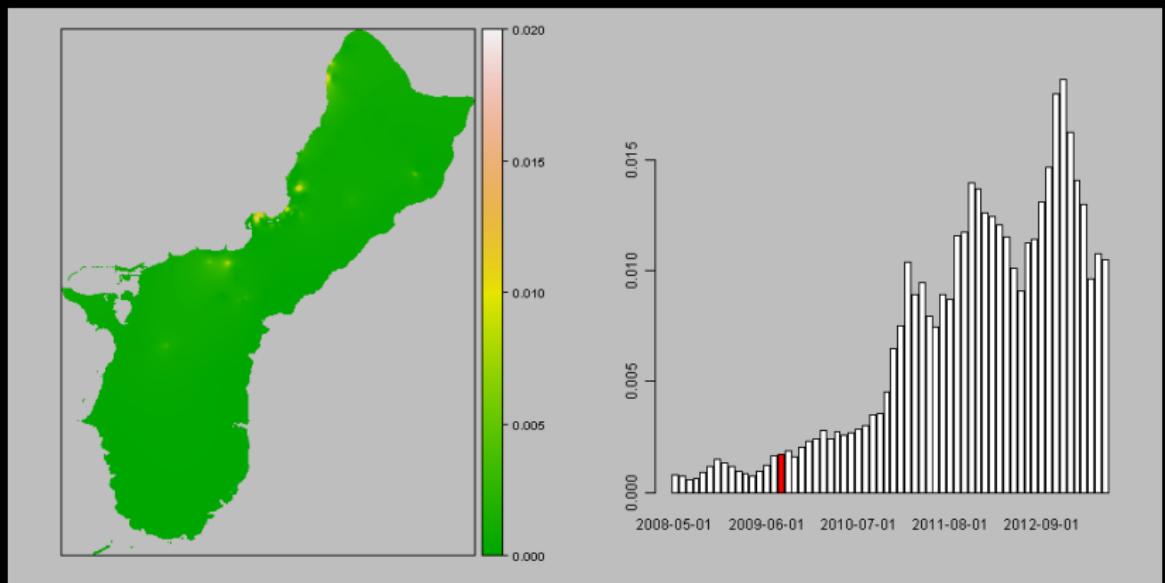
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jul 2009



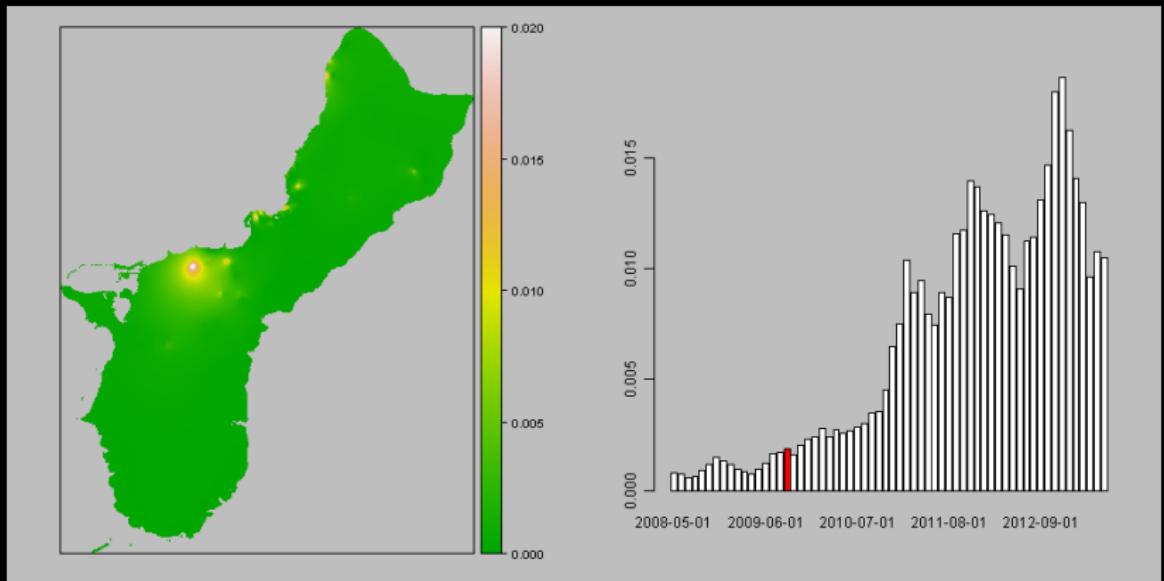
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Aug 2009



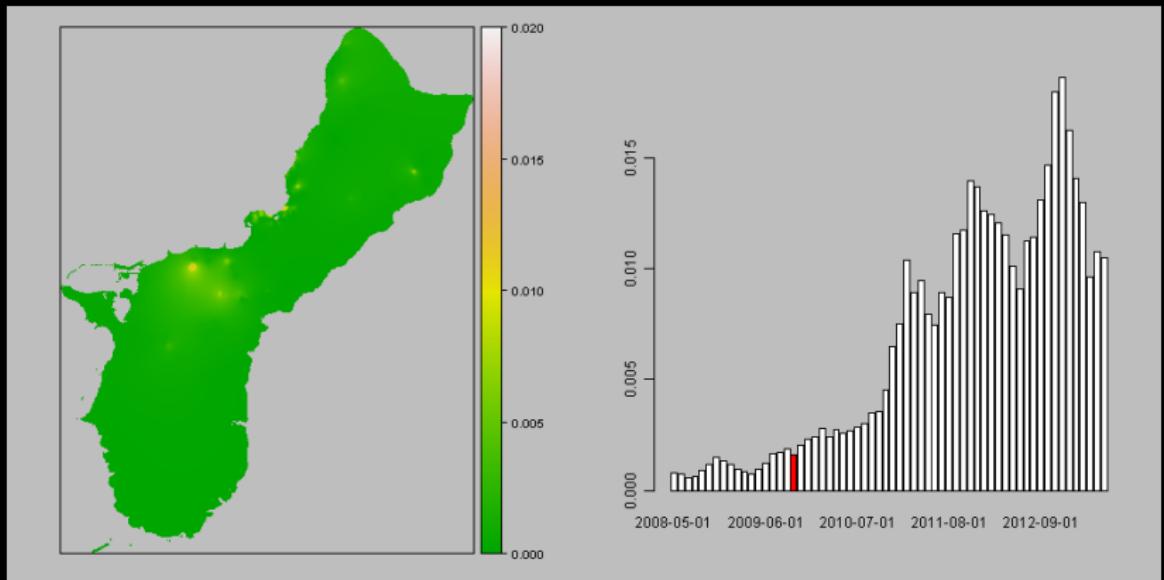
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Sep 2009



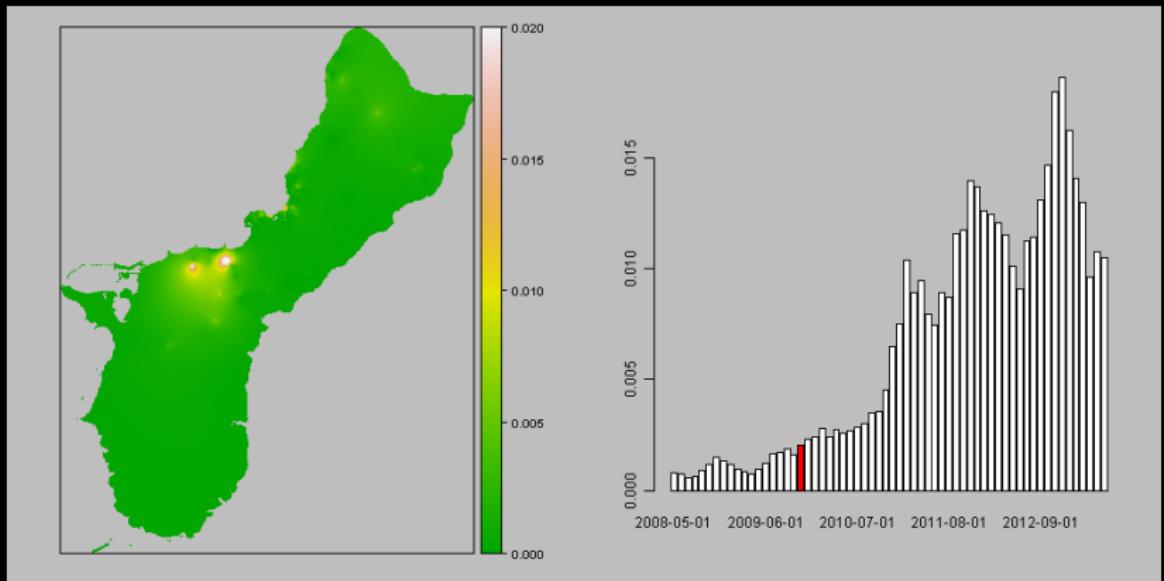
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Oct 2009



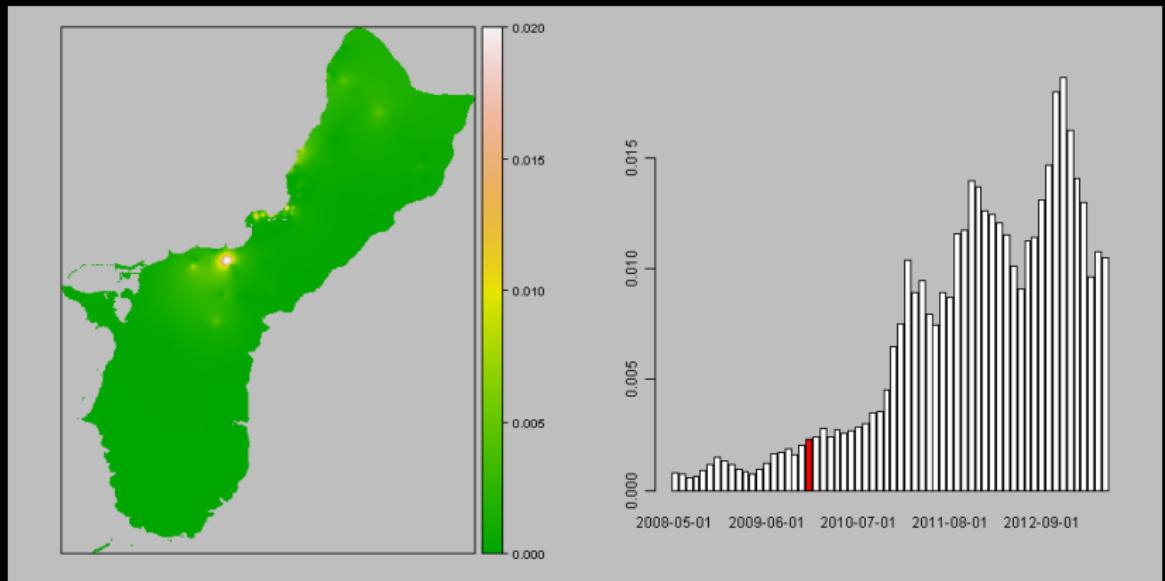
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Nov 2009



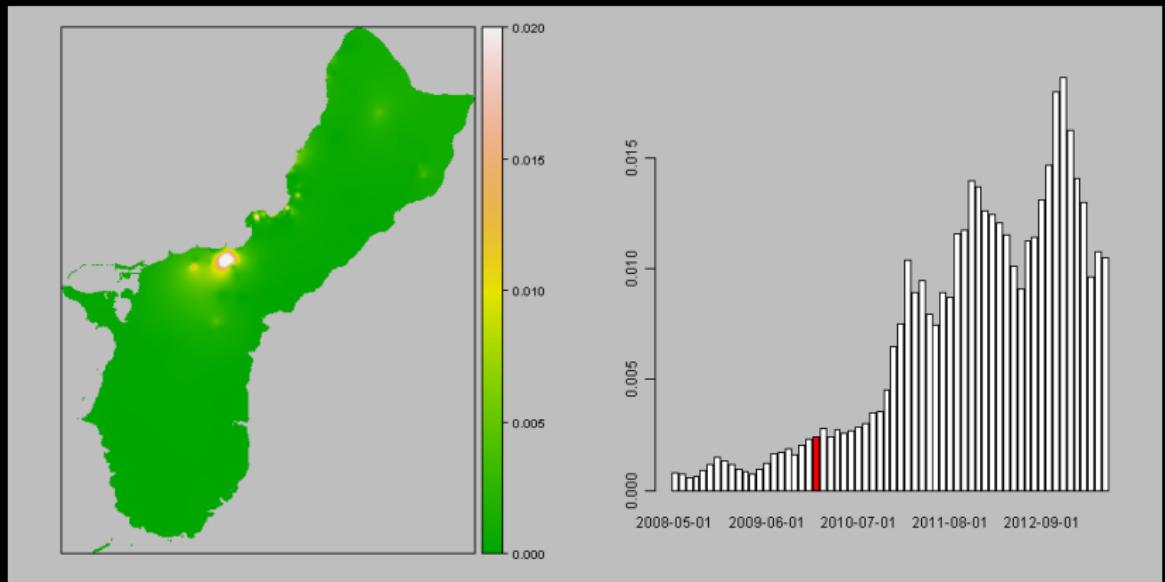
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Dec 2009



