

Parallel Universes: Remarkable Similarities in the Siege of Invasive Species on Florida and Hawai'i



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**If Hawai'i were
at the same
Longitude as
Florida...**

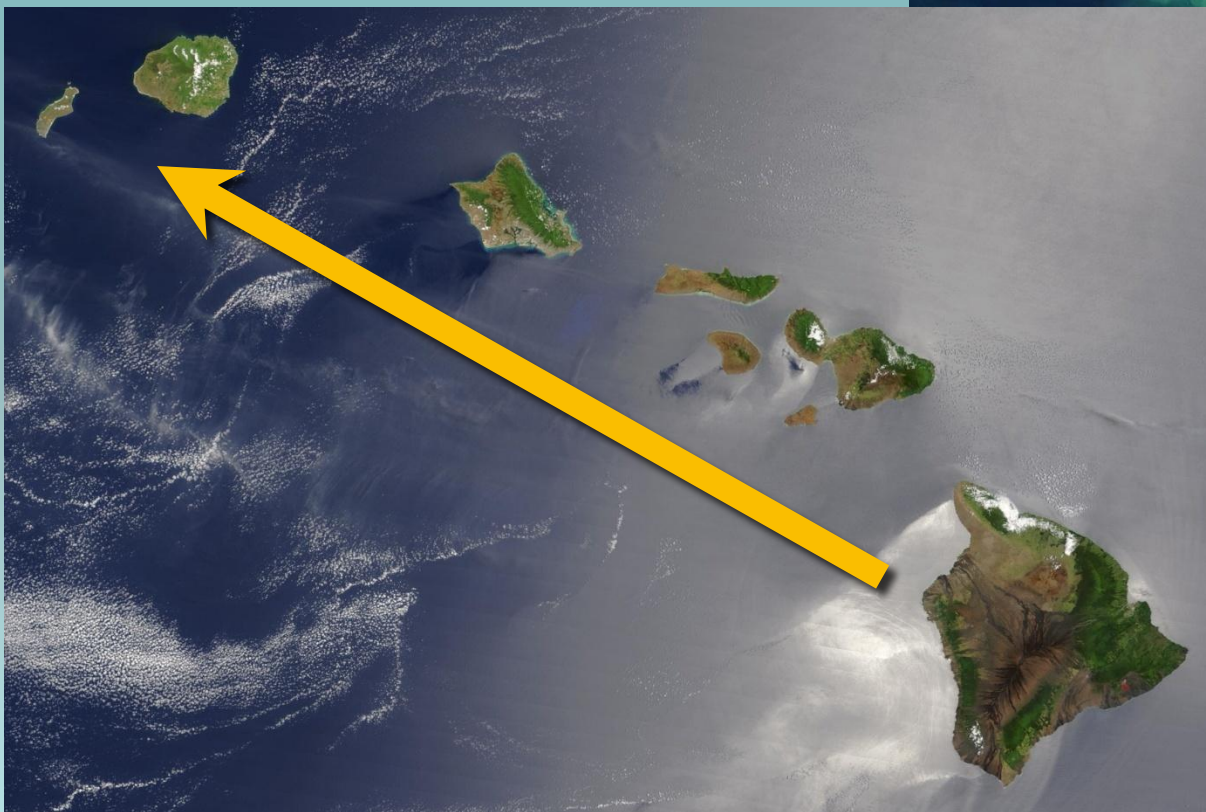
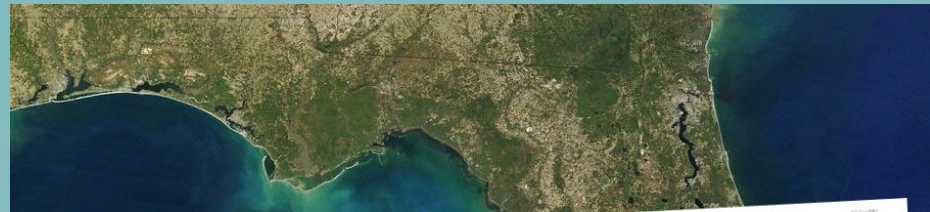


Similarities Between Hawai`i and Florida

- **Subtropical / Tropical Climates**
 - **Between 19–30° N**
- **Insular / Peninsular Geography**
 - **Past isolation**
 - **Young terrestrial environments**
 - **Fast forward of invasions**
- **Ecosystem Functions Altered by Invasive Species**

Similarities Between Hawai'i and Florida

Surrounded by
Water!



Dissimilarities

- **Topography**
 - Florida is flat (≤ 105 m)
 - Hawai'i is not
 - Large Subalpine / Alpine zones $\leq 4,205$ m
- **Geology**
 - Florida doesn't have volcanoes
 - Hawai'i does
 - Recent basaltic lava flows and volcanic ash
- **Hydrology**
 - Florida has extensive wetlands
 - Hawai'i does not
 - Some coastal fringing wetlands

Common Invasive Animals

- **Mammals**

- Feral pigs
- Feral cats
- Black rats



- **Birds**

- Cattle Egrets
- Parrots



- **Herptiles**

- Cane toads

- **Invertebrates**

- Little fire ants



Feral Pigs



- **Ecosystems**

- Alter nutrient cycling
- Accelerate soil erosion

- **Vegetation**

- Browse, trample, & uproot native plants
- Disperse invasive plants

- **Management**

- Sustained removals in Florida
- Fenced and removed from $\sim 750 \text{ km}^2$

