

Guam as a Source of New Insects for Hawaii

Pacific Entomology Conference

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Where is Guam?

Guam as a Source of New Insects for Hawaii

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Challenges

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- Limited taxonomic expertise
 - only 6 active PhD level entomologists in all of Micronesia (4 on Guam; 2 in Palau)
- High endemism (~45%); many undescribed species
- Very high introduction rate for alien insects

Origin of New Insects on Guam

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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)

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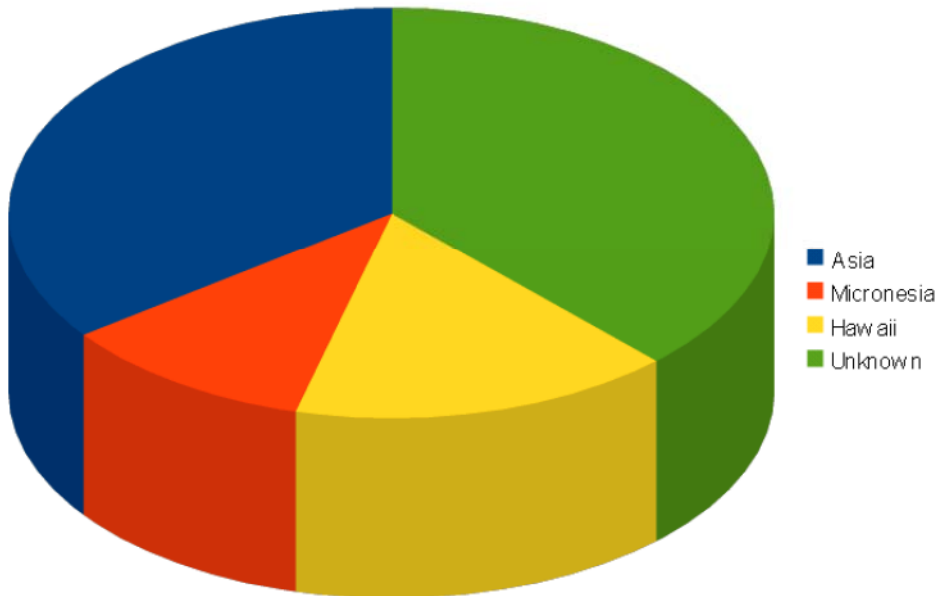
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Data source: [Schreiner(1991)]

Current Invasions

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- 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, *Wasmania auropunctata* - detected 2011

15 new island records in 2010-2011

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- 4 bark beetles, Scolytidae, from a single CBB trap at a single location
- 2 biting flies: a black fly and an anopheline mosquito
- little fire ant
- 8 other species

New Island Record for 2012

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- *Dinurothrips hookeri* Hood (Thysanoptera: Thripidae)
- Distribution: Caribbean, Florida, Brazil
- Hosts: leaves of banana, tomato, various Asteraceae, sweet potato, eggplant
- For more info, visit <http://guaminsects.myspecies.info/thrips-attacking-young-banana-leaves>

Early Concerns

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1936 Entomological Survey of Guam

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- Sponsored by the Hawaiian Sugar Planters Association
- Results reported in:
 - Swezey, O. H. 1942. Insects of Guam - 1. Bernice P. Bishop Museum Bulletin 172 1-218.[Swezey and Association(1942)]
 - Swezey, O. H. 1946. Insects of Guam - 1. Bernice P. Bishop Museum Bulletin 172 1-218.[Swezey and Association(1946)]
 - Gressitt, J.L. 1954 - present. Insects of Micronesia series.
<http://hbs.bishopmuseum.org/pubs-online/iom.html>

1936 Entomological Survey of Guam

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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

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- 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)]

Insects Suspected of being Introduced from Guam or Other Mariana Islands to Hawaii

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- Island Hoppers
 - Oriental fruit fly
 - Banana leaf roller
 - Southern green stink bug
 - Grass bagworm
 - Oriental flower beetle
- Endemics
 - Hibiscus whitefly
 - Ochrosia fruit fly
 - Biting bug

Oriental fruit fly, *Bactrocera dorsalis*

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"As much troop and other military movement occurred about this time between Hawaii and Saipan, where the fly occurred, this new pest could have come from the latter island."

