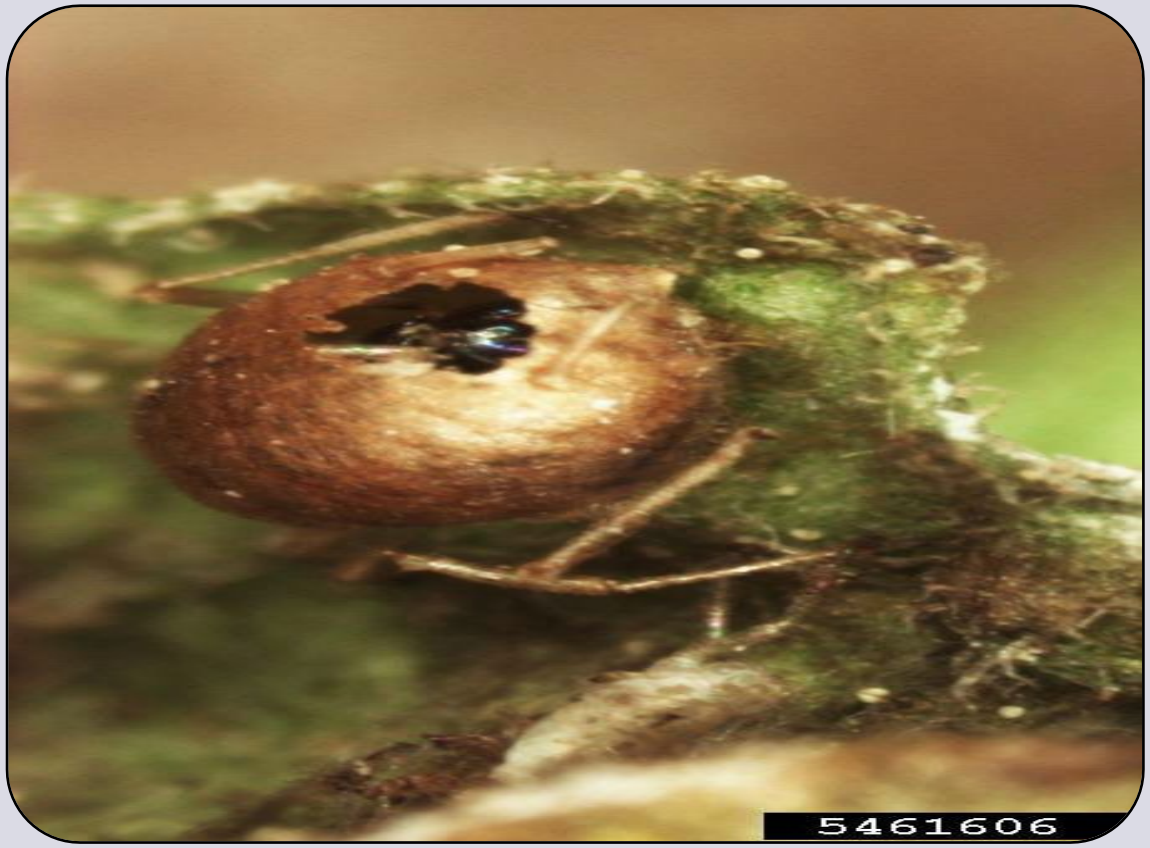
UF | IFAS Extension
UNIVERSITY of FLORIDA

Biological Controls

FLORIDA FIRST DETECTOR

Introduction

- **Biological control –** populations of beneficial organisms are intentionally used and manipulated, under the role of natural enemy, to manage and limit insect pest populations.
- **Natural enemy -** a predator, parasite, or pathogen that is used to target and limit specific insect pest populations.
- **Three types of biocontrol**
  - Classical Biocontrol
  - Conservation
  - Augmentation



Parasitoid ready to emerge from mummified aphid.

