

Everglades Cooperative Invasive Species Management Area



Biological Control of Weeds

Operational & Research Report 2024

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BRAZILIAN PEPPERTREE

Schinus terebinthifolia (Anacardiaceae)

Lead Scientist: Dale Halbritter, Ph.D.



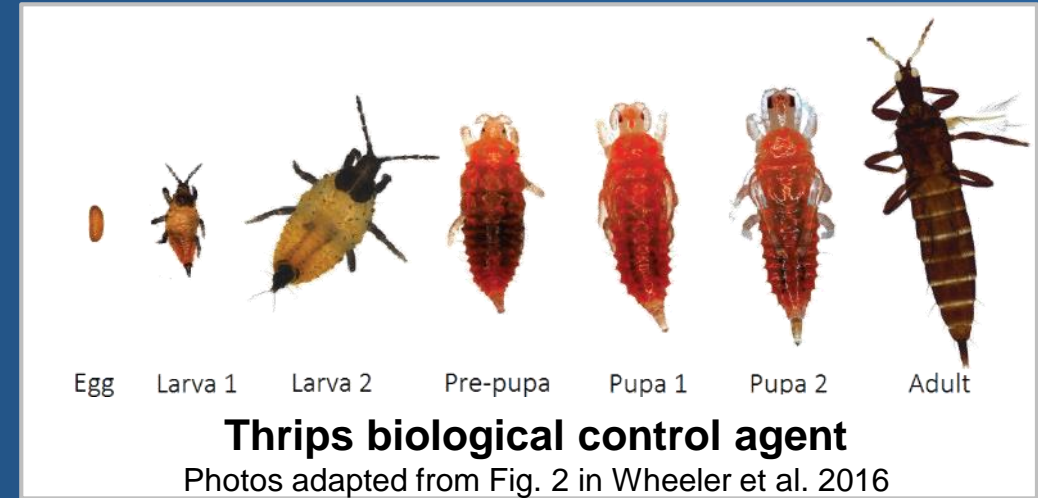
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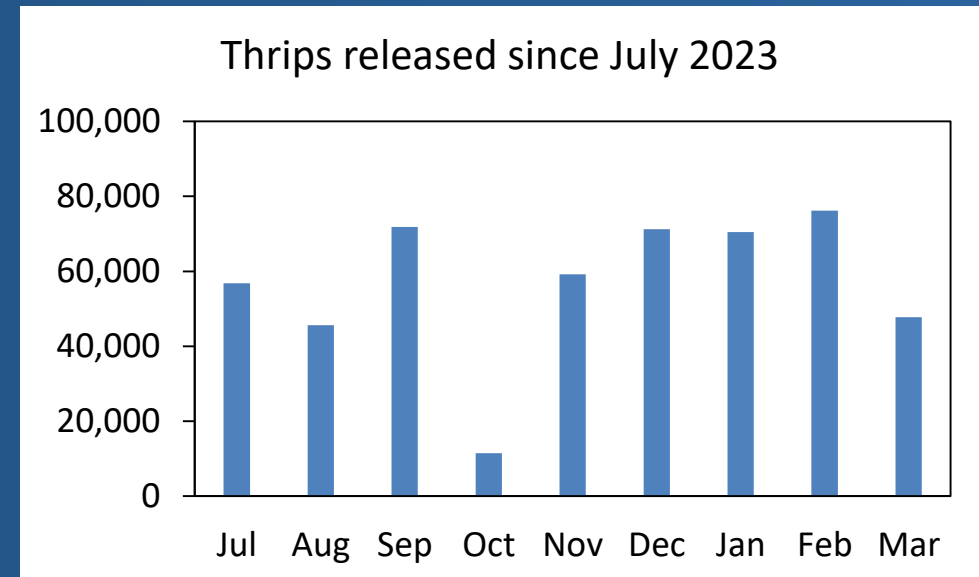
BRAZILIAN PEPPERTREE

Schinus terebinthifolia (Anacardiaceae)

- Highly invasive woody shrub or small tree in both natural and urbanized areas: over 700,000 acres in FL
- ***Pseudophilothrips ichini*** (Thysanoptera: Phlaeothripidae) attacks flushing stems and leaves. Mass rearing and release continues



July 2023 to June 2024	
Number of release points	Number of thrips released
154	510,522



