

# Evaluating new waterhyacinth and waterlettuce biological control agents in Florida

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## The Tale of Two Weeds





# Waterlettuce (*Pistia stratiotes*)



Forest and Kim Starr, Starr  
Environmental, Bugwood.org

- 1 natural enemy in quarantine
- *Lepidolphax pistiae*
- Host range testing
- Investigations on biology





# Waterlettuce: Native or Exotic?

- Pro: Native – has always been here
- Highly speculative work by Evans, 2013,
- Fossil seeds from Lake Annie from 12,000 BP,
- If weight of evidence convincing – no biocontrol releases.
- Con: Native was extirpated during ice age then new types re-introduced from further south
- No specialist natural enemies,
- Molecular work needed







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Please contact us with questions or to offer  
your help. Thank you for your assistance.

***Pistia stratiotes***  
**Genetic Diversity Project**



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Sample species:	<i>Pistia stratiotes</i>
Collector name:	
Date:	
Location Name:	
Location:	



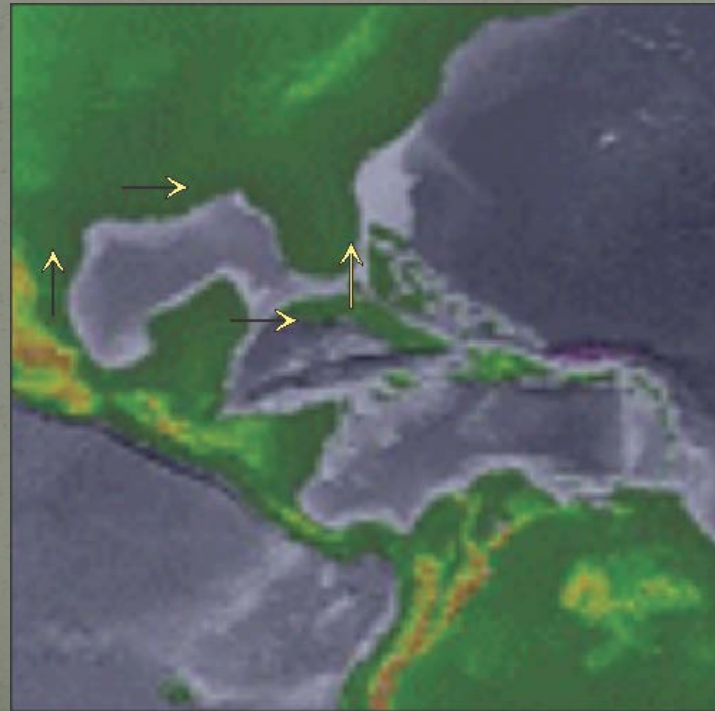


A. Is *Pistia stratiotes* a native? Seed found in Lake Annie from approximately 12,000 to 14,000 years ago.

B. Approximate sea level before last Ice Age

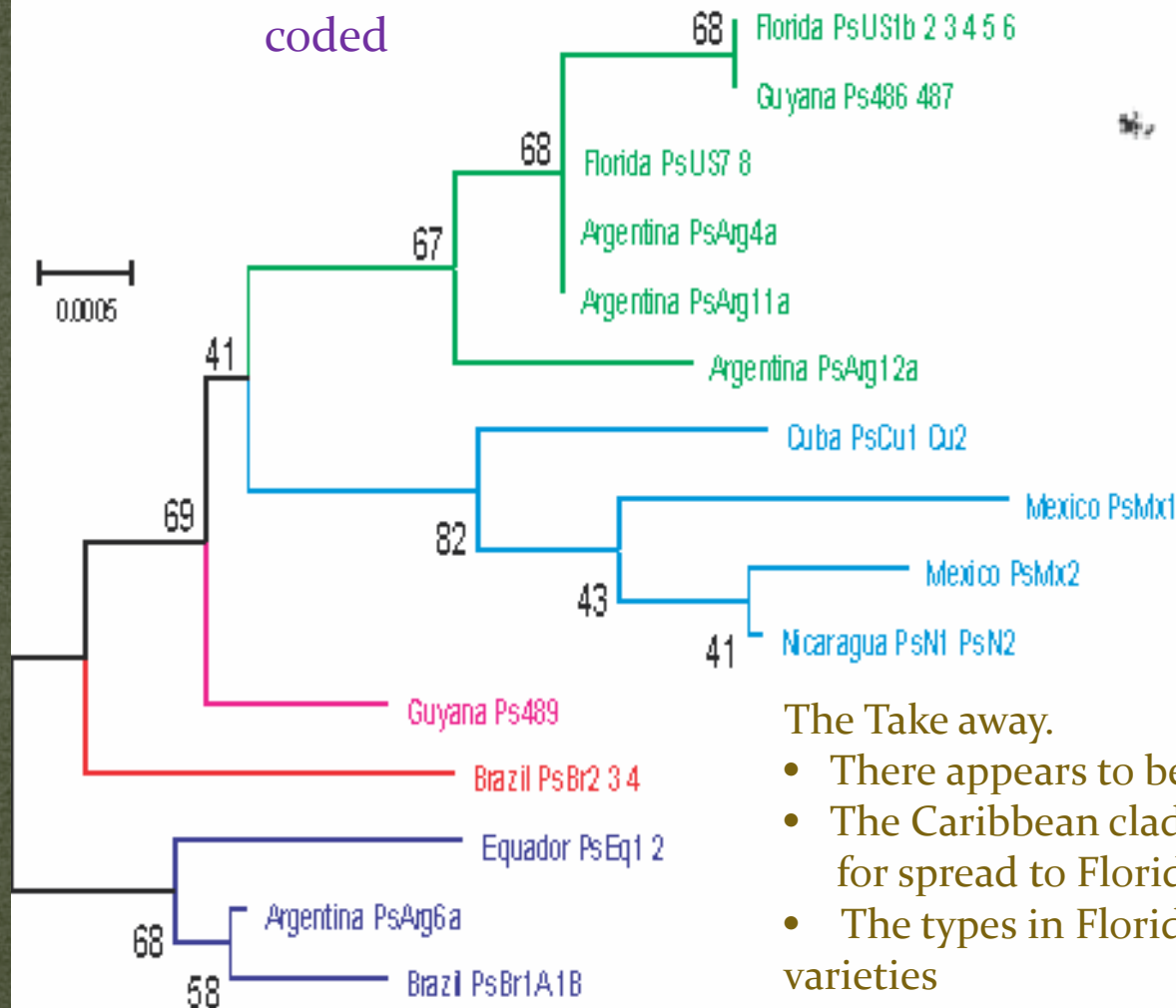
Approximately 18,000 years ago sea level was at least 394 feet (120 meters) lower than today. How did *Pistia* get there?

2  
possible  
routes!