[Pemberton(1964)]



Photo by Scott Bauer

Banana leaf roller, *Erionata thrax*

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- Oahu (Hickam AFB) Davis and Kawamura 1975
- PHES 22(1): 21.



Photo by Forrest and Kim Starr

Southern green stink bug, *Nezara viridula*

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"As this insect is known in Guam and Samoa but not in California, it possibly came from one of those islands."

[Pemberton(1964)]



Photo by Russ Ottens, University of Georgia, Bugwood.org

Grass bagworm

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Brachycyttarus griseus

1976: first detected
on Guam

1984: first detected
on Oahu at Kaneohe
Marine Base

Oriental flower beetle

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Protaetia orientalis

~1970: first detected
on Guam

2002: first detected
on Oahu at Hickam
AFB golf course

Endemics

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- Ochrosia fruit fly, *Bactrocera ochrosiae* (Malloch) 1942 (Diptera: Tephritidae)
 - Molokai 1972 Kjargaard, PHES 32: 5.
- *Botocudo marianensis* (Usinger) 1946 (Hemiptera: Lygaeidae)
 - Oahu 1974, Beardsley, PHES 22:160-161
 - Maui 1972, Gagne, PHES 22:167
 - Hawaii 1977, Beardsley, PHES 22: 410
 - Kauai 1977, Nakahara, PHES 23(2): 158

Interceptions

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Armed Forces Pest Management Board Technical Guide No. 31

RETROGRADE WASHDOWNS:

Cleaning and Inspection Procedures

Published and Distributed by the
DEFENSE PEST MANAGEMENT INFORMATION ANALYSIS CENTER
Forest Glen Section
Walter Reed Army Medical Center
Washington, DC 20307-5001
March 2008

<http://www.afpmb.org/sites/default/files/pubs/techguides/tg31.pdf>

Appendix J - USDA APHIS History of Interceptions

<http://www.afpmb.org/sites/default/files/pubs/techguides/tg31/appendix-j.xls>

APHIS Interceptions on USAF Aircraft Arriving in Honolulu from Guam I

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■ COLEOPTERA

■ Curculionidae

- *Myloccerus* sp. (10/27/1987; 6/10/1986)

■ Elateridae

- *Conoderus* sp. (6/11/1989)

■ Chrysomelidae

- *Altica* sp. (10/11/1984)
- *Rhyparida* sp. (10/18/1984)

■ Scarabeidae

- *Adoretus sinicus* (8/28/1987; 4/1/1990; 7/29/1990)
- *Anomala* sp. (11/27/1986; 8/20/1987; 6/14/1985; 5/16/1990; 5/12/1989; 6/8/1992; 6/11/1990; 5/25/1991)
- *Popillia lewisi* (7/22/1991; 8/2/1991; 6/8/1990)

APHIS Interceptions on USAF Aircraft Arriving in Honolulu from Guam II

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- *Protaetia orientalis* (11/22/1984; 5/10/1993)

■ Tenebrionidae

- *Caedius* sp. (7/2/1990; 6/9/1990; 6/9/1990)
- *Gonocephalum* sp. (4/8/1990; 6/15/1990; 6/15/1990)

■ LEPIDOPTERA

■ Noctuidae

- unidentified sp. (9/18/1987; 11/30/1984; 9/17/1989; 9/17/1989)
- *Chrysodeixis chalcites* (11/11/1984) NKFG
- *Helicoverpa armigera* (4/6/1986)
- *Leucania* sp. (8/30/1987; 12/14/1985)
- *Mocis frugalis* (9/18/1987; 7/6/1990)
- *Platysenta* sp. (10/23/1986; 8/16/1987; 8/31/1987; 12/11/1984; 11/7/1984) NKFG
- *Pseudaletia* sp. (9/4/1987; 3/31/1990)

