



Beneficials for Management of ACP

Predators, Parasitoids, Entomopathogens

Jawwad Qureshi, UF/IFAS SWFREC

Asian citrus psyllid (ACP)

- Feeds on all types of citrus and other hosts such as orange jasmine
- Easy to find in developing and expanding shoots
- A single female can lay several hundred eggs
- Economically important, **HLB** factor



Eggs



Nymphs



Adult

Biological control of ACP

Predators

Common in the citrus groves



Predators

Commercially available



Biological control of ACP

Parasitoids

Tamarixia radiata



Entomopathogens

Hirsutella citriformis

Cordyceps fumosorosea

Beauveria bassiana

Ladybeetle predators of ACP

Larva

Adult

Olla v-nigrum
Southern 2-spotted ladybeetle



Cycloneda sanguinea
Blood red ladybeetle



Ladybeetle predators of ACP

Larva

Adult

Harmonia axyridis
Multicolored Asian ladybeetle

Curinus coeruleus
Metallic blue ladybeetle



Ladybeetles – Additional pest targets



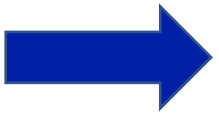
Aphids, Mites



Aphids, Mites, Scales, Mealybugs, Leafminers

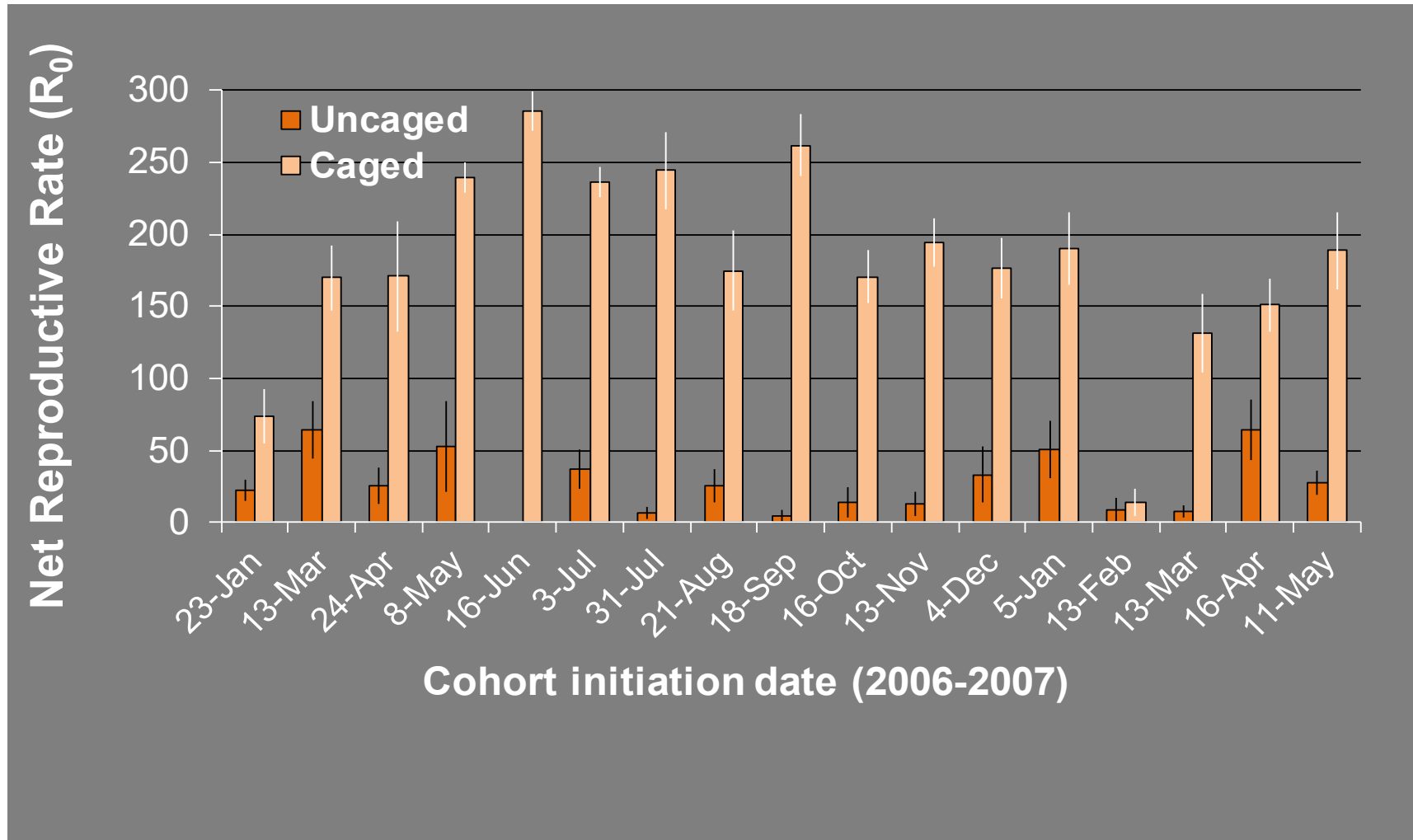


Aphids, Mites, Scales, Mealybugs



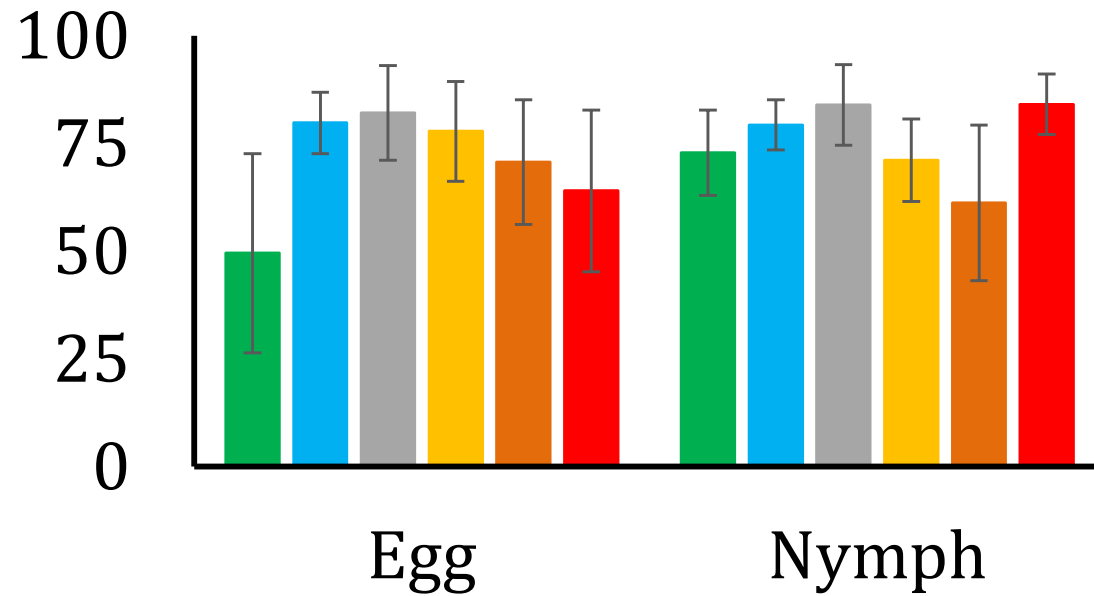
Scales, Aphids

- ACP reduction from naturally occurring predators in the field.
- More than 80% reduction of ACP immatures in colonies exposed to natural enemies (uncaged) compared to colonies protected with sleeve cages (caged).

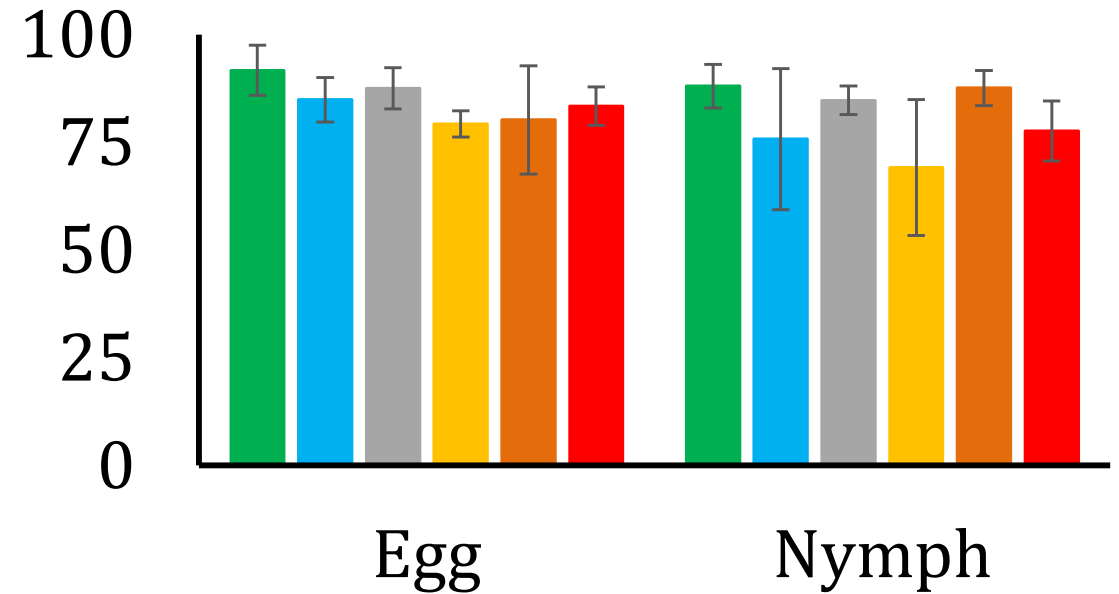


Recently observed natural mortality (%) in ACP colonies: 2021-2022

August 2021



March 2022



Tree Density/ha
(1 ha = 2.5 ac)

■ 447

■ 512

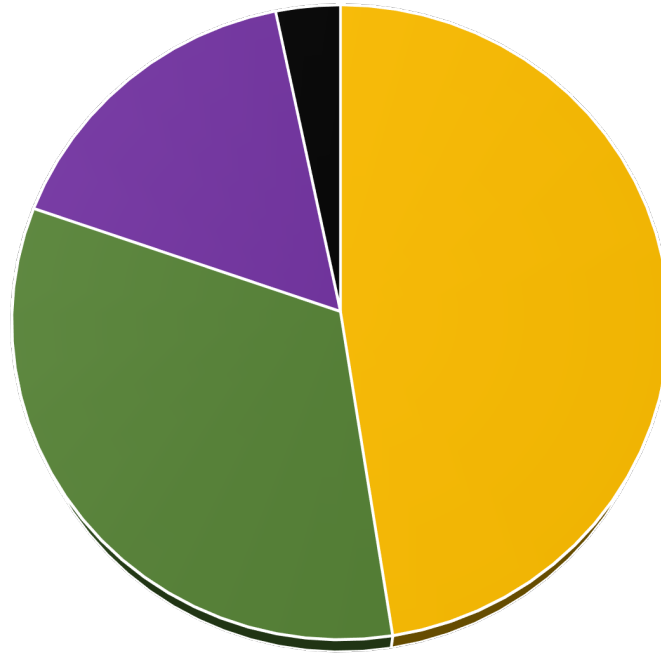
■ 598

■ 717

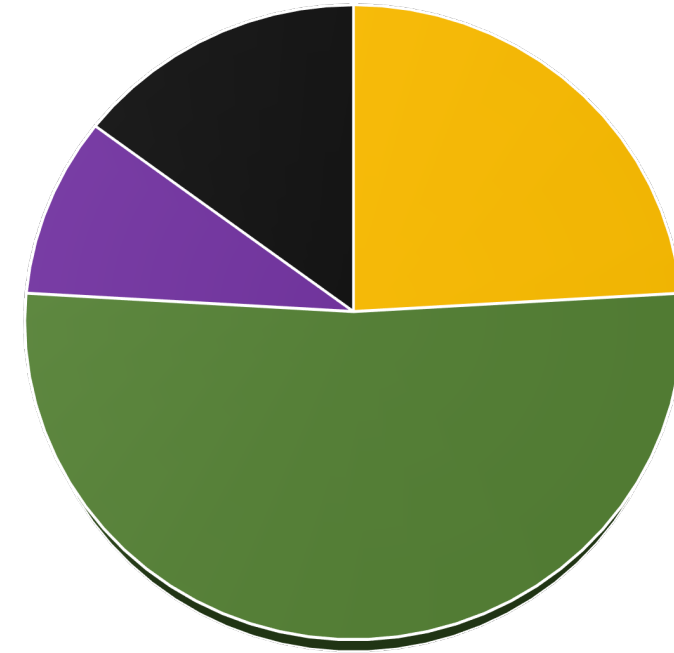
■ 745

■ 897

Abundance of ladybeetles in suction samples: 2021-2022



447 trees/ha



897 trees/ha

1 ha = 2.5 ac

 *Olla v-nigrum*

 *Harmonia axyridis*

 *Curinus coeruleus*

 *Cycloneda sanguinea*

Lacewings, another important group of predators which attack ACP and several other pests

