Biological control of Chinese tallow; Results from Foreign Exploration and Host Testing

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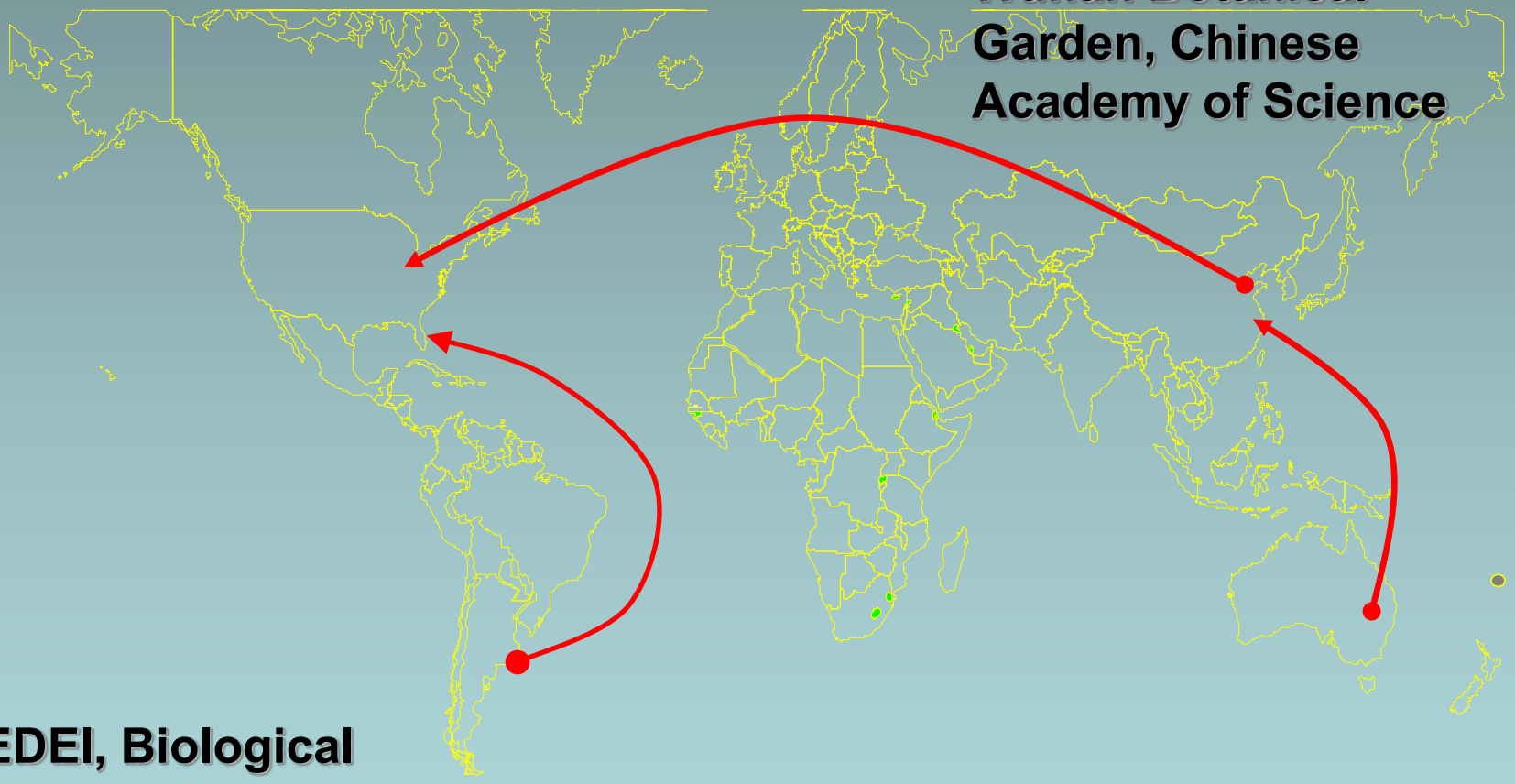
International collaborations facilitate biological control