Thrips damage: leaves



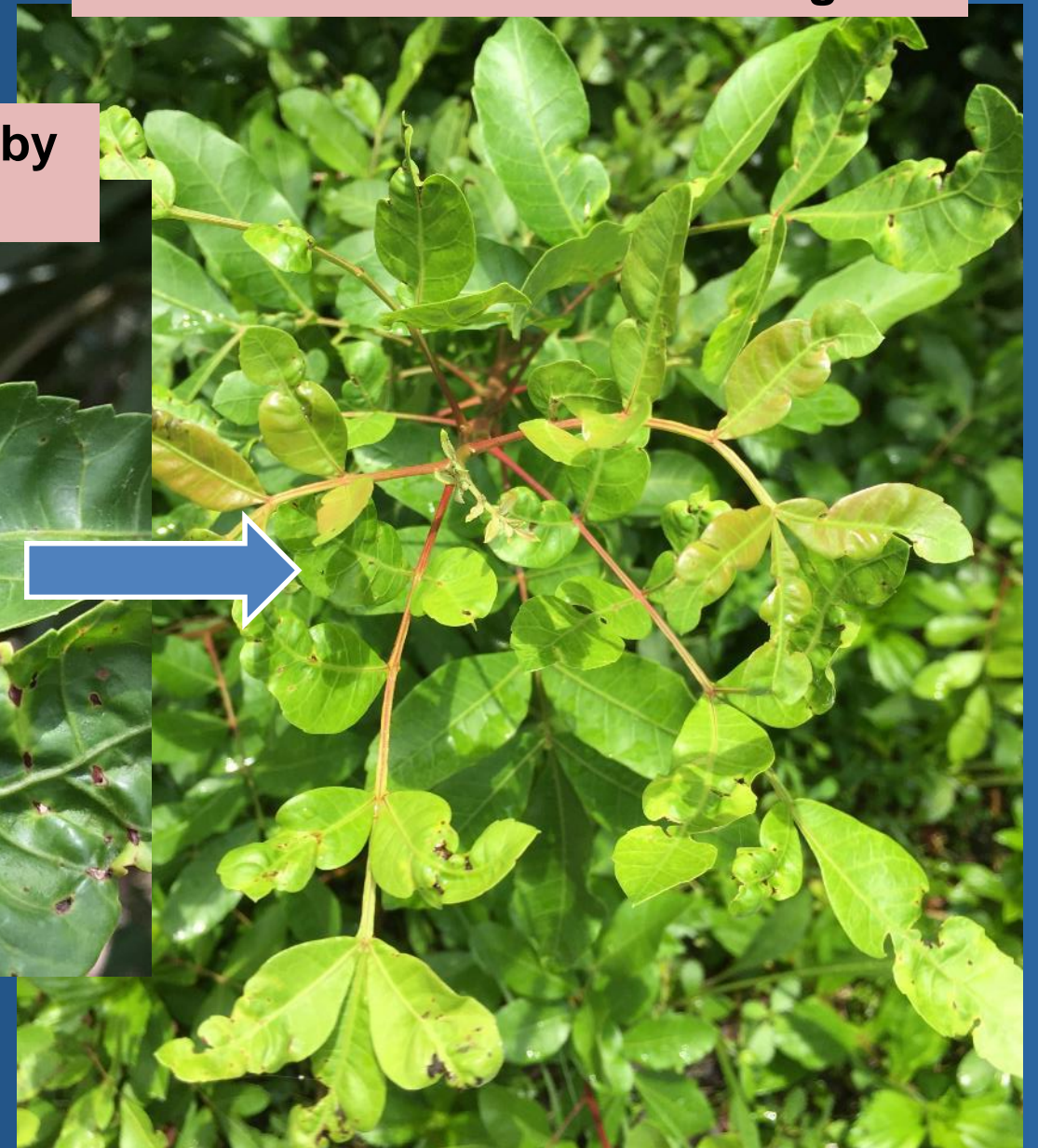
Fresh leaf damage



Mature leaf deformed by earlier damage



Accumulation of leaf damage



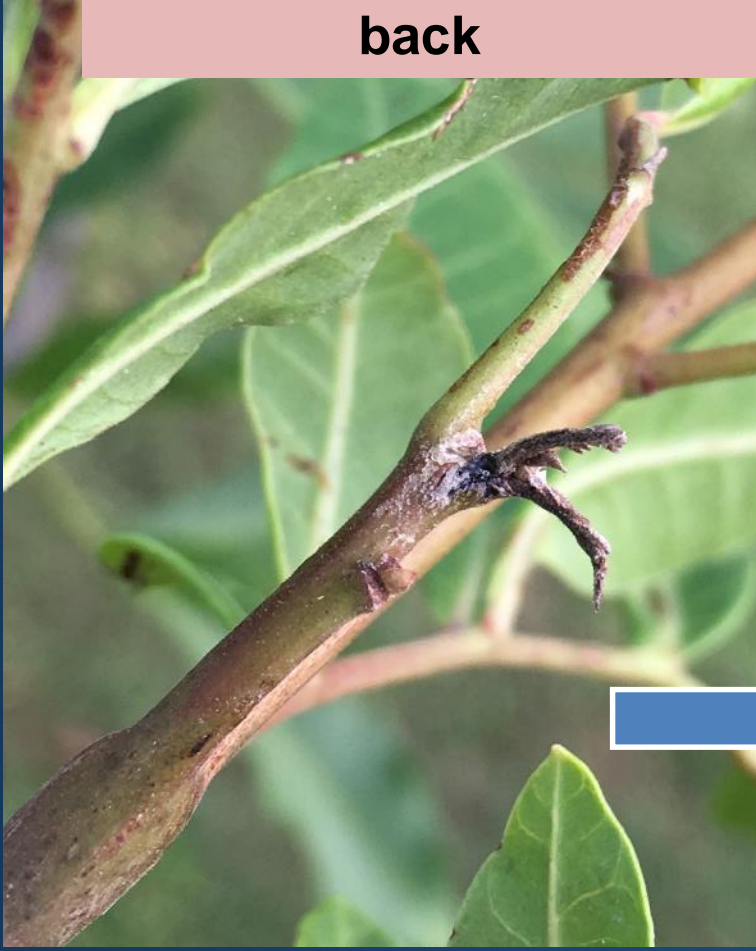


Thrips damage: stems

Terminal meristem die-back

Stem die-back past several nodes

Flagging and major stem die-back



Low thrips densities

thrips densities

High





Thrips damage ca



ecture (Halbritter et



BRAZILIAN PEPPERTREE

Updates on thrips establishment

- 57% of sites now have thrips documented
- 41 sites have thrips after 1 year + since last release
- One site still has thrips 1,437 days after the last release
- Another dispersal event to new site near Markham Park

