Biological Control Updates

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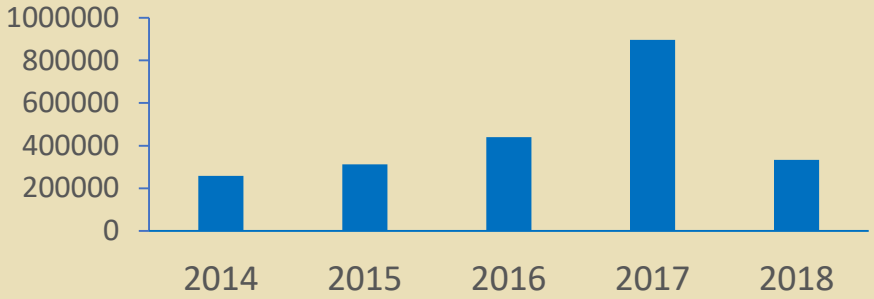
USDA-ARS-Invasive Plant Research Laboratory

Ft. Lauderdale, FL

Overview

- 1. Statistics on agent releases



- 2. Assessment updates: Evaluation and methods improvements

- 3. New agent development

Overview

- **Old World climbing fern, Lygodium (*Lygodium microphyllum*)**
- **Air potato (*Dioscorea bulbifera*)**
- **Waterhyacinth (*Eichhornia crassipes*)**
- **Brazilian peppertree (*Schinus terebinthifolia*)**
- **Melaleuca *(Melaleuca quinquenervia)***
- Earleaf Acacia (*Acacia auriculiformis*)
- Downy rose myrtle (*Rhodomyrtus tomentosa*)

1. Agent releases: Lygodium

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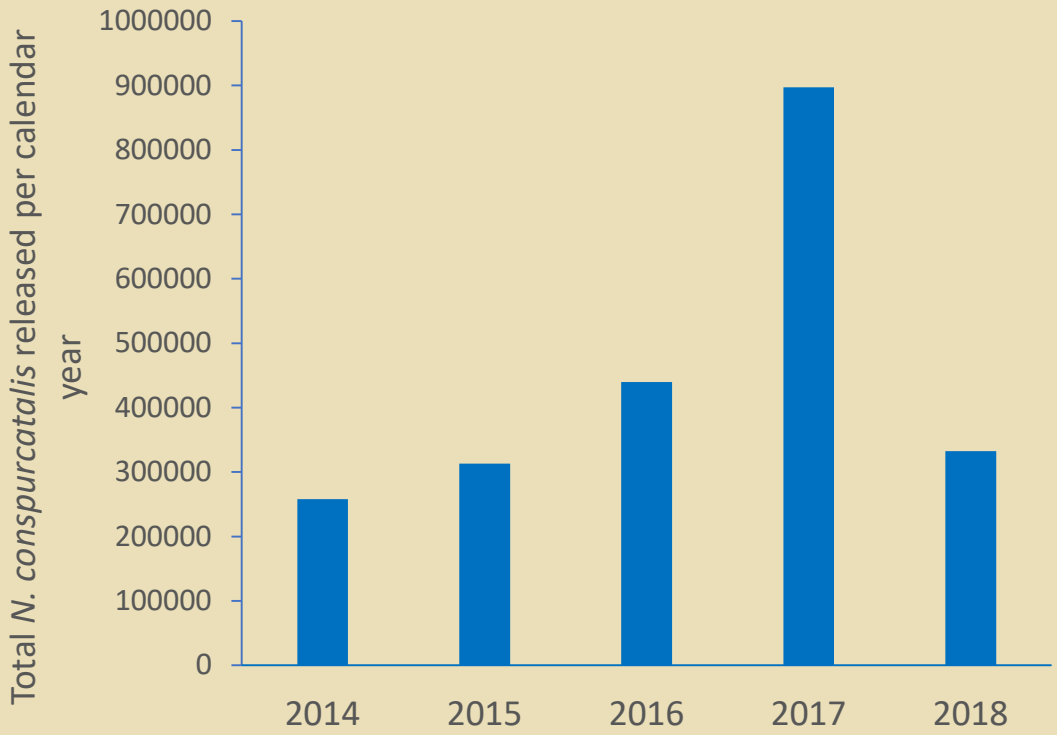
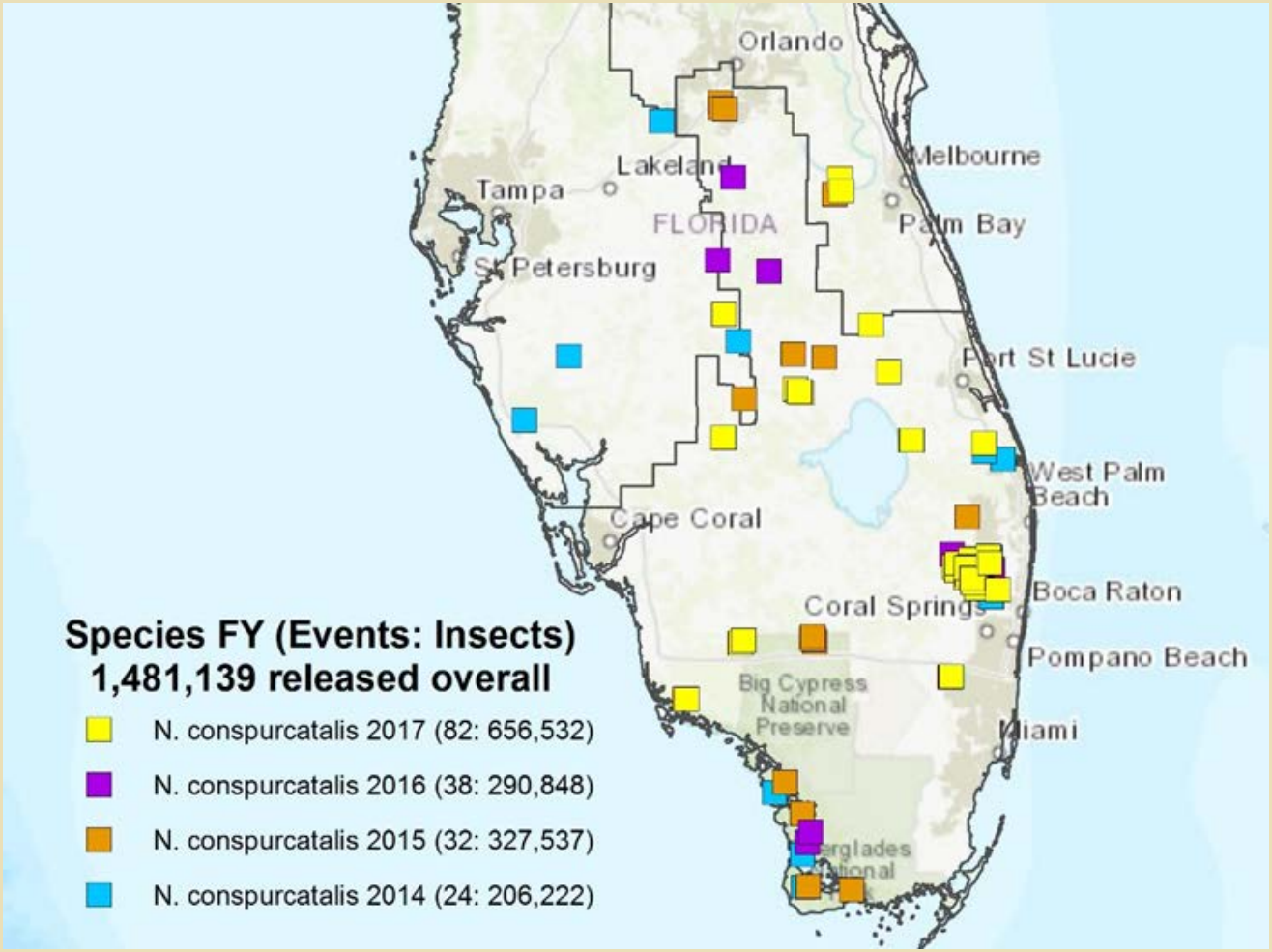
Brown Lygodium moth, *Neomusotima conspurcatalis*



