Beneficials for the management of Lebbeck mealybug

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Are there predators for Lebbeck mealybug in Florida?

- Predators have been found to be **MORE** effective than many insecticides in other impacted regions
- As a newer pest, do we have any predators present or available for purchase that could help gain control of lebbeck mealybug?
- Research to date:
  - Gut content of potential predators from groves
  - Predation assays
  - Rearing assays

Photo credit: L. Diepenbrock

Looking for potential predators using gut contents

- Field collection
  - Insects, spiders, and mites in canopy sampled using suction sampler
  - Killed on site and preserved to maintain stomach contents
  - Sorted and identified in lab
- Gut content analysis
  - Determine feeding interactions using DNA from the guts of potential predators using PCR and primers specific to the mealybug

Kristen Gaines, MS research

Photo credit: L. Diepenbrock

Gut content analysis

- Developed DNA primers
  - Specific to lebbeck mealybug (*Nipaecoccus viridis*)
- Feeding assays with mealybug destroyers to determine DNA retention time under optimal conditions
- Tested a suite of potential predators collected from infested trees

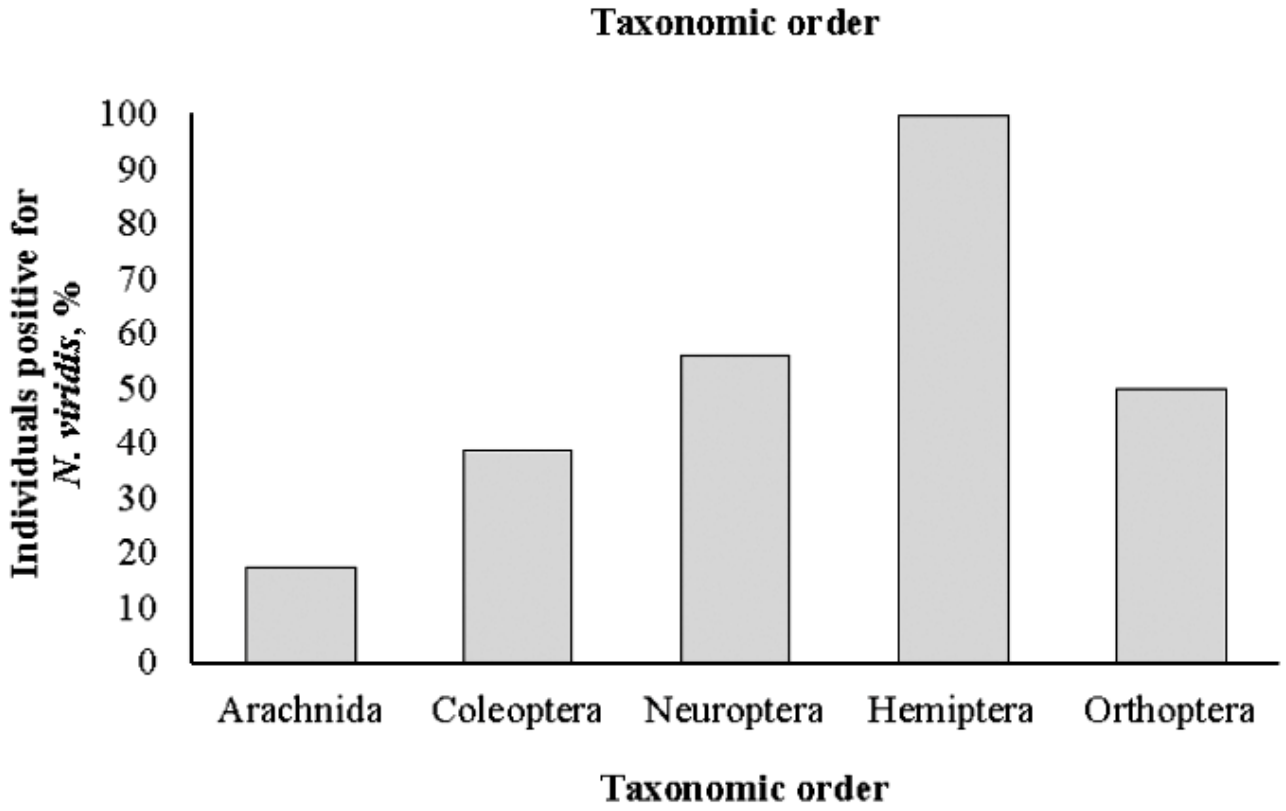


Photo credit: K. Gaines

Predation assays