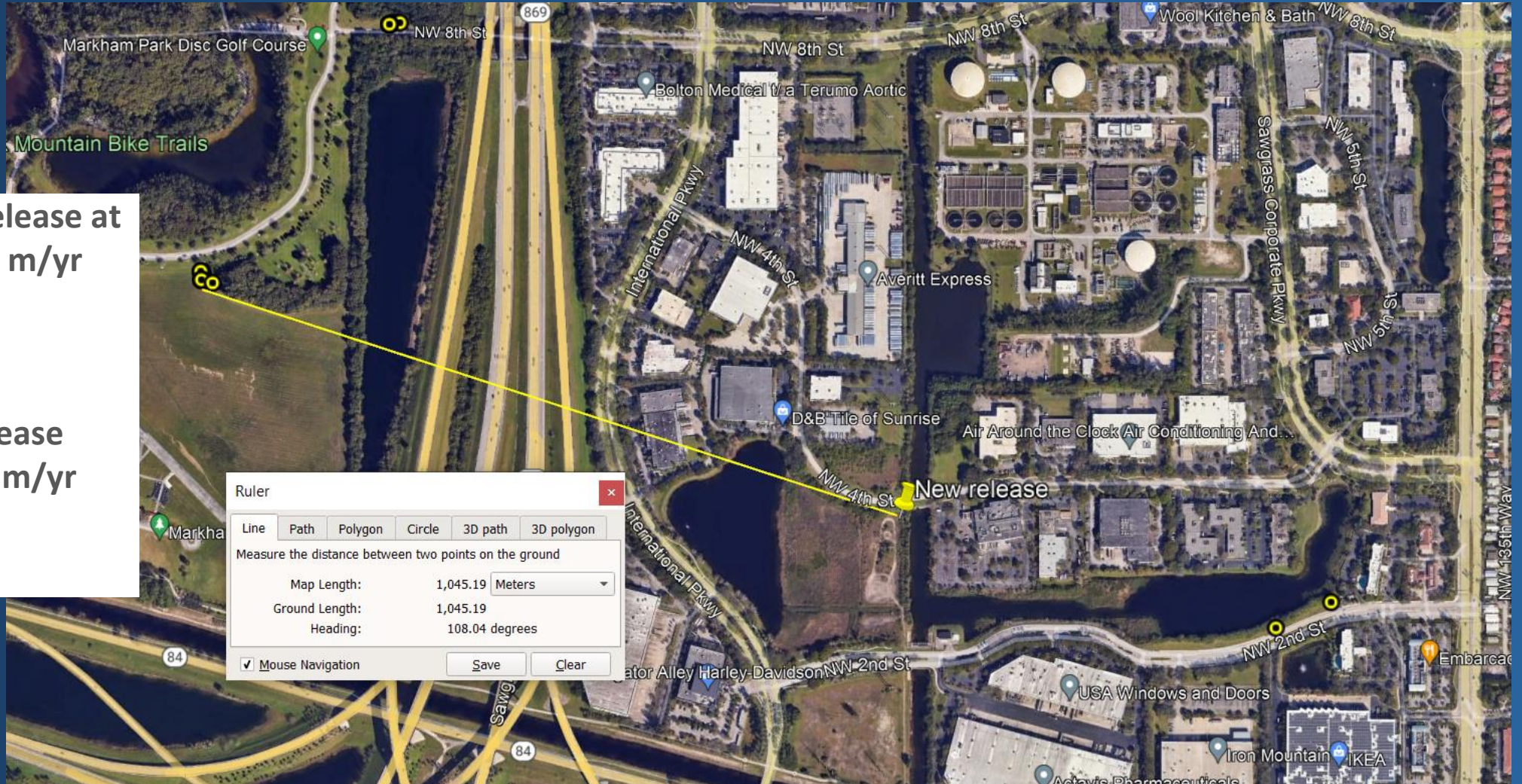


Release statistics: Dispersal

- Based on first release at Markham -> 240 m/yr

OR

- More recent release nearby -> 1,277 m/yr





BRAZILIAN PEPPERTREE

Long-term impacts in Environmentally Endangered Lands (Miami-Dade Co) and SFWMD sites

- Measure changes in plant understory communities
- Capture litterfall, including fallen thrips damage
- Collect canopy demographics
- 3 site replicates



AIR POTATO *Dioscorea bulbifera* (Dioscoreaceae)

Lead Scientist: F. Allen Dray Jr., Ph.D.



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Lilioceris egena releases have started

The two *Lilioceris* species, *L. cheni* and *L. egena*, have biologies that complement each other in ways that should amplify the stress on air potato populations

1. Primary adult feeding site

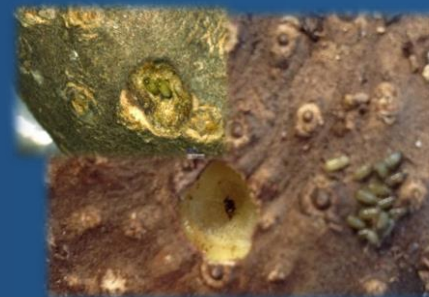
2. Primary oviposition site

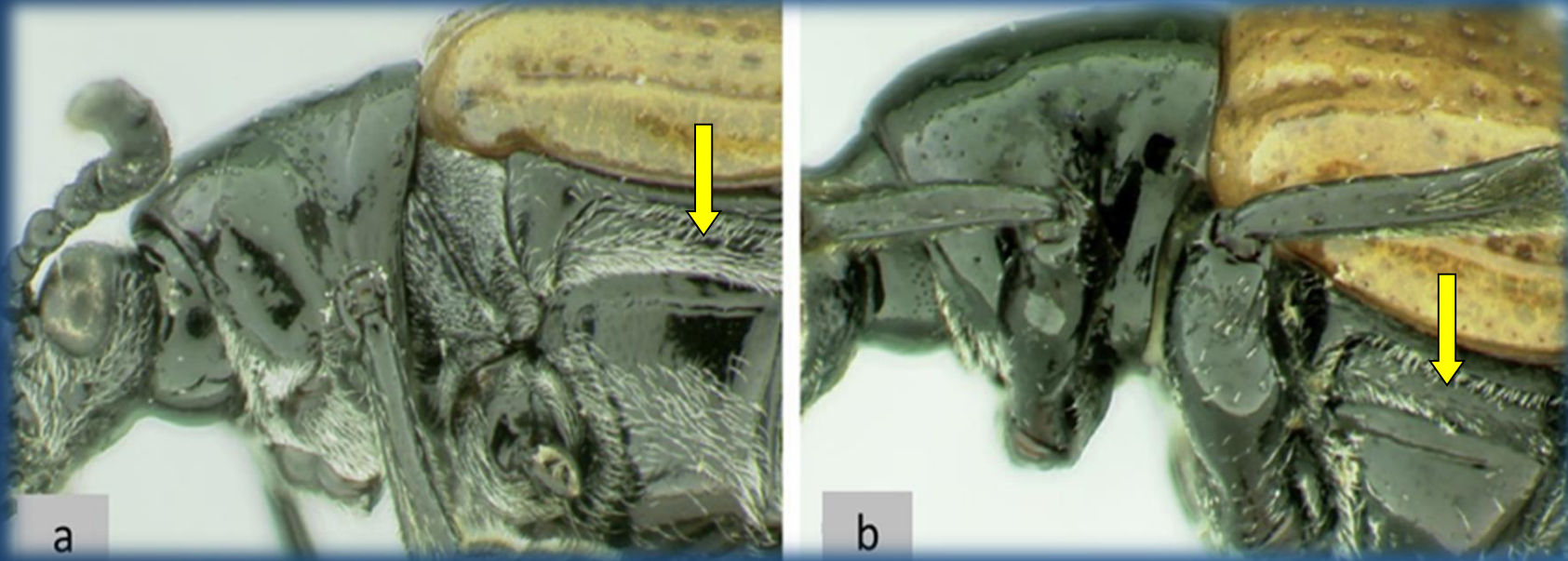
3. Primary larval development site

L. cheni
(leaves)



L. egena
(bulbils)





(1) *Lilioceris cheni* (a) and *Lilioceris egena* (b)

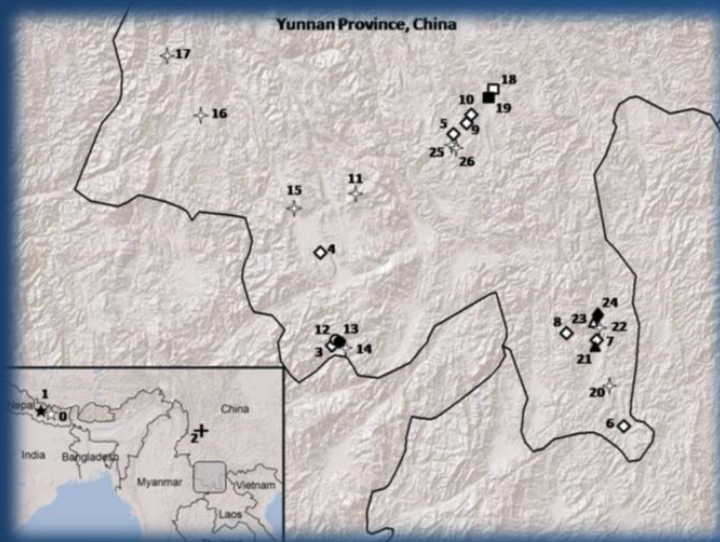
Credits:

(1) Tishechkin et al. (2011) *ZooKeys* 103: 68-83.