Chysoperla

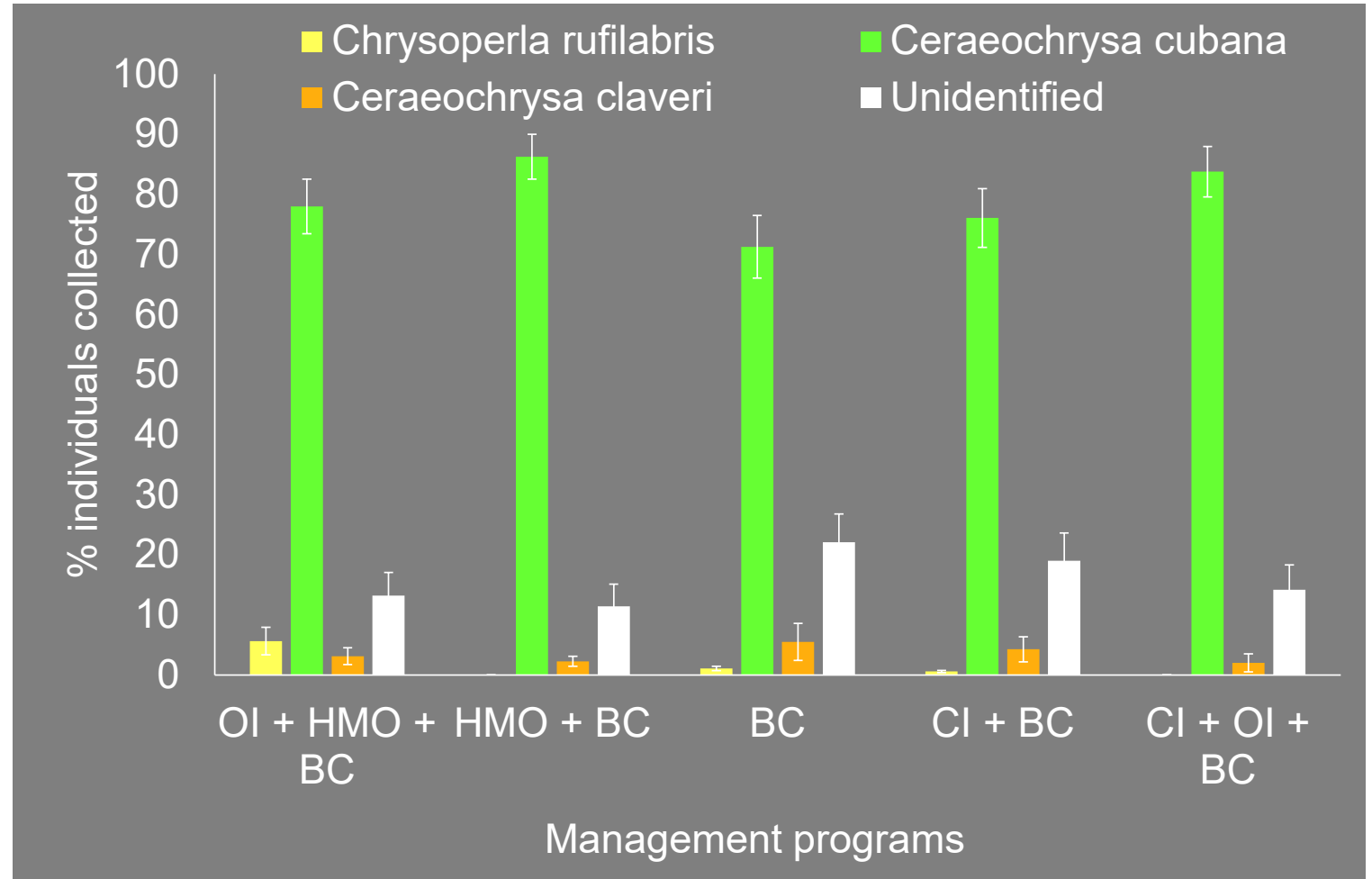


Ceraeochrysa

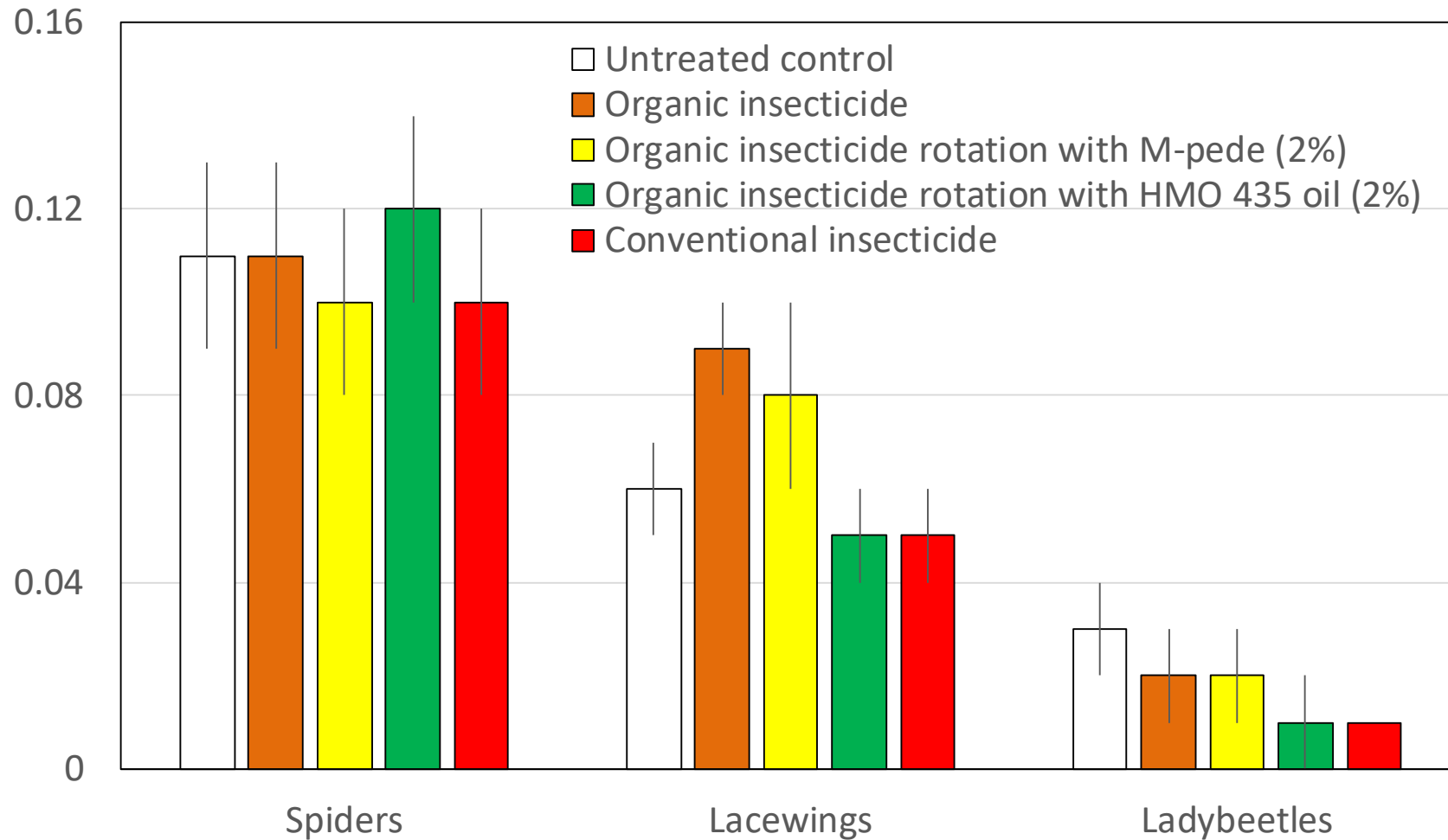




Abundance of lacewing species in different ACP