More information: Ellen Lake, Aaron David

1. Agent releases: Lygodium

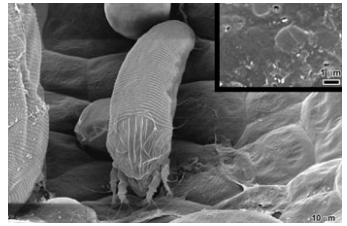
Brown Lygodium moth, *Neomusotima conspurcatalis*



More information: Ellen Lake, Aaron David

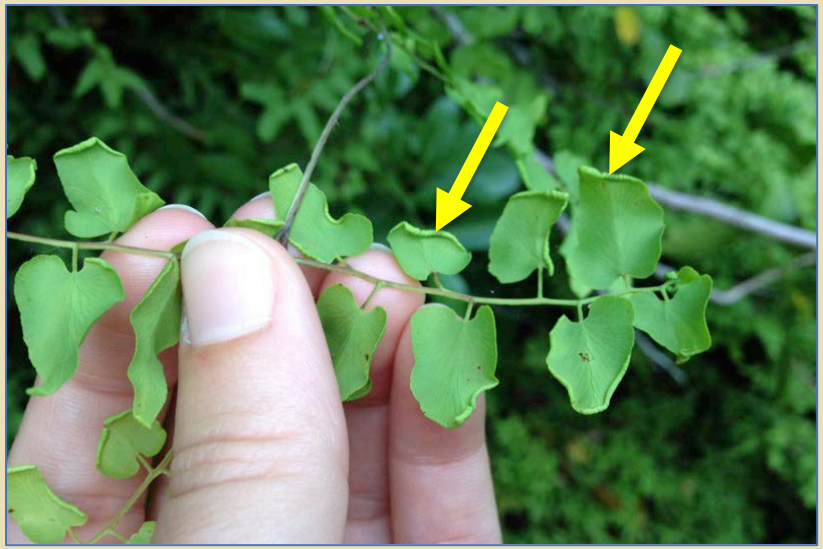
1. Agent releases: Lygodium

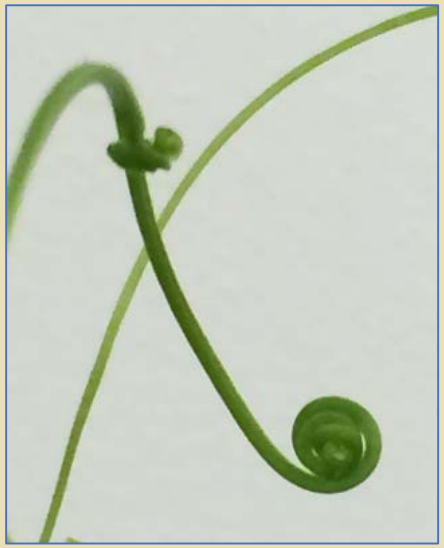
Lygodium mite, *Floracarus perrepae*



Freeman et al. 2005

- Very low establishment success measured in 2011 after initial field releases in 2008
- BUT, now agent more widely distributed than originally thought
- 247,938 released to date in FY 2017-2018





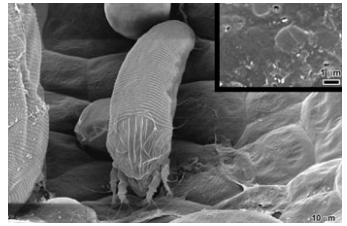
Normal “fiddle head”

Galled “fiddle head”

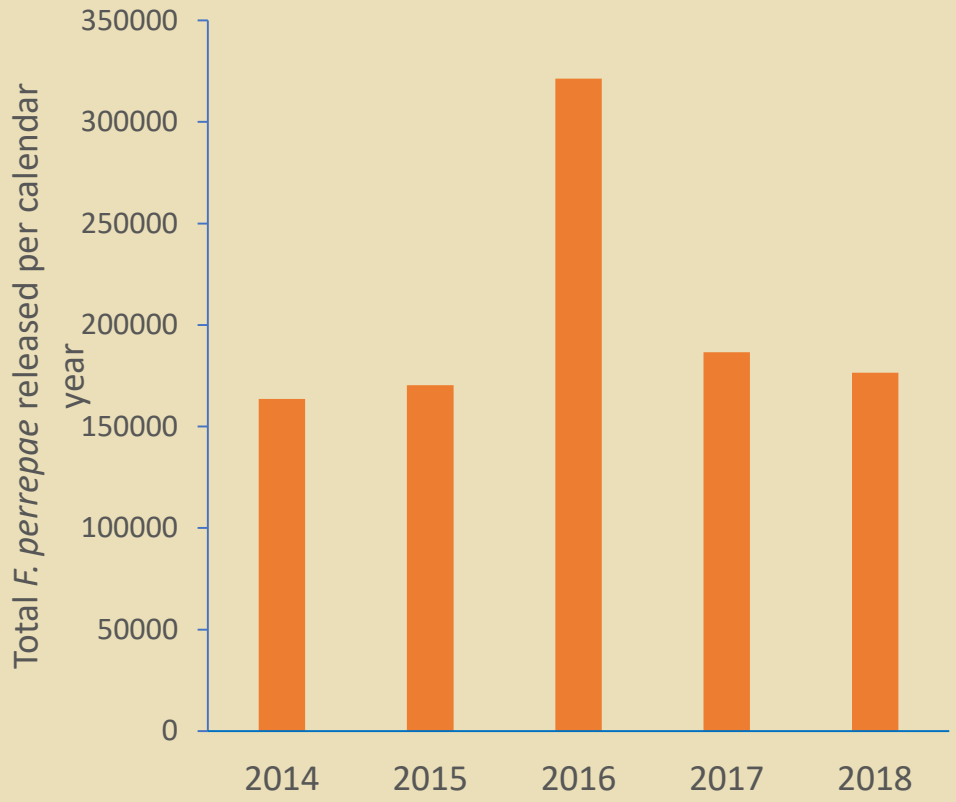
More information: Ellen Lake, Aaron David