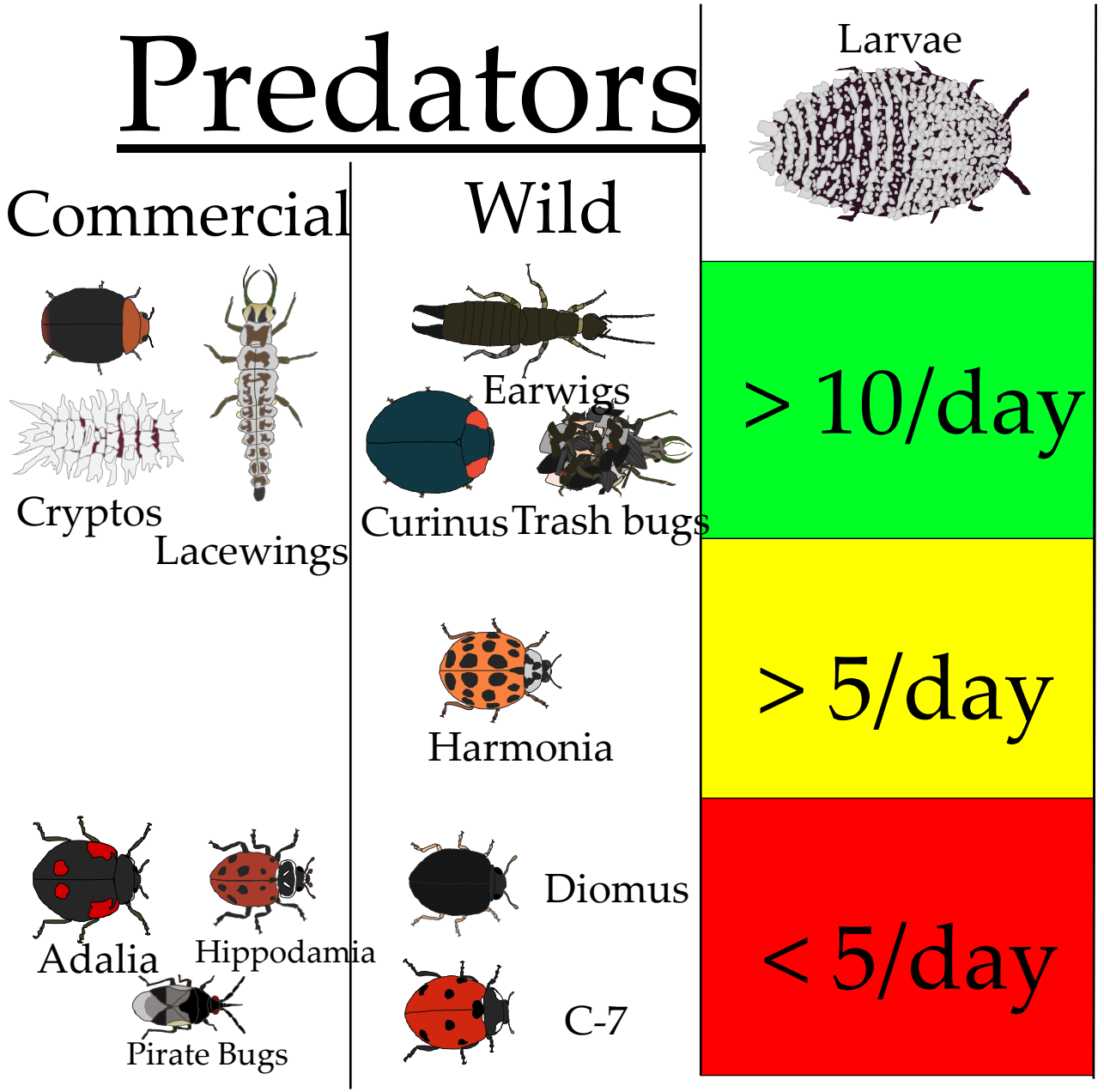
- Laboratory assays
- Tested a range of wild collected/lab acclimated predators and predators available for purchase:
  - What life stages of the mealybug will the predators eat?
  - How much will they eat?

Predators		Larvae 
Commercial	Wild	
		> 10/day
		> 5/day
		< 5/day

Source: Eric Middleton research

Predators

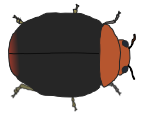
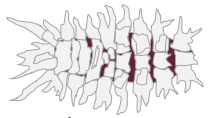
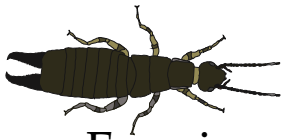
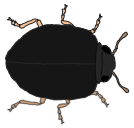
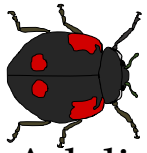
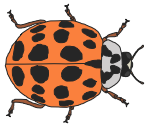
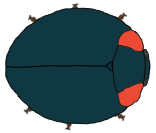
- Predators consuming more than 10 larvae/day
  - For purchase: Crytolaemus montrouzieri, lacewings
  - Wild: earwigs, Curinus sp. beetles, and trash bugs
- All other could contribute to predation but likely to opt for other food resources



Source: Eric Middleton research

Predators

- Lacewings available for purchase were unable to get through ovisac wax
- Best options overall are
  - Cryptolaemus montrouzieri (mealybug destroyers)
  - Earwigs
  - Trash bugs

Commercial	Wild	Larvae	Ovisacs
  Cryptos	 Earwigs  Trash bugs	> 10/day	> 50%
 Lacewings	 Diomus  C-7	> 5/day	> 0%
  Adalia Hippodamia  Pirate Bugs	  Harmonia Curinus	< 5/day	0%

Source: Eric Middleton research

Parasites reared from Lebbeck mealybug

Fragosa sp.