management programs: 2019-2021

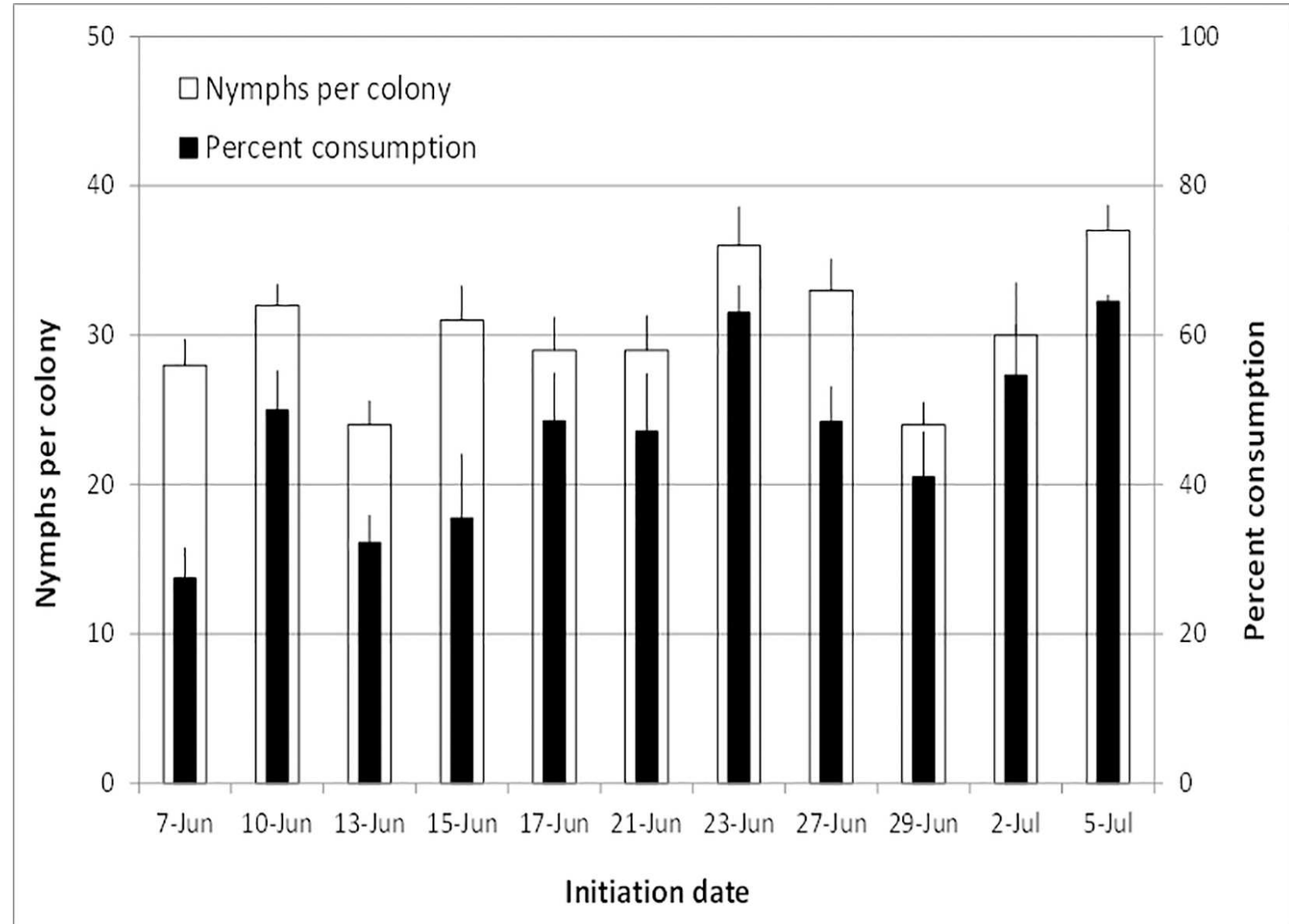


Predators in organic and conventional psyllid management programs (average no./tap sample)