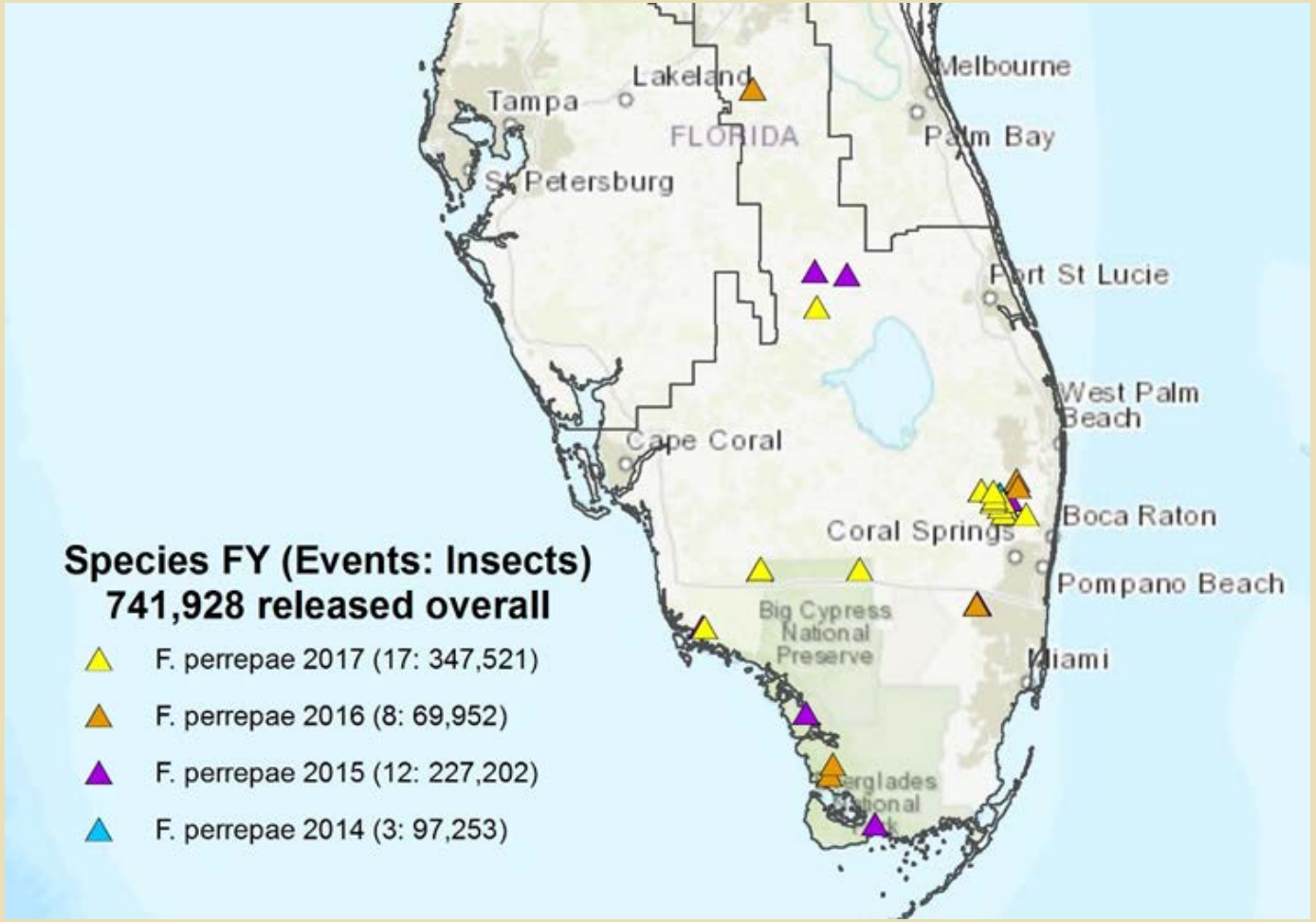
1. Agent releases: Lygodium

Lygodium mite, *Floracarus perrepae*



Freeman et al. 2005





More information: Ellen Lake, Aaron David

1. Agent releases: Air potato

Air potato leaf beetle, *Lilioceris cheni*

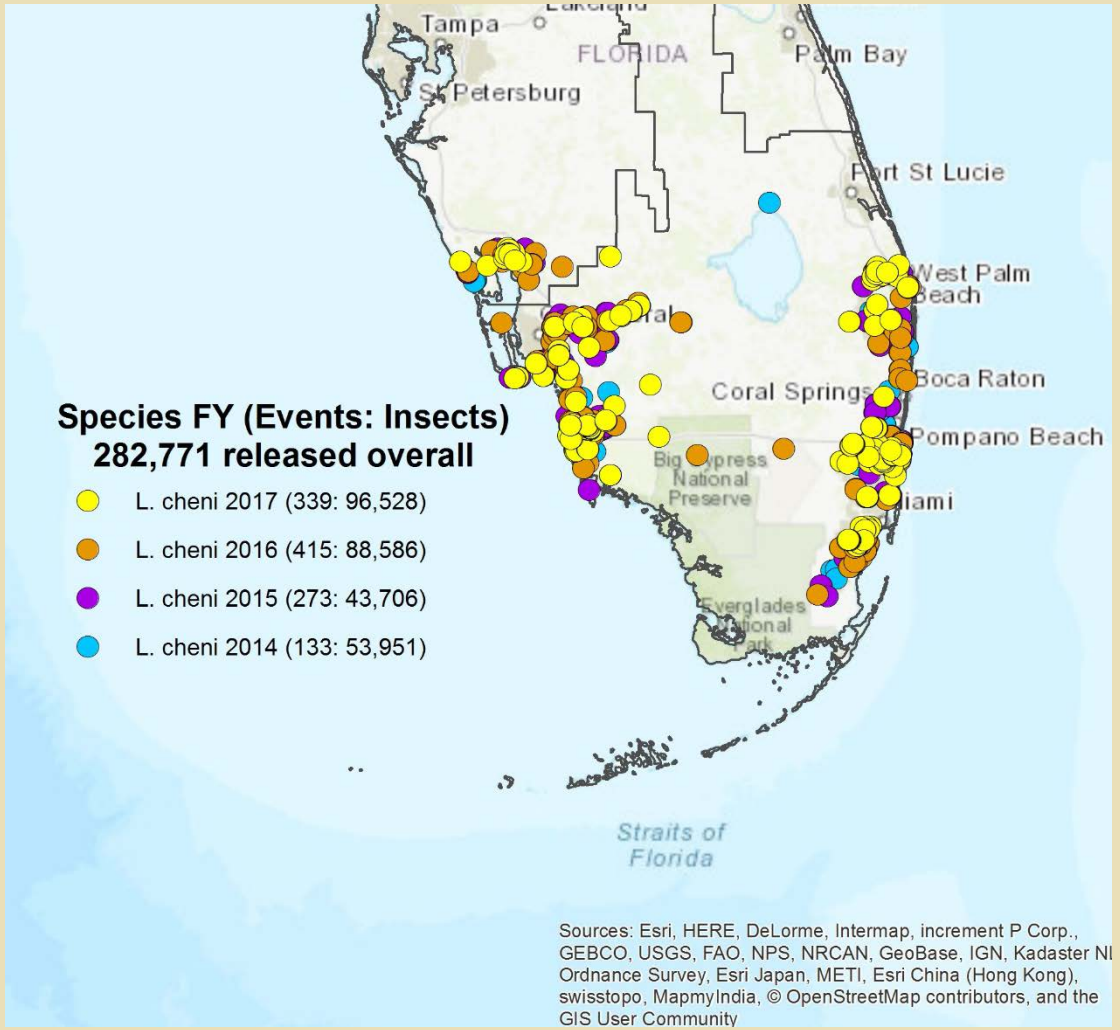
- USDA: 2012 to June 2017
  - 343,326 (southern nine CERP counties)
- FDACS-DPI: 2012 to Sept. 2016
  - 246,747 (central and northern Florida)
- UF-Fort Pierce: 2012 to Sept. 2016
  - 41,224 (central and northern Florida)

More information: Min Rayamajhi

1. Agent releases: Air potato

Air potato leaf beetle, *Lilioceris cheni*

- Map showing releases from 2014 to 2017



More information: Min Rayamajhi

1. Agent releases: Waterhyancinth

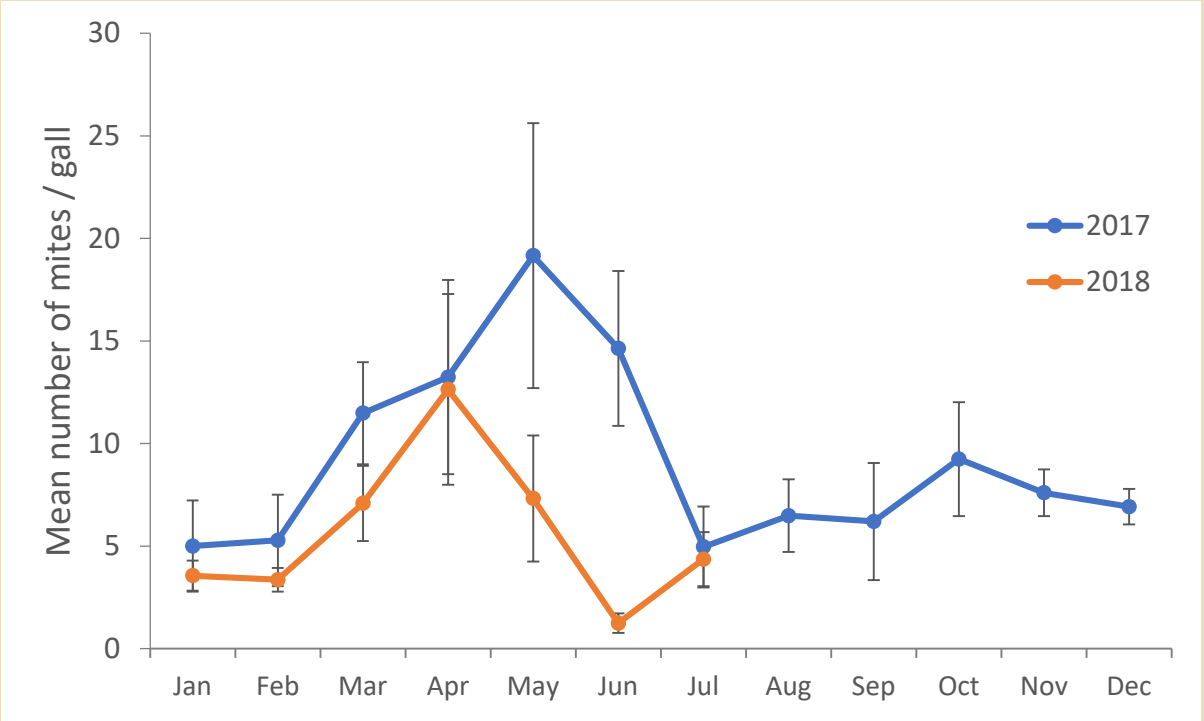
Waterhyacinth planthopper, *Megamelus scutellaris*