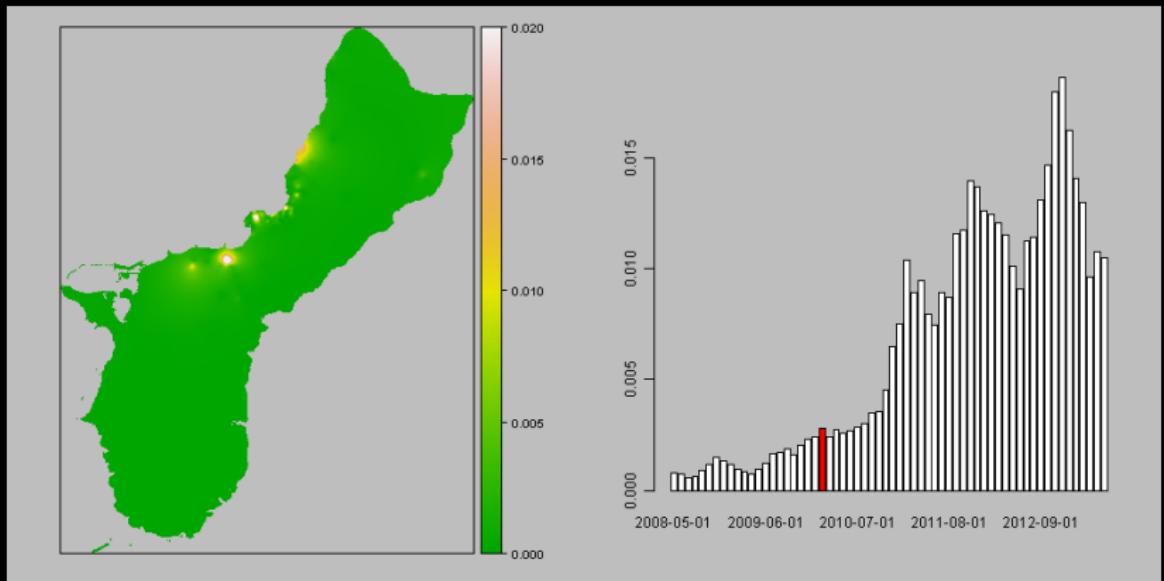
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jan 2010



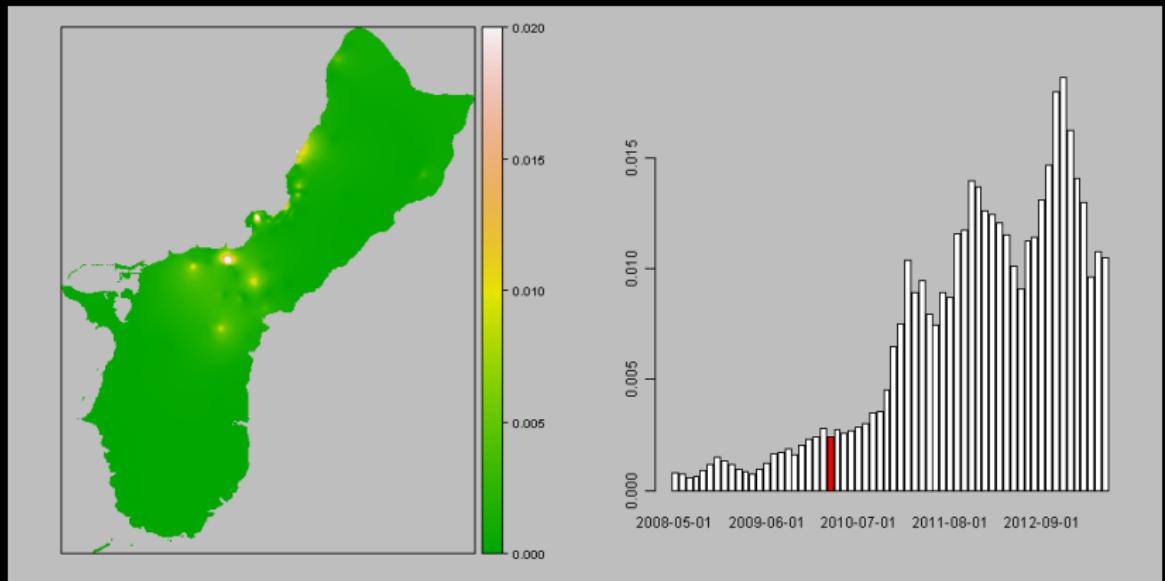
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Feb 2010



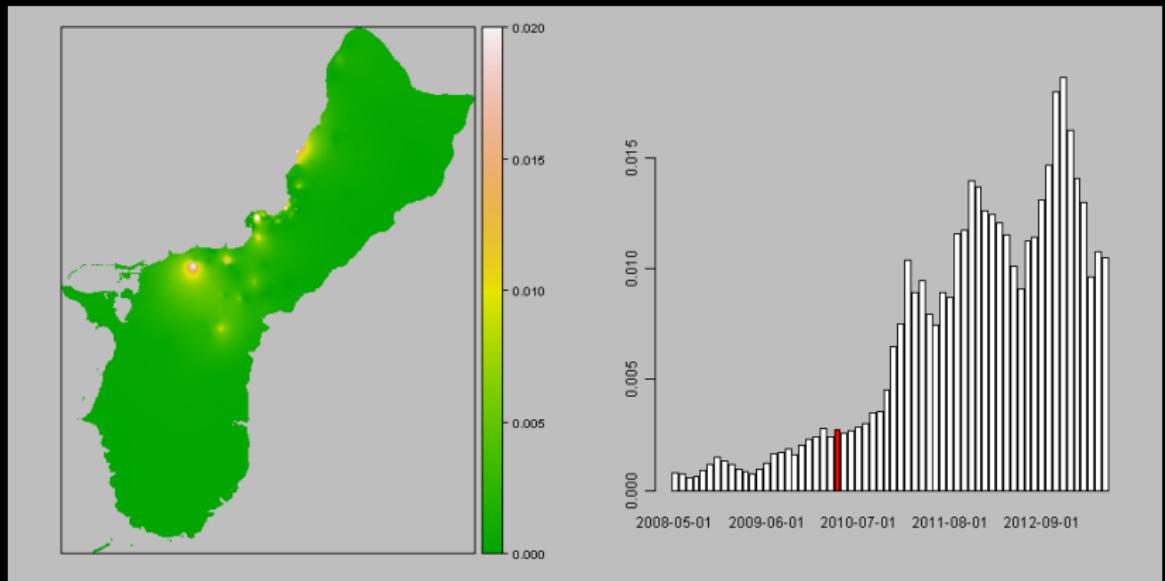
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Mar 2010



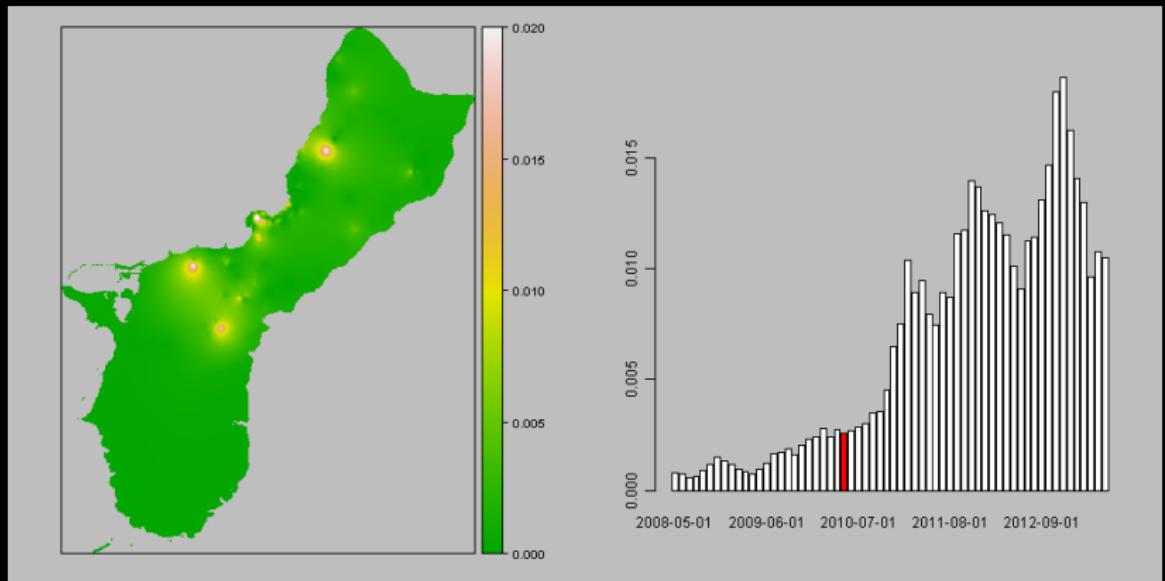
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Apr 2010



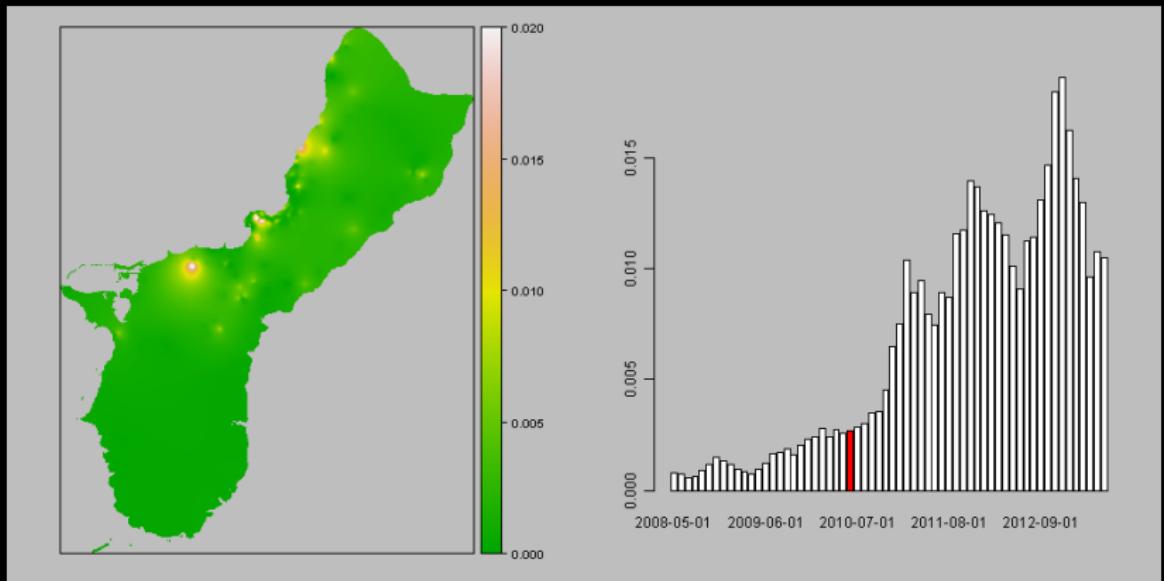
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 May 2010



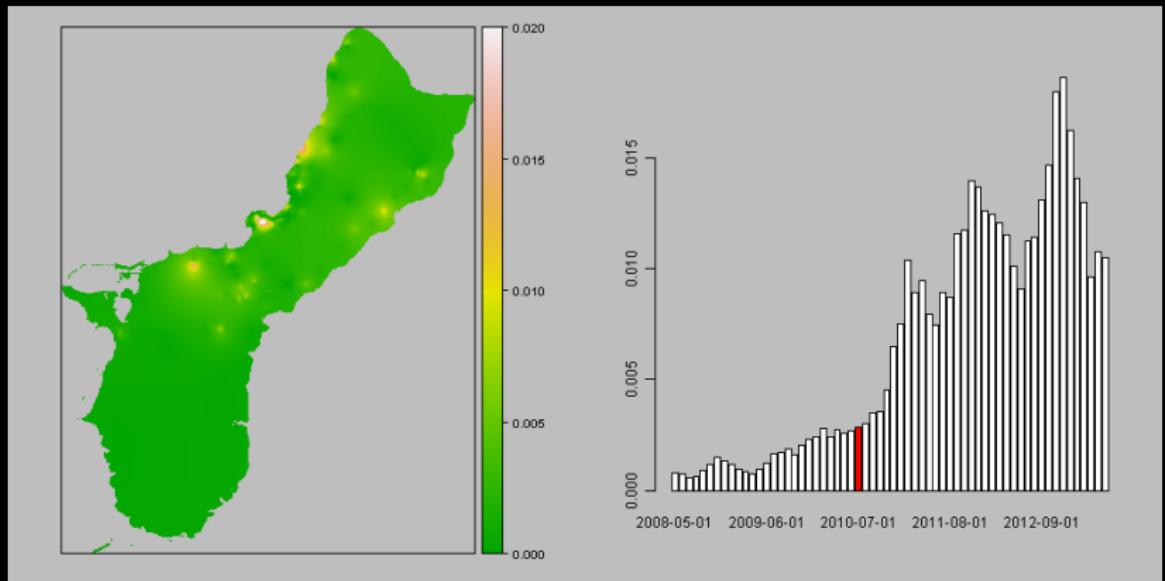
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jun 2010



