



# Meeting of the Hawai'i Invasive Species Council

Wednesday, June 9, 2021

1:00 PM

Held virtually through Zoom and livestreamed to YouTube

[https://www.youtube.com/channel/UCFT6SAASZIUxd\\_XgZMCjGsQ](https://www.youtube.com/channel/UCFT6SAASZIUxd_XgZMCjGsQ)



# Council Agenda – June 9, 2021

1. Call to order
2. Introductions
3. Approval of minutes from January 27, 2021 meeting
4. Submittal 1: Requesting approval of HISC Resources Working Group members
5. Presentation: Hawaii's biological control programs, past and present, and future needs for building capacity in Hawai'i and the Pacific region through the coordinated efforts of the Biocontrol Working Group
6. Submittal 2: Supporting the Planning, Construction, & Operation of Pacific Regional Biocontrol Facilities and Committing Agency Engagement
7. Public Comments
8. Adjournment

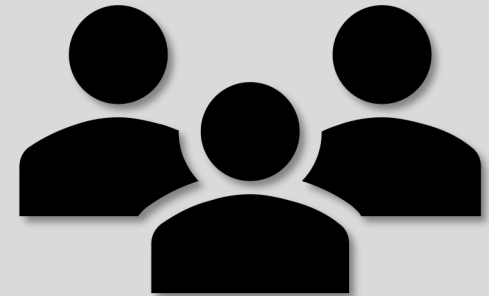
## Submittal 1:

# Requesting approval of HISC Resources Working Group members

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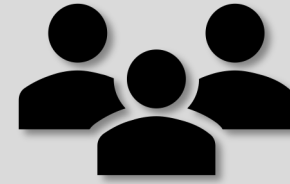
Duties of the HISC Resources Working Group include:



- Evaluation of proposals for HISC funding
- Developing the HISC recommended budget for Council approval
- The HISC Resources Working Group duties could expand beyond the HISC funding process to identify resource shortfalls for invasive species work and secure dedicated and sustained funding mechanisms and sources.

# Submittal 1: List of Recommended RWG Members

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## List of Recommended Members:

- **Justine Nihipali**; Department of Business, Economic Development, and Tourism
- **Grace Simmons**; Department of Health
- **Darcy Oishi**; Department of Agriculture
- **Janis Matsunaga**; Department of Agriculture
- **Masatomo Murata**; Department of Transportation
- **Robert Hauff**; Department of Land and Natural Resources, Division of Forestry and Wildlife
- **Natalie Dunn**; Department of Land and Natural Resources, Division of Aquatic Resources
- **Kim Fuller**; Department of Land and Natural Resources, Division of Aquatic Resources
- **Mike Melzer**; University of Hawai'i, College of Tropical Agriculture and Human Resources
- **Christy Martin**; UH Pacific Cooperative Studies Unit, Coordinating Group on Alien Pest Species
- **HISC Program Support Staff**



## Submittal 1:

### Requesting approval of HISC Resources Working Group members

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#### Recommendation:

1. That the HISC approve the recommended members of the HISC Resources Working Group to evaluate HISC funding applications and prepare the recommended budget.
2. That, if there are any additional actions related to identifying and/or securing resources for invasive species work, the Resources Working Group could be utilized to assist that effort with HISC Program Support Staff direction.
3. That, if there are any changes to members of the HISC Resources Working Group, the Council designates HISC Program Support Staff to approve those changes.



## Presentation:

“Hawaii’s biological control programs, past and present, and future needs for building capacity in Hawai’i and the Pacific region through the coordinated efforts of the Biocontrol Working Group”