Pig Proof Fences



Feral Cats



- **Notorious Predators**
 - Endangered native birds in Hawai'i
 - Endangered Key Largo woodrat



- **Host of *Toxoplasma***
- **Hard to manage**
 - Cryptic
 - Nocturnal
 - Trap Wary

Cat Proof Fences



Little fire ant (*Wasmannia auropunctata*)

- Discovered on Hawai'i Island 1999
- Implications for red imported fire ant
- Ad-hoc control methods widely used
- Candidate for classical biological control



Little fire ant (*Wasmannia auropunctata*)



Department of Agriculture
STATE OF HAWAII

LICENSED

PERIOD 2012-2014 LIC. NO.
9426.637

**AN ANT GROWTH REGULATOR FOR CONTROL OF
PROTEIN AND SUGAR FEEDING ANTS INCLUDING
ARGENTINE AND PHARAOH ANTS**

A liquid concentrate for use in refillable bait stations that controls ants in agricultural crops and structures by sterilizing egg-laying queens and preventing larval development

KEEP OUT OF REACH OF CHILDREN
CAUTION
See back panel for additional precautions

NET CONTENTS: 2.5 GAL (320 FL OZ) 9.46 L

106169

ACTIVE INGREDIENT:
(S)-Methoprene (CAS #65733-16-6)..... 4.9%
OTHER INGREDIENTS:..... 95.1%
Total 100.0%

This product contains 0.4 pounds/gallon (48 grams/liter) (S)-Methoprene active ingredient



- Chemical control
- S-methoprene gel bait recipe
- FIFRA Section 2 Approved for Hawai'i

Common Invasive Plants

- **Brazilian peppertree or Christmas berry (*Schinus terebinthifolius*)**
- **Myrtaceae**
 - **Strawberry guava (*Psidium cattleianum*)**
 - **Paperbark (*Melaleuca quinquenervia*)**
- **Lantana (*Lantana camara*)**
- **Swordfern (*Nephrolepis* spp.)**
- **Fountain grass (*Pennisetum setaceum*)**
- **Molassesgrass (*Melinis minutiflora*)**

Common Invasive Plants

- **Dominate large areas**
- **Alter ecosystem processes**
 - Nutrient cycling
 - Hydrology
 - Fire regimes
 - Wildlife habitat
- **Myrtaceae**
 - Strawberry guava (*Psidium cattleianum*)
 - Paperbark (*Melaleuca quinquenervia*)



Brazilian peppertree or Christmas berry (*Schinus terebinthifolius*)

- Highly invasive in Florida and Hawai`i
- Native to South America
- Subject of biological control in Hawai`i
- One beetle and two moth species introduced from Brazil
- Seed-feeding wasp accidentally introduced from South Africa



Potential Biocontrol Agents for *Schinus terebinthifolius*

- **Evaluated in Florida**
 - Sawfly
 - *Heteroperreyia hubrichi*
 - Thrip
 - *Pseudophilothrips ichini*
 - Leaf-rolling moth
 - *Episimus utilis*
 - Stem Boring Weevil
 - *Apocnemidophorus pipitzi*
- **Accidentally Reached Hawai'i and Florida**
 - Seed-feeding wasp
 - *Megastigmus transvaalensis*



- **Released in Hawai'i**
 - Moths 1954
 - *Episimus utilis*
 - *Crasimorpha infuscata*
 - Beetle 1954
 - *Lithraeus atronotatus*

Lantana (*Lantana camara*)

- **Highly invasive in Hawai'i and Florida**
- **Native to West Indies**
- ***L. depressa* endangered in Florida**
- **Thorny! Toxic!**
- **Subject of successful biological control in Hawai'i**
- **Ornamental varieties may preclude biological control in Florida**



Pests and Biological Control Agents

- Globalization of trade
- Oceanic islands vulnerable
- One place's pest is another's biocontrol



Cycad Aulacaspis scale

Eucalyptus Rust

Puccinia psidii

- Pathogen of Myrtaceae
- In Florida >30 years
- Found in Hawai'i 2005
- Devastated rose apple (*Syzygium jambos*) trees
- Threat to native 'ōhi'a (*Metrosideros polymorpha*) trees and associated fauna
- Potential adventive biological control in Florida for paperbark (*Melaleuca quinquenervia*)



Guava scale insect (*Tectococcus ovatus*)



- Pathogen of strawberry guava (*Psidium cattleianum*)
- Native to Brazil
- Potential biological control agent for strawberry guava in Florida
- Host specificity tested in Florida and Hawai'i
- Released in Hawai'i 2011

Opportunities?

- **Invasions may be seen as unfortunate**
- **Natural resources in need of protection**
- **Potential mutually beneficial applications**
- **Reciprocal information transfer**
- **Centers for development of broader application**
- **Work in isolation won't solve problems**
- **Proactive cooperation**



Reciprocal Information & Applications Transfer

- **Effects of invasive species on ecosystems**
- **Fence designs**
 - Feral pigs
 - Predators
- **Biological control**
 - Fire ants
 - Myrtaceae
- **Pesticide development**
 - **National conservation registration for rodenticides**



Photo by Heather Eijzenga, courtesy of the U.S. Fish & Wildlife Service

Acknowledgments

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Mahalo!