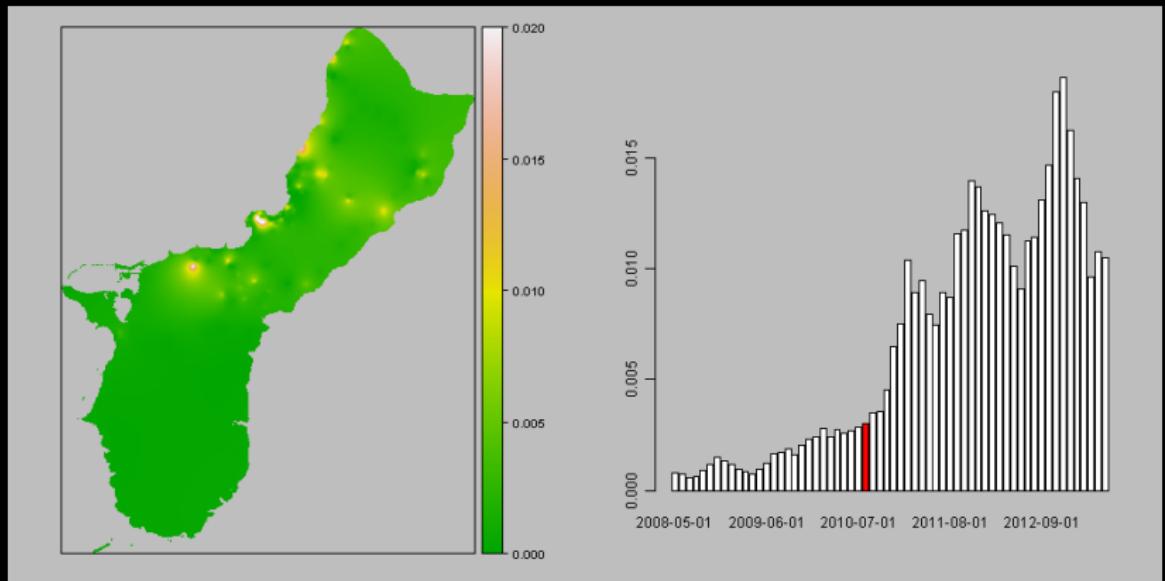
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jul 2010



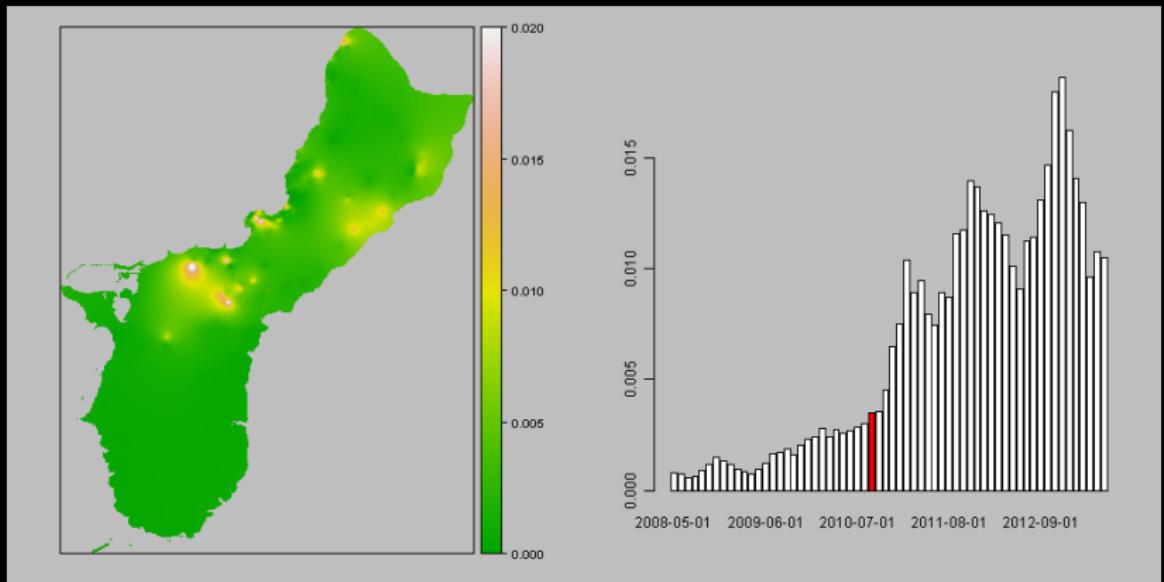
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Aug 2010



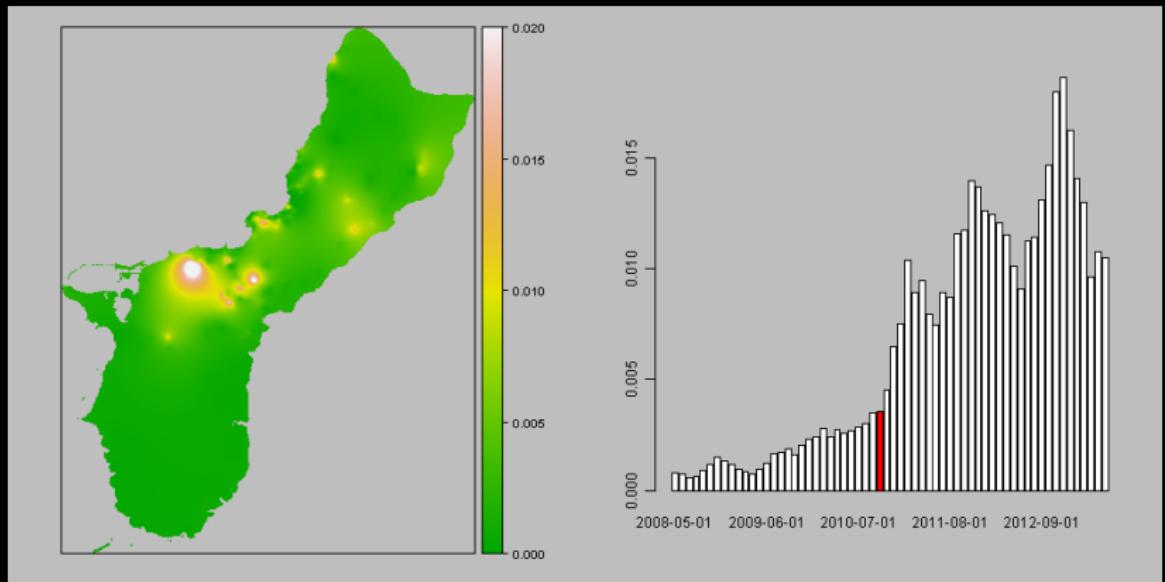
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Sep 2010



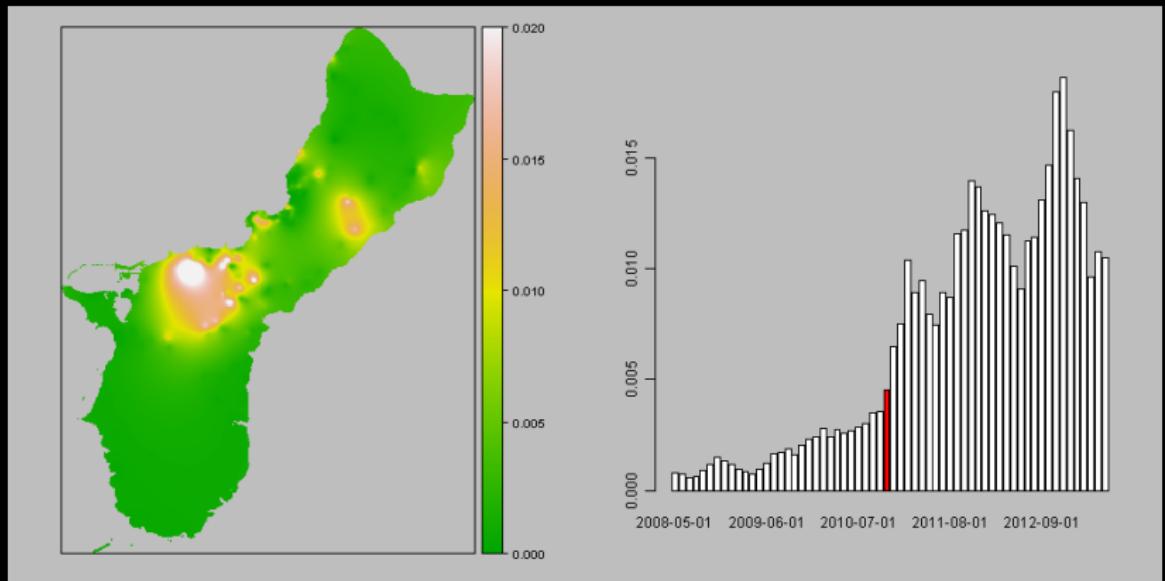
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Oct 2010



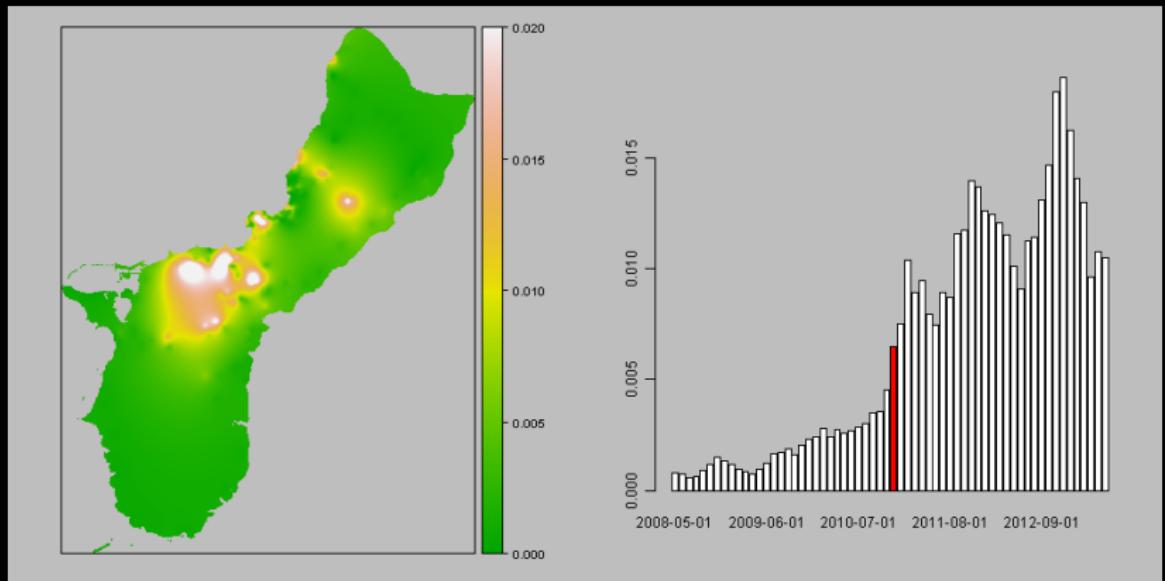
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Nov 2010



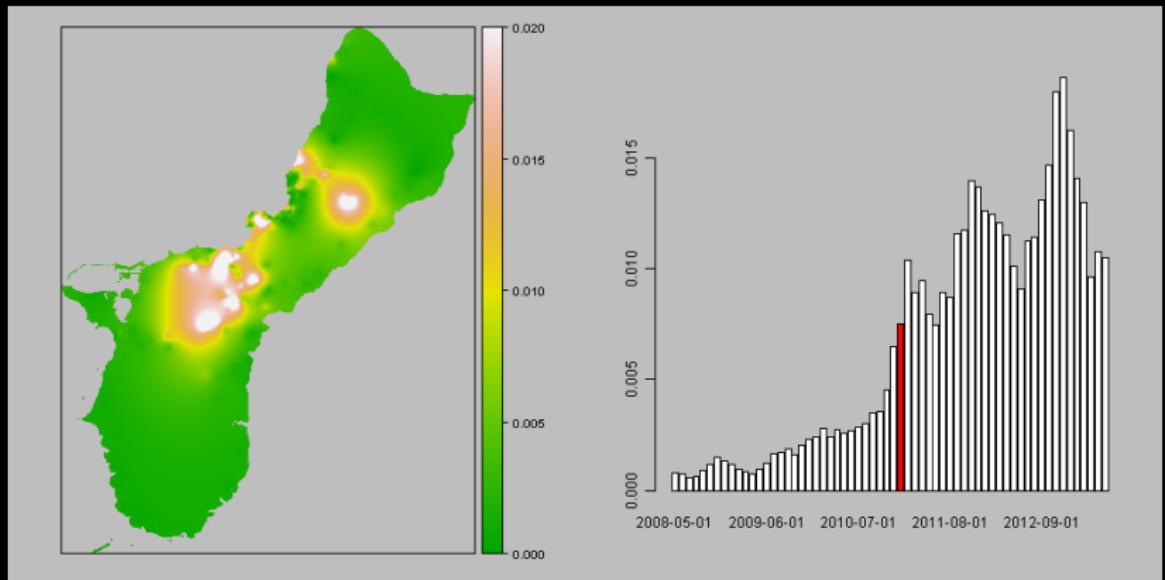
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Dec 2010