- 2015: 570,552
- 2016: 560,297
- 2017: 1,278,133
- 2018: 65,045 so far

More information: Phil Tipping, Ashley Goode

2. Assessment updates: Lygodium

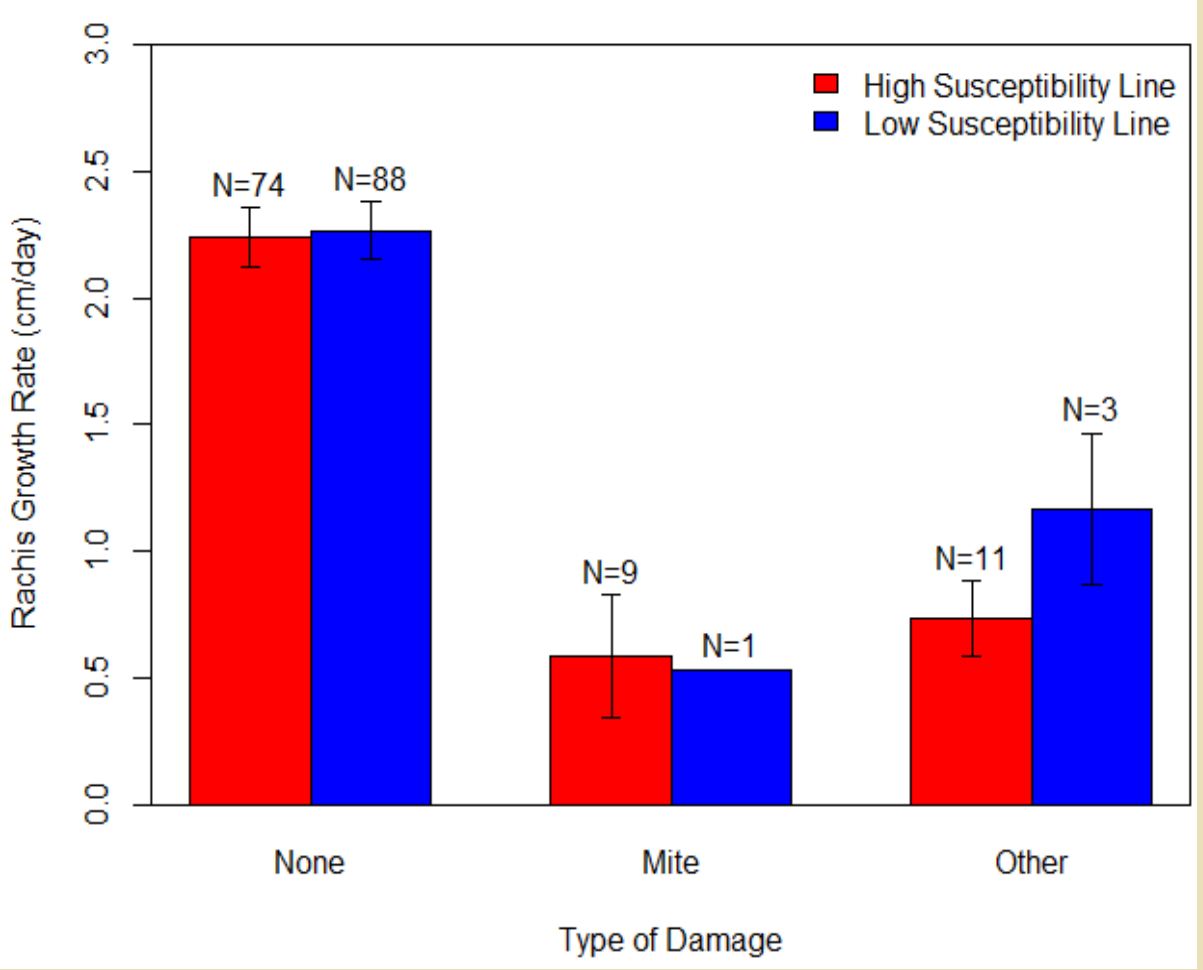
- Mite population monitoring
- Peak mite populations occur in spring, with a sharp drop off in summer



More information: Ellen Lake, Aaron David

2. Assessment updates: Lygodium

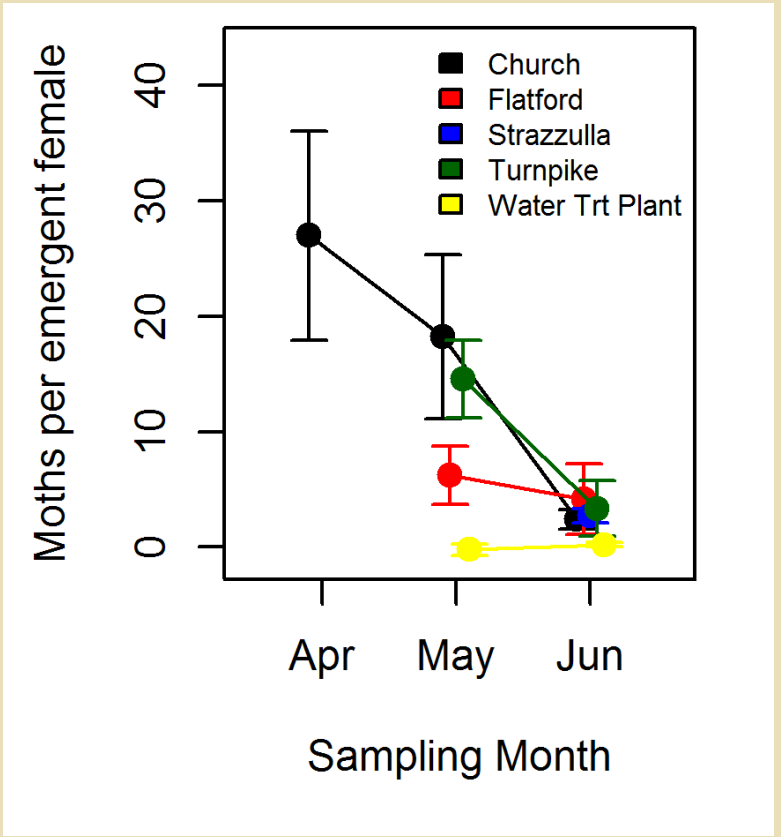
- Mite damage reduced rachis growth rate 4x



More information: Ellen Lake, Aaron David

2. Assessment updates: Lygodium

- Moth population monitoring



More information: Ellen Lake, Aaron David

2. Assessment updates: Lygodium

- Synergistic effects

More information: Ellen Lake, Aaron David

2. Assessment updates: Air potato

- *Lilioceris cheni* established at 75% of surveyed points
- Impacts
  - Reduction in bulbil coverage: 20-42/m^2 in 2012 to < 1/m^2 in 2016
  - Reduction in vine cover: 73% in 2012 to 16% in 2016
  - Additional impact analyses in progress

More information: Min Rayamajhi

2. Assessment updates: Waterhyacinth

- Dispersal observed from almost every release site
- Interactions between *M. scutellaris*, *M. davisi*, and *Kalopolynema ema* – is parasitism affecting release efforts?
- Refuge sites – can reservoirs of untreated waterhyacinth help maintain agent populations?
  - Tank study with USACE
  - Field study on Lake Okeechobee with FWC