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Quarantine Colonization and Host Range Testing Timelines



- Imported from China and colonized May 2011
- 82 species tested, of which 33 had storage organs
- 14 species from Dioscoreaceae + 1 other Dioscoreales
- 25 species related to hosts of other *Lilioceris* species
- 23 economic species

- APHIS approved release Mar 2021

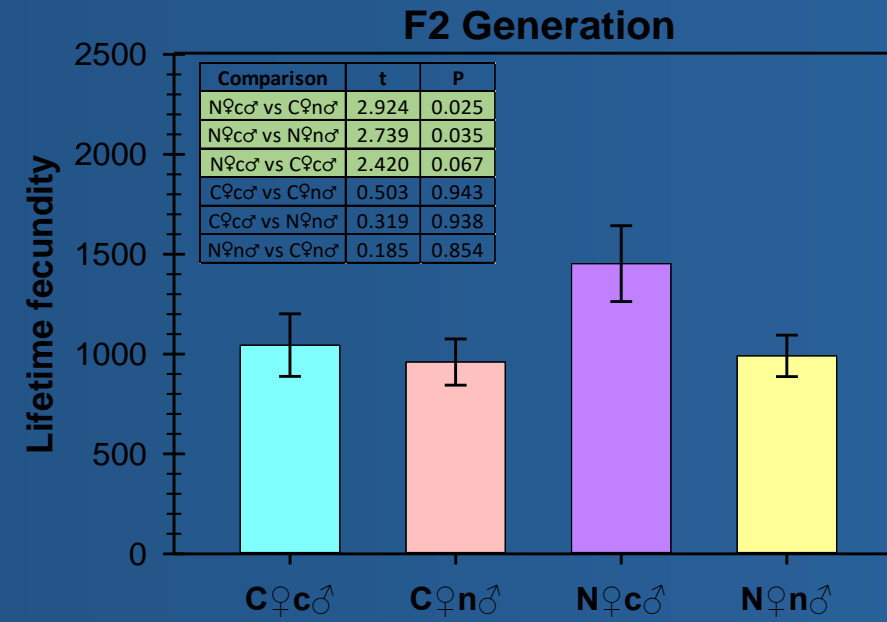
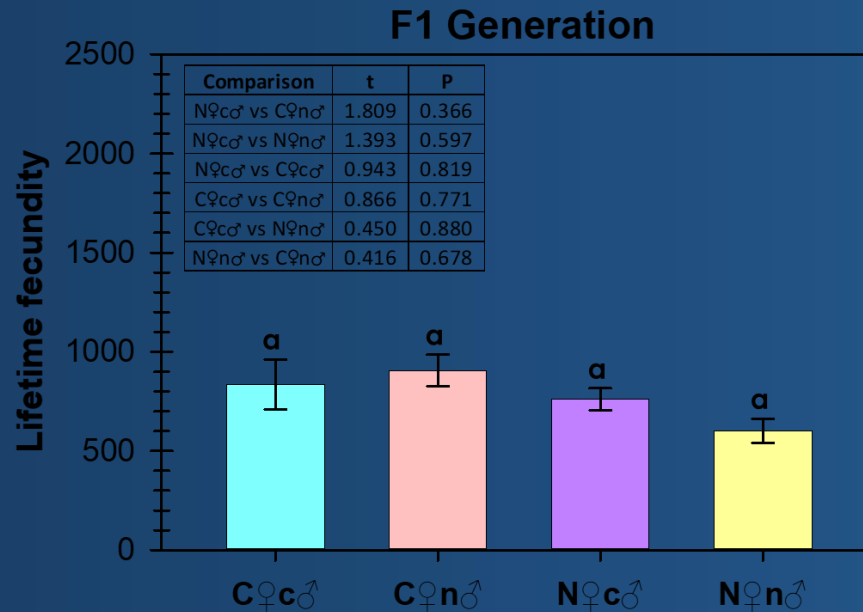


- Adults of both biotypes are reddish in color, with no discernable distinction between the two
- Larvae of both biotypes are crème-colored until 4th instar, before pupation, when they turn more peach-colored