Adalia bipunctata

- Ladybeetle consumption of ACP nymphs in developing colonies in the field
- Commercially available species



Sympherobius barberi

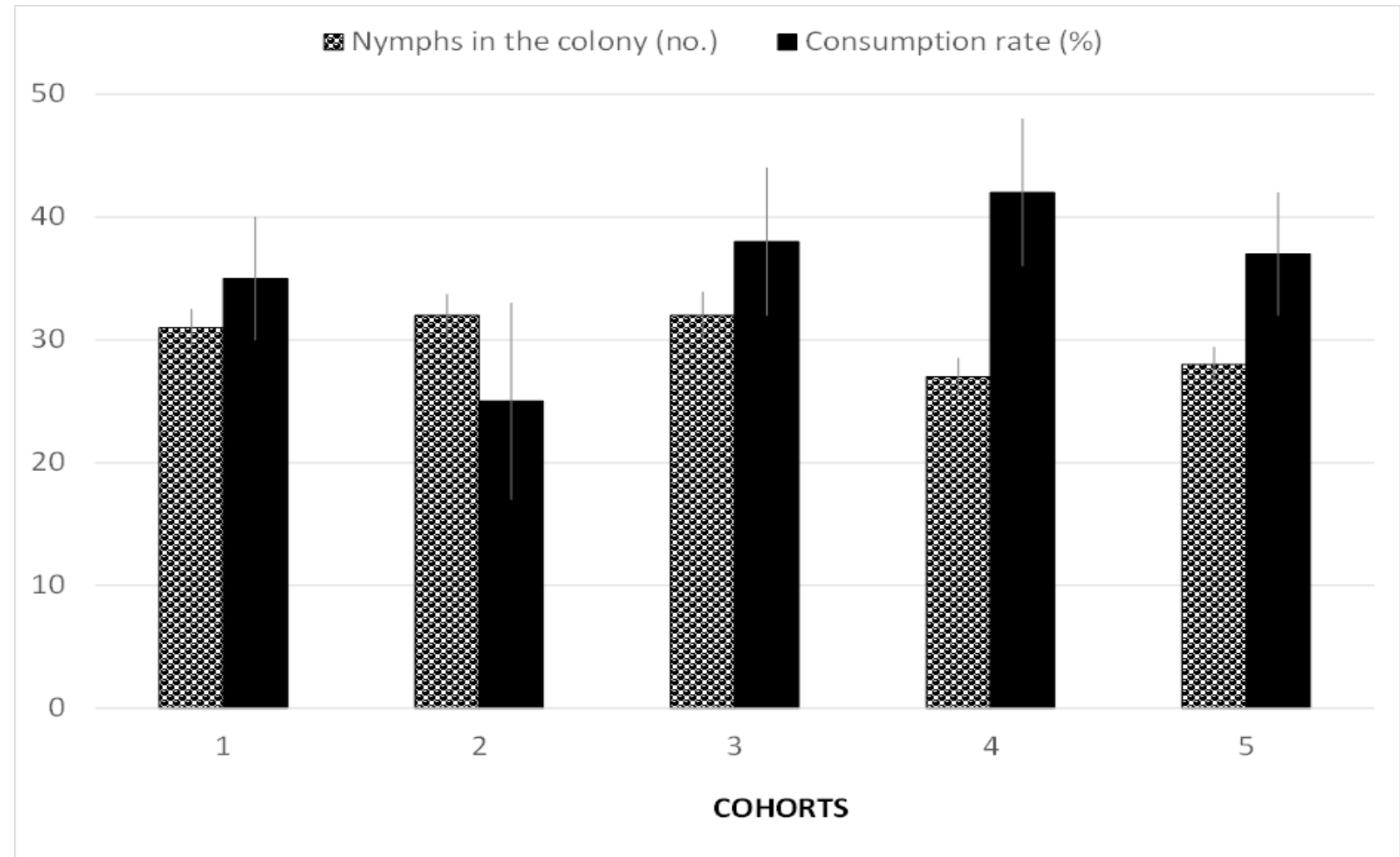
- A commercially available species of brown lacewing



