NATURAL ENEMIES OF THE CYCAD AULACASPIS SCALE

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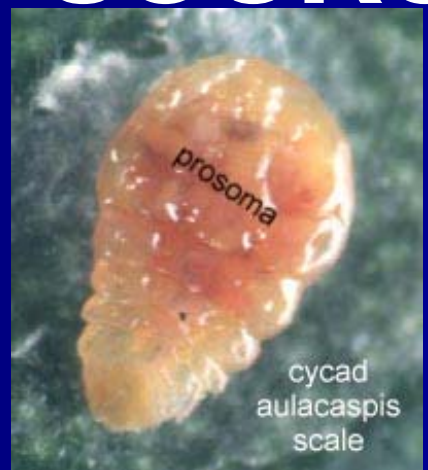
AN OVERVIEW OF THE PREDATORS, PARASITOIDS, AND NEMATODES THAT USE THE SUCCULENT NUTRIENTS OF *Aulacaspis yasumatsui* AS A FOOD SOURCE



PREDATORS

Coccinellidae – 16 species

Chilocorus cacti

Exochomus childreni

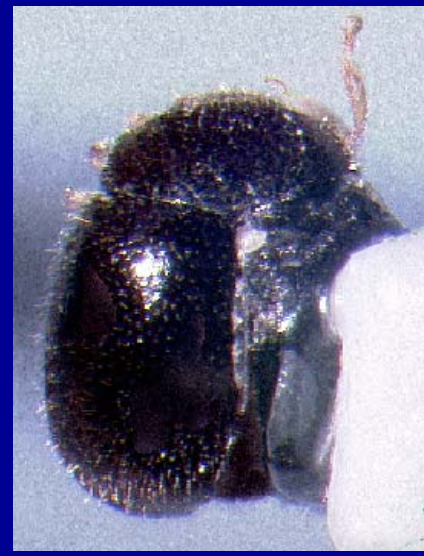
Curinus coeruleus

PREDATORS

Coccinellidae

Cryptolaemus montrouzieri

Diomus austrinus



Olla v-nigrum

Larvae of Coccinellidae

Why do we not find more eggs, larvae, and pupae of these beetles on scale-infested plants?

Rhyzobius lophanthae

Generalist predator from Australia but widely spread for biological control purposes

Voracious consumer of CAS in Hawaii and Tampa, FL; introduced into Guam

Rhyzobius lophanthae

Development time is 34 days at 25˚C

Adults live on average 5-6 months

Female may lay 100s of eggs in a lifetime

Can tolerate cold temperatures

No known parasitoids

Commercially available

Why is it not more widespread in Florida?

Cybocephalus nipponicus
(Cybocephalidae)

Native to Asia, released in Florida in 1999 for CAS control, but already present in the state before then

Larvae and adults are predaceous on many species of armored scales

Cybocephalus nipponicus

Development time is 40 days at 25˚C

Female lays about 288 eggs

Adults live 89-100 days

VERY susceptible to pesticides

Pupae are parasitized by *Aphanogmus albicoxalis*

PARASITOIDS

confirmed:

***Coccobius fulvus* (Aphelinidae)**

***Arrhenophagus chionaspidis* (Encyrtidae)**

***Aprostocetus* sp. (Eulophidae)**

found in association:

***Pteroptrix chinensis* (Aphelinidae)**

***Aphytis lepidosaphes* (Aphelinidae)**

Coccobius fulvus (Aphelinidae)