Photo: Sandra Jensen, Cornell University, Bugwood.org, #5461606

Biocontrol Agents/ Natural Enemy: Predators

- Predators: Arthropods
  - Order Aranea: Spiders
  - Order Odonata: dragonflies
  - Order Neuroptera: Lacewings
  - Order Coleoptera: beetles
  - Order Diptera: Flies
  - Order: True bugs
  - Order Hymenoptera: ants
  - Order Thysanoptera: some thrips
  - Order Mantodea: generalist mantids

Clubtail dragonfly, *Gomphus vulgatissimus*

Syrphid fly larvae, Family Syrphidae

Photo: Mary C Legg, Mary C Legg, Bugwood.org, #5581832; David Cappaert, Bugwood.org, #5490094

Biocontrol Agents/ Natural Enemy: Predators

Lacewings larvae eating aphids

Predatory stink bug
Euthyrhynchus floridanus

Ground beetle
Harplaus affinis

Photo: David Cappaert, Bugwood.org, #5255046; Herbert A. 'Joe' Pase III, Texas A&M Forest Service, Bugwood.org, #9009073; Mary C Legg, Mary C Legg, Bugwood.org, #5581906

Biocontrol Agents/ Natural Enemy: Parasitoids

- **Parasitoids**:
  - Roundworms
    - Nematodes (phylum Nematoda): entomopathogenic nematodes
  - Arthropods:
    - Order Diptera: flies
    - Order Hymenoptera: wasps

Entomopathogenic nematodes
Steinernema scapterisci

Photo: David Cappaert, Bugwood.org, #5351012;