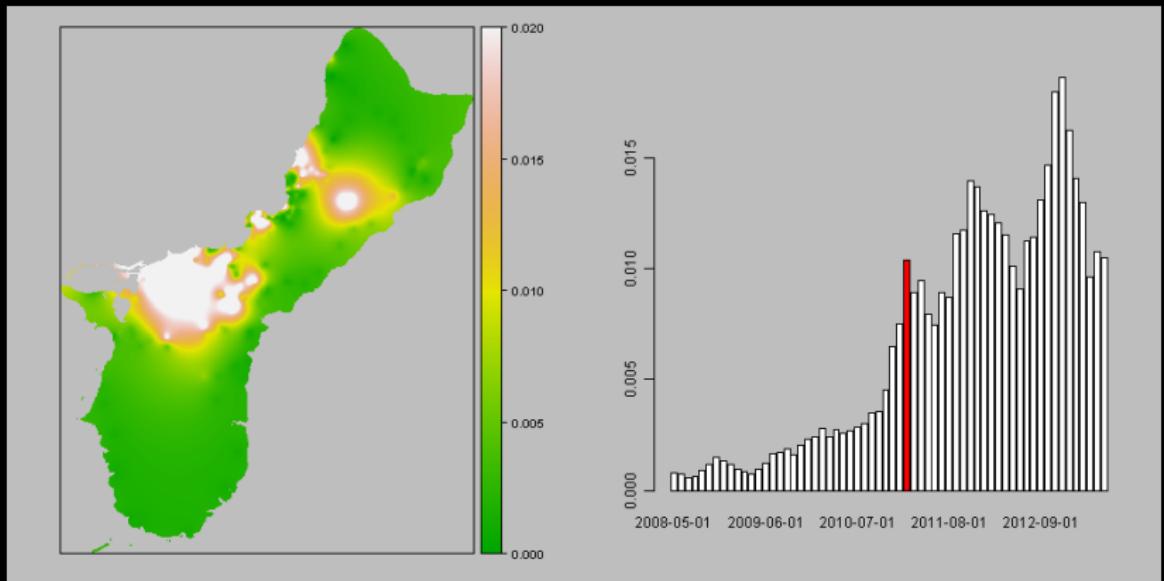
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jan 2011



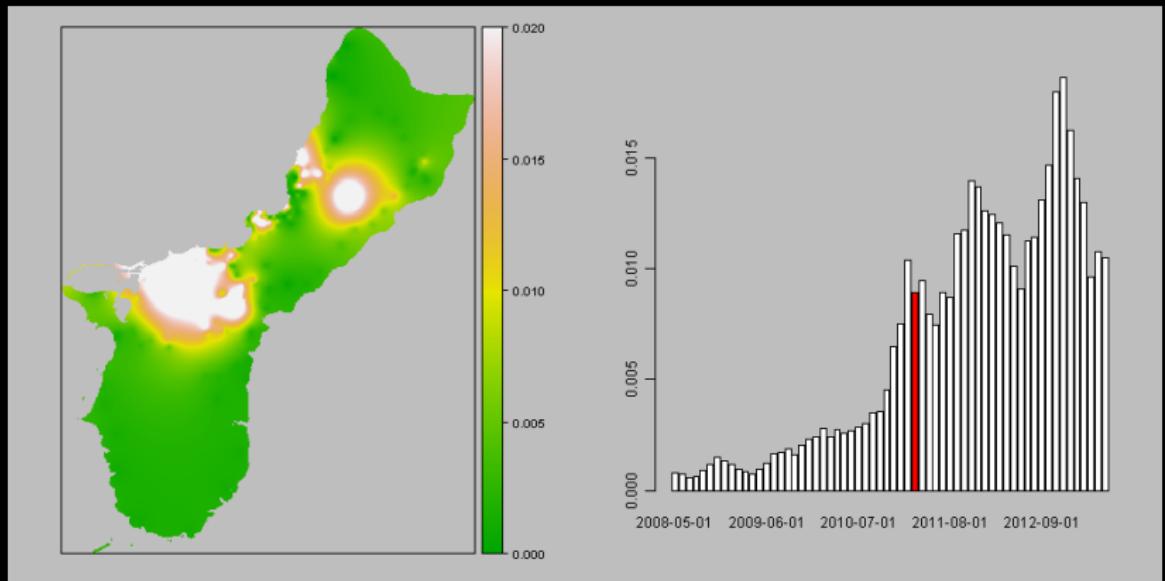
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Feb 2011



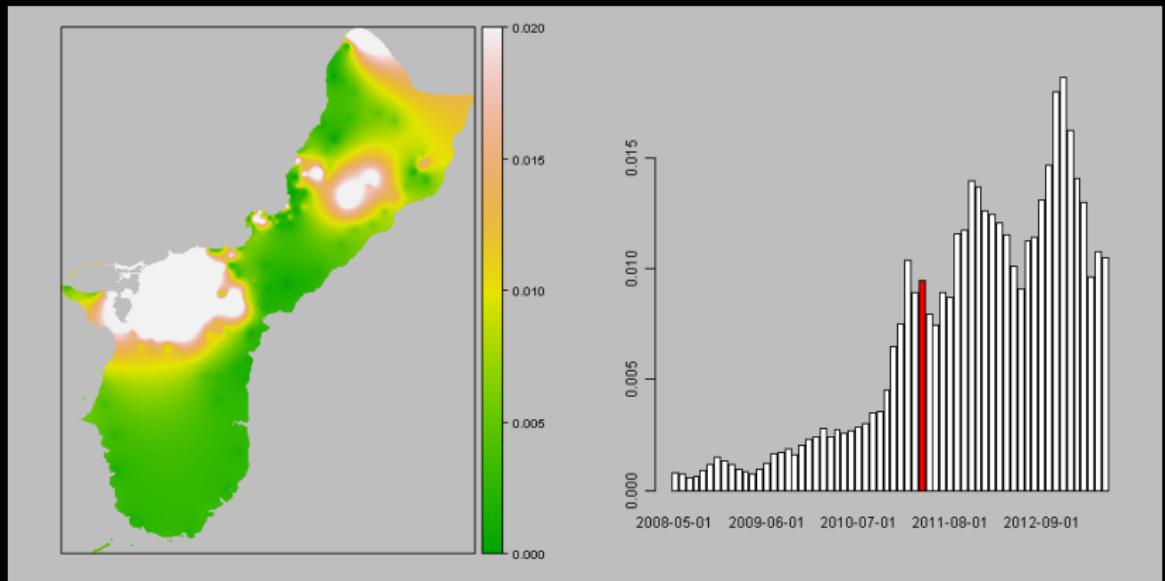
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Mar 2011



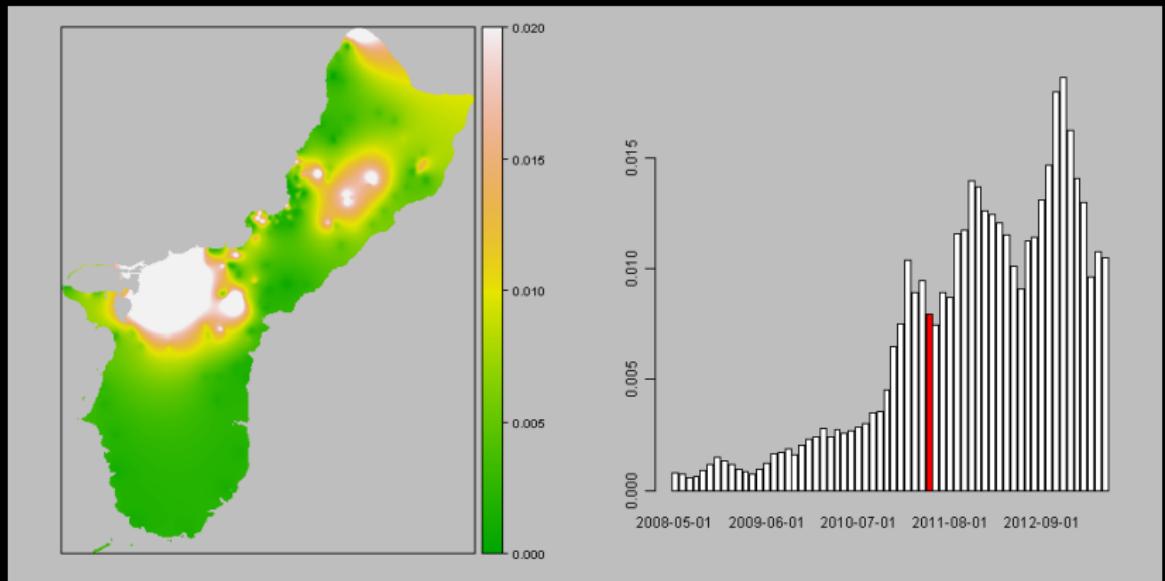
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Apr 2011



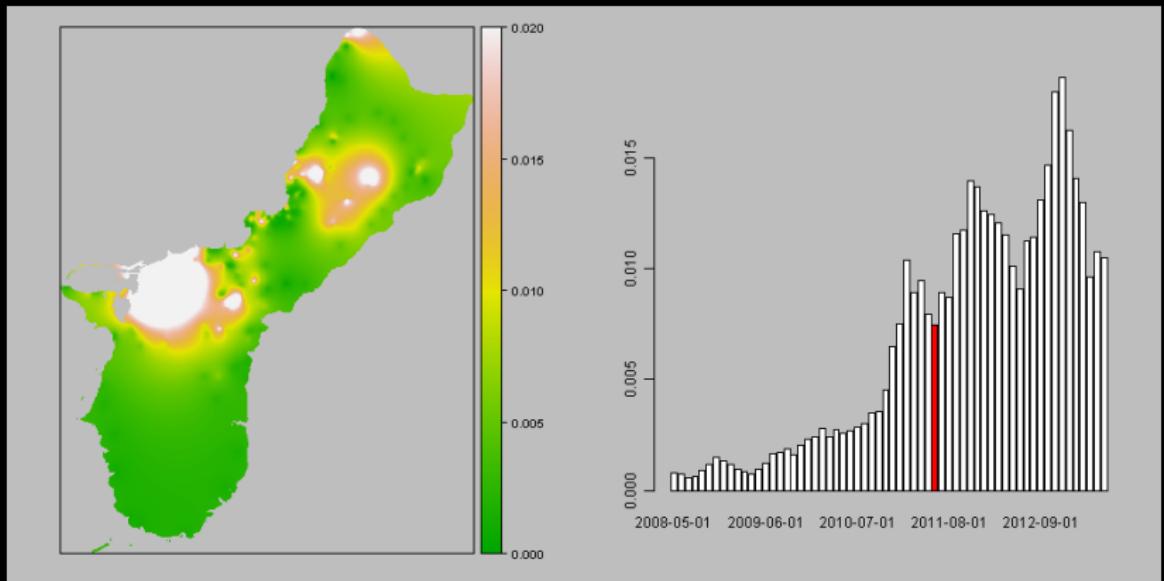
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 May 2011



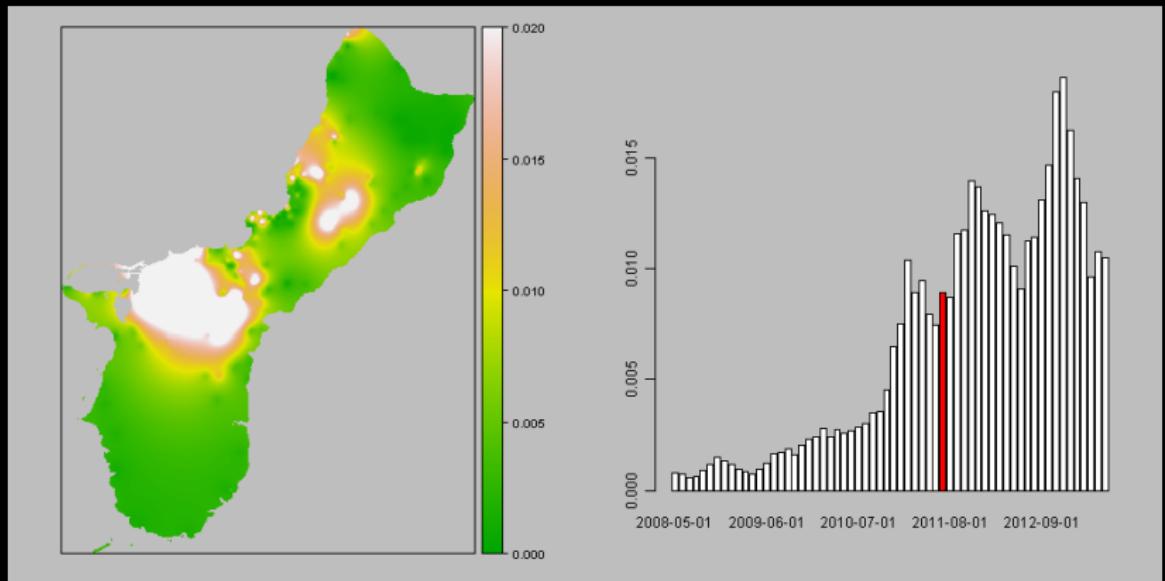
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jun 2011



