Evaluating new waterhyacinth and waterlettuce biological control agents in Florida

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The Tale of Two Weeds
Waterlettuce (*Pistia stratiotes*)

- 1 natural enemy in quarantine
- *Lepidelphax 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
Pistia stratiotes
Genetic Diversity Project

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Please contact us with questions or to offer your help. Thank you for your assistance.
A. *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 Ided 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
Help save Lepidelphax!

Forest and Kim Starr, Starr Environmental, 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

Thyrpticus 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
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
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

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<tr>
<th><strong>waterlettuce</strong></th>
<th><strong>waterhyacinth</strong></th>
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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 *Lepidelphax pistiae* | *Eccritotarsus catarinensis* no longer being pursued as a potential natural enemy  
  - *Megamelus* currently being released and evaluated |
## Future work

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