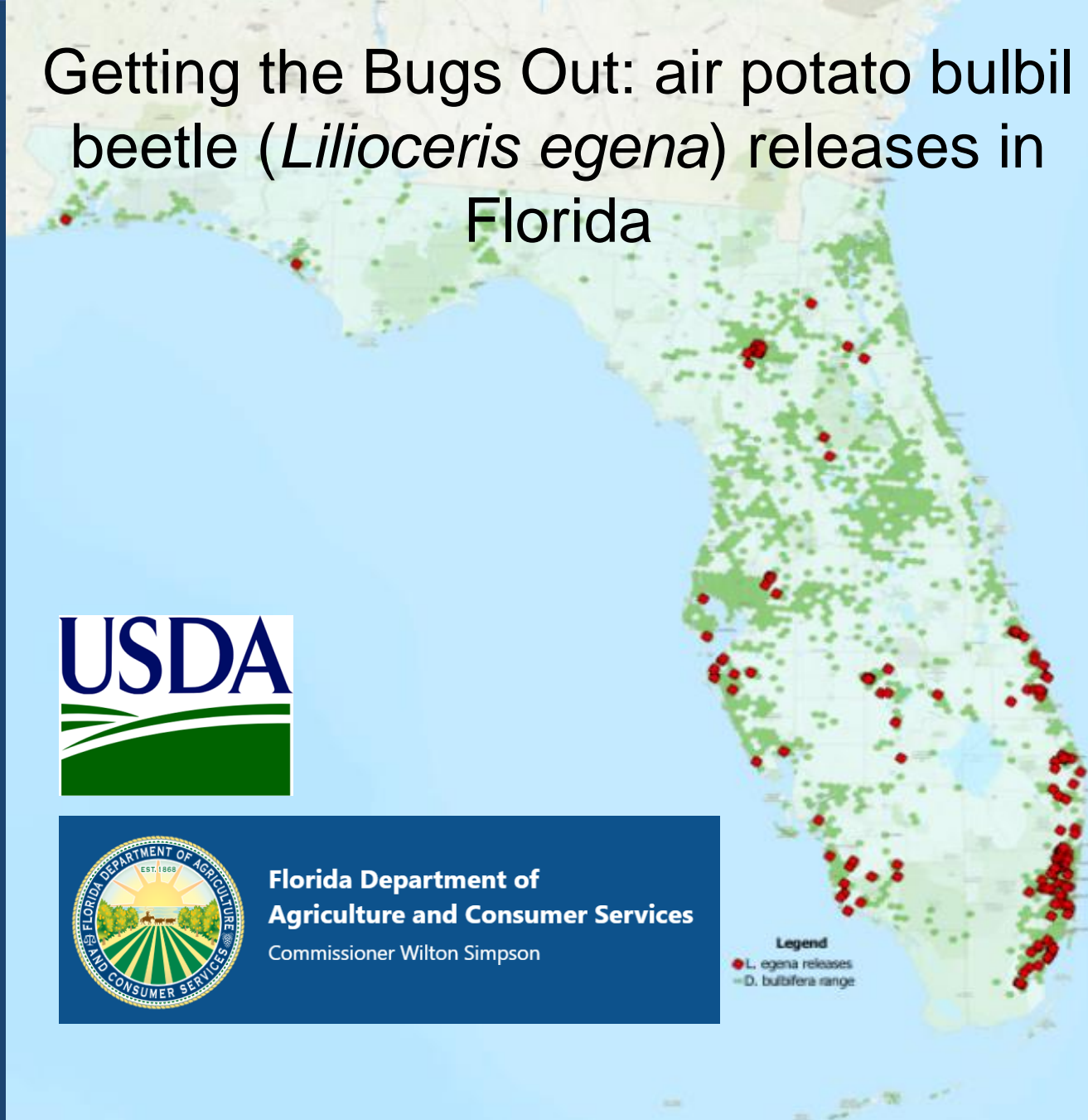


- No differences among lineages in F1 generation
- Nepalese ♀ x Chinese ♂ hybrids were more fecund than other lineages in F2 generation
- Nepalese ♀ F2 fecundity > F1 overall

F2 vs F1	t	P
C♀c♂	1.241	0.217
C♀n♂	0.321	0.748
N♀c♂	4.111	<0.001
N♀n♂	2.315	0.022



Getting the Bugs Out: air potato bulbil beetle (*Lilioceris egena*) releases in Florida



Legend
 ● *L. egena* releases
 ⇨ *D. bulbifera* range

County	Sites	Releases	Beetles
Alachua	15	56	58,514
Bay	1	39	1,843
Broward	32	203	16,781
Charlotte	2	4	228
Clay	1	1	50
Collier	8	32	3,367
Escambia	1	39	1,820
Glades	1	3	300
Highlands	6	28	4,243
Hillsborough	3	10	1,100
Indian River	4	58	4,600
Lake	1	1	50
Lee	1	2	200
Leon	1	1	100
Manatee	7	36	2,476
Marion	1	1	50
Martin	1	5	486
Miami-Dade	18	122	10,593
Palm Beach	14	52	5,801
Pinellas	2	56	5,560
Putnam	2	2	150
St. Lucie	9	25	3,539
Grand Total	131	779	121,851



Lilioceris egena preliminary release results

Cage study, IPRL campus, Aug-Nov 2021

Matheson Hammock, Miami-Dade County
field releases Jan-Sep 2022



Decomposing medulla of
air potato bulbil, result of
large larval feeding load



Frass indicating larval
feeding in bulbil on vine



OLD WORLD CLIMBING FERN

Lygodium microphyllum (Lygodiaceae)

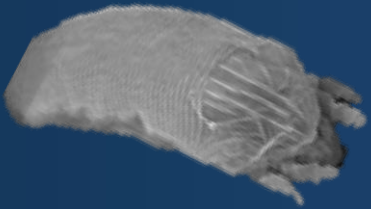
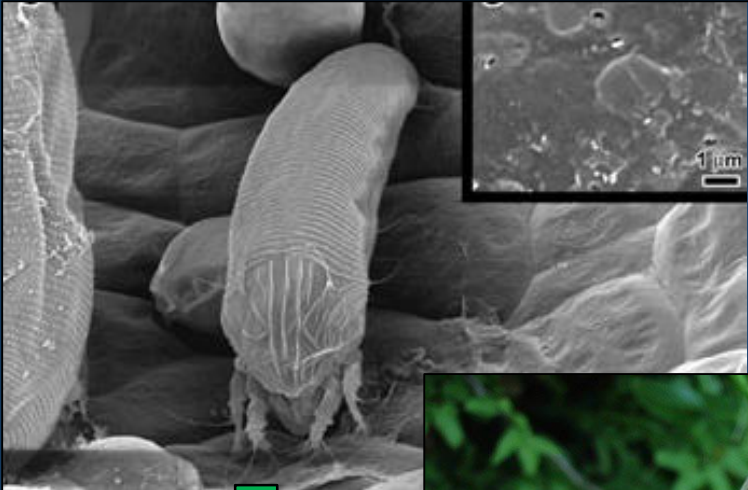
Lead scientists: F. Allen Dray Jr., Ph.D.
Jessene Aquino-Thomas, Ph.D.
Gregory S. Wheeler, Ph.D.



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Lygodium: Biological Control Agents

Floracarus perrepae (Prostigmata: Eriophyidae)

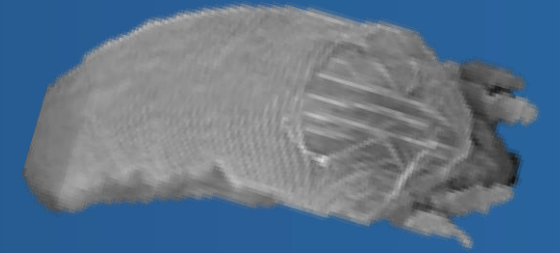


Neomusotima conspurcatalis
(Lepidoptera: Crambidae)