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Triadica sebifera

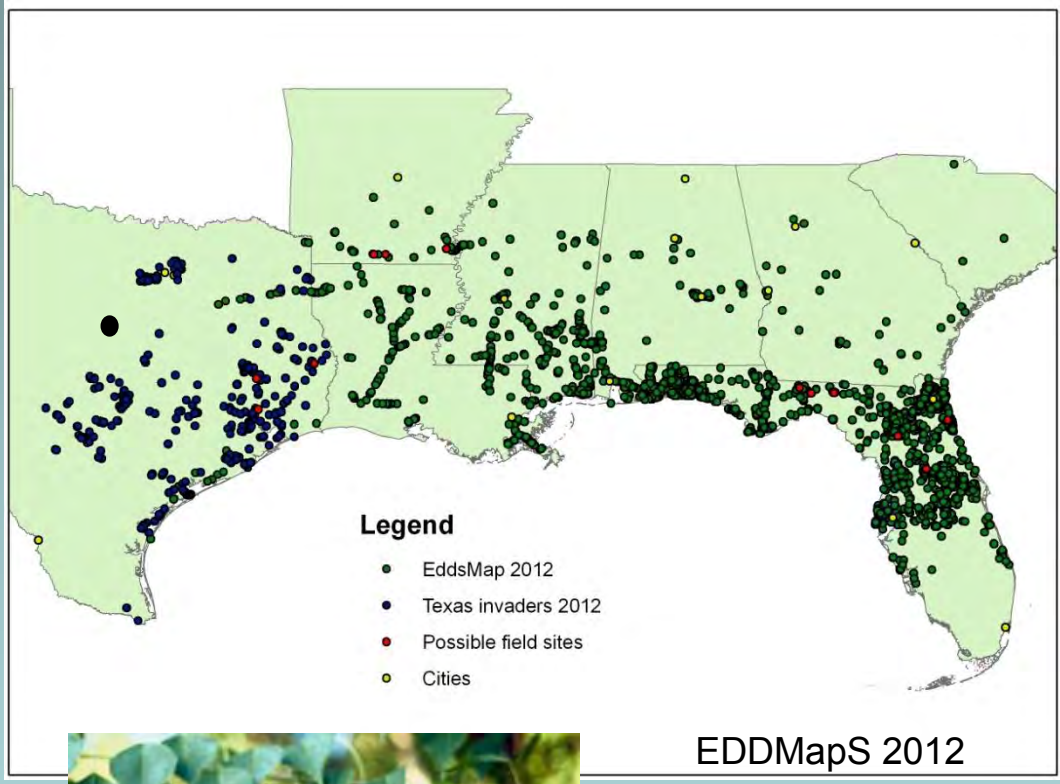
(Chinese Tallow, Popcorn Tree, Tallowtree, Florida Aspen)

Tallow distribution in China

- Distributed in China south of the Yellow river to Hong Kong
- Cultivated sp.
- Possibly 200 spp of herbivore pests that are potential biological control agents

Tallow's distribution US

- The dominant woody sp in many forests & wetlands
- Infestations impact endangered Whooping crane and Attwater's prairie chicken populations
- Expanding range, $200-$400 million to control over next 20 yrs
- biological control is a sustainable, cost-effective alternative



EDDMapS 2012

Tallow biological control agents

Heterapoderopsis bicallosicollis

Bikasha collaris

***Gadirtha* n. sp.**

***Caloptilia* n. sp.**

Tallow leaf roller

Heterapoderopsis bicallosicollis

Tests conducted 2007-2009

- No choice tests
  - Adult feeding
  - Oviposition
  - Larval development
- China
  - 54 spp in 8 families
  - Results v promising
- US quarantine
  - 21 spp in 15 genera

Results with leaf roller

- **Adult feeding on several non-target spp., including several natives**
- **Oviposition and feeding on *Heterosavia bahamensis***
  - **FL State Endangered spp.**