Release of biocontrol agent (*Secusio extensa*) to control fireweed



Inside HDOA's containment section



Photos HDOA, US FS

Viewing methods for rearing insect in petri dish at USFS



Brazilian scale (*Tectococcus ovatus*) to control strawberry guava



Target and non-target testing

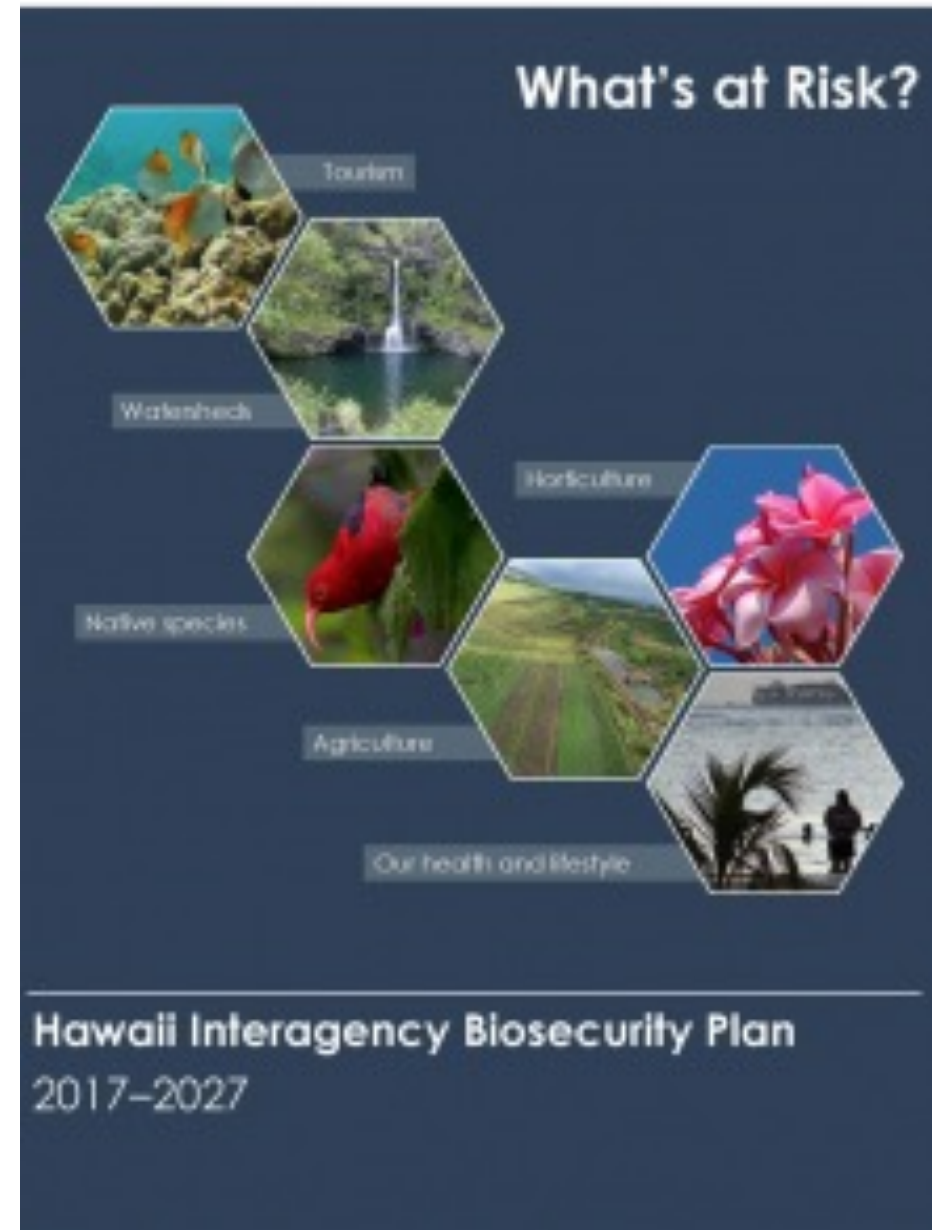


Host specificity testing on native species



# A Biosecurity Priority:

*new state and  
federal biocontrol  
laboratories,  
capable of serving  
regional biocontrol  
needs*





**“A regional biocontrol research center should be established, and interagency collaboration on biocontrol research, permitting, and utilization should be improved and streamlined.”**

 **WESTERN GOVERNORS' ASSOCIATION**

**BIOSECURITY AND INVASIVE SPECIES INITIATIVE**

Thursday, July 12, 2018

**Initiative Launch**

**MODERATOR:**  
**Bill Whitacre**  
*Policy Advisor, Western Governors' Association*

**REMARKS:**  
**James Ogsbury**  
*Executive Director, Western Governors' Association*  
**Hawaii Governor David Ige**  
*WGA Chair*

**PANELISTS:**  
**Chuck Barger**  
*Associate Director for Invasive Species and Information Technology, Center for Invasive Species & Ecosystem Health, University of Georgia*  
**Pam Fuller**  
*Program Leader, Nonindigenous Aquatic Species Database, USGS*  
**Stinger Guala**  
*Director of Biodiversity Information Serving Our Nation (BISON), USGS*  
**Jamie Reaser**  
*Executive Director, National Invasive Species Council*  
**Lori Scott**  
*Interim President & CEO, and Chief Information Officer, NatureServe*





# Presenters:



**Mark Wright,**  
UH CTAHR



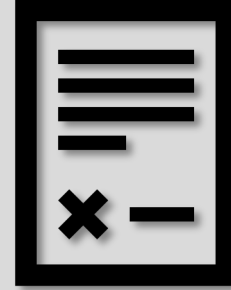
**Tracy Johnson,**  
USFS Pacific  
Southwest  
Research Station

**Darcy Oishi,**  
HDOA Plant Pest  
Control Branch



**Nicholas Manoukis,**  
USDA Agricultural  
Research Services





## Submittal 2:

REQUESTING A RESOLUTION TO SUPPORT THE PLANNING,  
CONSTRUCTION & OPERATION OF PACIFIC REGIONAL BIOLOGICAL  
CONTROL FACILITIES IN HAWAI'I AND COMMITTING AGENCY  
ENGAGEMENT

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## Submittal 2: Recommendations

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That the HISC adopt a resolution, substantially similar to the attached draft resolution, in order to:

1. Recognize the need for new regional biological control research facilities to collaboratively conduct and develop safe and effective biocontrol agents for priority agricultural and environmental pests and weeds that threaten Hawai'i, the Pacific region, and the continental U.S.;
2. Recognize Hawaii's need for modern biocontrol facilities and additional researchers is a top priority in the Hawai'i Interagency Biosecurity Plan and the Western Governors Association's initiative on biosecurity and invasive species; and
3. Support the efforts of the Biocontrol Working Group to identify and pursue funding assistance toward planning and development of new, state-of-the-art biological control facilities in Hawai'i that can serve as a regional research center for biological control programs.