Releases of Lygodium Agents

Lygodium mite, *Floracarus perrepae*

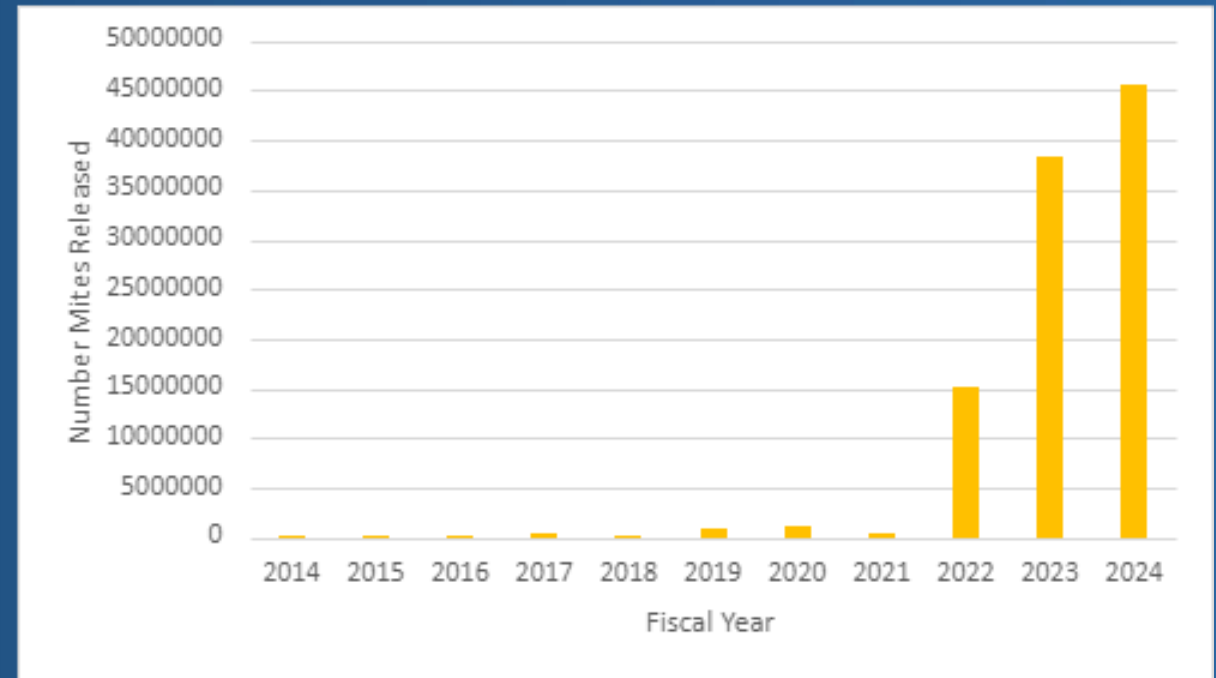


Above ground
biomass reduced
by up to 49%



Releases of Lygodium Agents

Lygodium mite, *Floracarus perrepa*



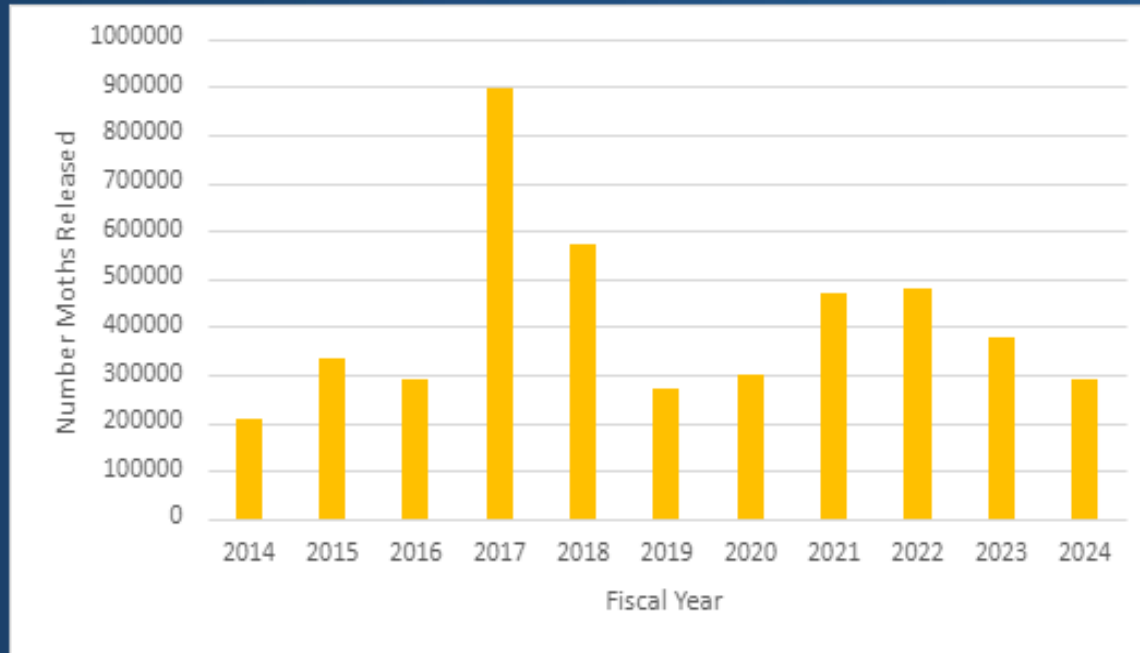
281.7% increase in the estimated mites per plant

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Releases of Lygodium Agents

Brown Lygodium Moth, *Neomusotima conspurcatalis*



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Potential biological control agents in quarantine IPRL

Lygomusotima stria

Under review with TAG



Neostromboceros albicomus *Callopietria exotica*

TAG recommended; 2/2024



TAG recommended; 10/2023



COGONGRASS *Imperata cylindrica* (Poaceae)

Lead scientist: Gregory S. Wheeler, Ph.D.



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Cogongrass surveys in Africa - Center for Biological Control, Rhodes University, South Africa

Started June 2022

- Old world sub- and tropics distribution
- RADseq DNA analysis being used to determine origin of invasive types in US