Heterosavia bahamensis

Nidi on *Heterosavia bahamensis*

Ditrysinia (=Sebastiania) fruticosa

Acalypha amentacea

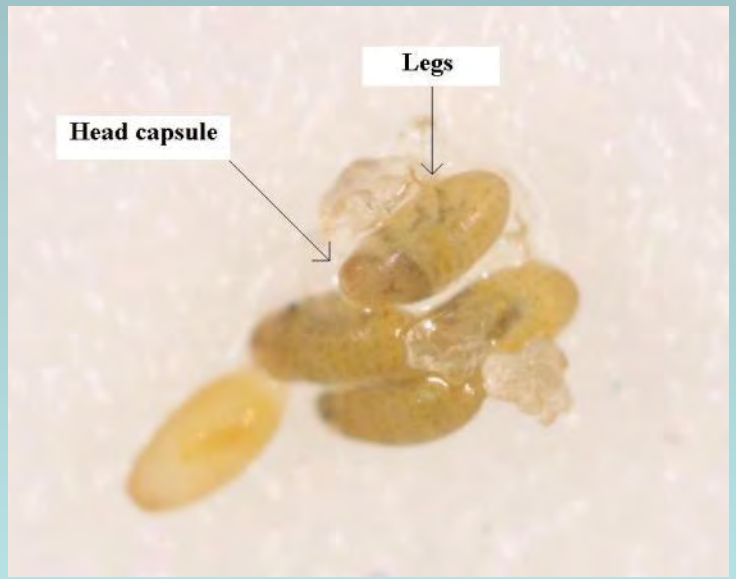
Testing of leaf roller - Oviposition

- *T. sebifera* ~ 200 nidi produced 195 adults
- *H. bahamensis* – 7 nidi – 0 adults
- Adult feeding extensive