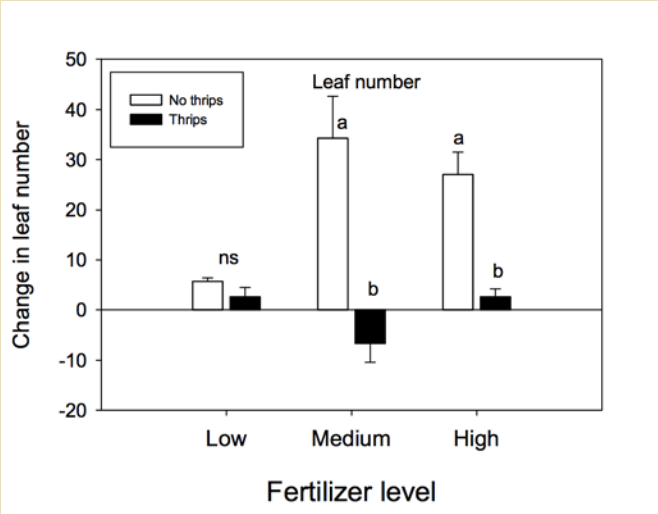

Refuge site on Lake Okeechobee

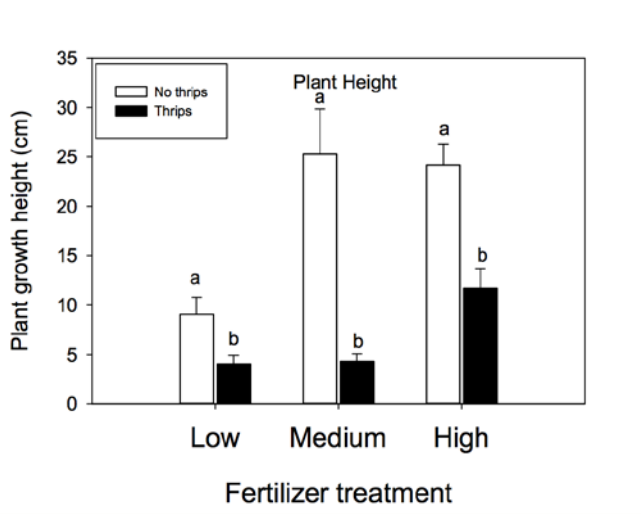
Dispersal of MS on the Lake

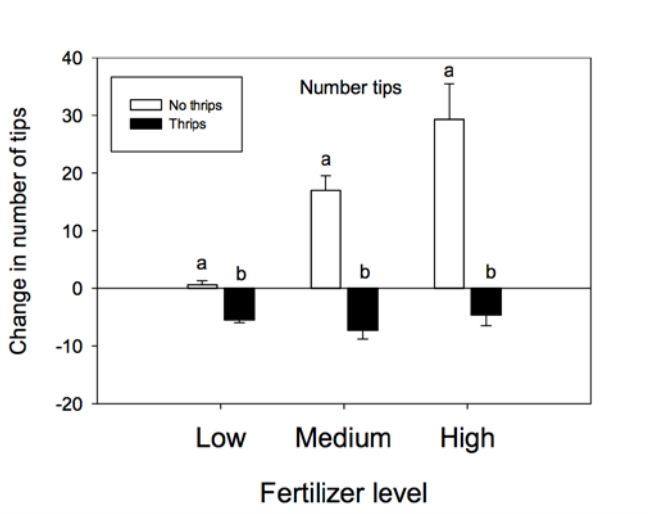

Looking at parasitism at different distances from *Nuphar*

2. Assessment updates: Brazilian peppertree

- *Pseudophilothrips ichini*

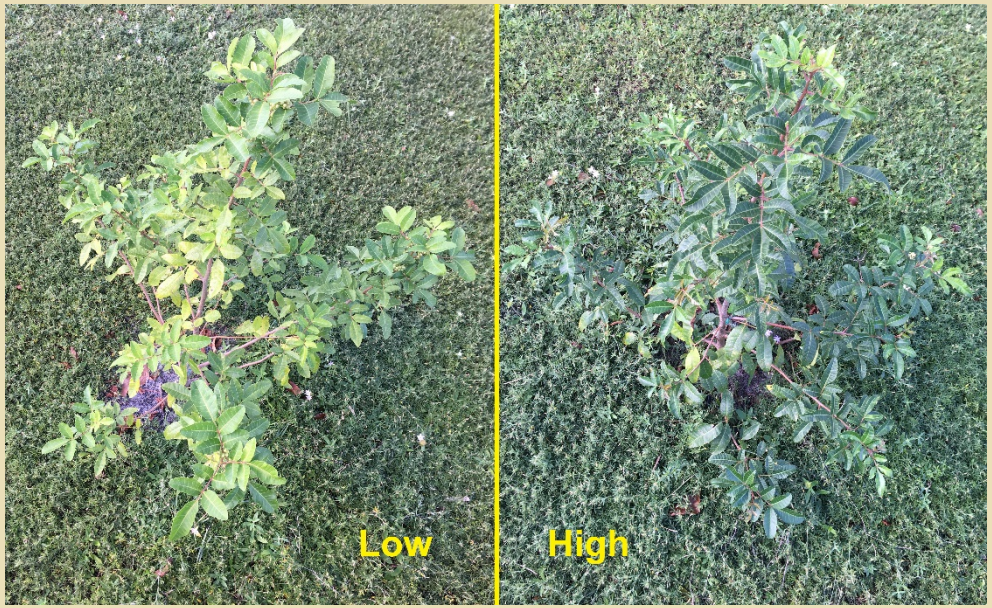


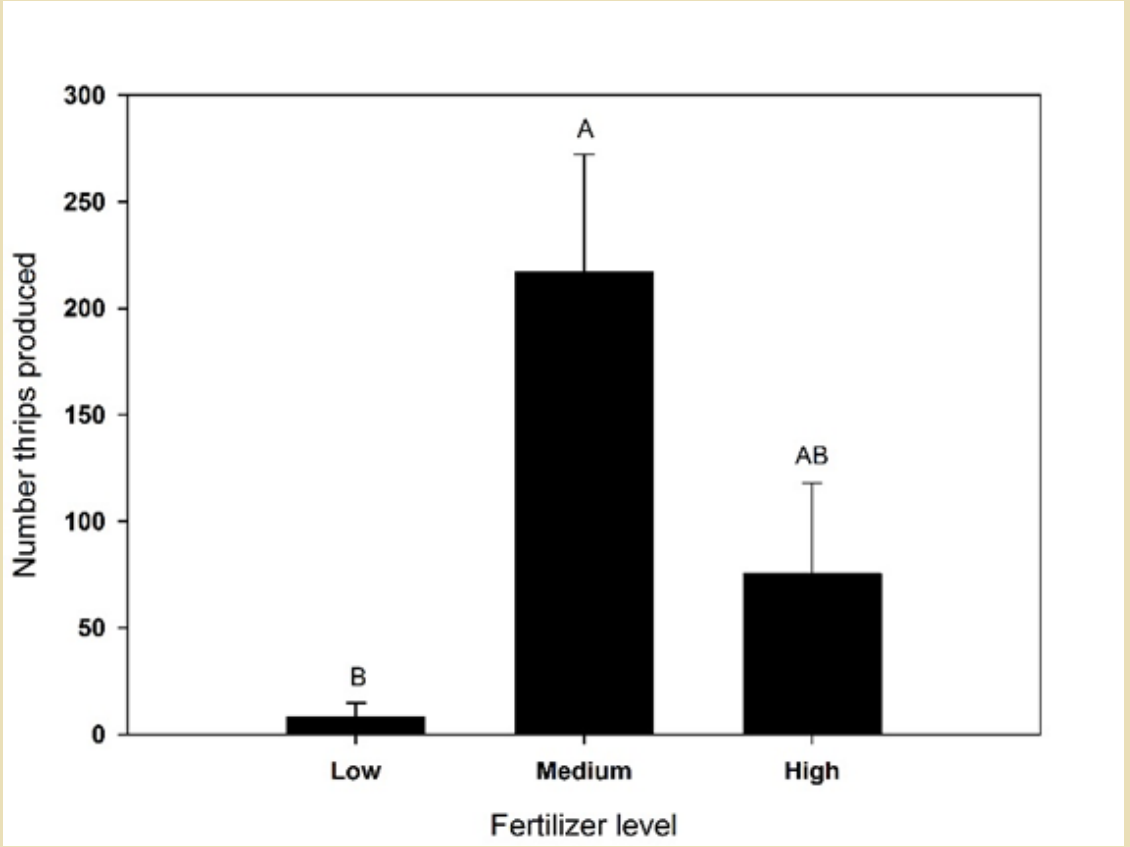




2. Assessment updates: Brazilian peppertree

- Will fertilized nursery plots bolster thrips source populations?