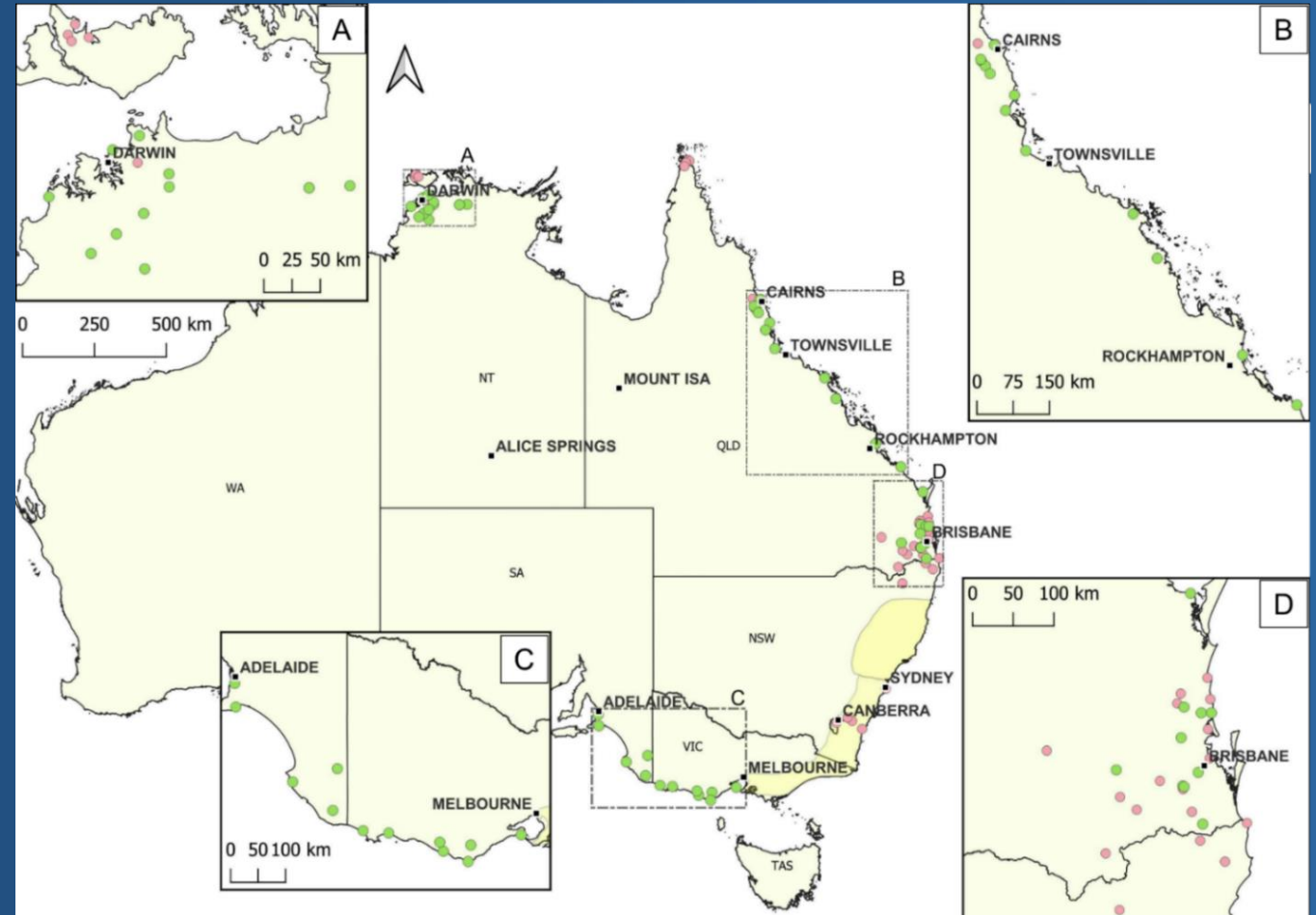
Surveys focusing on South Africa (2023) and east Africa (2024) (red circles)

- Target insects include stem borers (*Acrapex* spp.)



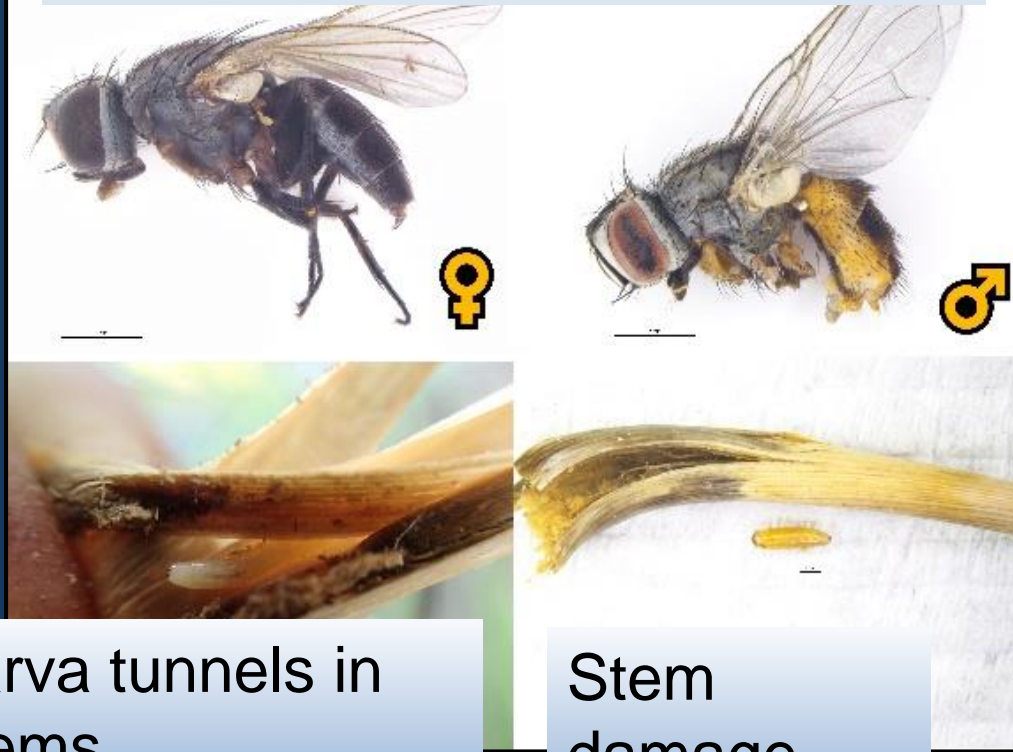
Cogongrass surveys in Australia - USDA/CSIRO/ABCL Brisbane

- Current surveys are focusing on eastern Australia
- Target insects include stem gallers and stem & shoot borers
- Report 60 insect spp attacking cogongrass in Australia
- Prioritizing 7 spp.



Cogongrass surveys in Australia

Introduced into IPRL quarantine Dec 2023



Larva tunnels in stems

Stem damage

Atherigona sp. (Diptera: Muscidae)

Larva bores in young shoots

Larvae passed preliminary host range tests with *Sorghum* sp. and *Saccharum* sp.



Introduced into IPRL quarantine Dec 2023



Rhizome damage

Stem damage

Stem borer - *Emmalocera latilimbella*

Will weaken stem

Larvae passed preliminary host range tests with *Sorghum* sp.

WATERHYACINTH *Pontederia (Eichhornia) crassipes*

Lead scientist: Melissa Smith, Ph.D.



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Waterhyacinth (*Pontederia crassipes*)