# University of Hawaii Biological Control Research

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Mark G Wright

Dept. Plant & Environmental Protection Sciences

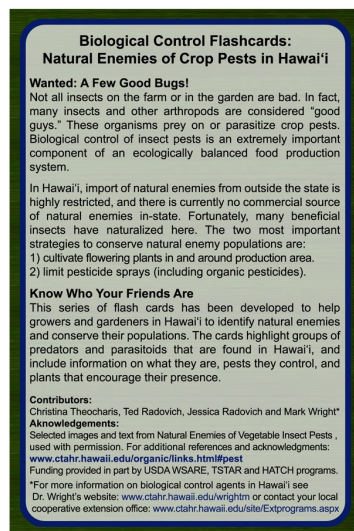
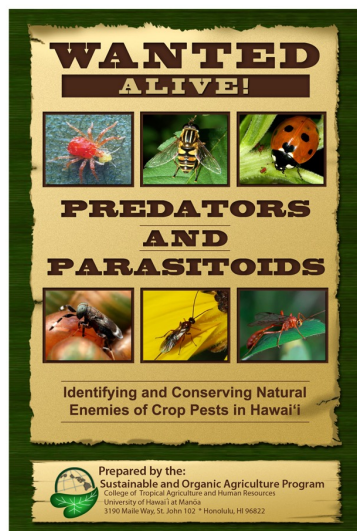
CTAHR, University of Hawaii at Manoa



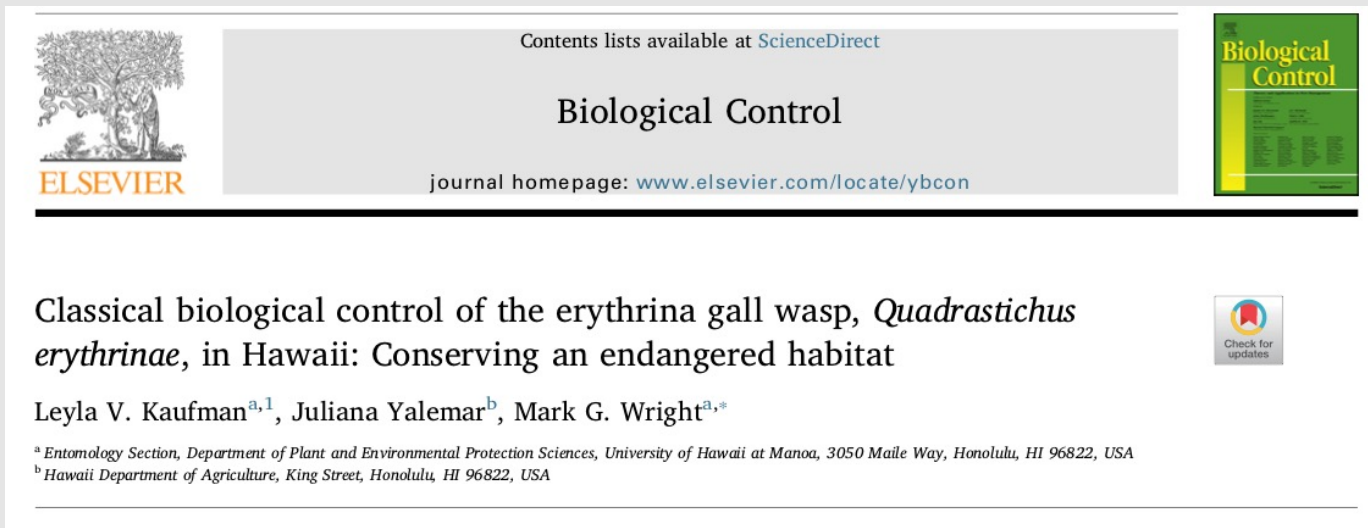
# Historically: UH role

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- Limited access to quarantine facilities; UH typically not considered an exploration partner
- With some exceptions: mostly worked on post-release monitoring, conservation biocontrol, augmentative biocontrol, pest surveys
- Assist with hire of staff for quarantine facility for collaborative projects
- Extension