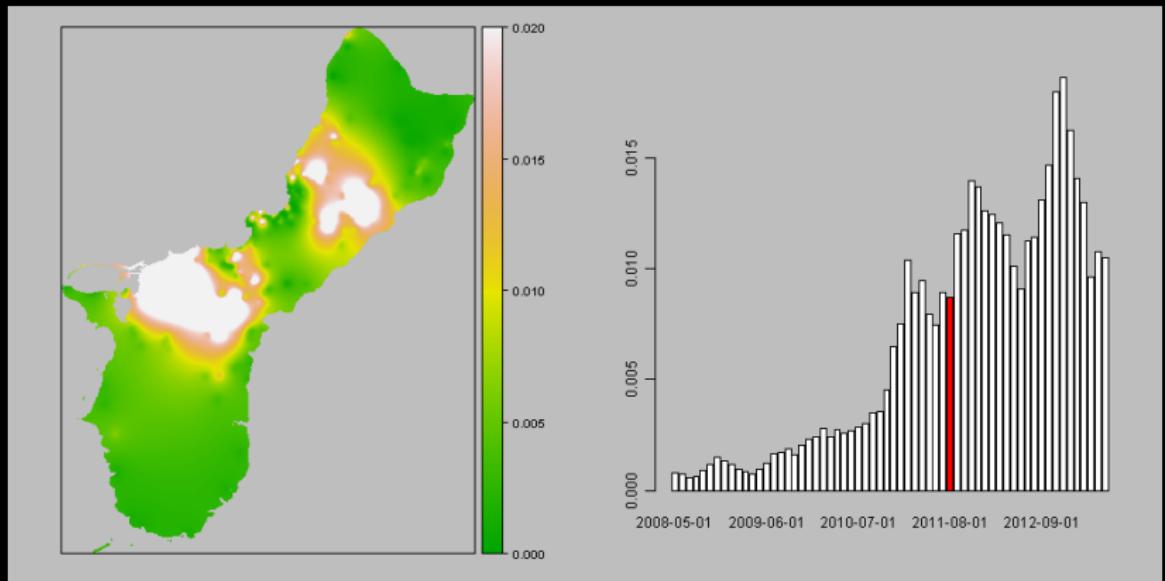
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jul 2011



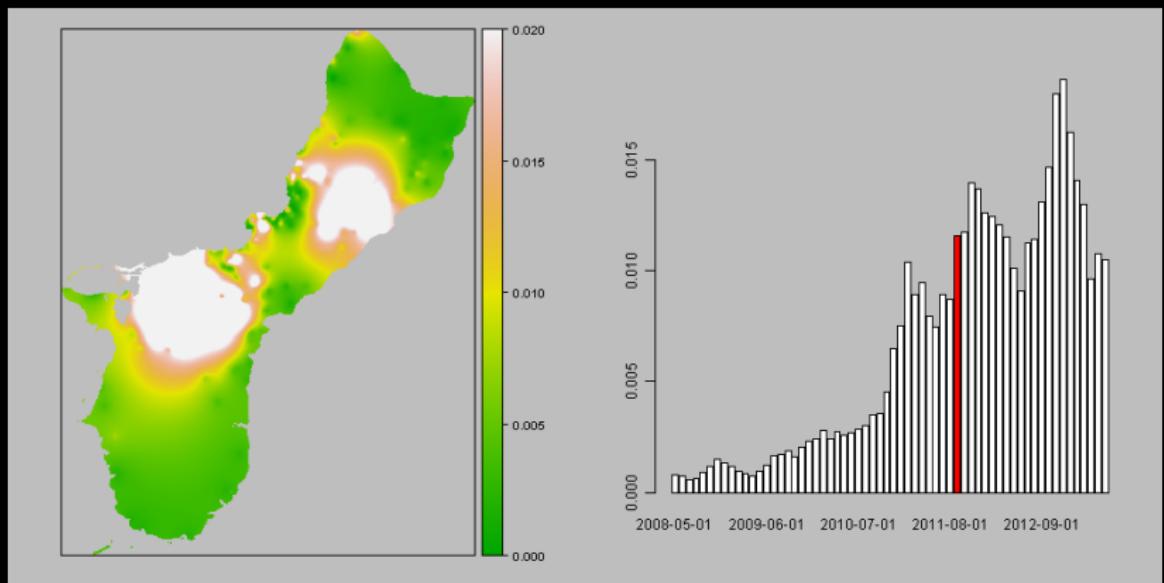
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Aug 2011



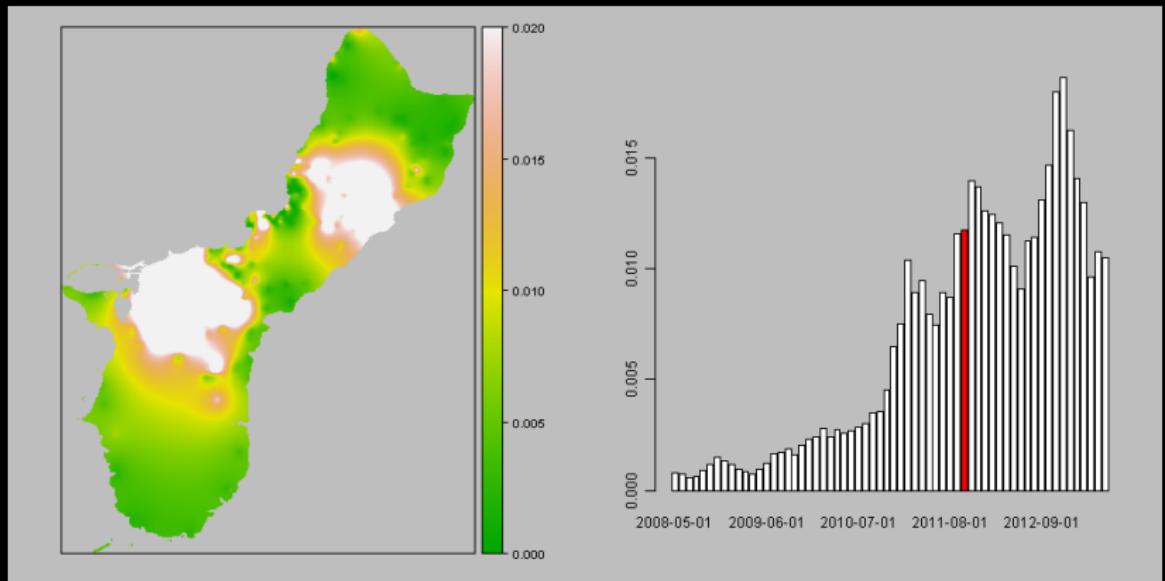
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Sep 2011



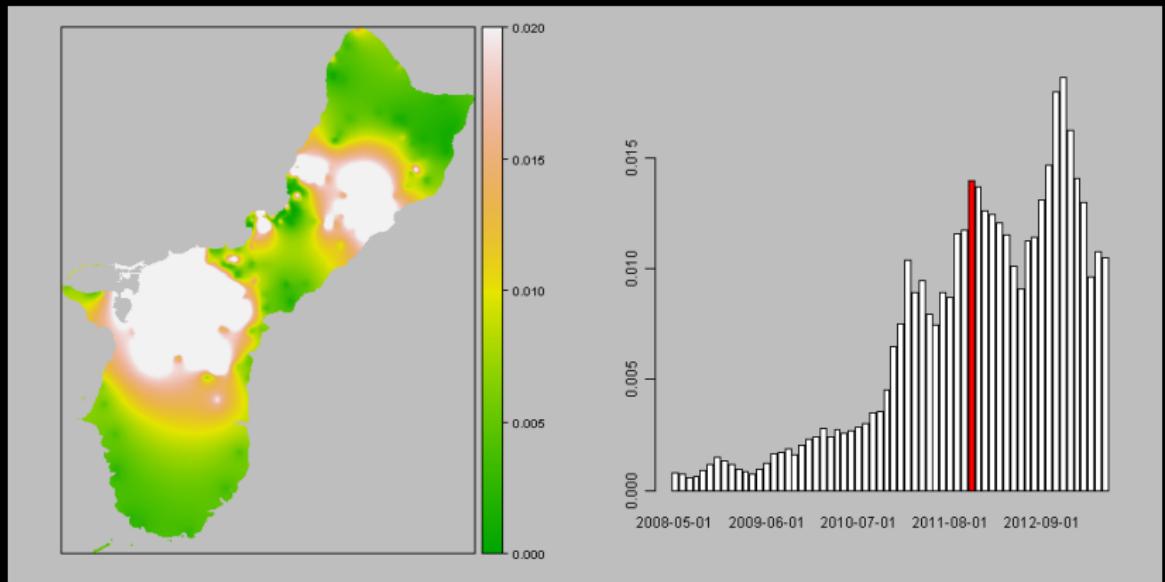
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Oct 2011



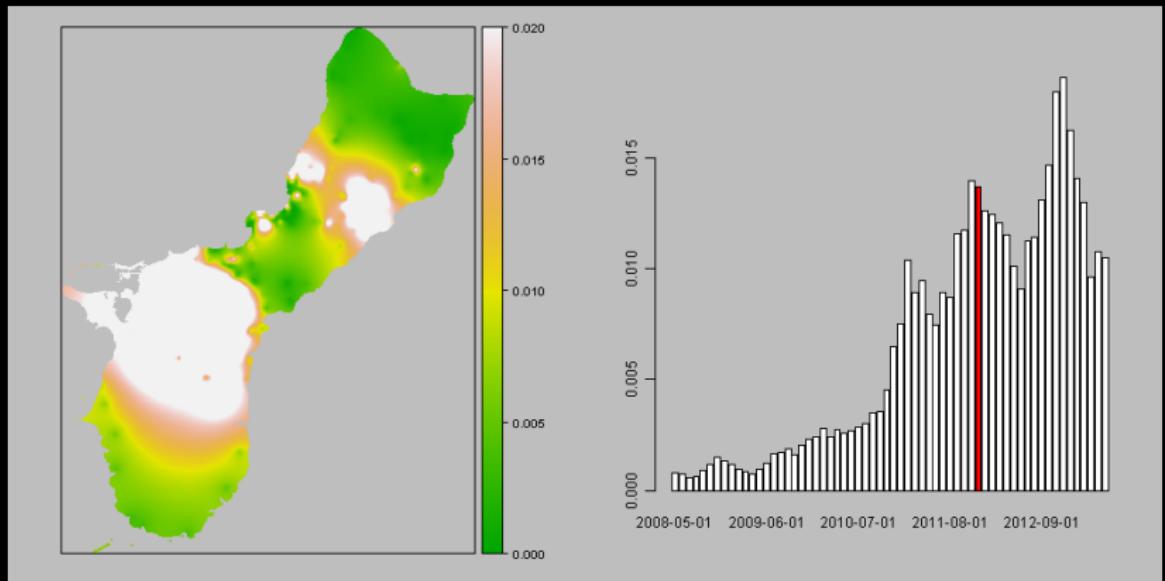
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Nov 2011



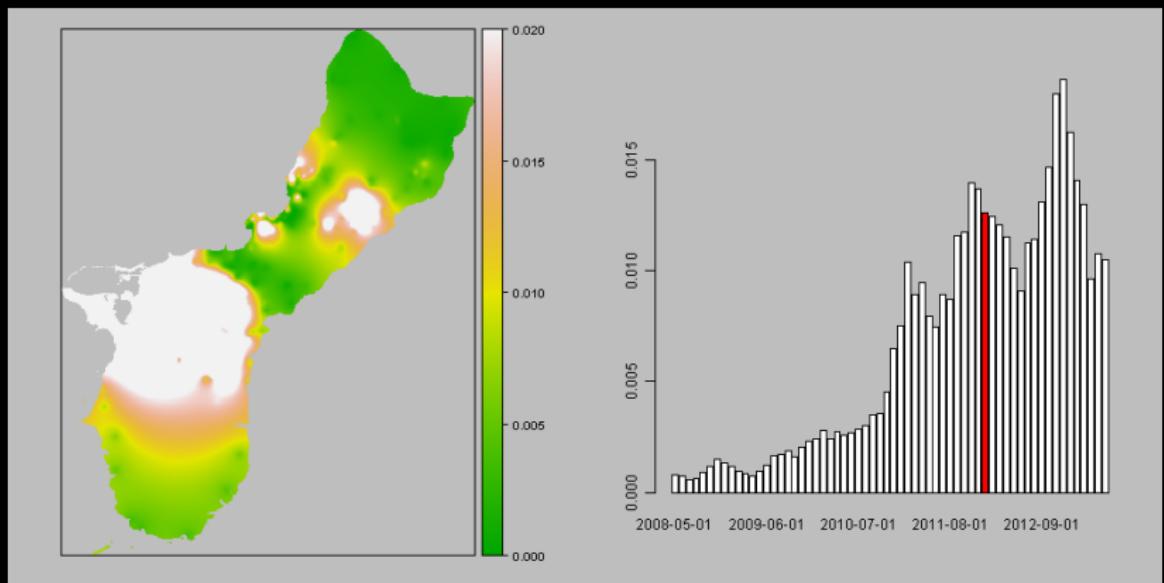
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Dec 2011