Waterhyacinth planthopper,
Megamelus scutellaris



Waterhyacinth weevil,
Neochetina eichhorniae

No Biological
Control

Biological
Control



Tipping et al. 2014

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No Herbicide



No Biological control



Biological Control

Half Rate



Herbicide

+

No Biocontrol



Herbicide

+

Biocontrol



Label Rate



Herbicide

+

No Biocontrol



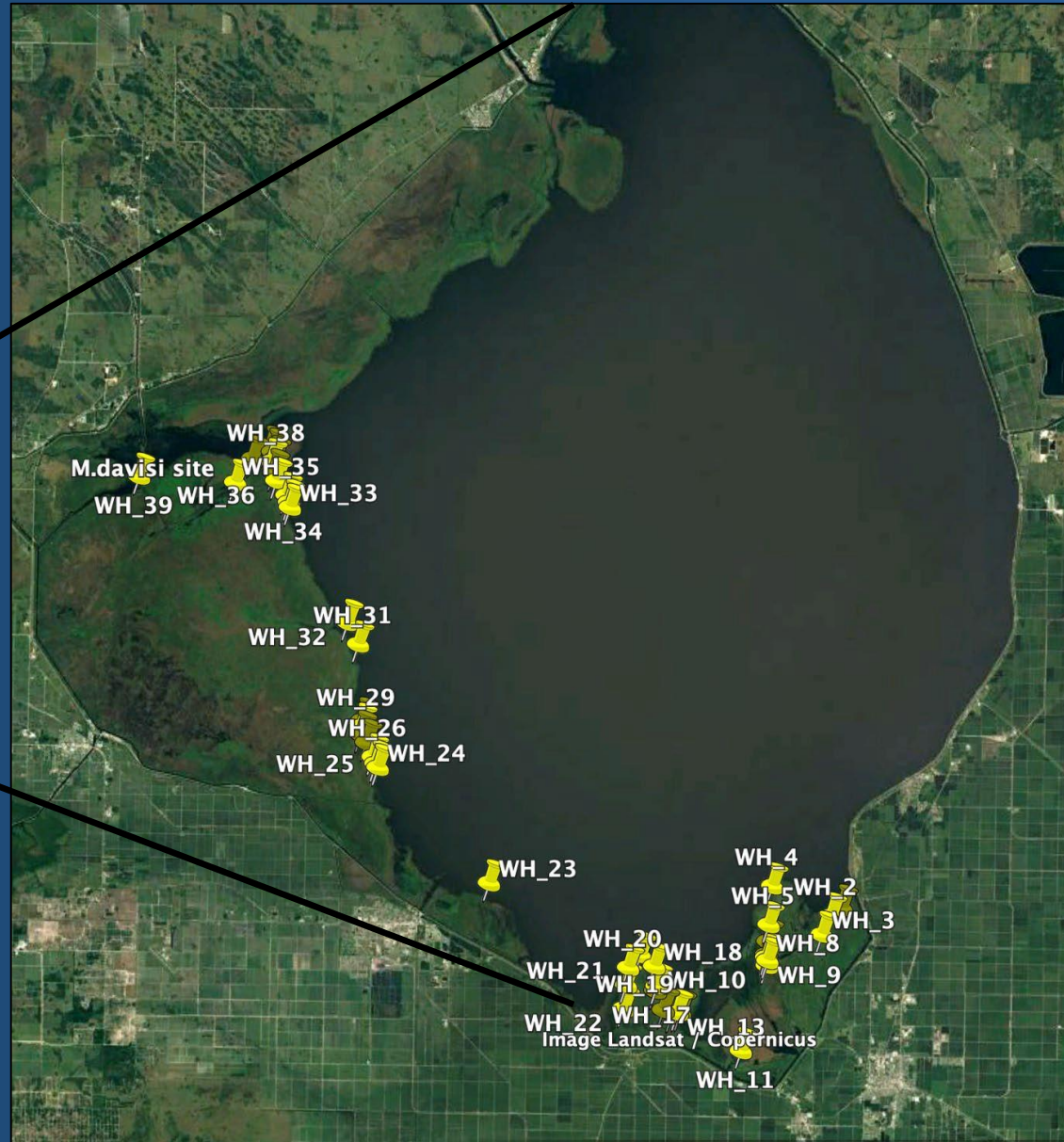
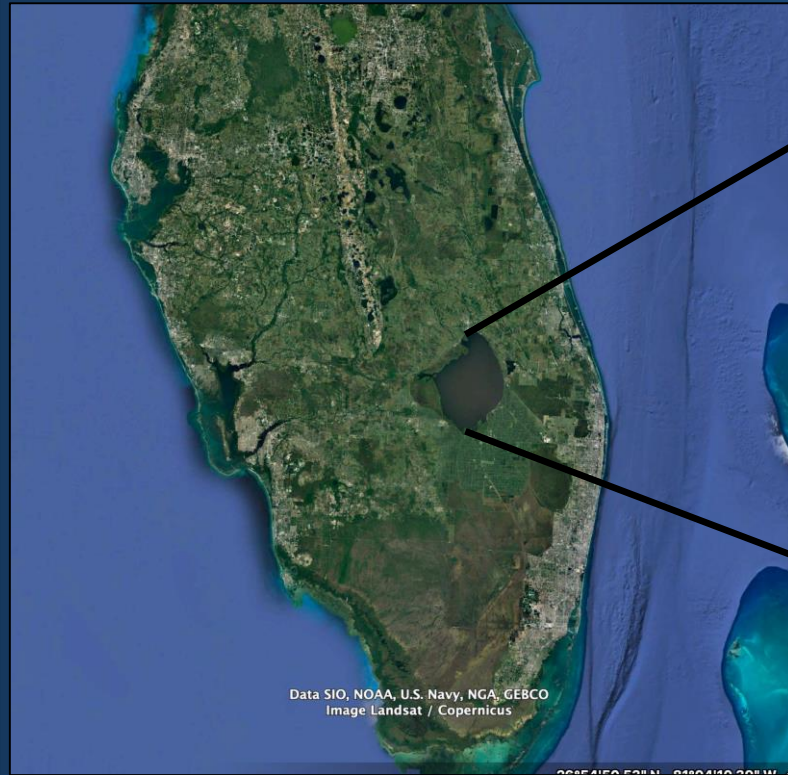
Herbicide

+

Biocontrol



22 weeks post treatment



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MELALEUCA *Melaleuca quinquenervia* (Myrtaceae)

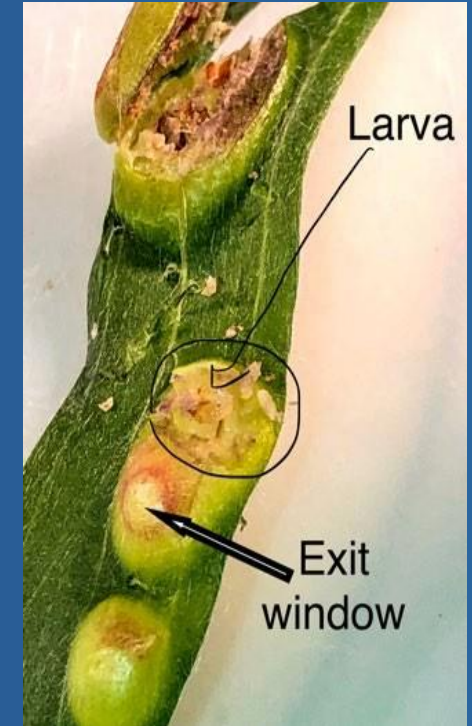
Lead scientist: Melissa Smith, Ph.D.



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Melaleuca: New Agent! *Lophodiplosis indentata*

- Approved for release in Fall 2022
- Inaugural release last June at East Coast Buffer Water Preserve Area, 3 releases since



Acknowledgements

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- University of Blumenau: Marcelo Vitorino.
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Questions?



Think locally, Act neighborly
invasive species know no boundaries!



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Exploring, Explaining and Conserving the World of Tropical Plants