# Collaborative work – UH & HDoA



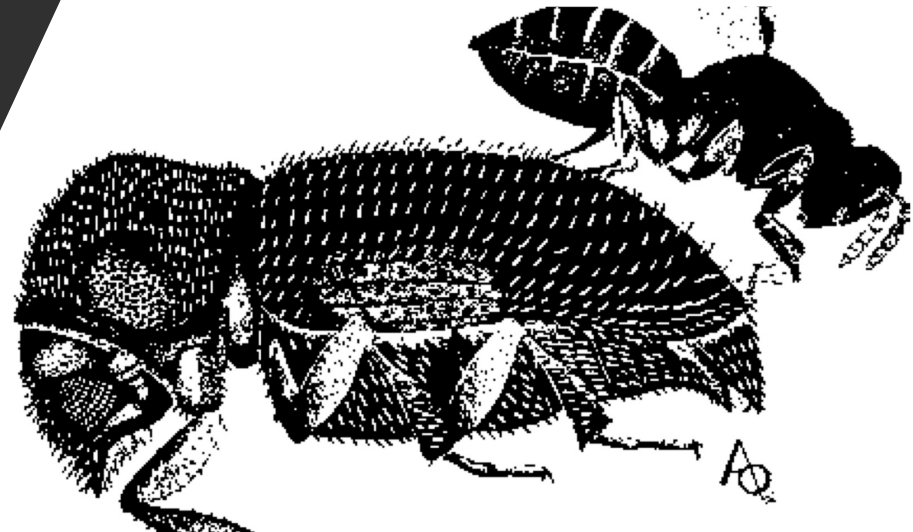
- Contributed to exploration and quarantine work in some cases, e.g. fruit fly parasitoids, aphid parasitoids, erythrina gall wasp parasitoids.
- Fruit flies: Russell Messing (ret) – postdocs to conduct quarantine work.
- Aphids 'exempt' from State quarantine – conducted work in UH facilities.
- Produced collaborative publications, releases of natural enemies.

# Current UH Classical BioControl research

- UH CTAHR / USDA ARS post-doc conducting non target screening of coffee berry borer parasitoid in Volcano quarantine facility
- Dependent on collaborative arrangements with Forest Service
- UH also conducting work on native Scolytinae for non-target screening



*X. molokaiensis*. C. Gillett





# Constraints, opportunities

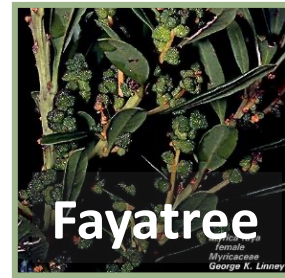
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- Inadequate space in current HDoA quarantine for extensive collaboration
- Small insect containment facility on Manoa campus (CRB)
- Impractical to have graduate students work on classical biocontrol projects from inception
- CTAHR has the potential to contribute extensively on classical biocontrol projects – research faculty, flexibility in hiring postdocs, students, technicians, and produce collaborative outcomes (with HDoA, ARS).



# Developing biological control for Pacific Island forest weeds

## Target Selection



## Foreign Exploration



## Quarantine Testing



## Release & Monitor



Biocontrol of strawberry guava

**Biocontrol is a lengthy process involving much collaboration!**



# Biocontrols for invasive Melastomataceae

(all melastomes in Hawaii are alien)



*Miconia*

*Syphraea uberabensis*



*Euselasia chrysippe*



*Tibouchina* &  
*Melastoma*



Nematode galls  
*Ditylenchus gallaeformans*

*Allorhogas clidemiae*  
wasp galls fruit



*Clidemia*











# Microscopic biocontrols require higher-level containment



Fungus on miconia  
*Coccodiella miconiae*



Nematode (on Clidemia / Miconia)  
*Ditylenchus gallaeformans*



Mite galls  
on leaf of  
Albizia





# Biological Control Facilities: Present and Future

Presentation to the Hawaii Invasive  
Species Council

Darcy Oishi

Hawaii Department of Agriculture





# Insect Containment

- Built in 1950's around an open concept design
- Larger insect projects (as both target for biocontrol and as natural enemy) OK
- Smaller projects (mites and thrips for example) cannot be worked on
- Open concept design creates work-flow issues especially with lack of green house space for plants
- Inadequate environmental control but especially bad in the containment greenhouse

# Support facilities

- Insectary
  - Inadequate climate control
  - Open design
- No green houses
  - Plants must be maintained outside in cages





# Plant Pathology- A troubling history

- 1986- Construction completed but failed commissioning by USDA
- 1988- Retrofitting of HV/AC to meet standards
- 1991- Grand opening of the facility
- 2011- Shut down of facility to re-do HV/AC systems
- 2013- Facility cannot meet USDA standards
- 2021



# Vision

- Containment
  - Ability to run 10 simultaneous projects in the same facility (pathogens and insects) in different suites including support for other agencies to work on projects
  - Ability to meet Level 3 containment standards (Filtration of water and air into and out of the designated suites) for insects and pathogens
- Support- biocontrol work includes more than containment!
  - Green houses to support plants for rearing of biocontrol agents and host range testing
  - Climate controlled insectaries with individual suites
  - Bank of growth chambers for pathogens
  - Diagnostic (morphological, molecular, and archives) facilities to support biocontrol work including diagnostic containment facilities for select agents.
  - Laboratories for related work