Anatrachyntis badia

Anagyrus dactylopii and *Aprostocetus* sp.

Photo credit: Eric Middleton

Supporting predators via ant management

- Many species of ants farm honeydew producing organisms
  - Mealybugs provide sugar-rich food to ants
  - Ants provide protection from predators and cleaning which will remove fungal spores (e.g. EPFs)

- Fire ants more aggressive defenders than other ants in groves!

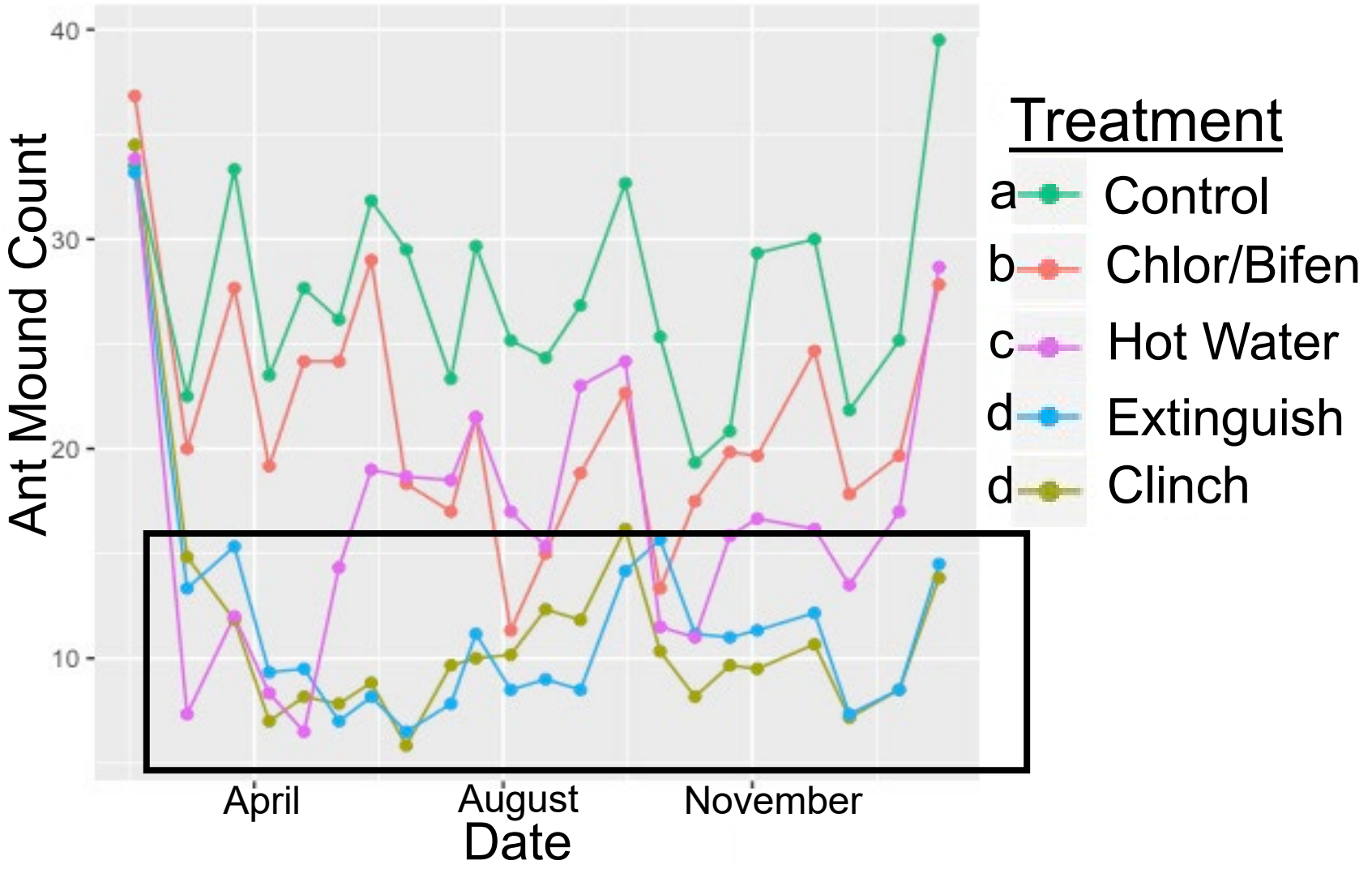
Photo credit: L. Diepenbrock
Source: Eric Middleton research

