

Biosecurity for Guam in the New Millennium

Are We More Secure?

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Pacific Entomology Conference
April 2015

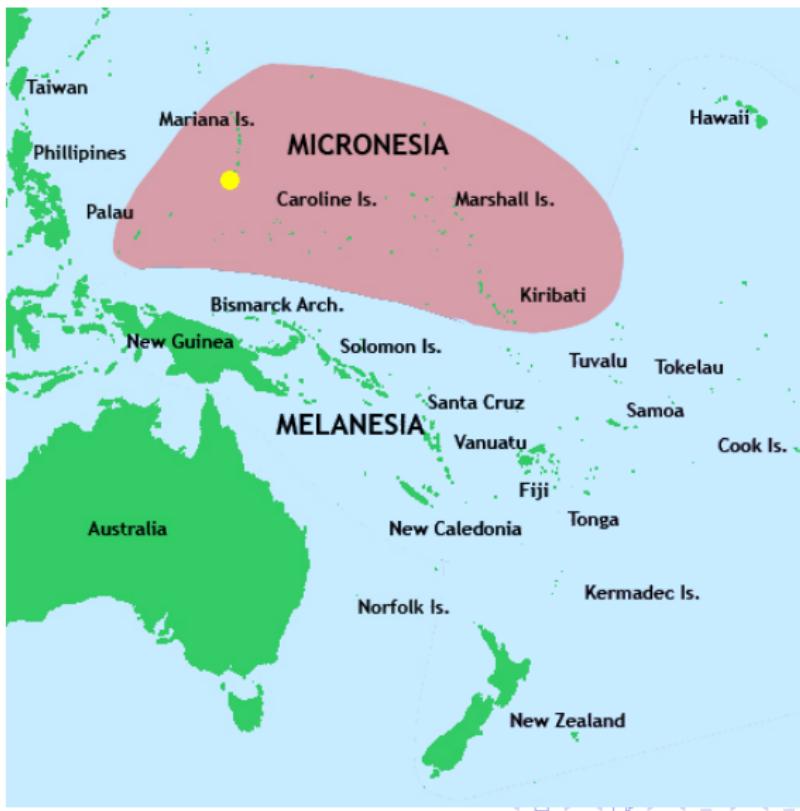
Abstract

Guam, a transportation hub for the western Pacific, has long been recognized as a stepping stone for island-hopping invasive insect species. The frequency of insect pest incursions on Guam has increased significantly during the past decade, coinciding with major changes to Guam's biosecurity infrastructure which include establishment of a USDA-APHIS Plant Inspection Station and transfer of Guam's plant protection and quarantine officers from the Guam Department of Agriculture to the Guam Customs and Quarantine Agency. Impacts of these changes and recent attempts to improve Guam's biosecurity will be discussed.

Where is Guam?

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Challenges

- Limited taxonomic expertise
 - only 3 active PhD level entomologists in all of Micronesia (Russ Campbell, Ross Miller, Aubrey Moore)
 - High endemism (about 45%); many undescribed species
 - Very high introduction rate for alien insects