Biocontrol Agents/ Natural Enemy: Parasitoids

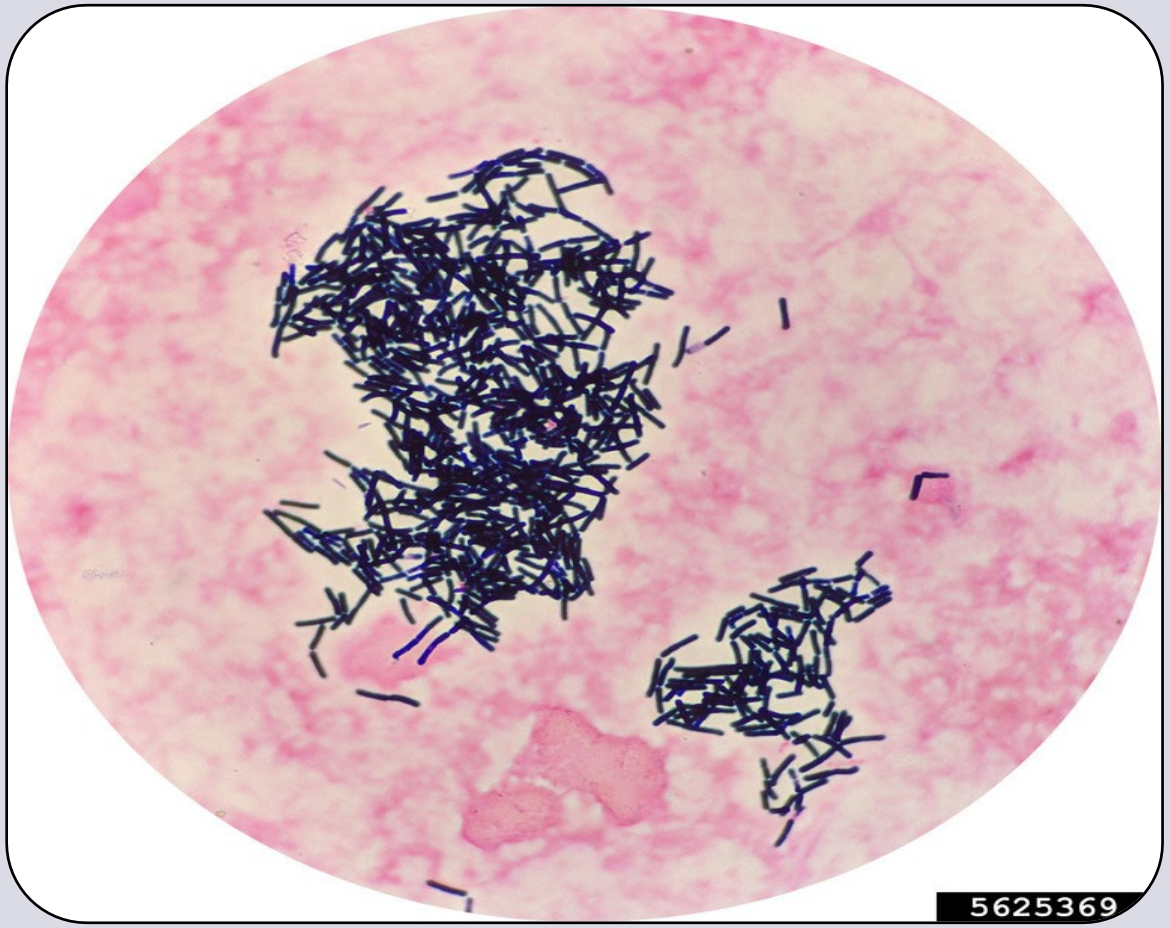
Tachinid flies
Phasia occidentis

Braconid wasp
Atanycolus cappaerti

Photo: Whitney Cranshaw, Colorado State University, Bugwood.org, #1326220; David Cappaert, Bugwood.org, #5352009

Biocontrol Agents: Pathogens

- Pathogens:
  - Fungi – entomopathogenic fungus
  - Bacteria
  - Viruses – entomopathogenic viruses
    - EX: Nuclear or Cytoplasmic Polyhedrosis virus



Bacterial biological control
***Bacillus thuringiensis* (Bt)**

Photo: Ansel Oommen, Bugwood.org, #5625369

Generalist vs. Specialist

- Generalist
  - Biocontrol agent that has a wide range of hosts that it will eat, parasitize, or infect (biocontrol pathogen).

Crab Spider, family Thomisidae

- Specialist
  - Biocontrol agent that is specific for usually one type or host, or narrow range of hosts that it can eat, parasitize, or infect (biocontrol pathogen).

Parasitoid wasp, *Encarsia lahorensis*

Photo: David Cappaert, Bugwood.org, #2106068; Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services, Bugwood.org, #5454330

Classical Biocontrol

- Import and release of non-native organism for the permanent establishment of this natural enemy to control target pest population.
- **Factors to consider**:
  - Origin of pest and biocontrol agent
  - Biological life stage of biocontrol agent
  - Time to study their interactions
  - Permits to bring non-native biocontrol agent for research.
  - Host specificity

Vedalia beetle (*Rodolua cardinalis)* feeding on pest cottony cushion scale (*Icerya purchasi)*

Photo: Florida Division of Plant Industry , Florida Department of Agriculture and Consumer Services, Bugwood.org, #5385575

Conservation Biocontrol

- Providing a habitat or environment that promotes and supports natural enemies that are present in the environment.
- Benefits:
  - Providing flowering plants– nectar or pollen
  - Trees for natural enemies to overwinter or use for shelter
  - Trap plants for pests
  - Intercropping

Trap crop: Sorghum attracts aphids

Mealybug destroyer, *Cryptolaemus montrouzieri*

Photo: Howard F. Schwartz, Colorado State University, Bugwood.org, #5361591

Augmentation Biocontrol

- Release of natural enemies in multiple applications as an additional source, but the goal is not to have them to become established within the environment.
- Pests are targeted with the release of higher numbers of natural enemies.
- There are 2 approaches to augmentation biocontrol:
  - Inundative
  - Inoculative

Trichogramma wasp, *Trichogramma ostriniae*

Photo: Peggy Greb, USDA Agricultural Research Service, Bugwood.org, #5526014

Inoculative

- Used for a long-term (growing season) control to manage pest populations from reaching intolerable numbers.
- Release small numbers of natural enemies early in pest life cycle.

Whitefly parasitoid, Encarsia formosa

Photo: David Cappaert, Bugwood.org, #2133029

Inundative

- During pest outbreaks, natural enemies can be released in large numbers to overwhelm pest numbers.
- This provides a quick reduction in pest population.
- Similar to the release of chemicals to reduce pest populations.