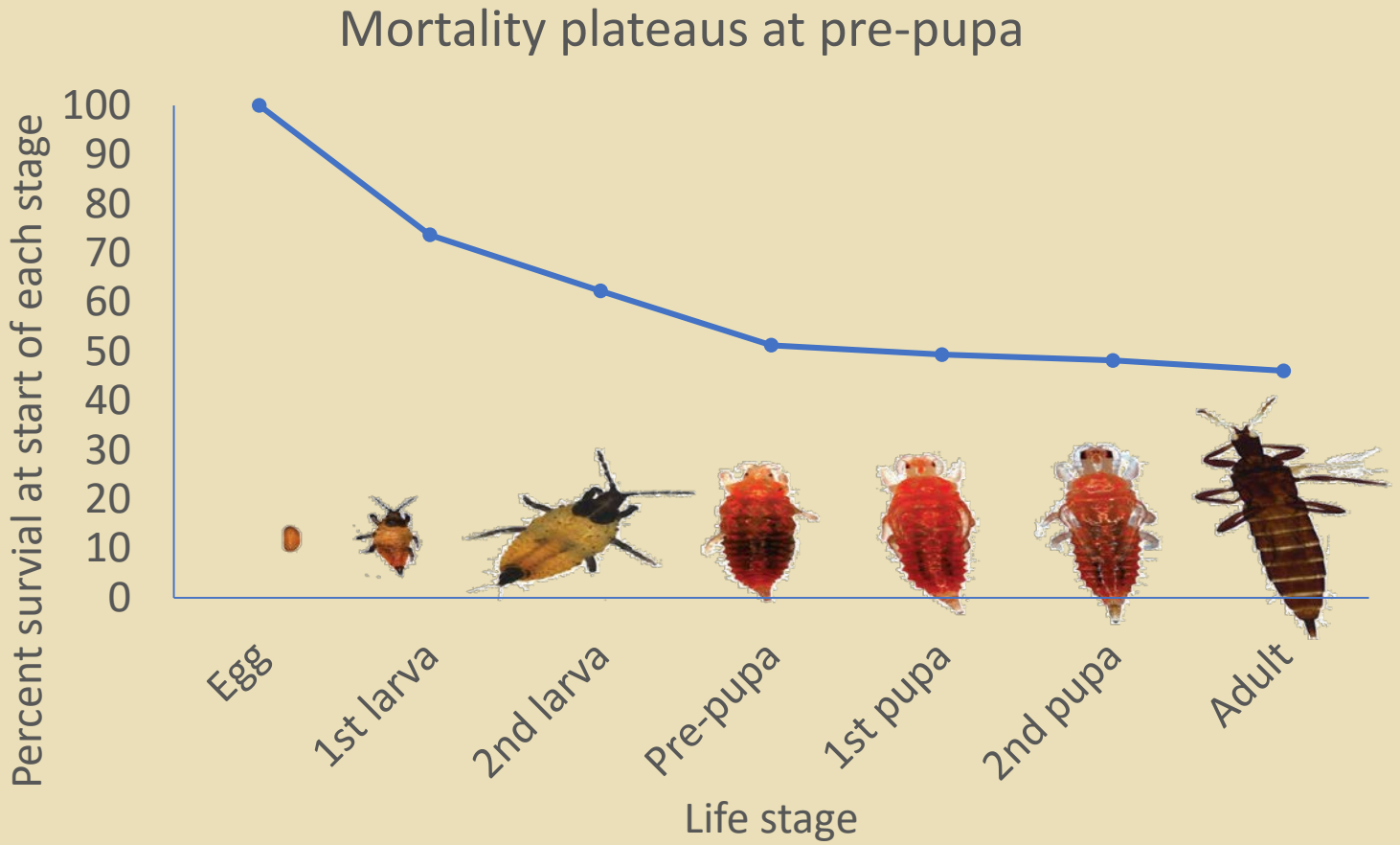




More information: Greg Wheeler, Dale Halbritter

2. Assessment updates: Brazilian peppertree

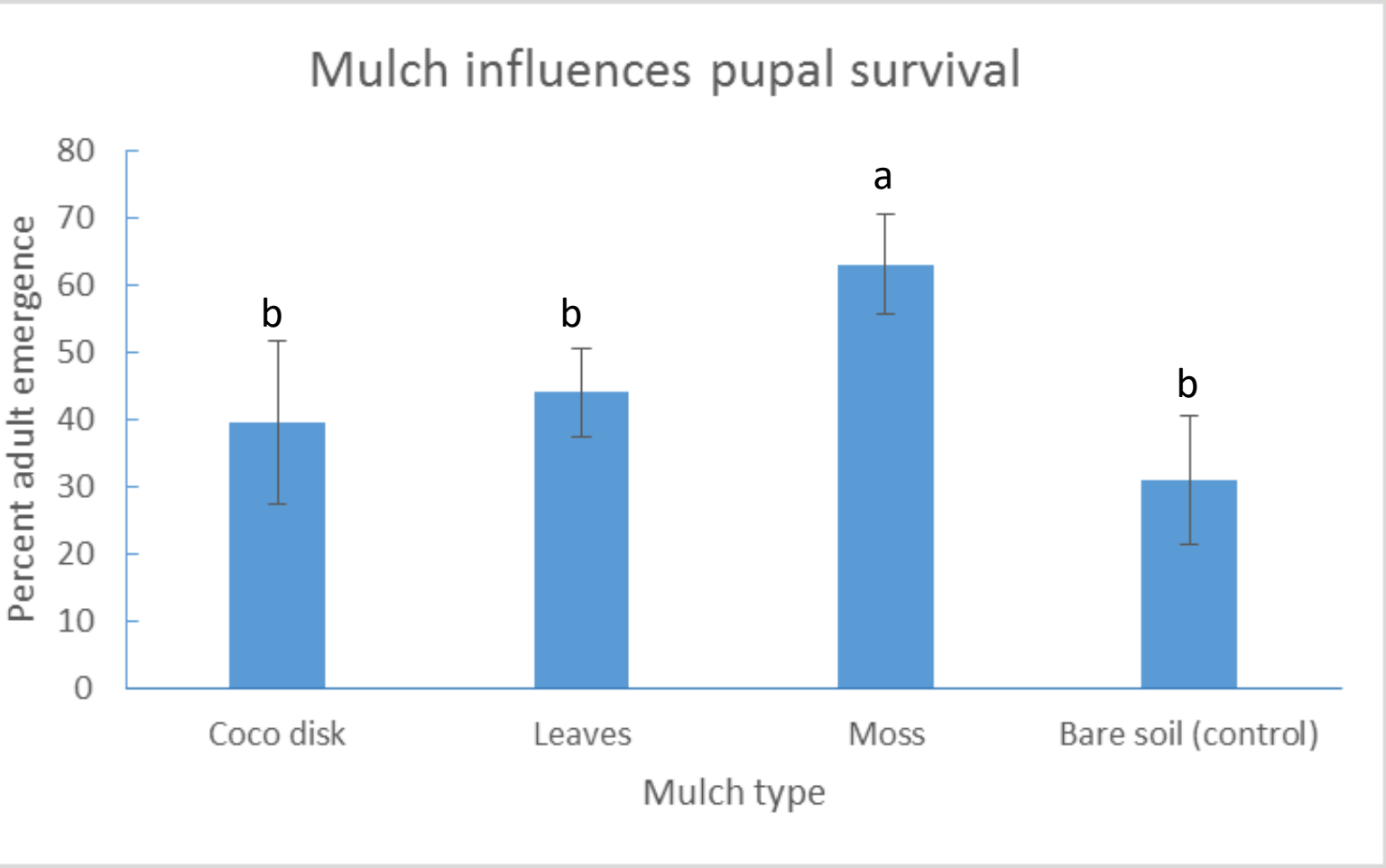
- Thrips: Which stage would be best to release?