Adult (left) and larva (right) of lacewing feeding on psyllid nymph

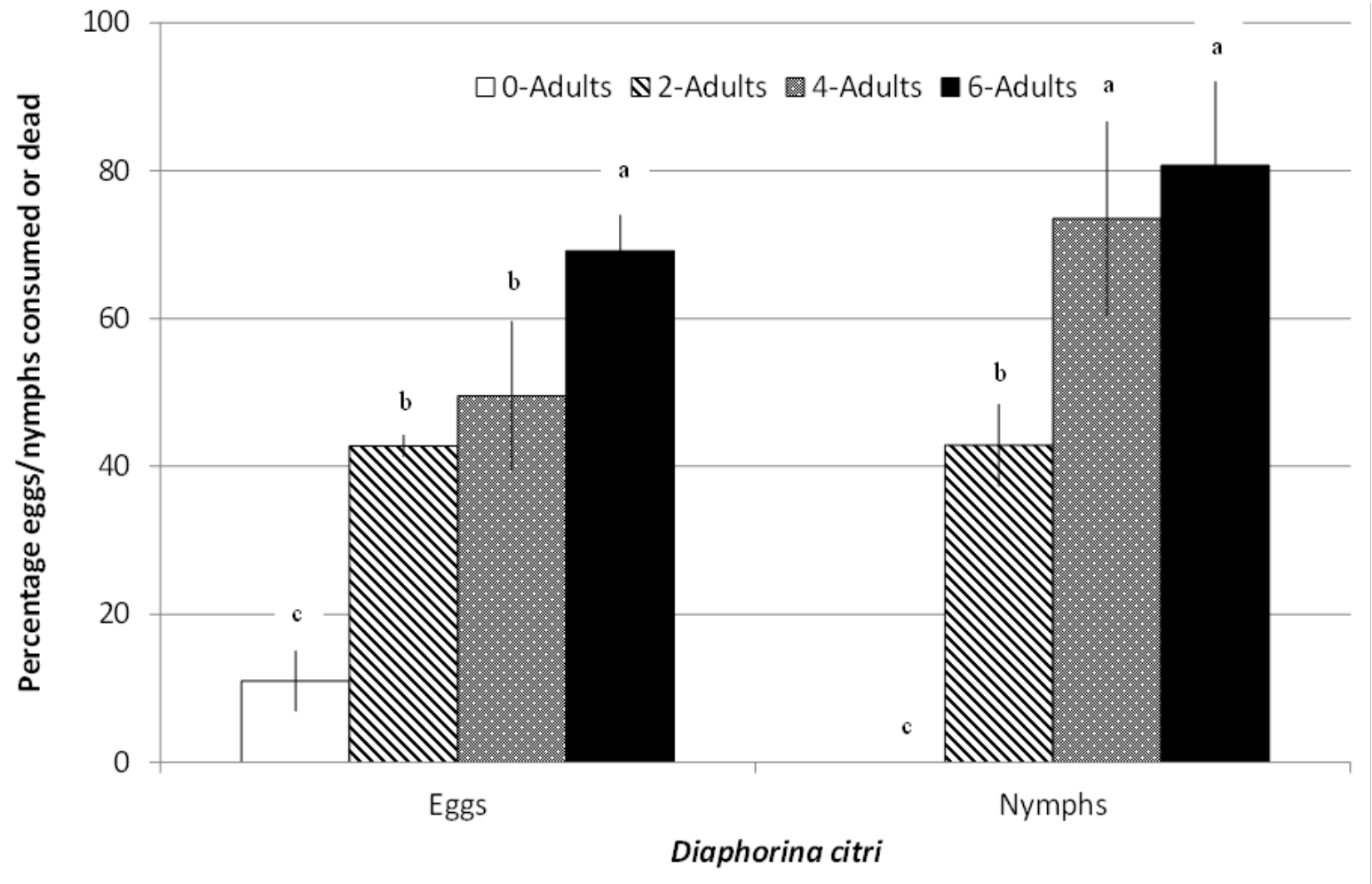
Sympherobius barberi

- Consumption of nymphs in developing colonies of ACP in the field cages



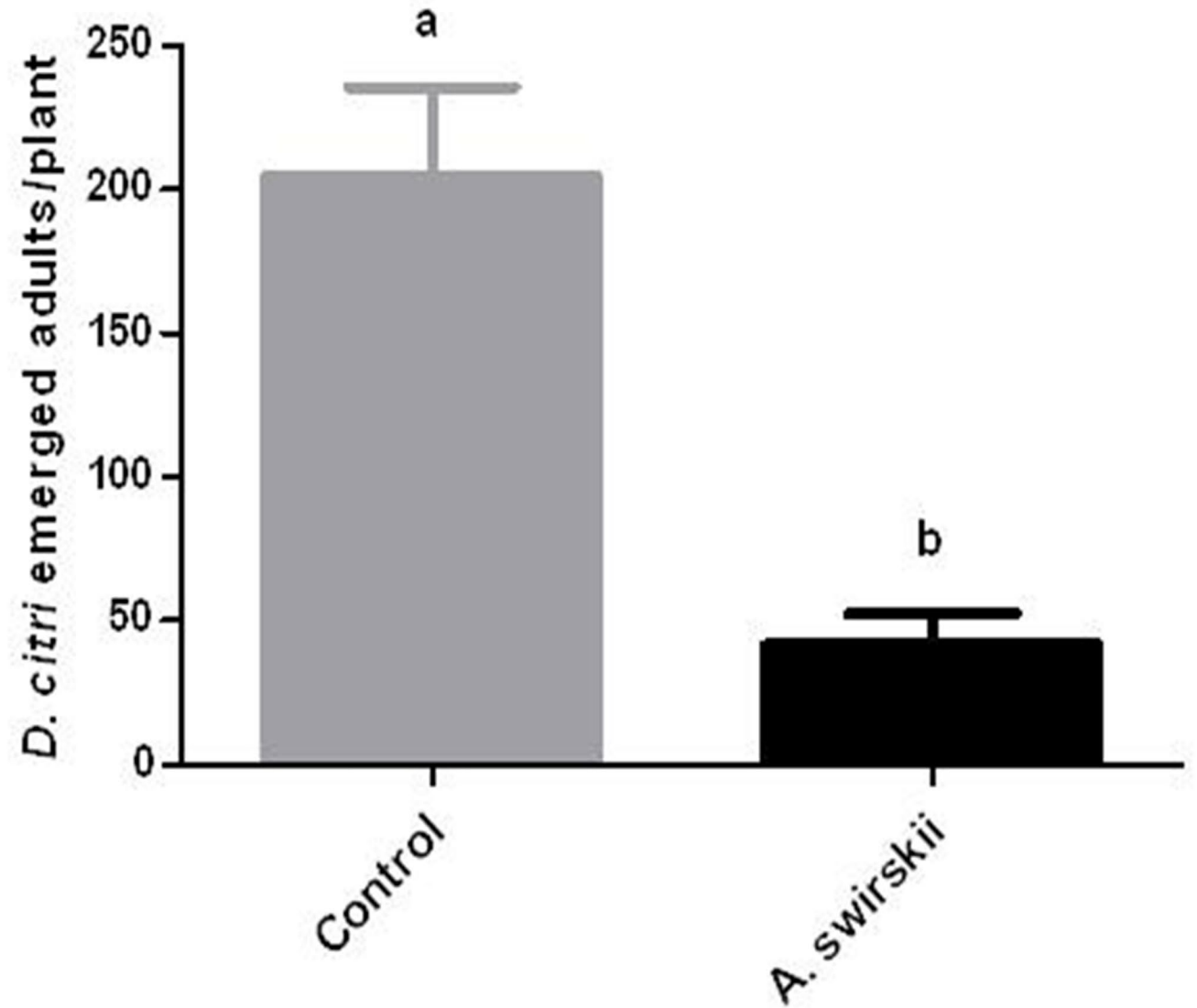
Sympherobius barberi

- Suppression of ACP eggs and nymphs at different release densities of predator
- A reduction of 43-81% in ACP immatures across three release rates