HISC Meeting  
9 June 2021

Nicholas C. Manoukis  
USDA-Agricultural Research Service  
Hilo, Hawai'i USA

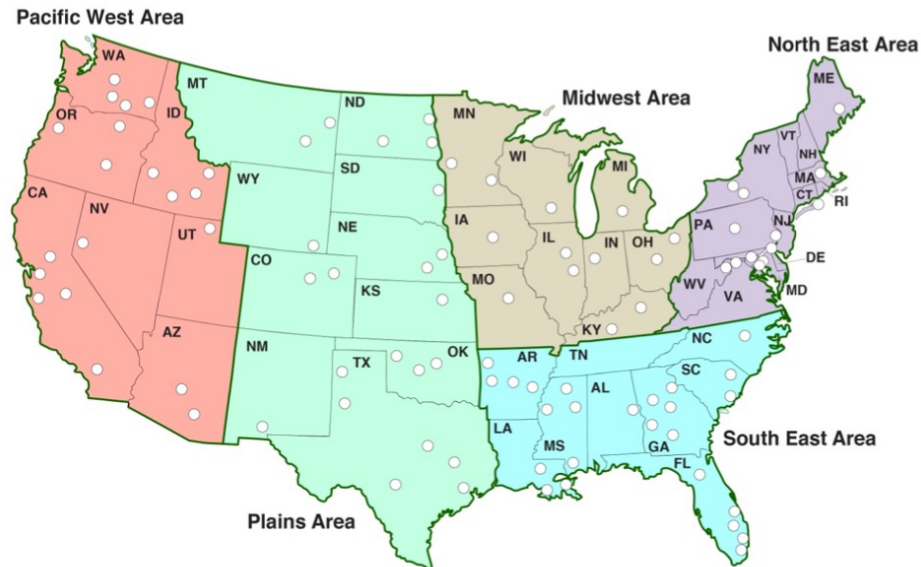
# Biological Control for Agriculture in Hawaii: Some Highlights



# USDA's chief intramural research agency

## Agricultural Research Service (ARS)

## USDA's chief in-house research agency



**The bold lines reflect the boundaries of the ARS geographic Areas.**



# Tropical Crop and Commodity Protection

- 15 Scientists
- 9 Postdocs
- 12 Technicians (perm)
- Total size ~45 people

## Invasive pest research:

- Biology
- Ecology
- Genomics
- Detection/Mitigation
- IPM
- Biocontrol/Quarantine

Screenshot of the Tropical Crop and Commodity Protection Research website (Hilo, HI).


**USDA Agricultural Research Service**  
U.S. DEPARTMENT OF AGRICULTURE

ARS Home | About ARS | Contact Us

### Tropical Crop and Commodity Protection Research: Hilo, HI

Research ▾ People ▾ Scientist Pages ▾

Fruit fly parasitoids ovipositing in rearing. Techniques to mass produce braconid biological control agents such as these have a long history in the unit. Photo: N Manoukis.



**MISSION**

The mission of the Tropical Crop and Commodity Protection Research Unit is to develop pre and postharvest technologies and management strategies for invasive pests, and to open and maintain market access and improved quality of tropical fruit, vegetable and ornamental crops grown in the Pacific Basin.

**RESEARCH PROJECTS**

- [Detection, Control and Area-wide Management of Fruit Flies](#)

**People**

- [Aldebron, Charlotte](#)
- [Asmus, Glenn](#)
- [Auth, Jean](#)
- [Bloch, Austin](#)
- [Carvalho, Lori](#)
- [Cha, Dong](#)

The Tropical Crop and Commodity Protection Research is located in Hilo, HI and is part of the [Pacific West Area](#).  
The Research Leader is Nicholas Manoukis.  
Email: [nicholas.manoukis@usda.gov](mailto:nicholas.manoukis@usda.gov)  
Phone: 808-932-2118  
Fax: 808-959-5470  
USDA-ARS-PWA-DKI-USPBARC  
64 Nowelo Street  
Hilo, HI 96720

# Outline

1. In depth: Fruit flies and their biological control history
2. Lessons learned
3. BC projects at USDA-ARS today & tomorrow