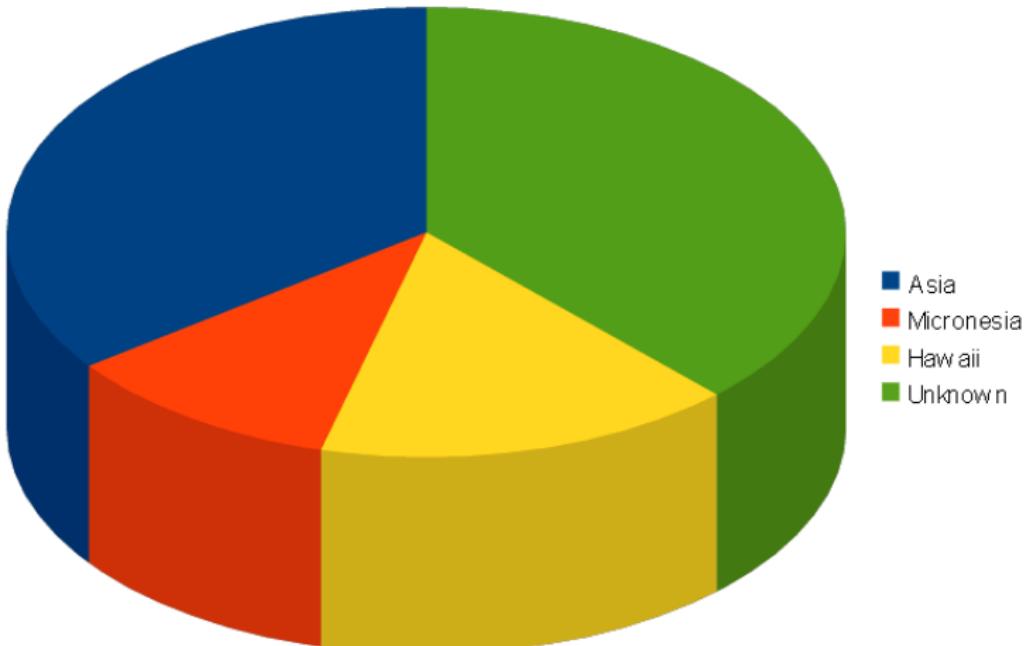
Origin of New Insects on Guam

New Insects on Guam (1945-89)

Schreiner, I. 1991. New insects in Guam. *Micronesica Suppl.* 3.

Source	1945-54	1955-69	1970-79	1980-89
Asia	7	2	9	8
Micronesia	1	1	4	2
Hawaii	0	2	2	8
Unknown	7	8	6	7
Total	15	13	21	25
No. per Year	1.5	0.9	2.1	2.5

Origin of New Insects on Guam (1945-1989)



Data source: [Schreiner(1991)]

Current Invasions

- Asian cycad scale, *Aulacaspis yasumatsui* - detected 2003; has killed 90% of Guam's endemic cycad which was Guam's most populous tree
- Coconut rhinoceros beetle, *Oryctes rhinoceros* - detected 2007; is killing coconut palms, which was Guam's second most populous tree
- Little fire ant, *Wasmannia auropunctata* - detected 2011

Early Concerns

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Via PAN AMERICAN

OVER pioneer aerial trade routes blazed by bird and by the lands of the West Indies, Central and South America, high above the ocean routes of Columbia and the Orient, Pan American Flying Clippers, clippers ships of another generation, now Flying Clipper Ships, now speed along radio-guided highways of the sky linking the Americas, the Orient, Australia, Africa, Asia, Europe, and South America. Looking the New World and the Old, they span the vast Pacific to Hawaii, the Philippines and China.

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Since your capable crews and the fine planes they fly, are the best in the world, you travel with the same...
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WORLD'S STANDARD FOR AIR TRANSPORTATION

1936 Entomological Survey of Guam

- Sponsored by the Hawaiian Sugar Planters Association
- Results reported in:
 - Sweezey, O. H. 1942. Insects of Guam - 1. Bernice P. Bishop Museum Bulletin 172 1–218.[[Sweezey and Association\(1942\)](#)]
 - Sweezey, O. H. 1946. Insects of Guam - 1. Bernice P. Bishop Museum Bulletin 172 1–218.[[Sweezey and Association\(1946\)](#)]
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1936 Entomological Survey of Guam

Justification for the Survey [[Swezey and Association\(1942\)](#)]:

"Guam is the most important station between the Philippines and Honolulu on the route of the Pan-American Airways across the Pacific, and as knowledge of the Guam insect fauna was meager, it was deemed important to acquire as complete a knowledge as possible of this fauna. Unknown insects were already being found in planes arriving at Pearl Harbor, Oahu, and, in spite of the system employed in the fumigation of the planes, an occasional insect was found which had not fully succumbed. There was some concern lest unknown pests might survive and succeed in becoming established, and, perhaps, destructive to sugar cane and other crops grown in Hawaii."