More information: Greg Wheeler, Dale Halbritter

2. Assessment updates: Brazilian peppertree

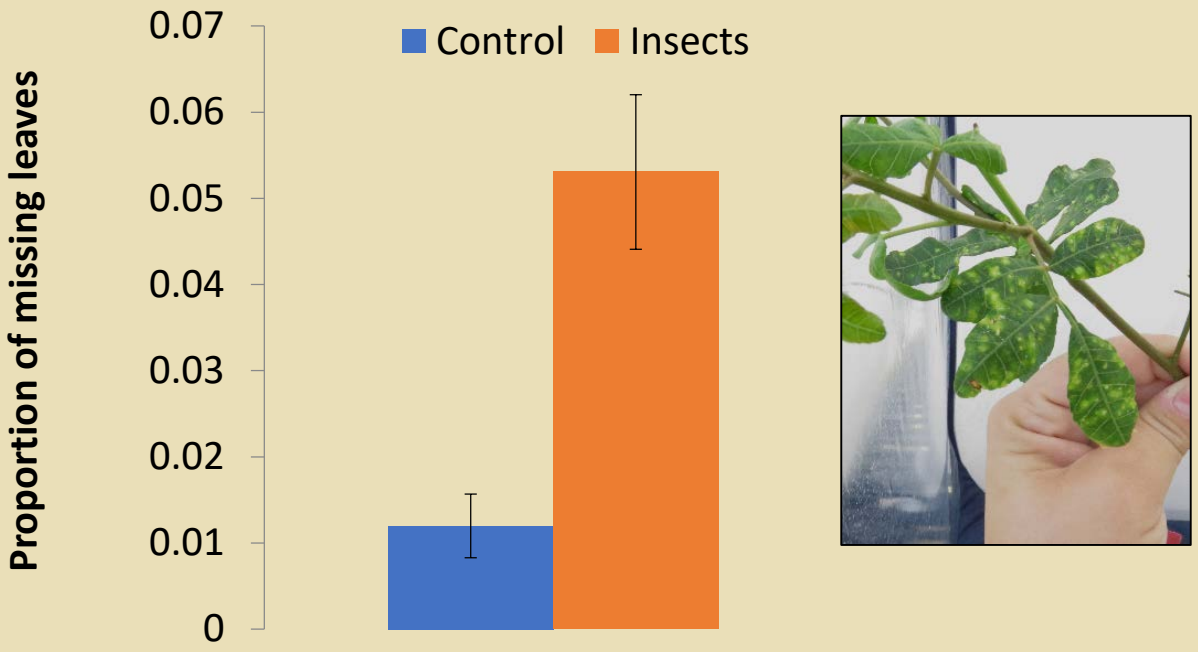
- Mass production strategies
  - Comparing pupation substrates

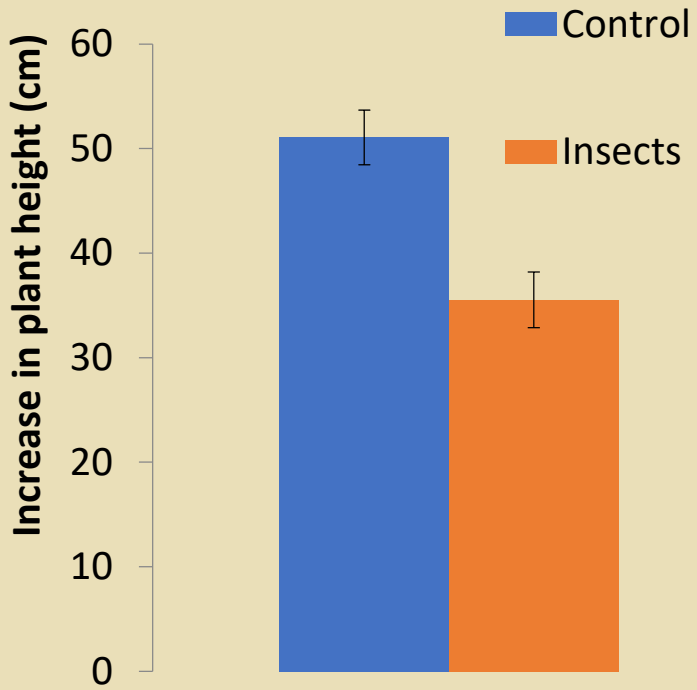


More information: Greg Wheeler, Dale Halbritter

2. Assessment updates: Brazilian peppertree

- *Calophya latiforceps:* pit galls reduce plant growth

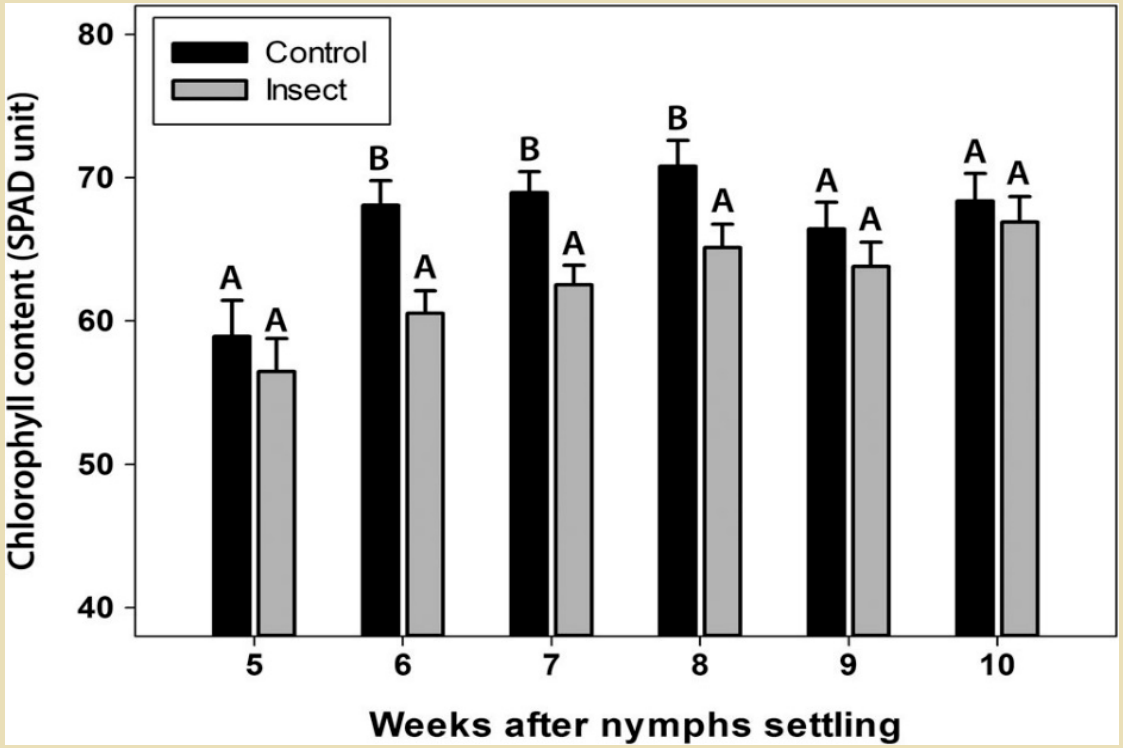


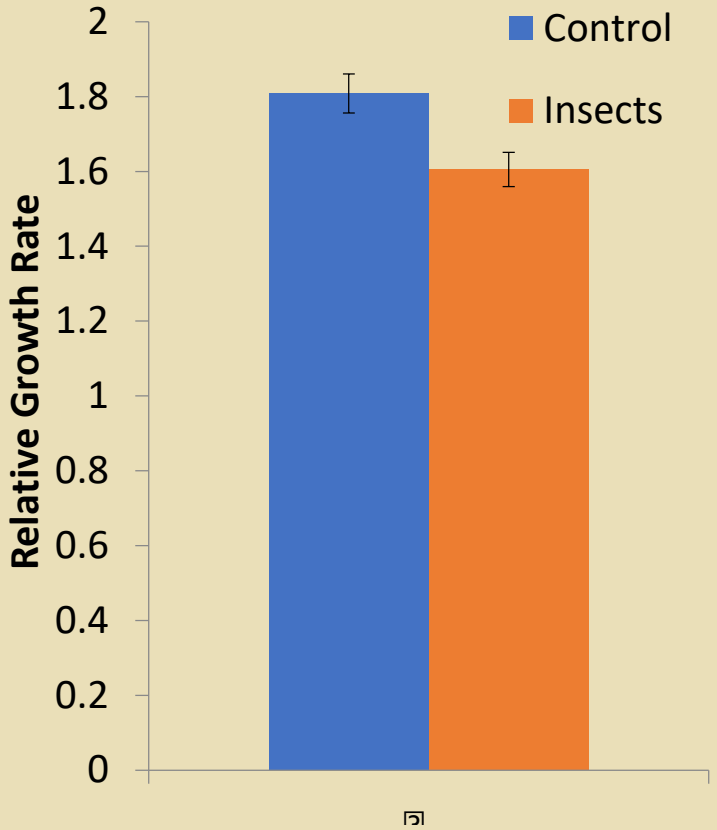


More information: Carey Minteer

2. Assessment updates: Brazilian peppertree

- *Calophya latiforceps:* pit galls reduce plant growth





More information: Carey Minteer

3. Agent development: Lygodium

- *Neostrombocerus albicomus*
- Egg to adult 37 to 43 d
- Multigen testing
- ~1-2 more years in development