Heterosavia bahamensis

Tallow

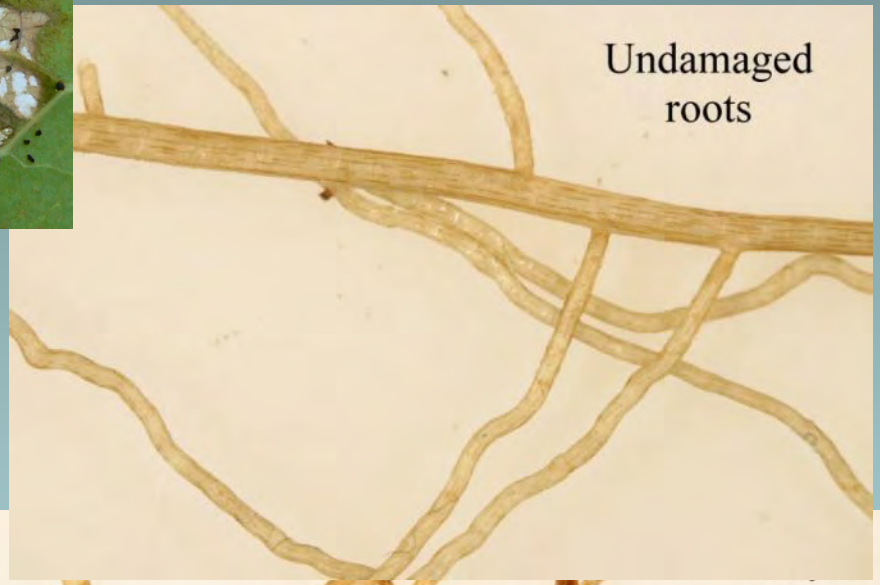
Bikasha collaris flea beetle

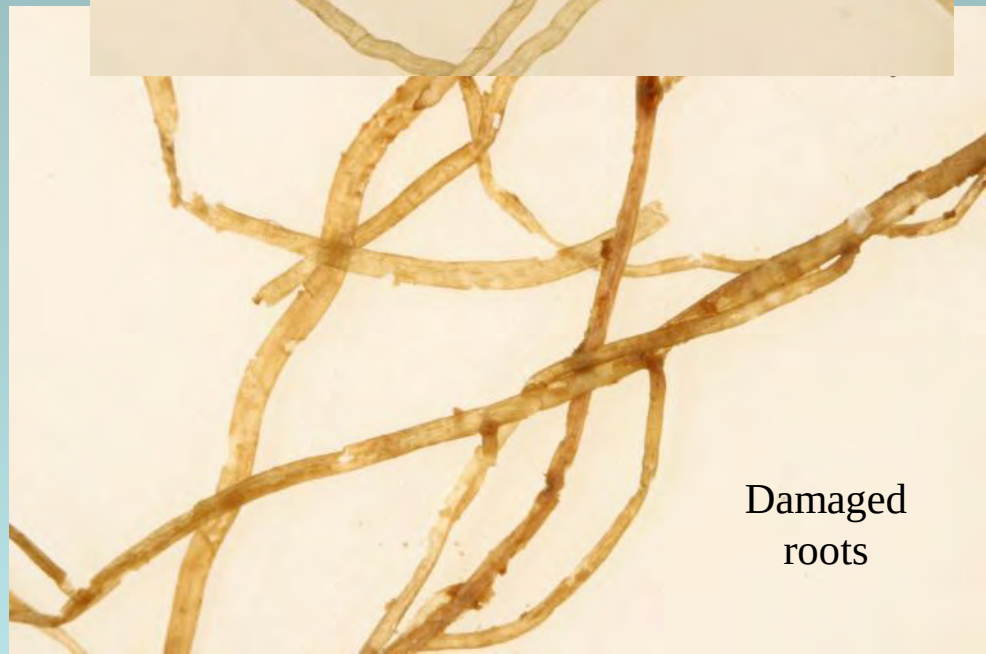


Adult Feeding

Bikasha collaris

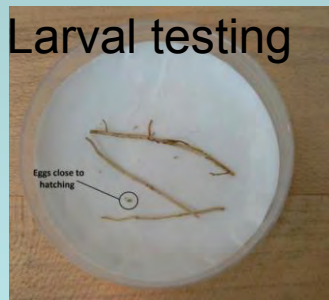
Larval Feeding





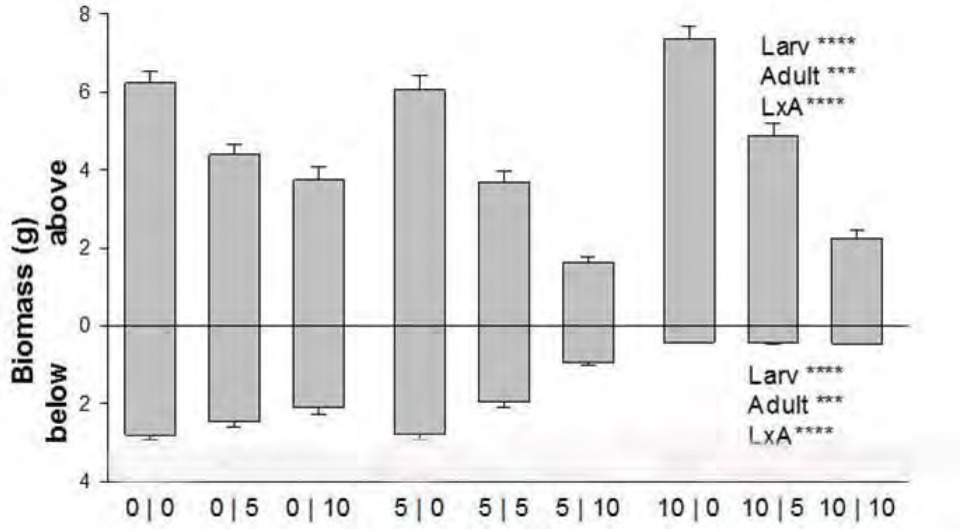
Results (Larvae & Adults)

- Larval no-choice testing complete (60 species e.g. *Euphorbia* spp, *Poinsettia* spp. etc)
  - 10 replicates of closest relatives, 5 unrelated spp
- Larvae quickly died on non-targets
- 10 spp larval choice tests completed with no damage to non-targets
- Adult no-choice tests almost done (10 more spp)
- Eggs only produced when adults fed tallow –
  - no reproduction on other spp
- Choice tests with non-targets is underway



Bikasha impact

- Larvae 0, 5,10/plt
- Adults 0, 5, 10/plt
- Both larvae & adults decrease biomass
- Greatest impact from both larval & adult feeding