1936 Entomological Survey of Guam

- The 1936 survey identified 50 agricultural pests on Guam which were not present in Hawaii at the time.
- "No doubt there are many among them which would become serious crop pests if they should reach Hawaii and become established." [[Swezey and Association\(1942\)](#)]

Why is Guam Such a Good Source?

Agricultural pests may remain hidden on Guam

- Guam has no large-scale commercial farming and limited variety of crops. Agricultural pests may be overlooked because their hosts are not grown as crops on Guam.
- Examples:
 - coffee berry borer, *Hypothenemus hampei* (Coleoptera: Scolytidae)
 - Saipan 1944 Dybas; Pohnpei 1953 Gressitt; Pohnpei 1950 Adams [[Wood\(1960\)](#)]
 - sugarcane leafmining buprestid, *Aphanisticus cochinchiniae seminulum* Obenberger (Coleoptera: Buprestidae)
 - Guam 2007 [[Zack et al.\(2009\)](#) [Zack, Moore, and Miller](#)]

Why is Guam Such a Good Source?

Active military pathway for movement of invasive species between Guam and Hawaii

- There is ample historical evidence that several pest insects have moved from Guam to Hawaii in association with movements of military personnel and equipment.
- It is expected that traffic of invasion species on this “military pathway” will increase as the Guam military buildup gets underway.

Changes

Guam PPQ Officers Transferred from Ag to Customs

In November 2004, the duties and functions of plant protection and quarantine were transferred from the Department of Agriculture to the Customs and Quarantine Agency of Guam. However, two (2) Plant Protection and Quarantine Officers, later re-designated and assigned the title of "Commodity Inspectors" and one (1) Entomologist, remained with the Department of Agriculture to manage and operate the USDA/Guam Plant Inspection Station. The duties of border inspection and various inland quarantine duties, including, but not limited to, store inspections, smuggling and interdiction, invasive species control and management, federal fumigations, federal export certifications, local export certifications, eradication program management, and local and federal monitoring program management, were left as responsibilities of the Department of Agriculture. [Respicio and Guthertz(2009)]

Changes

Establishment of the USDA APHIS Guam Plant Inspection Station

We are amending the regulations governing the importation of nursery stock and other articles by designating the ports of Atlanta, Georgia, and Agana, Guam, as plant inspection stations. The addition of the two plant inspection stations will help reduce transportation time and costs to importers who must currently import plants through inspection stations that are considerably distant from the importers' facilities.

[Register(2003)]

Number of Guam Invertebrate Interceptions During 2014

0.6 interceptions per day

- 1 Aphids: 38
- 2 Araneae (spiders): 38
- 3 Thrips: 32
- 4 Collembola: 20
- 5 Diptera: 20
- 6 Coleoptera: 20
- 7 Disease Symptoms: 10
- 8 Heteroptera: 10
- 9 Lepidoptera: 10
- 10 Mites: 10
- 11 Snails and Slugs: 9
- 12 Psocoptera: 5
- 13 Earwigs: 5
- 14 Hymenoptera: 3
- 15 Mealybugs: 3

Guam's Interception Rate Compared to Hawaii's

Location	Interceptions per day
Guam 2014	0.6
Hawaii State (1995-2001)	2.1
Kahului Airport Risk Assessment (2000-2001)	10.8

New Island Records in the Decade prior to 2004 Changes (1995-2004)

- 1 2000 EULOPHIDAE *Thripobius semiluteus*
- 2 2000 BDELLIDAE *Bdella distincta*
- 3 2002 PSEUDOCOCCIDAE *Paracoccus marginatus*
- 4 2002 TETRANYCHIDAE *Eotetranychus sexmaculatus*
- 5 2003 DIASPIDIDAE *Aulacaspis yasumatsui*
- 6 2003 ORTHEZIDAE *Orthezia insignis* (*unconfirmed*)
- 7 2003 TINEIDAE *Erechthisa* sp.
- 8 2003 DIASPIDIDAE *Pseudaulacaspis cockerelli*
- 9 2004 PSEUDOCOCCIDAE *Nipaecoccus nipae*
- 10 2004 ALEYRODIDAE *Metaleurodes cardini*