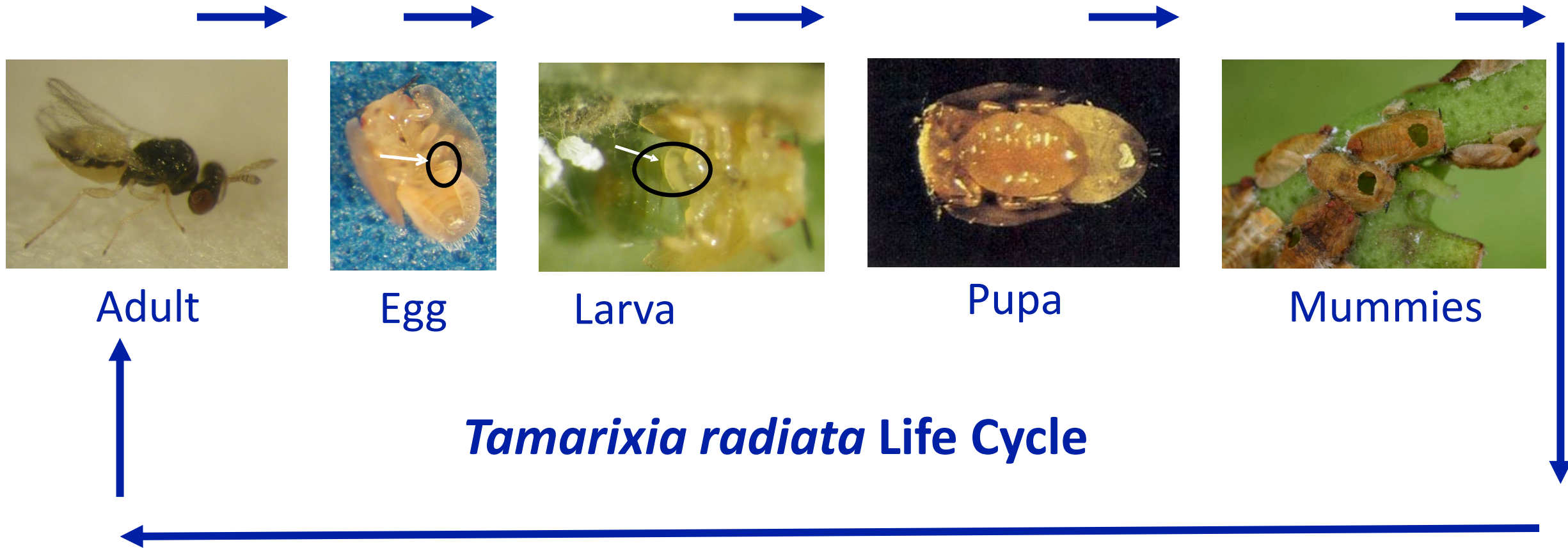
Amblyseius swirskii

- Impact of a predatory mite on ACP



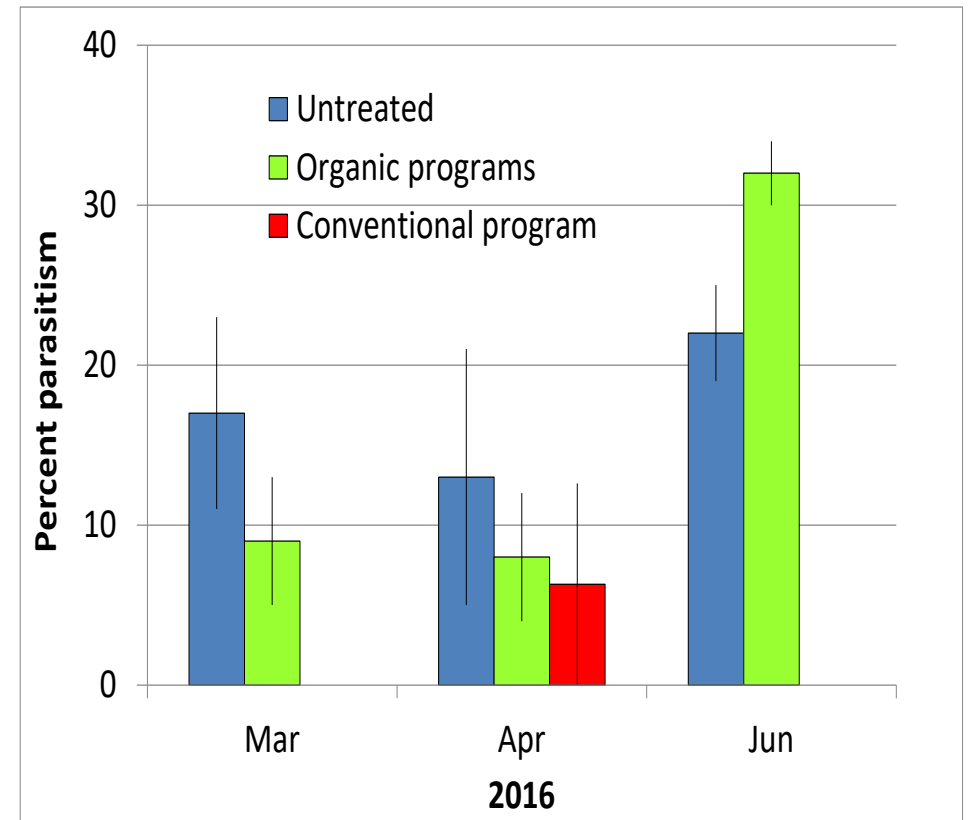
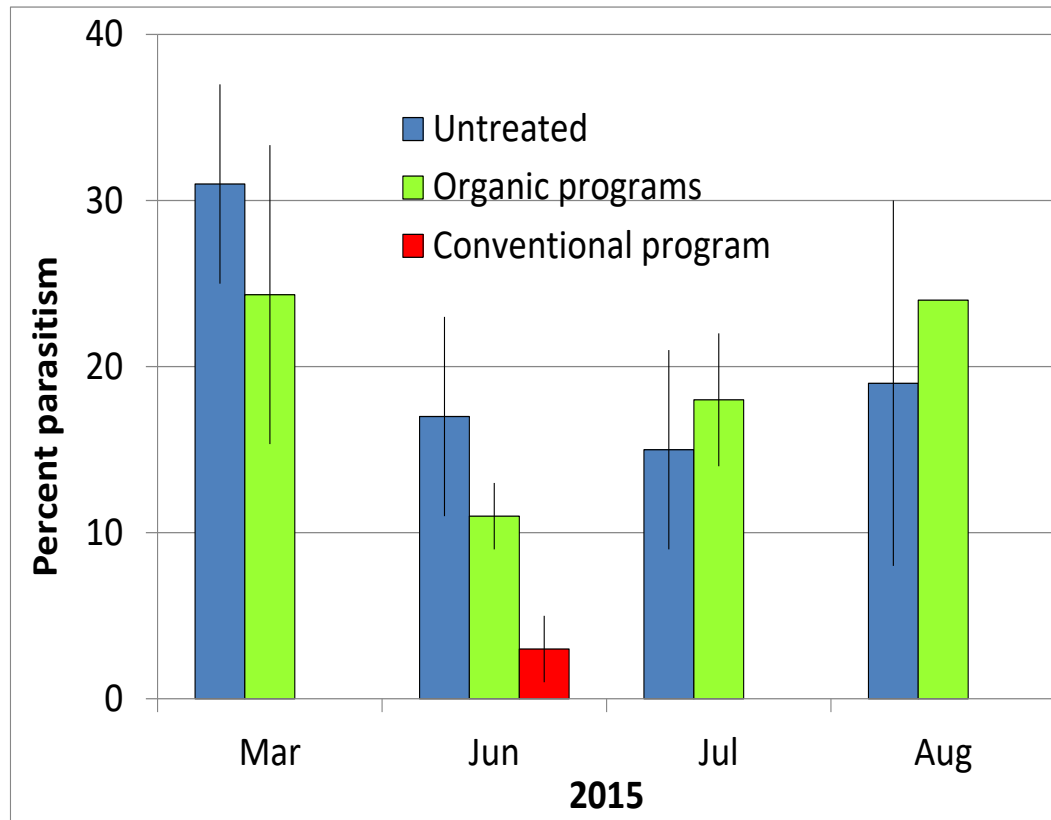
Parasitoid: *Tamarixia radiata*