Green lacewings, Genus Chrysoperla

Photo: Frank Peairs, Colorado State University, Bugwood.org, #5364257

Reporting to UF/IFAS Faculty in Florida

- Local county extension office

https://sfyl.ifas.ufl.edu/find-your-local-office/

- Insect ID Lab - Dr. Lyle Buss

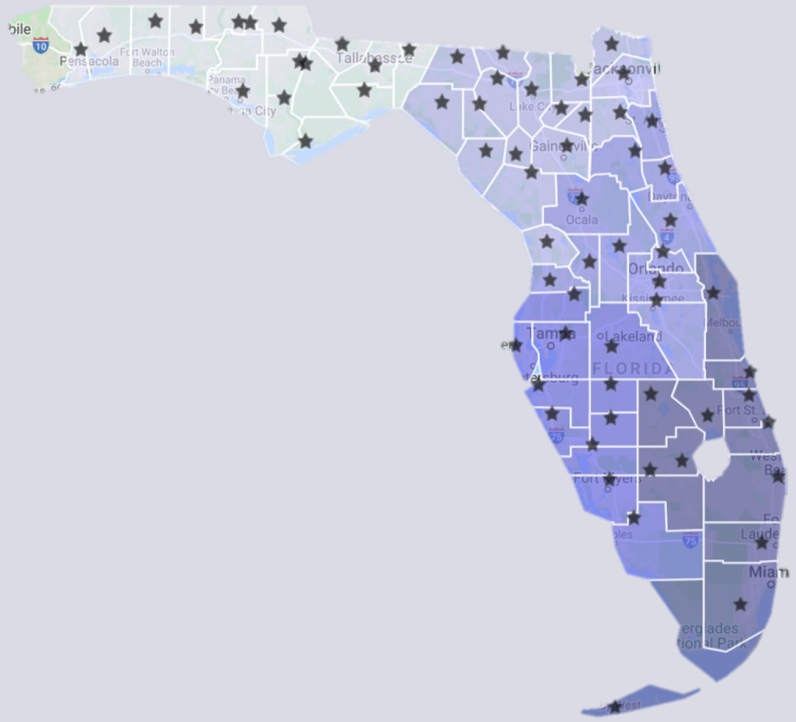
http://entnemdept.ufl.edu/insectid/

- Nematode Diagnostic Lab - Dr. Billy Crow

http://nematology.ifas.ufl.edu/assaylab/index.html

- Plant Diagnostic Center - Dr. Carrie Harmon

https://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/



Reporting to FDACS-DPI in Florida

Florida Department of Agriculture and Consumer Services (FDACS) - Division of Plant Industry (DPI)

- FDACS, DPI Responsibility
  - Announcing detection or establishment of new invasive species.
  - Reporting is a legal obligation under Florida Statute 581.091.
- Submission Form
  - http://forms.freshfromflorida.com/08400.pdf
  - https://www.fdacs.gov/Agriculture-Industry/Pests-and-Diseases/How-to-Submit-a-Sample-for-Identification

FDACS, DPI Contact

- Dr. Leroy Whilby, Bureau Chief-Entomology, Nematology and Plant Pathology
  - 352-395-4661
  - Leroy.whilby@freshfromflorida.com
- Dr. Paul Skelley, Assistant Chief-Entomology, Nematology and Plant Pathology
  - 352-395-4678
  - Paul.skelley@freshfromflorida.com
- Division of Plant Industry Hotline
  - 1-888-397-1517
  - DPIHelpline@FDACS.gov

Reporting using DDIS in Florida

Digital Diagnostic and Identification System (DDIS)

- Digital Diagnostic Collaboration
  - Extension agents
  - Laboratories
  - Clinics
  - Specialists
- https://ddis.ifas.ufl.edu/

Find More Information At:

https://entnemdept.ufl.edu/ffd/

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Collaborating Agencies

- U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS)
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- Florida Department of Agriculture and Consumer Services (FDACS)
- National Plant Diagnostic Network (NPDN)
- Sentinel Plant Network (SPN)
- University of Florida Institute of Food and Agricultural Sciences (UF-IFAS)
- Protect U.S.

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