New Island Records in the Decade after 2004 Changes (2005-2014) I

- 1 2005 SPHINGIDAE *Daphnis nerii*
- 2 2005 TINEIDAE *Dasydes rugosella*
- 3 2005 COSMOPTERIGIDAE *Anatrychintis* sp.
- 4 2006 EULOPHIDAE *Quadrastichus erythrinae*
- 5 2006 FORMICIDAE *Lepisiota frauenfeldi*
- 6 2007 ALEURIDAE *Tetraneurodes acaciae*
- 7 2007 COCCINELLIDAE *Epilachna cucurbitae*
- 8 2007 PSYLLIDAE *Diaphorina citri*
- 9 2007 SCARABAEIDAE *Oryctes rhinoceros*
- 10 2009 BUPRESTIDAE *Aphanisticus cochinchiniae*
- 11 2009 EULOPHIDAE *Selitrichoides casuarinae*
- 12 2010 CERATOPOGONIDAE *Culicoides peliliouensis*

New Island Records in the Decade after 2004 Changes (2005-2014) II

- 13 2010 CERATOPOGONIDAE *Dasyhelia carolinensis*
- 14 2010 CERATOPOGONIDAE *Dasyhelea dupliforceps*
- 15 2010 CYDNIDAE *Byrsinus varians*
- 16 2010 CYDNIDAE *Fromundus biimpressus*
- 17 2010 CYDNIDAE *Rhytidoporus indentatus*
- 18 2010 TERMITIDAE *Nasutitermes luzonicus*
- 19 2010 TERMITIDAE *Schederorhinotermes longirostris*
- 20 2010 ARANAEIDAE *Araneus ventricosus*
- 21 2010 CULICIDAE *Anopheles campestris*
- 22 2011 SCOLYTIDAE *Coccotrypes advena*
- 23 2011 SCOLYTIDAE *Hypothenemus burmanus*
- 24 2011 SCOLYTIDAE *Hypothenemus crudiae*
- 25 2011 SCOLYTIDAE *Xylosandrus crassiusculus*

New Island Records in the Decade after 2004 Changes (2005-2014) III

- 26 2011 CULICIDAE *Anopheles aureohirtum*
- 27 2011 HESPERIIDAE *species needed*
- 28 2011 ALEYRODIDAE *Dialeuropora decempunctata*
- 29 2011 COCCIDAE *Pulvinaria urbicola*
- 30 2011 FORMICIDAE *Wasmannia auropunctata*
- 31 2011 TENUIPALPIDAE *Brevipalpus californicus*
- 32 2011 CUNAXIDAE *Cunaxa sp.*
- 33 2011 EUPODIDAE *Eupodes sp.*
- 34 2011 PHYTOSEIDAE *Amblyscius obtusus species group A.*
nr lentiginosus
- 35 2011 ERIOPHYIDAE *Acerimina tiliaceae*
- 36 2011 GLYCIPHAGIDAE *Lepidoglyphus destructor*
- 37 2012 FORMICIDAE *Polyrachis sp. (not dives)*

New Island Records in the Decade after 2004 Changes (2005-2014) IV

- 38 2012 THRIPIDAE *Dinurothrips hookeri*
- 39 2013 PSEUDOCOCCIDAE *Cocoidohystrix insolita*
- 40 2014 PENTATOMIDAE *Halymorpha halys*
- 41 2014 DIASPIDIDAE *Pseudaonidia duplex*
- 42 2014 CHRYSOMELIDAE *Diabrotica undecimpunctata*
- 43 2014 VARROOIDAE *Varroa destructor*

Attempts to Improve Guam's Biosecurity

- GISAC
- GISC
- National Plant Diagnostics Network - First Detector Training
- Annual APHIS/SPC Training for Micronesian PPQ Officers

Attempts to Improve Guam's Biosecurity

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- Guam Department of Agriculture Biosecurity Division

Attempts to Improve Guam's Biosecurity

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- Micronesia Biosecurity Plan

Conclusions

- Evidence indicates that Guam has been and continues to be a high risk source of insects invading Hawaii.

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