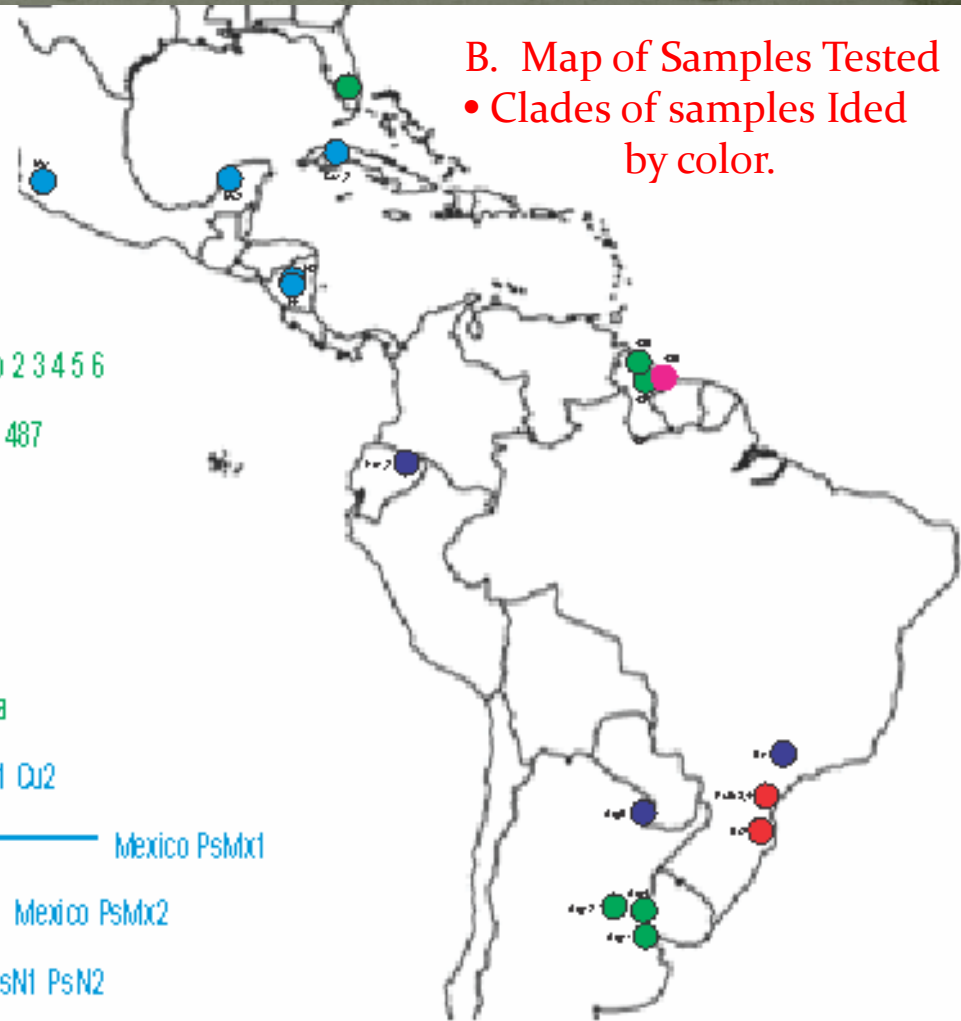
## A. Neighbor Joining Tree

- *TrnLF* sequence
- pdistance metric
- 14 SNPs & 3 gaps coded
- Individual clades color coded



## B. Map of Samples Tested

- Clades of samples Idd by color.



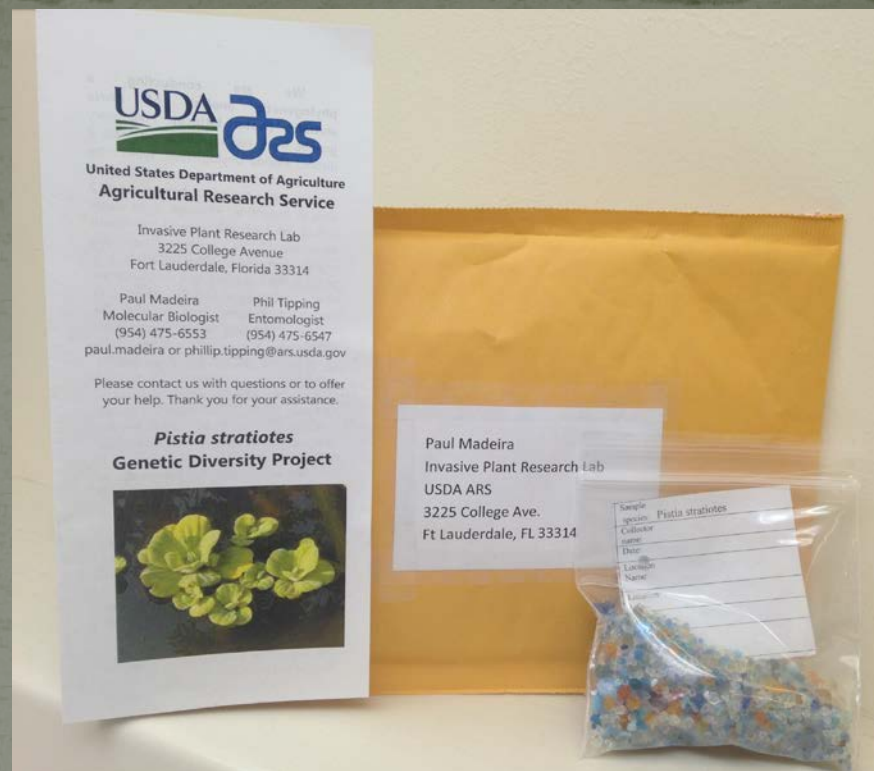
## The Take away.