Egg → Larva → Pupa → Adult → Egg

More information: Ellen Lake, Aaron David

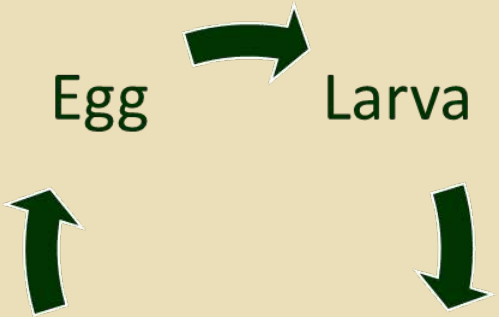
3. Agent development: Lygodium

- *Siamusotima disrupta,* + 3 others
- Stem borer
- Can damage and kill rachis
- Difficult to colonize thus far
- ~3-4 more years in development

More information: Ellen Lake, Aaron David

3. Agent development: Lygodium

- *Lygomusotima stria*
- Defoliator
- Lygodium specialist
- Cold tolerance testing
- ~ 1 more year in development



More information: Ellen Lake, Aaron David

3. Agent development: Lygodium

- *Callopistria* sp.
- Defoliator
- Appears to be Lygodium-specialist
- ~2-4 more years in development

More information: Ellen Lake, Aaron David

3. Agent development: Melaleuca

- *Lophidoplosis indentata (Diptera: Cecidomyiidae)*
  - Leaf galling insect
  - <u>Can establish where *Oxyops* cannot</u>

3. Agent development: Air potato

- *Lilioceris egena*
  - Adults and larvae feed on bulbils
  - TAG petition: awaiting Biological Assessment review

More information: Allen Dray

3. Agent development: Waterhyacinth

- Reproductive biology of *Taosa longula* in Argentina

Photo: Hernández 2008

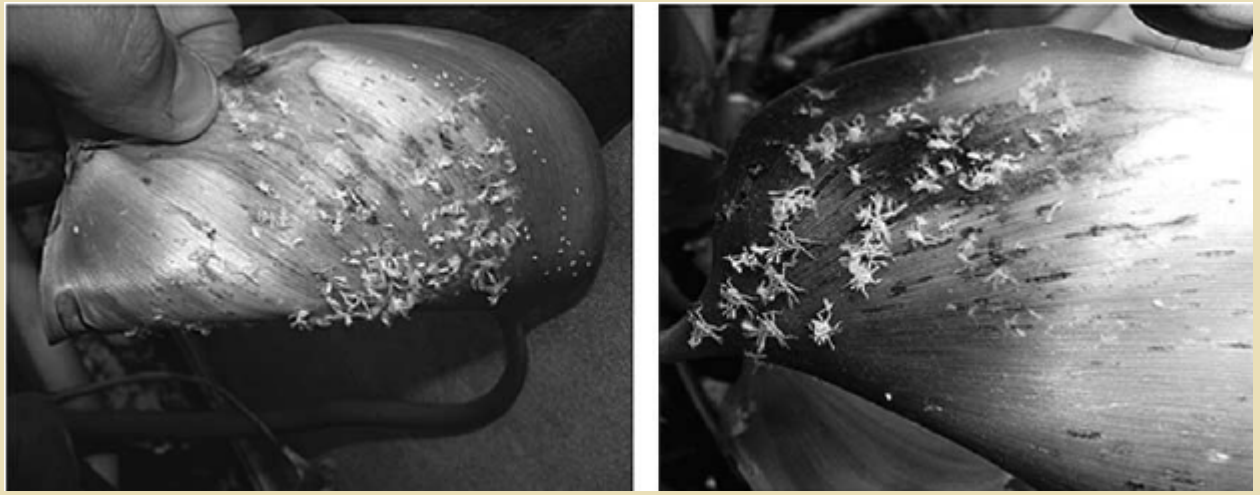


Figure 3 from Hernández et al. 2011

More information: Phil Tipping, Ashley Goode

3. Agent development: Brazilian peppertree

- *Pseudophilothrips ichini*
  - Awaiting permit (30-day public commentary next step)
  - Plans underway to enter mass production
- *Calopyha latiforceps*
  - Awaiting permit (30-day public commentary next step)

More information: Greg Wheeler, Carey Minteer, Dale Halbritter

3. Agent development: Brazilian peppertree

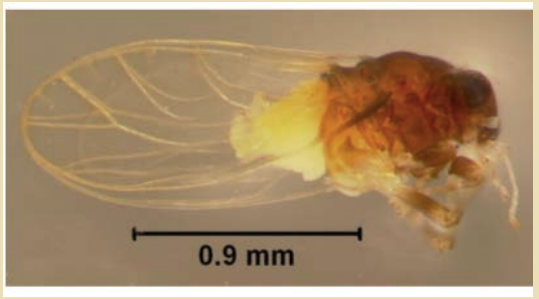
- *Calophya lutea*

Male

Female

- *Calophya terebinthifolii*

Male



Female

More information: Carey Minteer

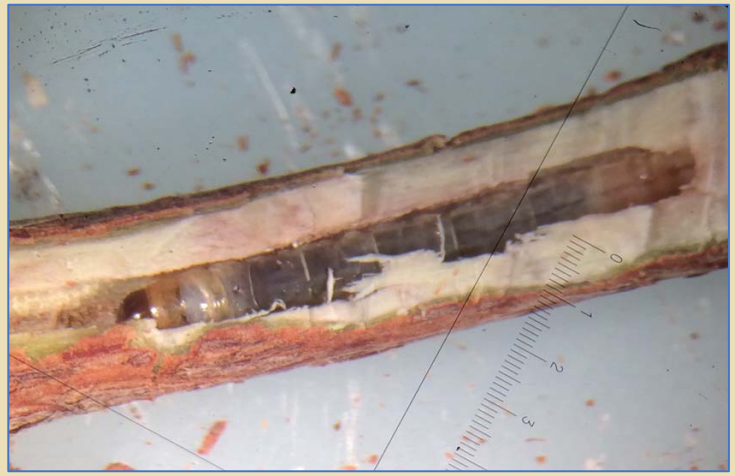
3. Agent development: Downy rose myrtle

- *Idiophantis spp. (Lepidoptera: Gelechiidae)*
  - Fruit boring moth from Malaysia
  - Import to quarantine in Gainesville in August/September
- More exploration into new areas in the Philippines

More information: Melissa Smith, Susan Wright, Matthew Purcell

3. Agent development: Downy rose myrtle

- *Casmara subagronoma (Lepidoptera: Oecophoridae)*
  - Stem borer with a long lifecycle
  - Quarantine host range testing
  - Successful oviposition
- *Mesophleps albinella (Lepidoptera: Gelechiidae)*
  - Not specific enough- agent rejected

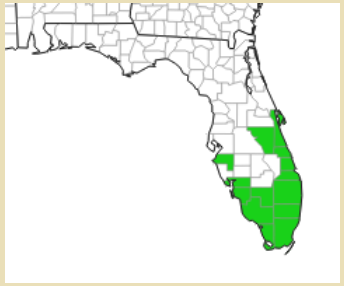


More information: Melissa Smith, Susan Wright, Matthew Purcell

3. Agent development: Earleaf Acacia

- *Calomela intermerata* (Coleoptera: Chrysomelidae)
- So far only develops on Australian Acacia species

- Trichilogastor spp. (Hymenoptera: Pteromalidae)



More information: Melissa Smith

Acknowledgements