Number of larvae | Number of adults

New Insects on Tallow

- *Gadirtha* n. sp. (Noctuidae)
- Narrow host range from Chinese field surveys and lab tests
- Quarantine 2012 and being tested now (Apr 2013)
- Larvae safe (~40 spp tested or in progress) & have high consumption rates

Leaves fed to one late instar larva

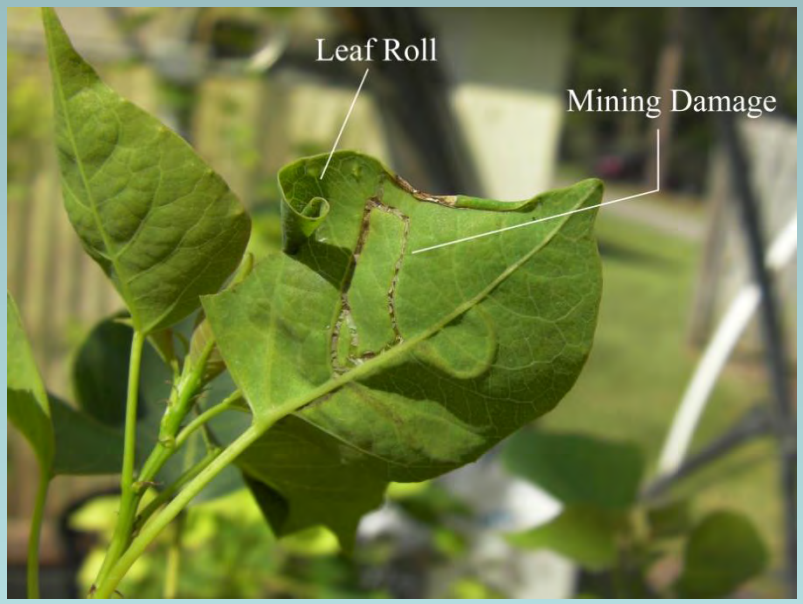
Leaf damage of one larva after 2 days (135 cm^2)

New Insects on Tallow - insects being developed

- Unidentified stem galling midge
- Abundant in many areas of China
- Work continues in China

Fortuitous Biological Control Agent

- Appeared nr Tampa & Gainesville in 2008
- An undescribed moth from China (*Caloptilia* n. sp.)
- Heavily damages Tallow plants in fall

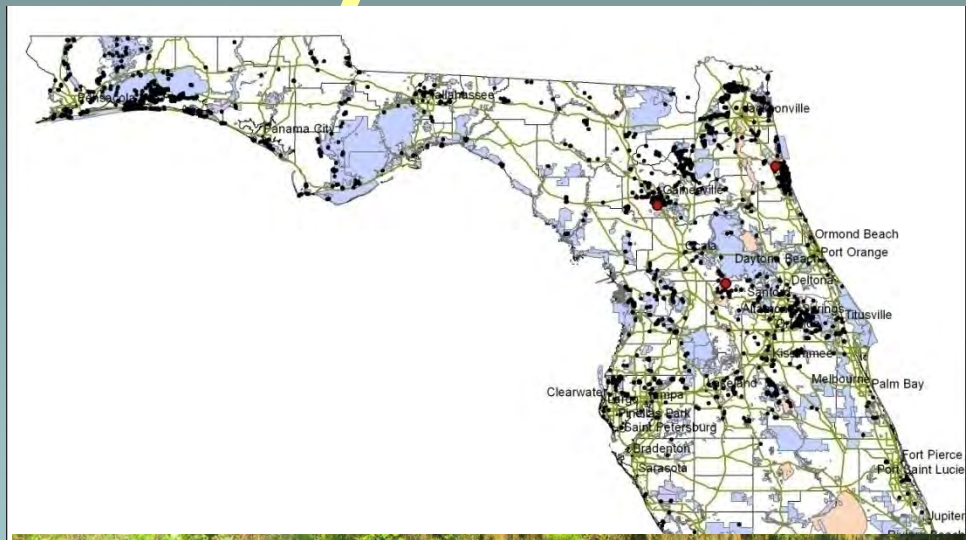


Caloptilia Specificity

- Major pest of our tallow test plants
- If our plant growing area was taken to be a giant two choice test, 41 non-target species "tested"
- One negative result
  - *Gymnathes lucida* (oysterwood)
- Possibly initiated mines on:
  - *Ditrysinia (=Sebastiania) fruticosa* (Sebastian bush)
  - *Hippomane mancinella* (manchineel)