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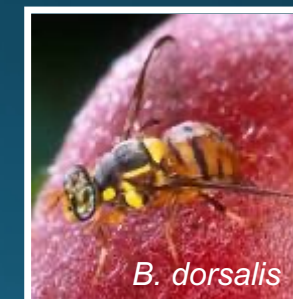
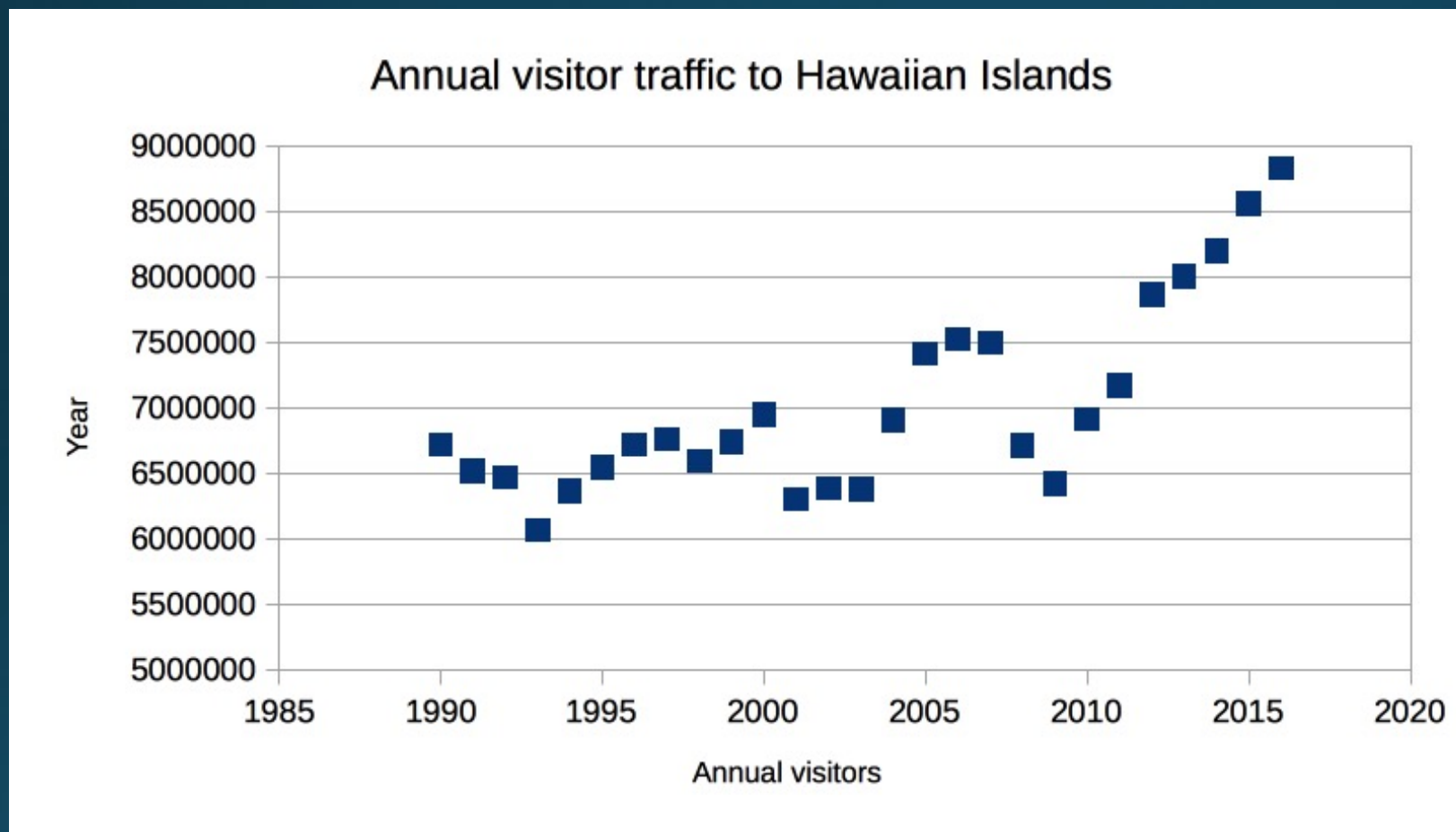


# Economic Impact of Tephritids

- Extensive direct damage to fruits and vegetables.
- Quarantine restrictions can be imposed on infested areas.
- Commercial fruits must undergo quarantine treatment prior to export.
- Provide a breeding reservoir for their introduction into other parts of the world due to current unprecedented levels of travel and trade between countries.



