Development of an Integrated Pest Management Solution for Cycad Aulacaspis Scale (*Aulacaspis yasumatsui*) & its Impact on Future Scale Control

By Christine Wiese

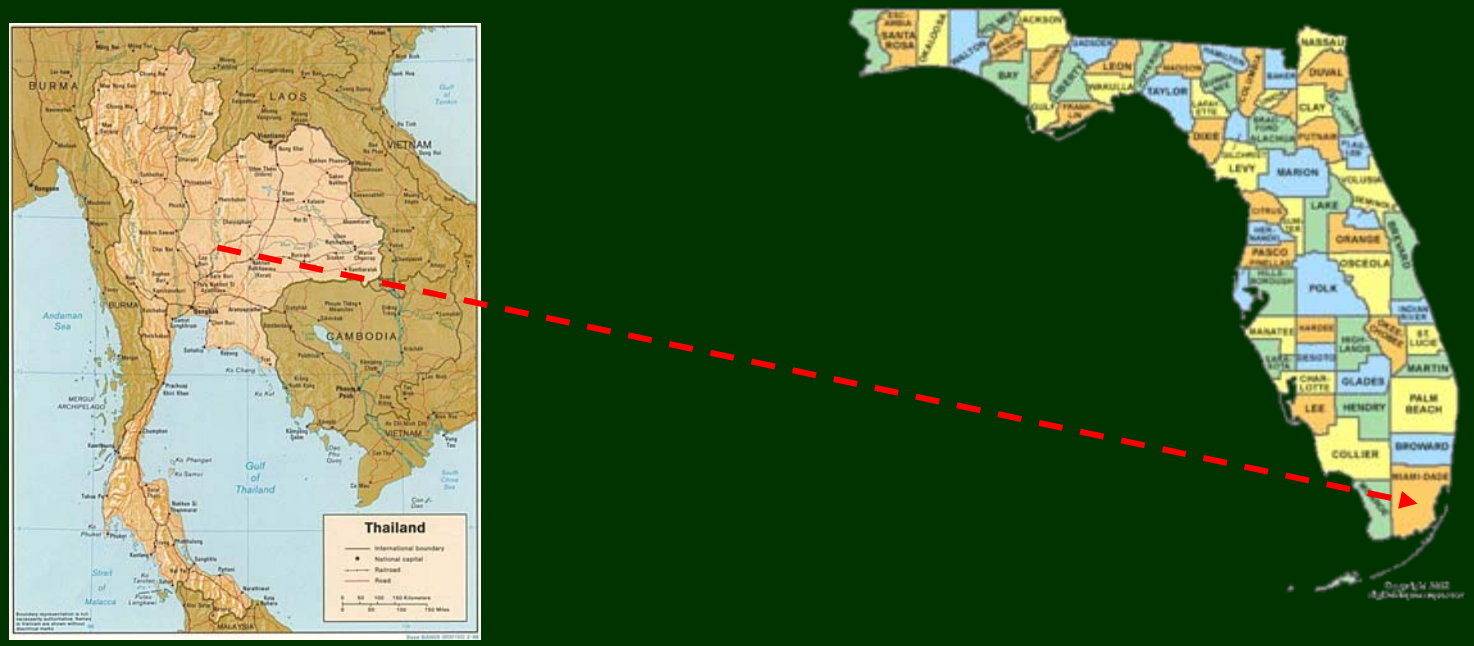
Cycad Aulacaspis Scale

- Native to parts of southeast Asia
- Part of a functioning ecosystem
  - parasites and predators are present in sufficient numbers
  - cycads survive low level of infestation

Photo by Holly Glenn

How Did It Get Here?

- First arrived in Florida in 1994
- Introduced in Miami area
- Encountered at both MBC and FTBG



Magnolia White Scale?

- Initially thought to be magnolia white scale
- Infestation pattern and intensity prompted ID