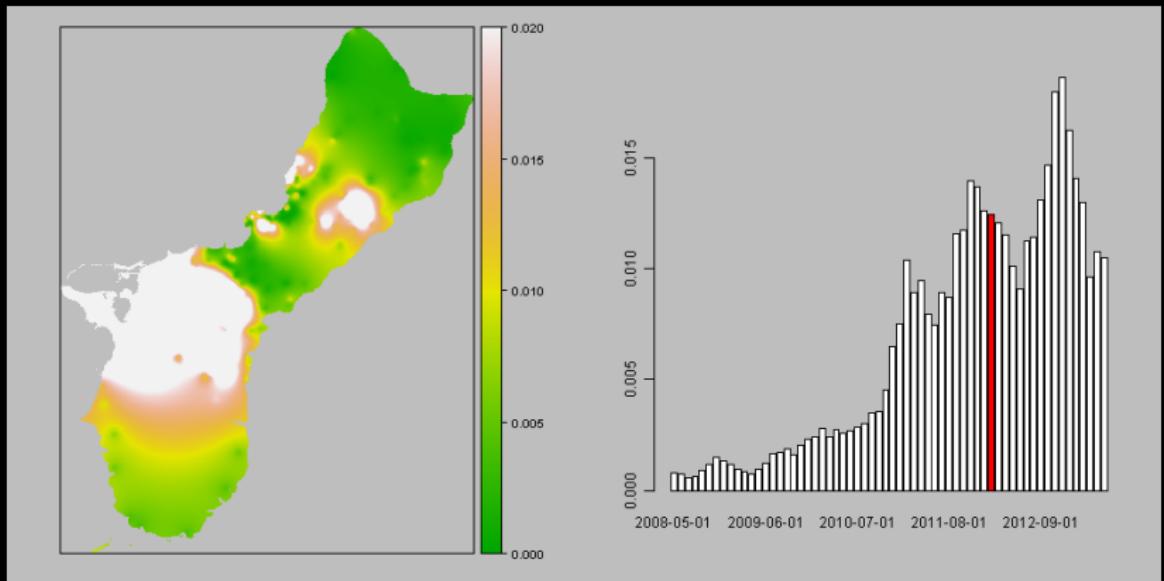
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jan 2012



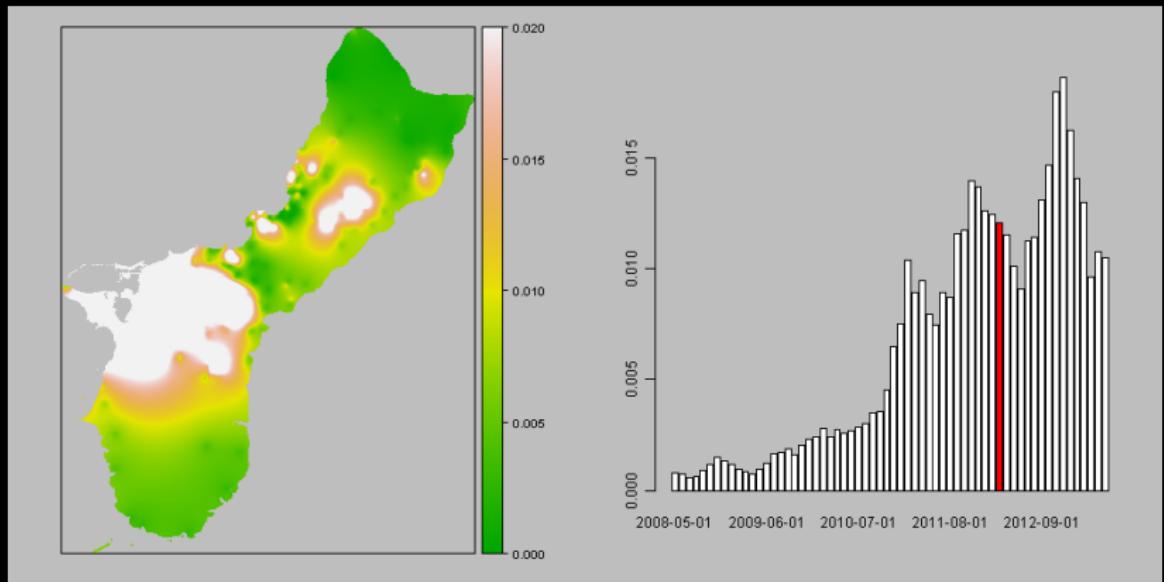
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Feb 2012



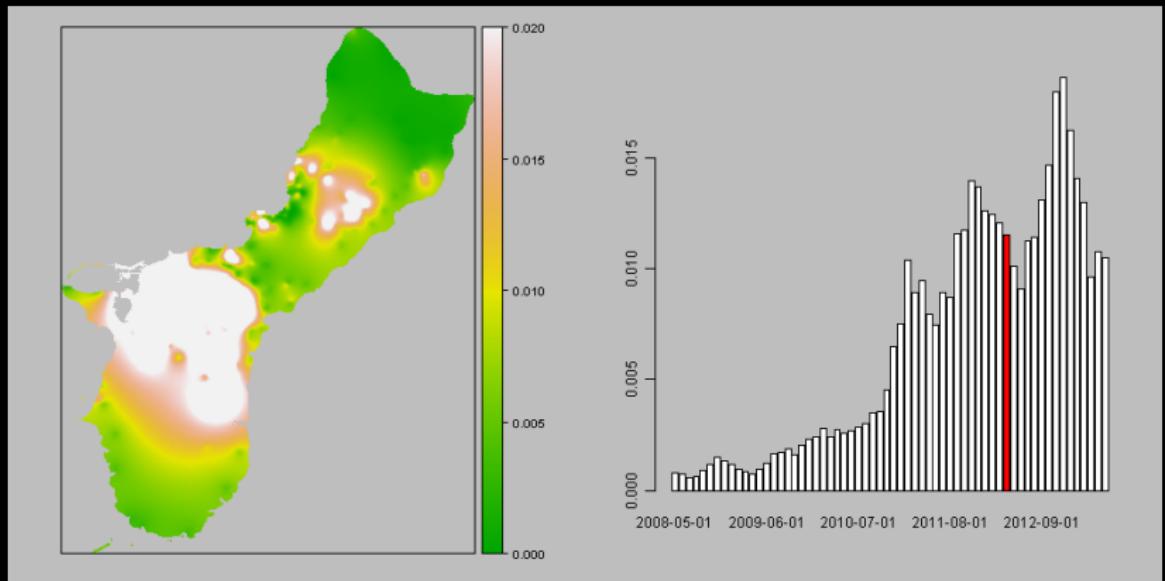
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Mar 2012



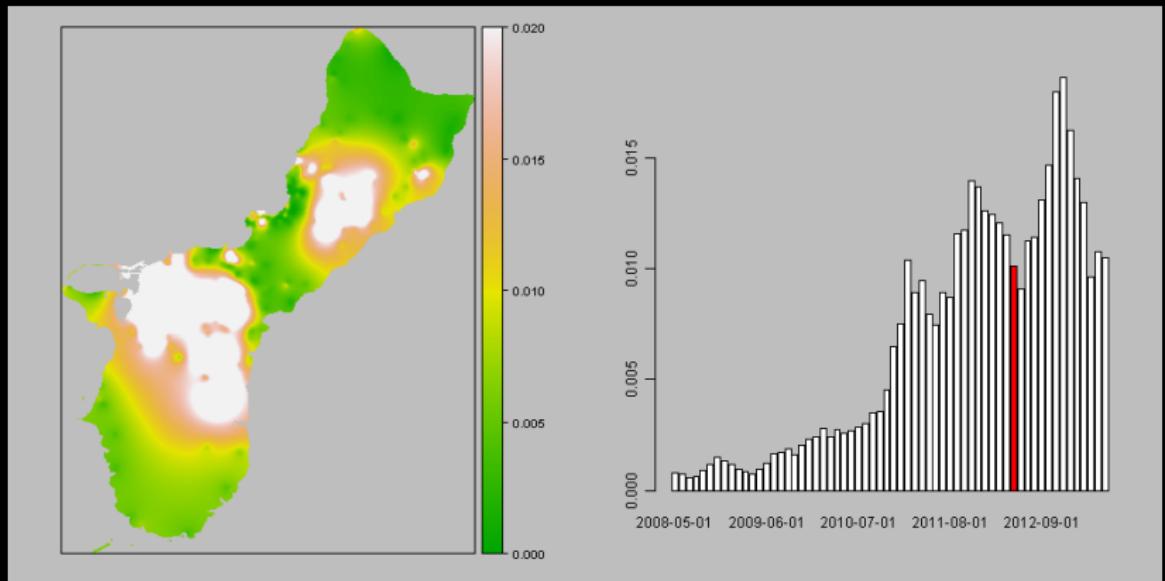
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Apr 2012



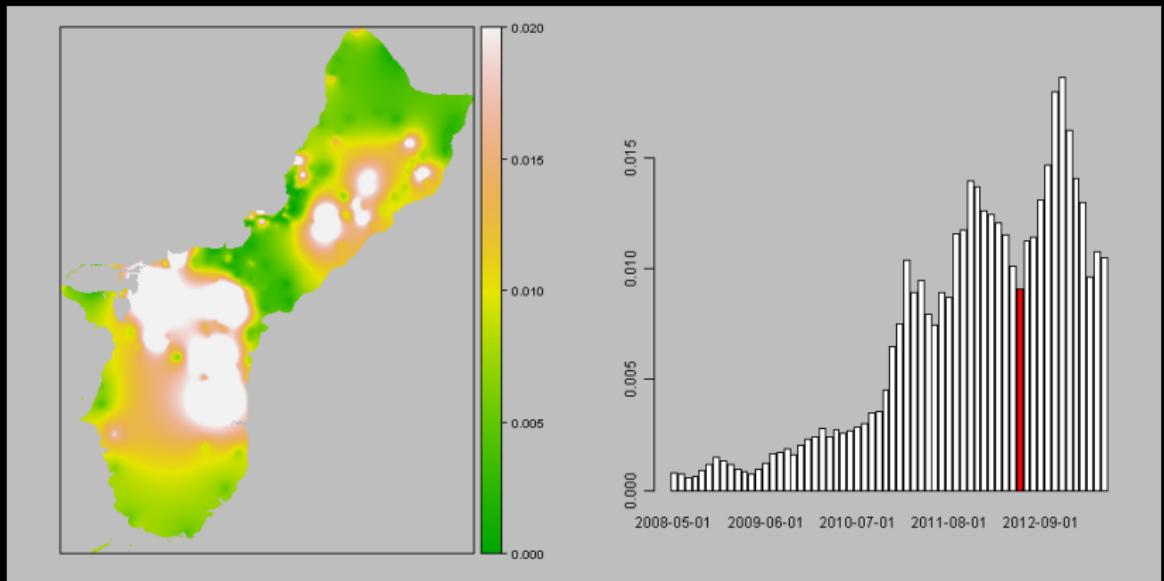
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 May 2012



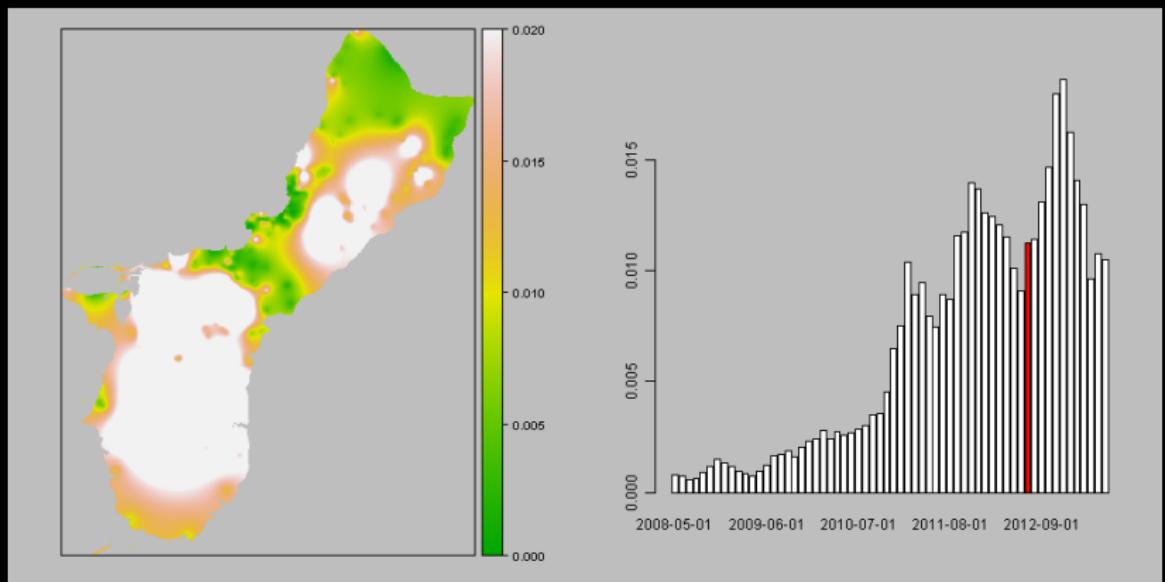
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jun 2012