Fire ant management study

- Treatments
  - Boiling water: 2 main applications
  - Ground applications Chlorpyrifos/Bifenthrin
  - Bait 1: Clinch (Abamectin)
  - Bait 2: Extinguish (S-Methoprene)
  - Control (no treatment)

Photo credit: E. Middleton

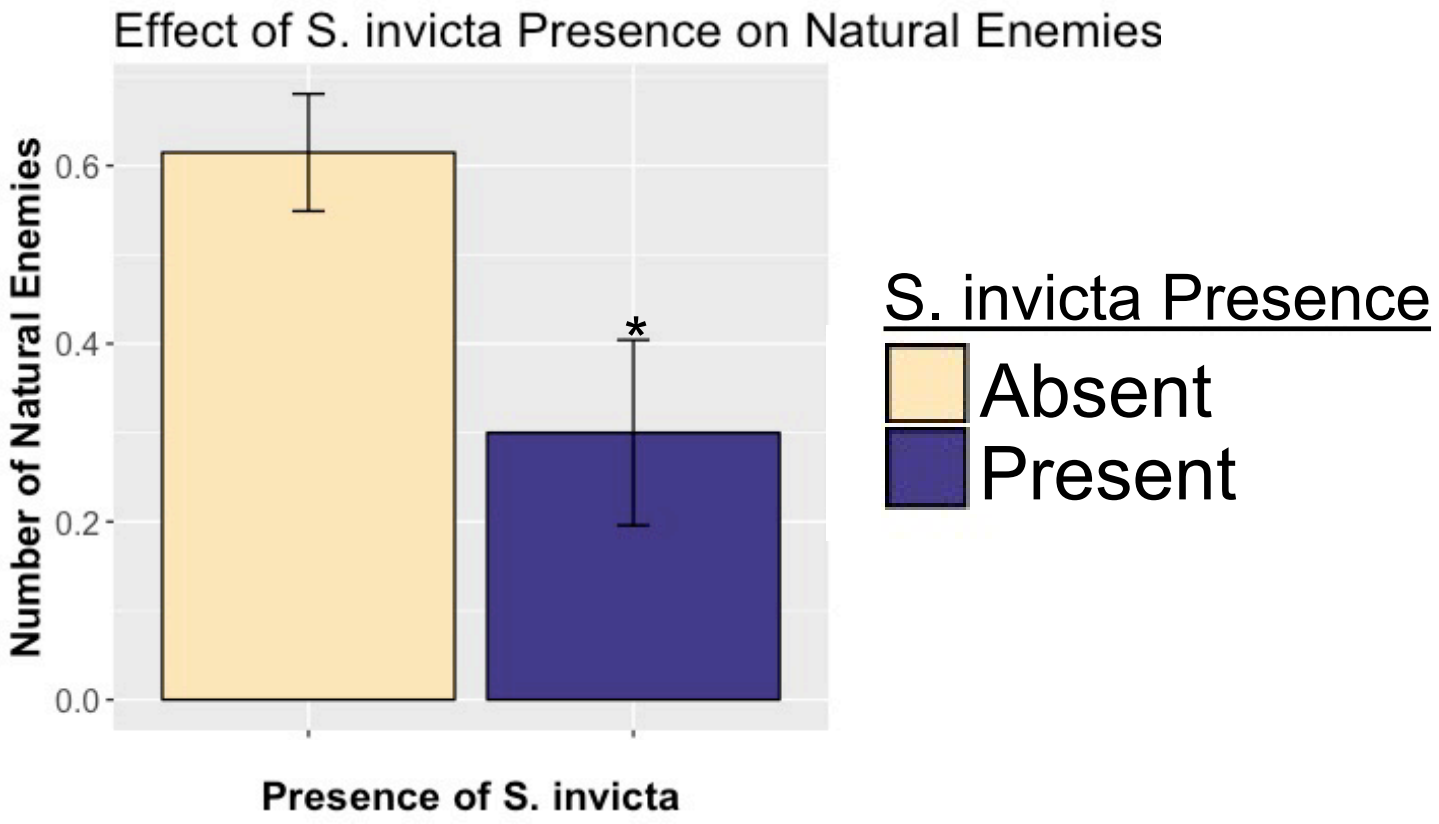
Both baits provided greater reduction in fire ant mounds compared to control than other treatments.



Source: Eric Middleton research

Will fire ant management support predators?

Mealybug clusters tended by fire ants had fewer predators present than those without fire ants



Source: Eric Middleton research

Acknowledgements

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Questions?

Photo credit: E. Middleton