Cycad aulacaspis scale; adult female

Magnolia white scale; adult female

Positive ID too late for quarantine
Management of the pest would be necessary

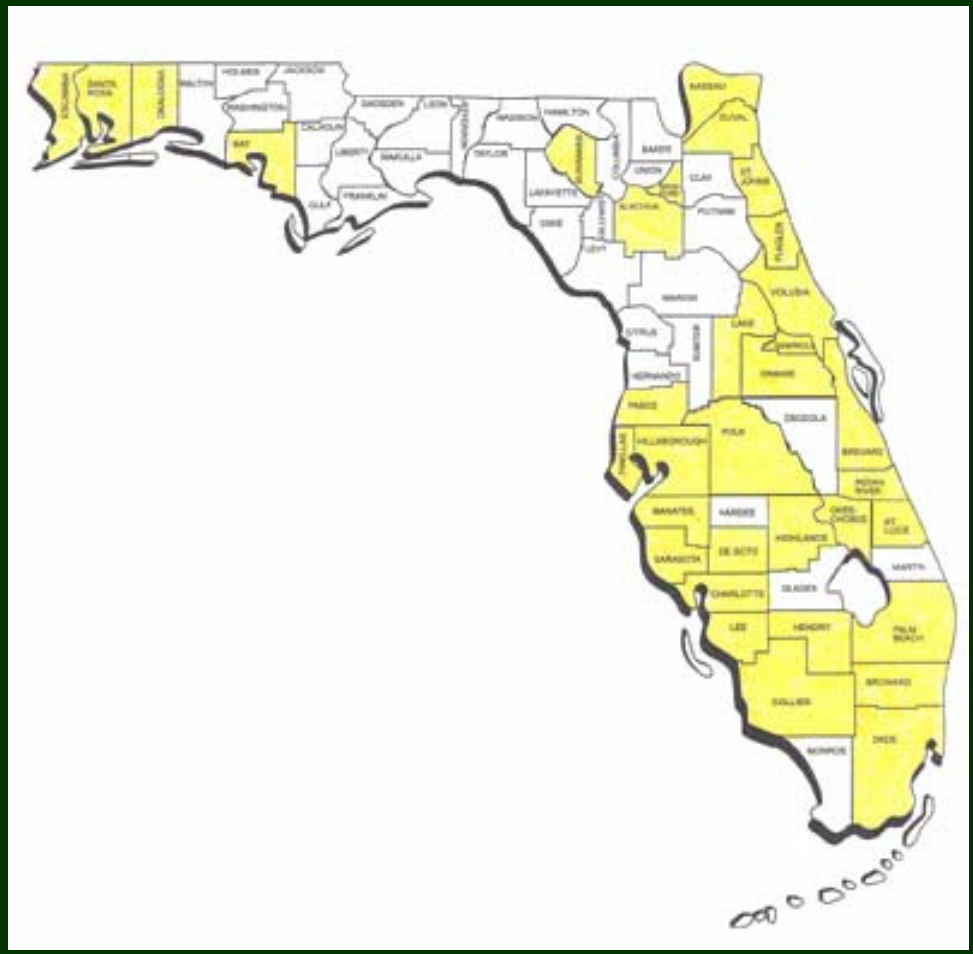
Photos by Hodges et al.

Effects of Florida Introduction

- Nursery growers, collectors, botanical centers and homeowners affected

- Sale of *Cycas* species dropped significantly in Florida

Scale Moves Rapidly in Florida



Map created by Florida Division of Plant Industry

Management Begins

- Initial efforts to control cycad scale
  - Products successfully used for magnolia white scale
    - Insecticidal soap
    - Horticultural oil
    - Imidacloprid (Merit, Marathon)
    - Dimethoate
    - Malathion

Initial Treatment Results

- Soap and oil
  - somewhat effective
  - time consuming, frequent applications
- Imidacloprid
  - not effective
- Dimethoate and Malathion
  - more effective than soap and oil
  - more caution needed by applicator, systemic insecticide
  - phytotoxicity from dimethoate and malathion

Management Study Continues – Chemical Treatments

- Entomologists see need for study of available chemical products
  - C. Mannion and H. Glenn at TREC
  - Study plants: 1 gallon *C. revoluta*
  - Evaluate soap, oil, imidacloprid, pyriproxifen, dimethoate, malathion, and thiamethoxam (Flagship)
  - Female scale examined for mortality of adults and eggs

Photo by jurassic landscape.com

Treatment Results

- Soap and Oil
  - effective only with multiple applications
- Imidacloprid and Thiamethoxam
  - not effective
- Malathion and Dimethoate
  - effective with single application
  - caused phytotoxicity of new growth
  - also kills beneficial insects
- Pyriproxifen
  - effective with single treatment

Pyriproxifen is the Best Choice

- Examined after 8 weeks
  - 100% of eggs dead
  - 99% of adult females dead
  - no phytotoxicity
  - not detrimental to beneficials
- Additional unpublished tests by Mannion and Glenn showed similar results