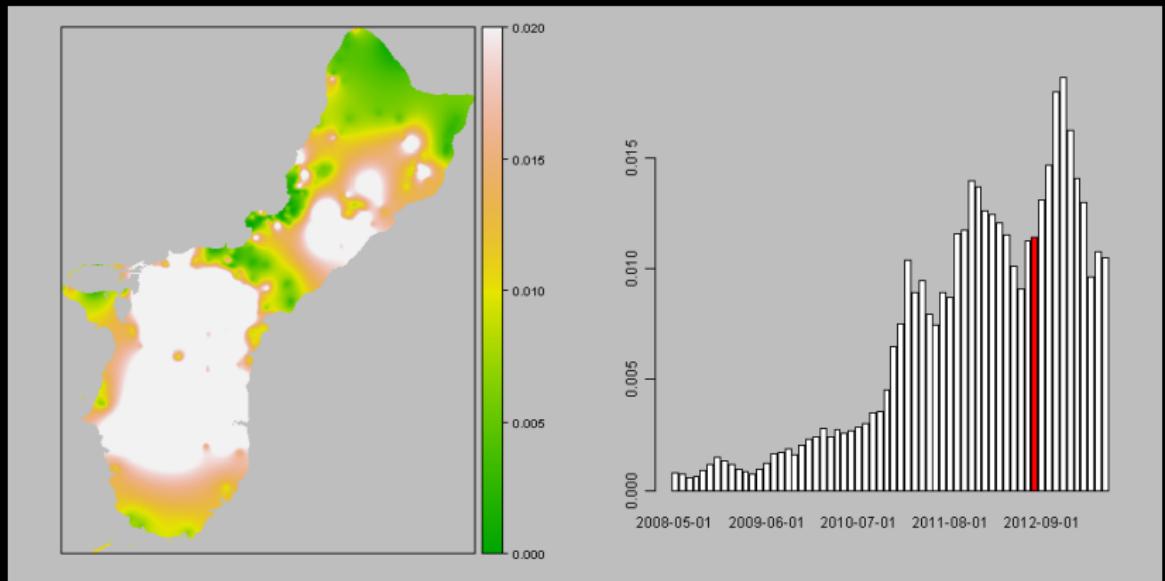
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jul 2012



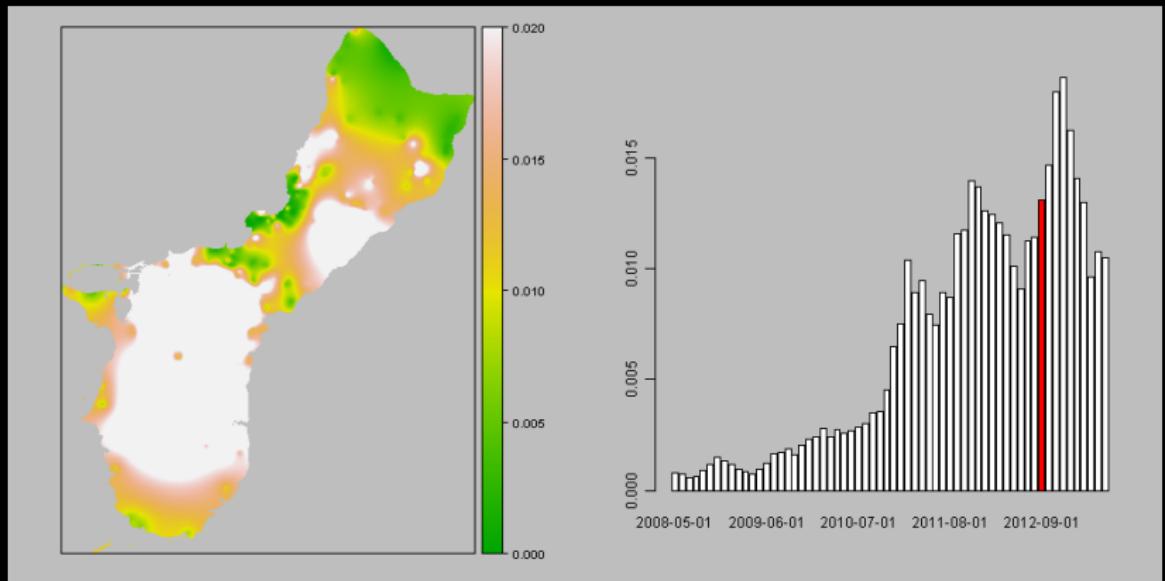
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Aug 2012



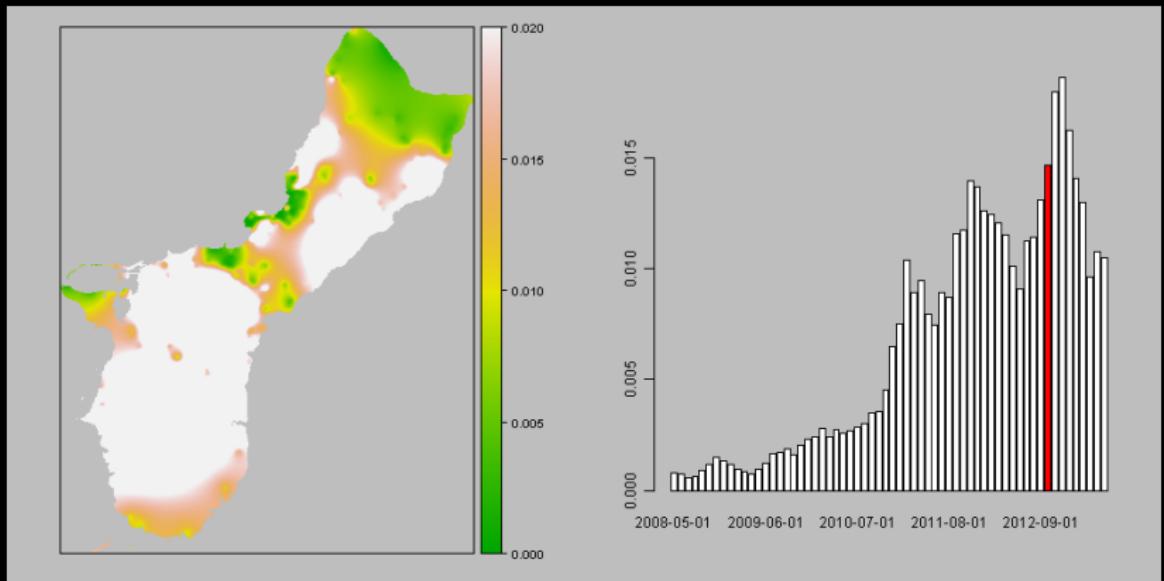
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Sep 2012



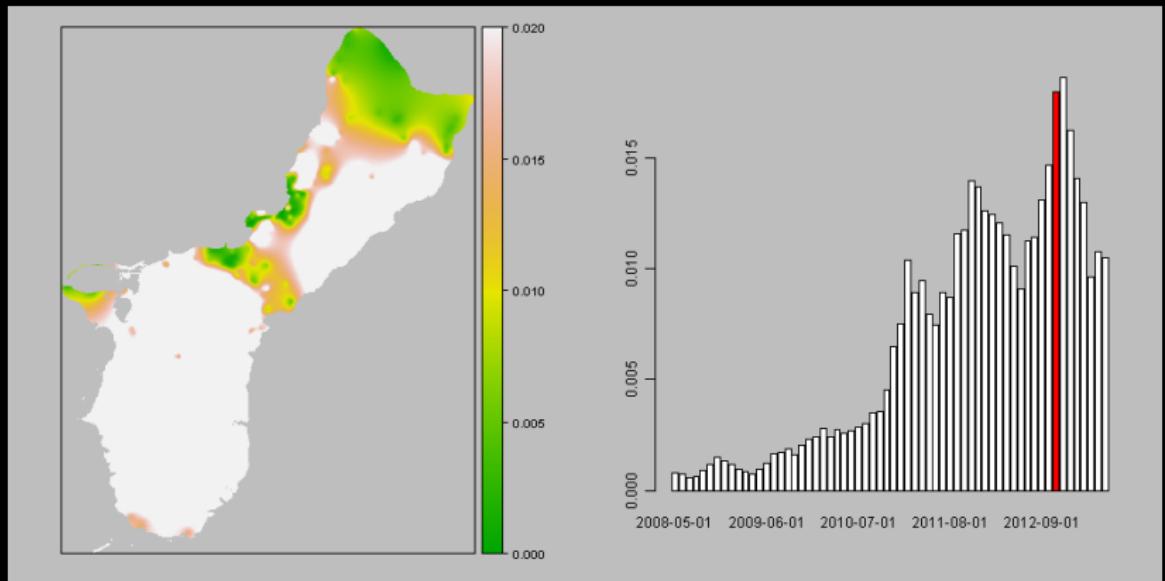
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Oct 2012



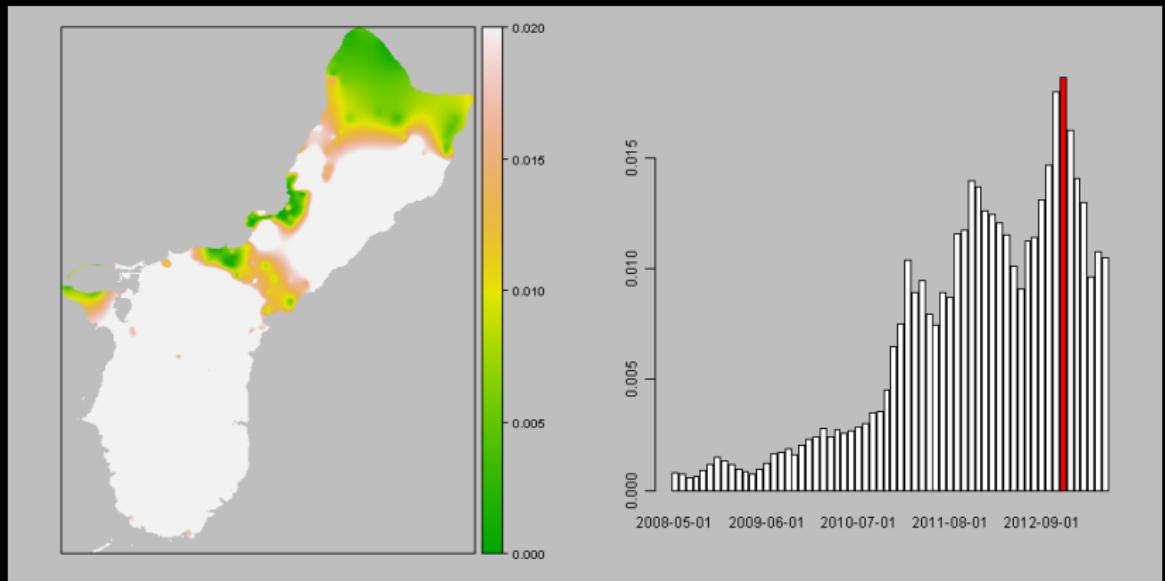
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Nov 2012



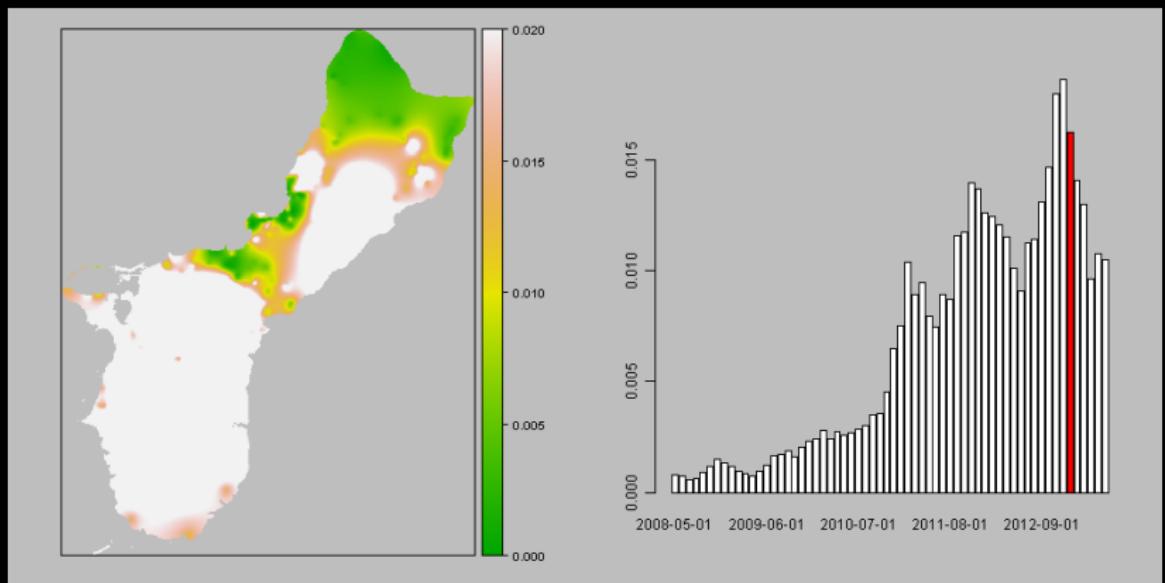
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Dec 2012