# Globalization and Spread of Fruit Flies



Up to 30K/day in 2017

# Exotic Tephritids in Hawai'i

MELON FLY (1895)  
*Zeugodacus cucurbitae*



MEDITERRANEAN FRUIT FLY (1910)  
*Ceratitis capitata*



OLIVE FRUIT FLY (2019)  
*Bactrocera oleae*



ORIENTAL FRUIT FLY (1945)  
*Bactrocera dorsalis*



MALAYSIAN FRUIT FLY (1983)  
*Bactrocera latifrons*





# >100 Years of USDA Fruit Fly Control Research in Hawai'i

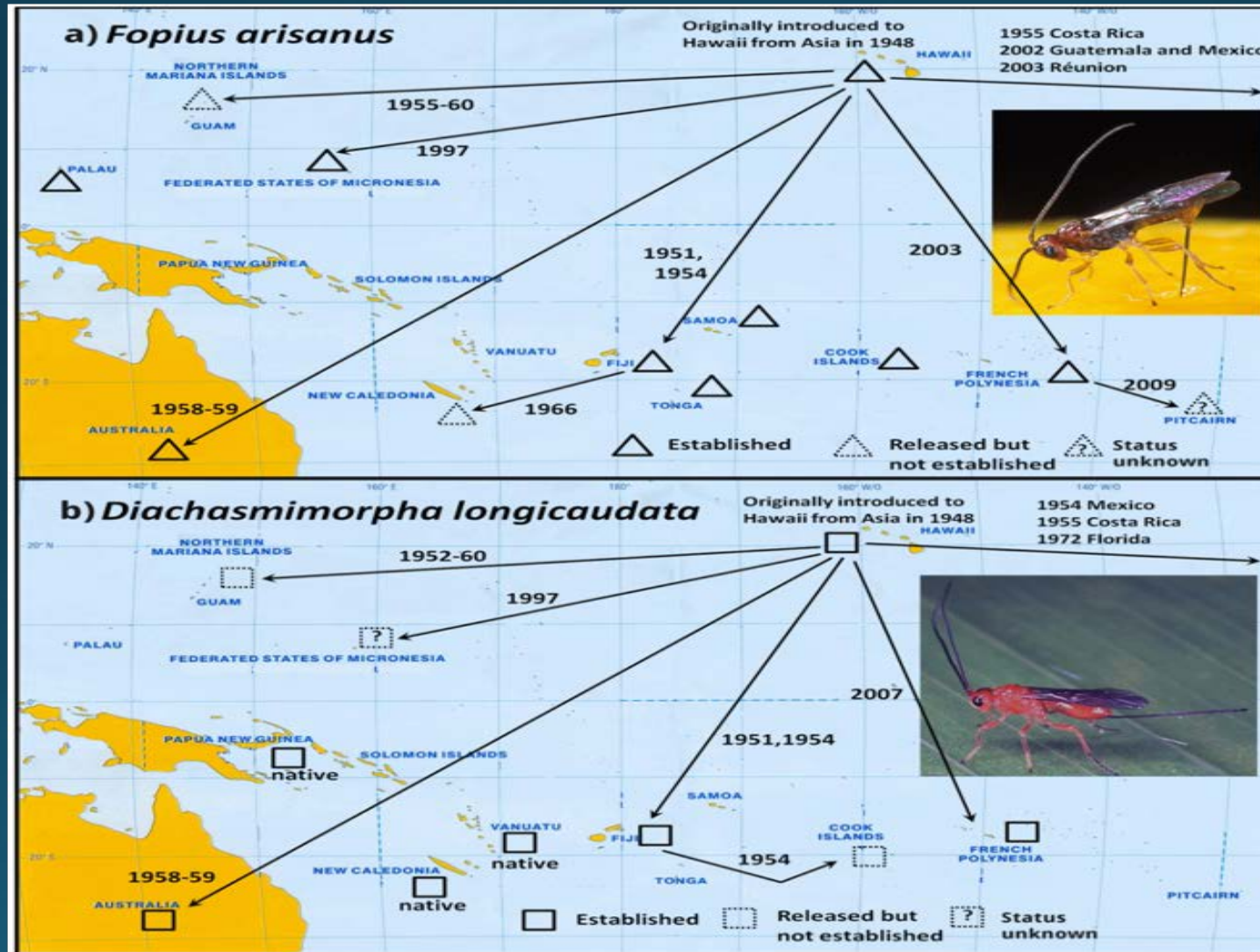




# Biological Control of FFs in Hawai'i

- 8 hymenopterous parasitoids and 6 predators introduced in response to *Z. cucurbitae* establishment in 1895 (1914-1950).
- 32 natural enemies introduced against *B. dorsalis* from 1947-1952.
- *Fopius arisanus* is an egg/larval parasite introduced into Hawai'i about 1950.
- *Diachasmimorpha longicaudata* was superseded by *Biosteres vandenboschi* which in turn was superseded by *F. arisanus*.
- Recent surveys have determined *F. arisanus* to be the primary parasitoid attacking oriental fruit fly, comprising more than 90% of the parasite guild.
- **Establishment of *F. arisanus* in Hawai'i is considered the most outstanding success in biological control of fruit flies.**

# Biocontrol Exports (1935-2010)



# Outline

1. In depth: Fruit flies and their biological control history
2. **Lessons learned**
3. BC projects at USDA-ARS today & tomorrow



# Lessons Learned

## 1. Focus on infrastructure is critical

- Quarantine & screening stage
- Operational experience takes time
- Rearing procedures are not simple, require development
- Colony loss can set program back

## 2. Measuring the outcome is essential

- Stakeholders will want to measure impact
- Will be a useful basis for comparison

# Outline

1. In depth: Fruit flies and their biological control history
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3. **BC projects at USDA-ARS today & tomorrow**

# BC Projects at USDA-ARS Today

- Coffee Berry Borer (Predators & *Phymasticus*)
- Olive fly
  - Screening established parasitoids
  - Collaboration with EBCL
- Other fruit flies

International Journal of Tropical Insect Science (2021) 41:285–294  
<https://doi.org/10.1007/s42690-020-00205-9>

## ORIGINAL RESEARCH ARTICLE

Feeding habits, movement, and reproduction of the predatory flat bark beetles *Cathartus quadricollis* (Coleoptera: Silvanidae) and *Leptophloeus* sp. (Coleoptera: Laemophloeidae) in Hawaii coffee and macadamia nut

Eva Brill<sup>1</sup>  · Peter A. Follett<sup>1</sup> · Andrea M. Kawabata<sup>2</sup>

Received: 7 October 2019 / Accepted: 2 July 2020 / Put  
© The Author(s) 2020

Journal of Pest Science  
<https://doi.org/10.1007/s10340-021-01353-8>

## ORIGINAL PAPER

Limited host range in the idiobiont parasitoid *Phymasticus coffea*, a prospective biological control agent of the coffee pest *Hypothenemus hampei* in Hawaii

Fazila Yousuf<sup>1,2</sup> · Peter A. Follett<sup>1</sup> · Conrad P. D. T. Gillett<sup>2</sup> · David Honsberger<sup>2</sup> · Lourdes Chamorro<sup>3</sup> · M. Tracy Johnson<sup>4</sup> · Marisol Giraldo-Jaramillo<sup>5</sup> · Pablo Benavides-Machado<sup>5</sup> · Mark G. Wright<sup>2</sup>