- There appears to be a distinct Caribbean clade
- The Caribbean clade occupies all natural routes for spread to Florida
- The types in Florida match South American varieties

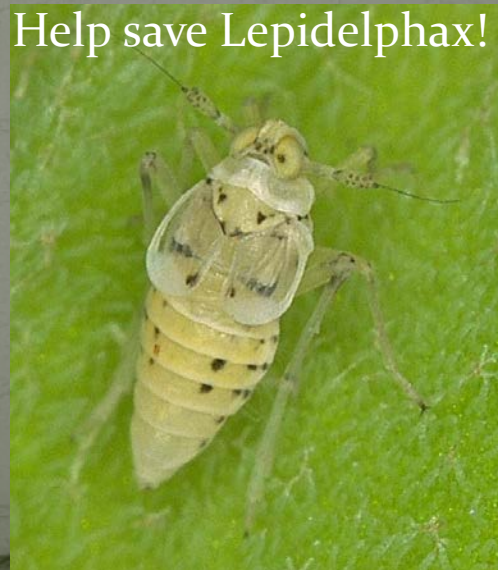




Forest and Kim Starr, Starr  
Environmental, Bugwood.org



Help save Lepidolphax!





# Waterhyacinth



Willey Durden, USDA-ARS, Bugwood.org





# Why waterhyacinth?

- Arguably still world's worst aquatic weed
- Present in 102 countries/territories
- All continents except Antarctica
- Previous biocontrol spotty
- Florida spends \$4-5 million annually in control





# Quarantine Waterhyacinth insects under development



*Eccritotarsus catarinensis*



*Thyrticus truncatus* (2-3 years)



*Taosa longula*  
(4-5 years)



# waterhyacinth



- *Eccritotarsus catarinensis*
- Miridae (plant bug)
- Sap feeding
- Several deleterious effects on WH (Coetzee et al. 2007)
  - Reduced daughter production
  - Reduced chlorophyll content of leaves





# *Eccritotarsus catarinensis*



Chris Evans, Illinois Wildlife  
Action Plan



- Fed and completed development on pickerelweed (*Pontederia cordata*)
- Pickerelweed
  - Native to the US
- Preferred WH
- WH and pickerelweed co-occur



# Quarantine

## Waterhyacinth insects under development



*Eccritotarsus catarinensis*



*Thyrpticus truncatus* (2-3 years)



*Taosa longula*  
(4-5 years)