Management Studies Move to the Field

- MBC and TREC collaborate on study to evaluate pyriproxifen (Distance) in the field
- Nine plants selected
  - *Cycas* sp. and *Stangeria eriopus*
  - plants selected based on prior heavy infestations

female cone of *Stangeria eriopus*

The Size Problem









Treatment

- One foliar treatment of pyriproxifen
  - 12 ounces /100 gallons
- Cover all plant surfaces

Sampling

- Two samples from each of the nine plants
  - one lightly infested
  - one heavily infested
- Samples examined for:
  - mortality of adult females and females with eggs

Results

- Lightly infested samples
  - 6/9 had 90% or greater mortality
  - all had at least 75% mortality
- Heavily infested samples
  - 7/9 had 70-90% mortality
- Result: good control with pyriproxifen
  - ...but still cannot reach every plant with a foliar spray

Newest Chemical Option: Safari

- New systemic insecticide: dinotefuron (Safari®)
  - available Spring 2005
- Experiments (unpublished) at TREC show excellent control of scale
- MBC uses dinotefuron May 2005
  - results are excellent
  - not harmful to many beneficial insects

Biological Control Study

- USDA and MBC collaborate on evaluation of a parasitic wasp *Coccobius fulvus*

adult

pupa

larva

Photos by Holly Glenn

Experimental Design

- Five groups of three replications selected
- Three releases of 100 wasps each per plant
- Each plant was sampled three times over eight months

Results: Biological Control

- Parasitoid is not active enough to be primary control agent
- Parasitoid will be useful as part of an integrated pest management system

Average percent parasitized scale 51%

Management Studies Result in IPM Program

- Methods: Overview
  - Address each step of IPM system
    - what are we doing now?
    - what else could we do?
    - what changes should we make?
  - Evaluate treatment methods
  - Develop an action plan

Methods:
Integrated Pest Management

- Attend to plant cultural issues
- Scout for pests regularly
- Identify Pests
- Establish a threshold of tolerance
- Evaluate all treatment options
- Apply the best option for the situation
- Keep records

Cycad Cultural Issues

- Correct plant placement
  - avoids plant stress
- Increase air flow and access to plant for treatment

Regular Scouting

- General evaluation of collection weekly
- Monthly examination plant by plant

Correctly Identify Pests

- Local entomologists identify unfamiliar pests

Threshold of Tolerance

- Our priority: healthy plants
- Two plants with CAS = time for treatment

Treatment Options

- Chemical Control
  - oils
  - dimethoate (Cygon®)
  - malathion
  - pyriproxifen (Distance®)
  - dinotefuron (Safari®)
- Biological Control
  - parasitic wasp *(Coccobius fulvus)*

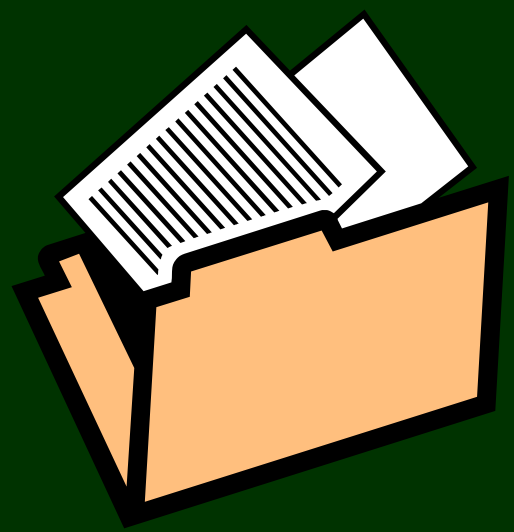
Photo by Doug Caldwell

Apply The Appropriate Treatment

- Light infestations can often be controlled with oil
- Parasitic wasp for hard to spray areas
- Retain chemical controls for widespread or heavier infestations
  - avoid chemical resistance by scale
  - use chemicals compatible with biological control (pyriproxifen and dinotefuron)

Keep Detailed Records

- Seasonal infestation levels
- Species preference by scale
- Can help to focus treatment plan



MBC Current Management Plan

- Increase air flow and plant access
- Regular scouting
- Light / spotty infestations
  - horticultural oils
- Widespread infestations
  - rotate pyriproxifen (Distance®) and
  - dinotefuron (Safari®)
- Utilize parasitic wasp

Value of MBC's IPM Program for the Future

- MBC can maintain its responsibilities as a repository for population based cycad collections including *Cycas* and other genera and species susceptible to cycad scale
- MBC's IPM program is a template for others to use

Conclusion

- Eradication no longer possible
- Need to stop spread
- Responsibly manage each collection
- Work together to share new control information

Special Thanks To:

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