Received: 2 August 2020 / Revised: 7 February 2021 / Accepted: 15 February 2021  
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BioControl (2021) 66:83–96  
<https://doi.org/10.1007/s10526-020-10057-4>

Non-target effects of the exotic generalist parasitoid wasp *Fopius arisanus* (Sonan) estimated via competition assays against *Doryctobracon areolatus* (Szepligeti) on both native and exotic fruit fly hosts

Beatriz A. G. Paranhos · Sonia Poncio · Renata Morelli · Dori E. Nava · Luiz A. N. de Sá · Nicholas C. Manoukis

Received: 28 March 2020 / Accepted: 8 October 2020 / Published online: 22 October 2020

BioControl (2017) 62:595–602  
DOI 10.1007/s10526-017-9827-7

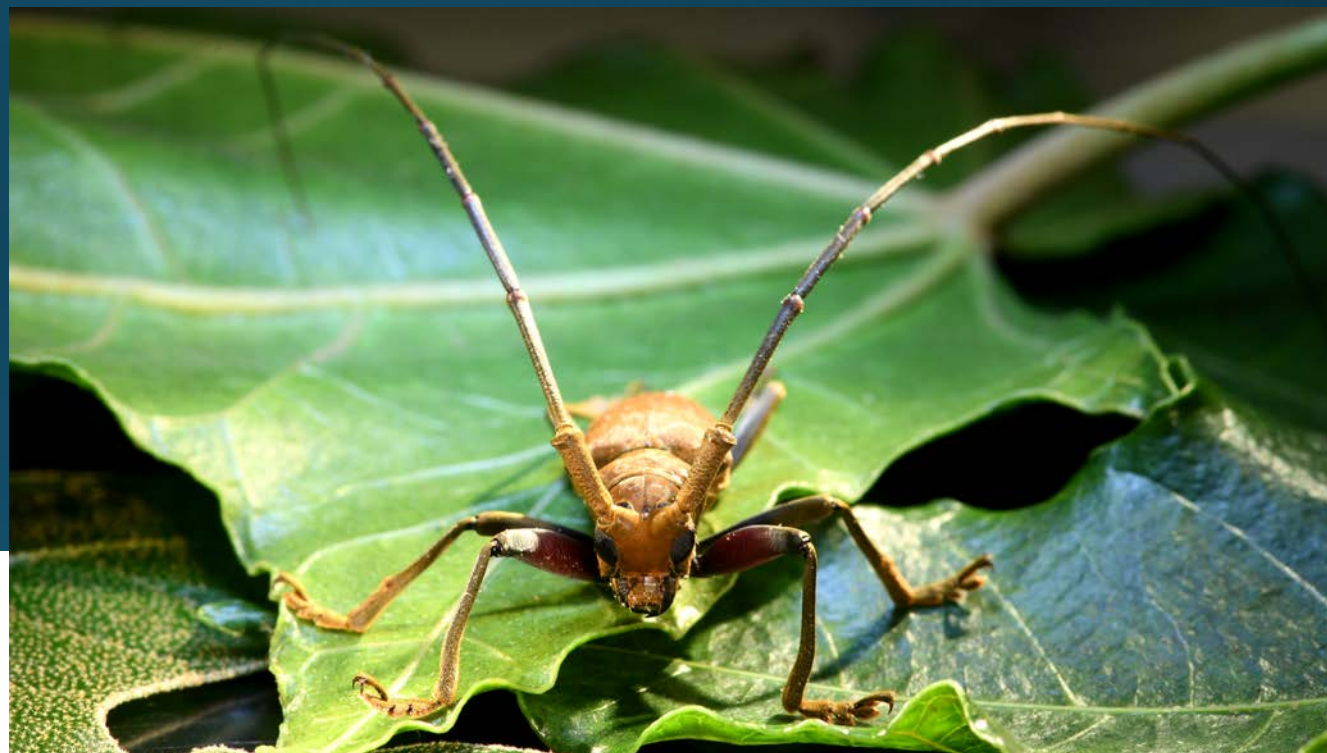
Effect of *Fopius arisanus* oviposition experience on parasitization of *Bactrocera dorsalis*

Rafael da Silva Gonçalves · Nicholas Chirivas Manoukis · Dori Edson Nava



# BC Projects at USDA-ARS Tomorrow

- Queensland Longhorn Beetle
- Macadamia Felted Coccid
- Two Line Spittle Bug
- Coffee Leaf Rust



5

## Environmental Impacts of Arthropod Biological Control: An Ecological Perspective

*David E. Jennings, Jian J. Duan and Peter A. Follett*

### 5.1 Introduction

Arthropod biological control (hereafter 'biocontrol') is the use of natural enemies such as herbivores, parasitoids and predators that act as a 'top-down' ecological force to regulate or suppress an arthropod or weed pest, with the goal of preventing populations from reaching sizes that would result in significant economic and/or ecological damage. The 'top-down' effect of biocontrol results from the dynamics of community-level pro-

# Acknowledgements

- Interagency biocontrol working group
- Previous and current USDA scientists & collaborators
- This work supported by USDA-ARS



Thank you for your attention!