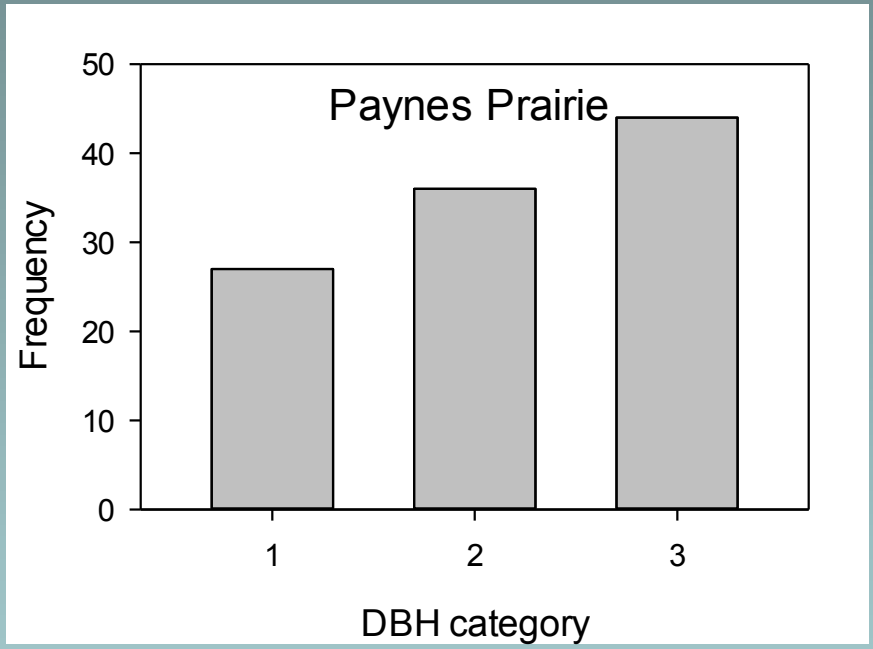
Tallow biological control release study

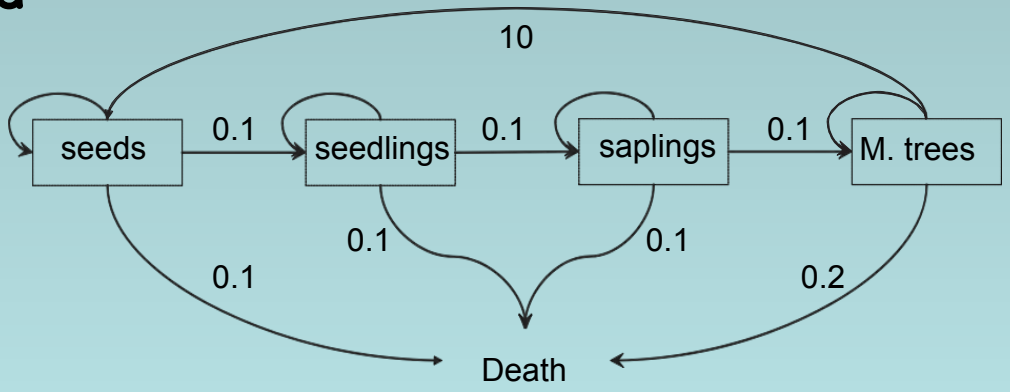
- Pre-release description of the plant population
  - Population recruitment, growth and mortality (~100 plants/site, demographics)
  - Plant biomass allocation (~30 plants/site
- Compare impact of biological control pre-release vs post-release
- Identify vulnerable stages of the plant's life stage that would impact the population



Preliminary results – 1st year

- Pre-release description of the plant population
  - Plant recruitment, growth and mortality (~100 plants/site)
  - Age class population
  - Monitor changes each yr
  - Life history of population
  - Compare population pre and post-release





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