Mass produced and released in the state



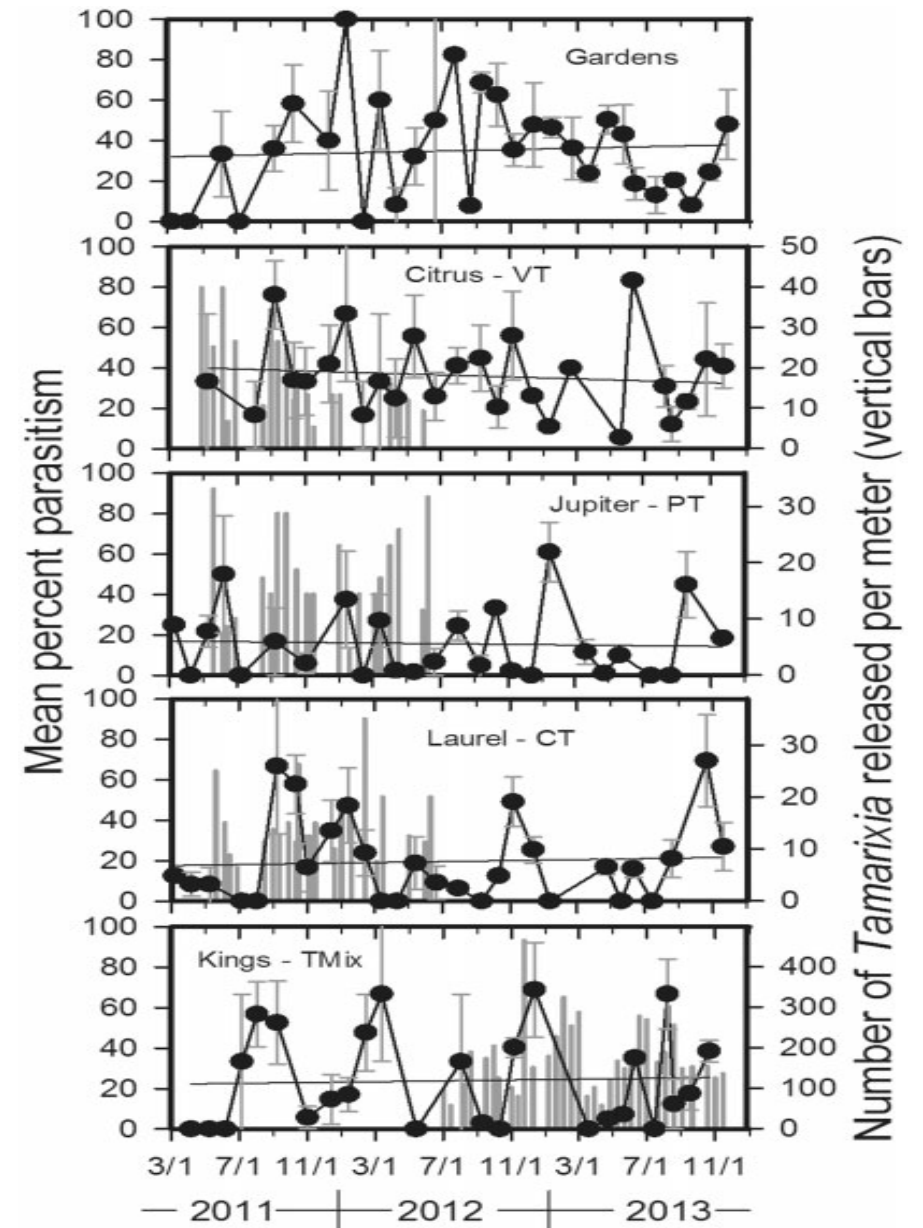
Parasitoid: *Tamarixia radiata*

Percentage parasitism in organic and conventional groves



Parasitoid: *Tamarixia radiata*

- Release and parasitism in orange jasmine hedges in Southeast Central Florida
- Percentage parasitism averaging 16-35% per shoot was observed.





Conclusions and Implications

- Predators and parasitoid *Tamarixia radiata* show significant potential in suppressing psyllid populations.
- Beneficial insects and mites are expected during the growing season when the preferred host ACP and other pests are present.
- Conservation and augmentation of biological control contribute to suppressing ACP and additional pests.
- Successful integrated area-wide citrus pest management requires using all available tools, including biological control.

Acknowledgements

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 - Jean-Vyes Berisse (Graduate student)
 - Research assistants: Monica Triana, Benny Peña, Adrian Hernandez
- *More information, please email jawwadq@ufl.edu*



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