APHIS Interceptions on USAF Aircraft Arriving in Honolulu from Guam III

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- *Spodoptera* sp. (4/21/1987; 9/20/1987; 5/9/1987; 8/17/1987; 7/10/1987; 12/14/1985; 8/28/1993; 6/29/1989; 6/30/1990)
- *Spodoptera litura* (1/29/1985; 11/30/1984; 10/6/1984; 8/5/1986)
- *Spodoptera mauritia* (8/24/1987; 3/5/1986)
- Pyralidae
 - Unidentified sp. (9/2/1987; 9/14/1987)
 - *Cnaphalocrocis medinalis* (5/17/1987; 9/20/1985; 9/15/1984; 10/6/1984; 10/23/1984) NKFG
 - *Herpetogramma licarsisalis* (8/22/1984)
 - *Ostrinia furnacalis* (9/15/1984)
 - *Sameodes cancellalis* (11/27/1984) NKFG
- Lyonetiidae
 - Unidentified sp. (7/30/1985) NKFG
- Sphingidae

APHIS Interceptions on USAF Aircraft Arriving in Honolulu from Guam IV

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- Unidentified species (11/24/1987)

■ HEMIPTERA

■ Cydnidae

- *Aethus indicus* (7/13/1990) NKFG

■ Pentatomidae

- *Plautia* sp. (7/2/1985) NKFG

■ Cicadellidae

- Unidentified sp. (6/6/1987; 6/16/1990)

■ ISOPTERA

■ Rhinotermitidae

- *Coptotermes* sp. (5/24/1990)

■ ORTHOPTERA

■ Tettigoniidae

APHIS Interceptions on USAF Aircraft Arriving in Honolulu from Guam V

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- *Euconocephalus* sp. (11/22/1987; 11/30/1987; 10/30/1987; 9/11/1987; 10/16/1987; 12/15/1984; 1/15/1986)

- Gryllidae

- *Metioche vittaticollis* (8/3/1986) (listed in MAD as *Trigonidium vittaticolis*)
- *Phyllopalpus* sp. (8/30/1987) NKFG

- HYMENOPTERA

- Torymidae

- *Megastigmus pistaciae* (1/14/1985) NKFG

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NO RECORDS AVAILABLE



Why is Guam Such a Good Source?

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- Guam's biosecurity is weak
- Guam is hypersusceptible to pest invasions and outbreaks
- Agricultural pests may remain hidden on Guam
- Active military pathway for movement of invasive species between Guam and Hawaii

Why is Guam Such a Good Source?

Guam's biosecurity is Weak

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- 2003 - USDA APHIS establishes the Guam Plant Inspection Station
 - 0 APHIS inspectors; 0 identifiers
- 2003 - GovGuam PPQ inspectors moved from Agriculture to Customs
- Intercepted insects are usually identified only to taxonomic level of order or family
- Double standard for treatment
 - Infested plant material from US or trans-shipped through the US is "reconditioned" (washed with soapy water)
 - Infested plant material from elsewhere is destroyed

Why is Guam Such a Good Source?

Guam is hypersusceptible to pest invasions and outbreaks

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All tropical islands are susceptible to biological invasions and outbreaks.

- Guam is hypersusceptible because:
 - the brown treesnake has exterminated birds and other vertebrate insectivores
 - large day-flying insects are extremely abundant
- Guam does not have a large guild of previously imported biocontrol agents, as does Hawaii

Why is Guam Such a Good Source?

Agricultural pests may remain hidden on Guam

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- 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 cochinchinae 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

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- 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.

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

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Ilse Schreiner.

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<http://books.google.com/books?id=ftcrAAAAMAAJ>.



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Obenberger (Coleoptera: Buprestidae) from Micronesia.

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