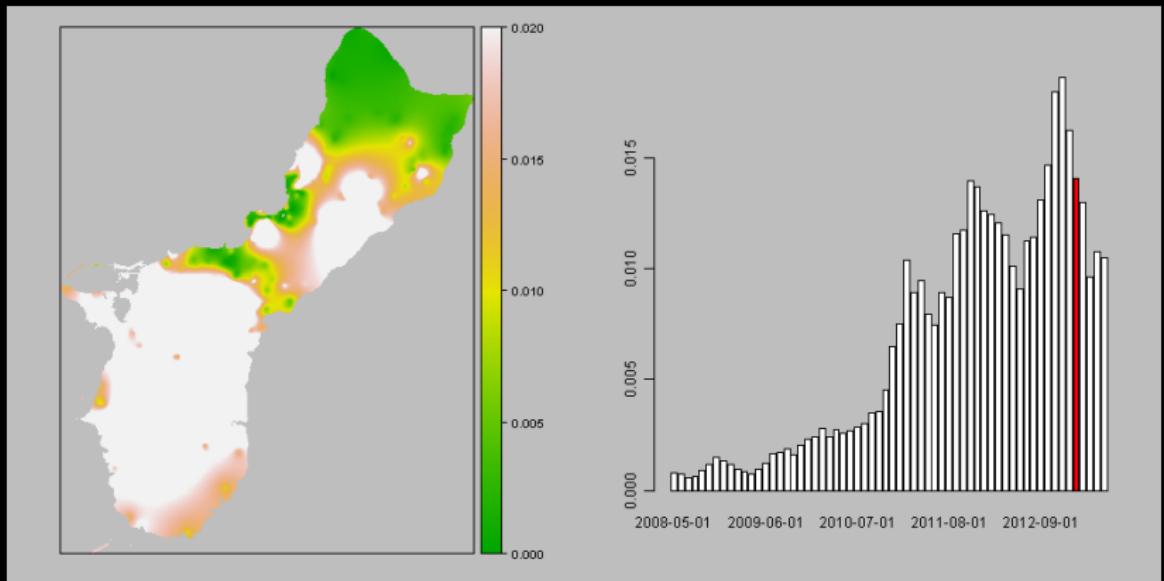
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jan 2013



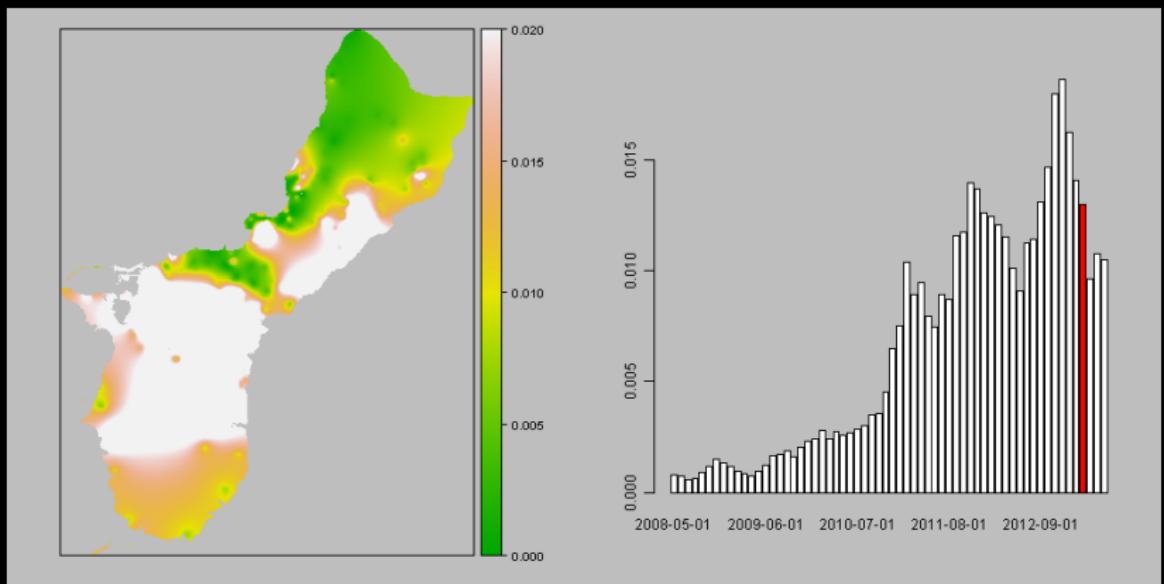
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Feb 2013



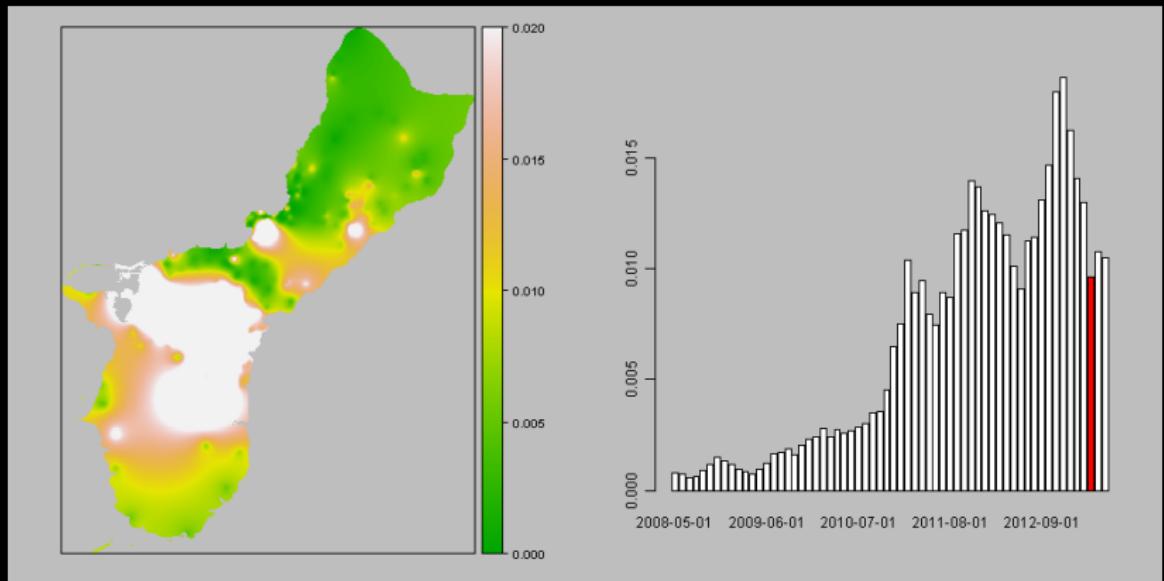
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Mar 2013



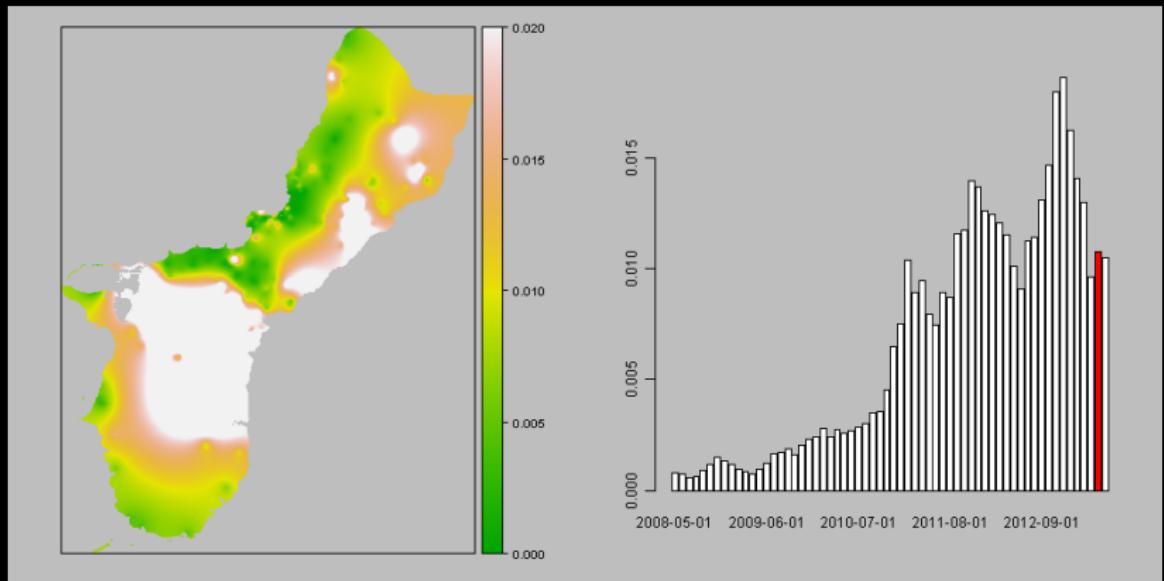
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Apr 2013



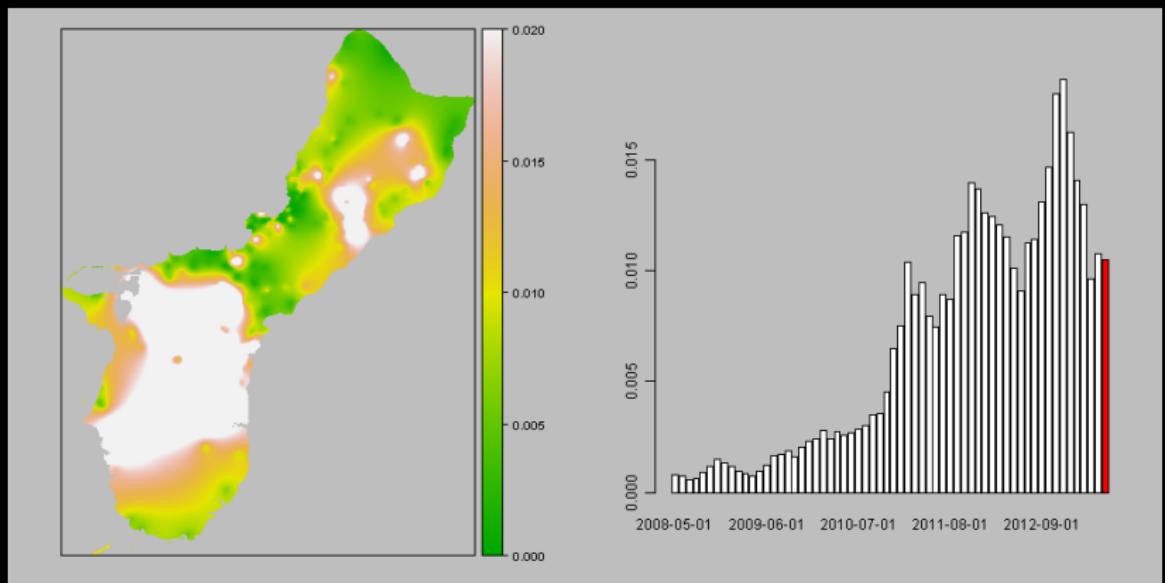
Mean number of beetles caught per trap-day

90 day trapping period ending on 01 May 2013



Mean number of beetles caught per trap-day

90 day trapping period ending on 01 Jun 2013



Mean number of beetles caught per trap-day

## Reduced Release Rate



# Ultraviolet Light Emmitting Diodes (UVLED)



# Development of the Hotel California Trap



"Beetles Check In But Can Never Leave"







# Sanitation









**GRUBS – 296**

**PUPAE – 41**

**ADULTS - 15**

**DANGER**  
**RESTRICTED  
AREA**

2007/12/09





2007/12/11

# 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

# Spraying Crowns with DEMON MAX (Cypermethrin)



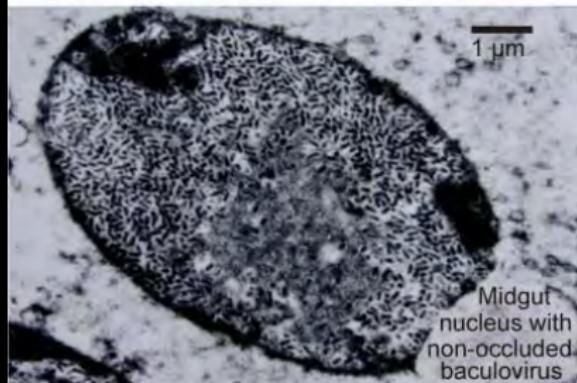
# Efficacy of Crown Spraying



# BIOCONTROL



Palm rhinoceros beetle



Midgut  
nucleus with  
non-occluded  
baculovirus







## *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