More information: Phil Tipping



# Waterhyacinth

## Current Biocontrol

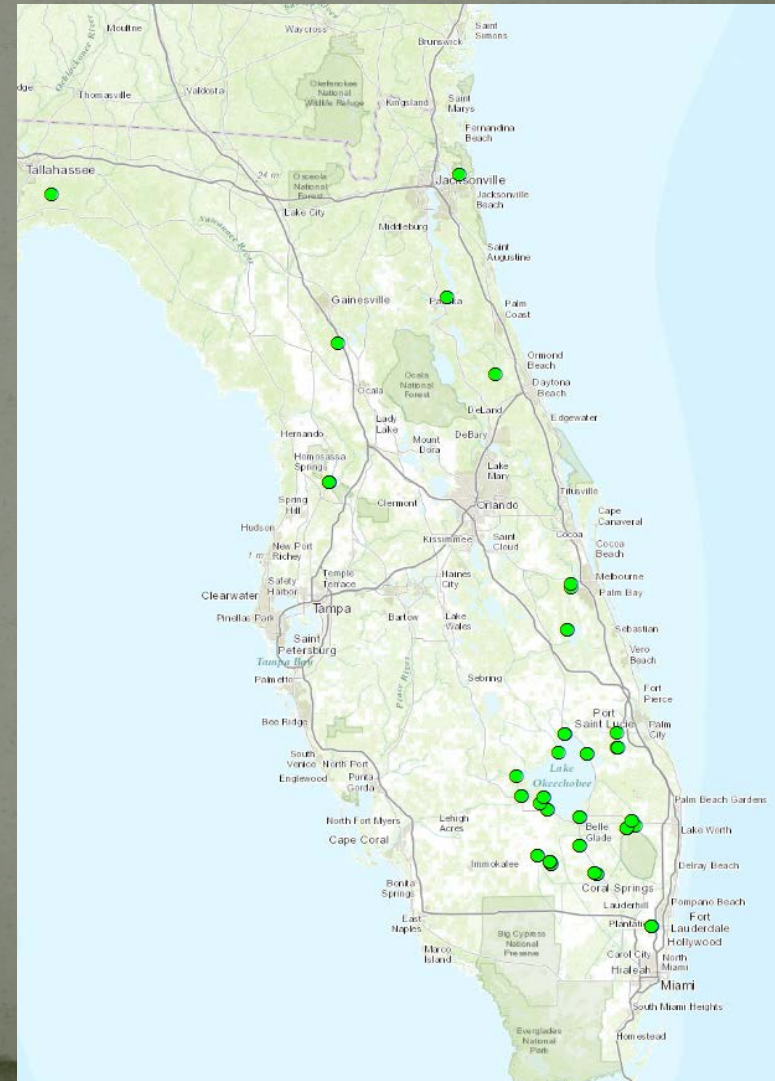
- Plant hopper
  - *Megamelus scutellaris*
  - 2010
  - Feeds externally
  - More compatible with herbicides





# Megamelus releases

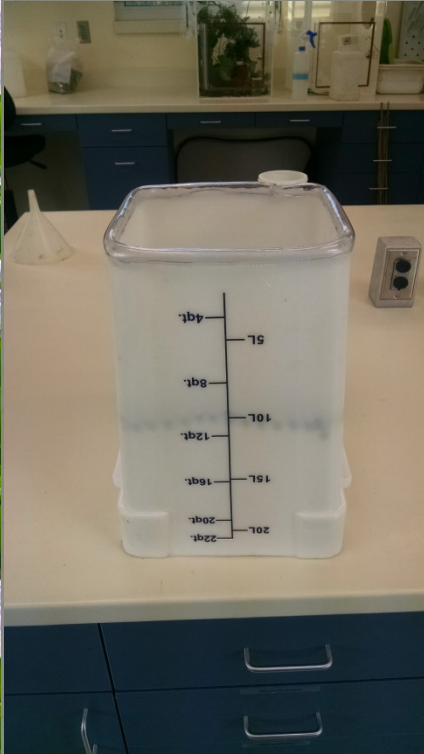
- > 308,000 Megamelus released since 2010
- 175 releases
- 15 counties





# *Megamelus* recovery

- Determine establishment
- Determine best release strategy
- Monitor density over time







## *Megamelus* recovery (new method)

- 4 sites surveyed
- *Megamelus* present at 3 of the 4 sites surveyed
- Highest density at site where insects have been present the longest (multiple releases)
- Second highest density is at site with the highest release #'s and the shortest time since release
- Use this information to modify release strategies





# *Megamelus* efficacy

- Issues
  - Difficult to monitor the effects of *Megamelus* on the density of WH in the field
  - Floating, mobile mat of plants
  - Quickly sprayed with herbicides in many areas
- Ideas:
  - Concentrate evaluations in areas with no herbicide sprays and plants “trapped”
  - Potential for satellite imagery to be used



# Summary

## waterlettuce

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- Speculation that it may be native to Florida
  - Currently collecting data to support or disprove this claim
- Meanwhile....host range and biology studies continuing on *Lepidophax pistiae*

## waterhyacinth

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- *Eccritotarsus catarinensis* no longer being pursued as a potential natural enemy
- *Megamelus* currently being released and evaluated



# Future work



## Waterhyacinth

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- Determine efficacy of *M. scutellaris*
- Investigate the effects of *M. scutellaris* on aquatic insect food webs
- Post-doc at FuEDEI – mating of *Taosa longula*
- Next insect (probably), *Thrypticus truncatus*

## New projects

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- Biological Control feasibility study of Caesar weed (*Urena lobata*)



Sandy Koi