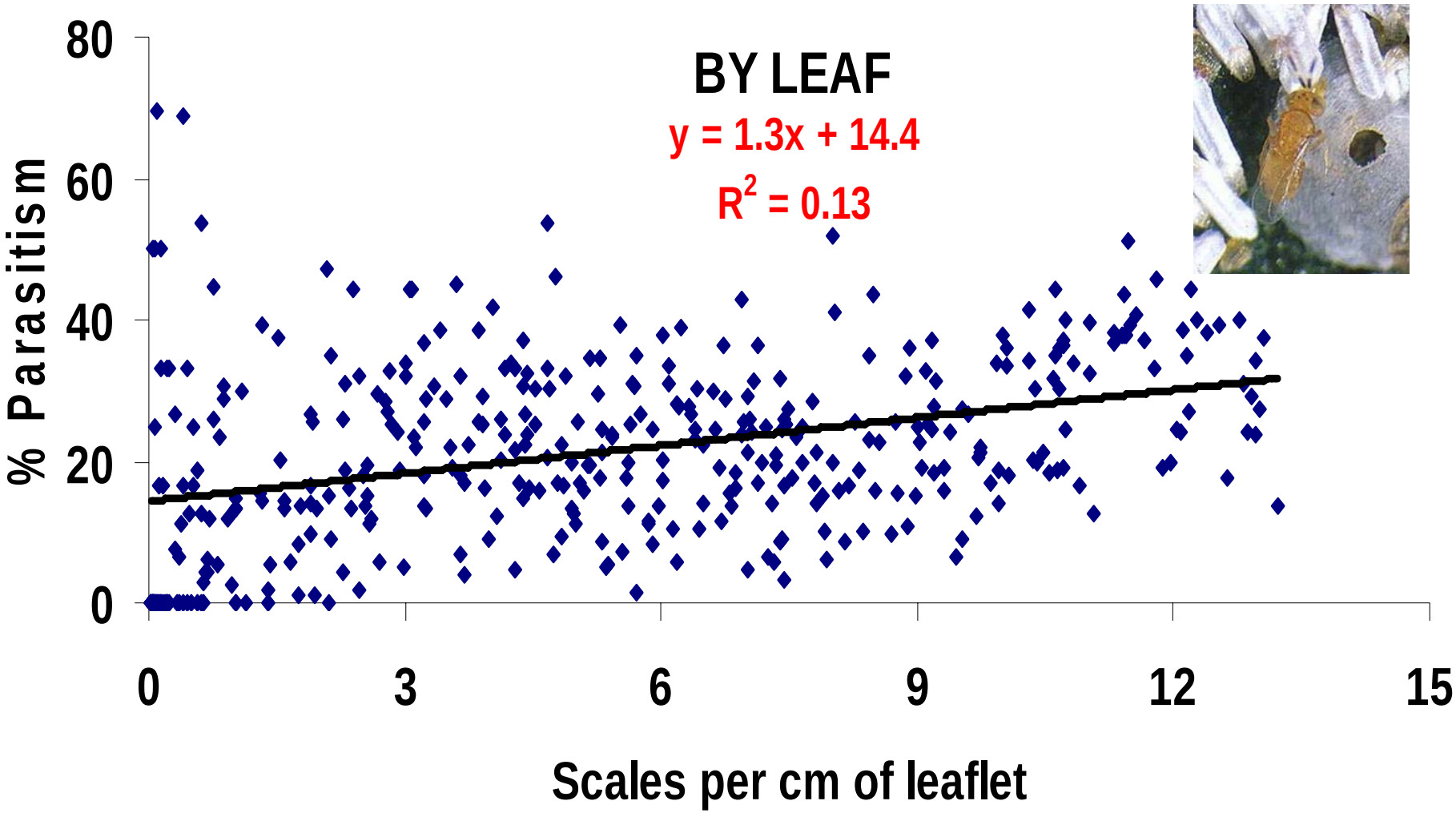
Native to southeast Asia

Introduced into Florida by R. Baranowski

95% parasitism initially in Homestead area

Coccobius fulvus

- Females develop in 2nd instar & adult female scales
- Males develop as hyperparasites on female larval *Coccobius*
- Development time is 21 days at 25˚C
- Females can live up to 2 months when fed honey
- Fecundity w/ CAS as host is unstudied
- No other known hosts in Florida, but attacks arrowhead scale in Asia (fecundity = 60 parasitized hosts/female)
- Hyperparasitized by *Ablerus elegantulus*



Overall, greater parasitism at higher scale densities on a leaf, but *Coccobius fulvus* is not doing the job we want.

Arrhenophagus chionaspidis (Aphelinidae)

- Attacks young 2nd instar male scales
- Cosmopolitan distribution
- A very frequent parasitoid of cycad aulacaspis scale in Asia:
  70% parasitism in Taiwan
- Present in Florida, but has NEVER been reared from cycad aulacaspis scale (WHY NOT?)
- VERY difficult to colonize in the laboratory (at the moment)

Exploration for additional parasitoids,

ID species and colonize *Aprostocetus,*

and test *Aphytis yanonensis*

UNFORTUNATELY, PREDATORS AND PARASITOIDS CANNOT REACH *ALL* THE SCALES ON A CYCAD PLANT

ENTOMOPATHOGENIC NEMATODES

	% lab infection
Steinernema feltiae	24 (37)
Heterorhabditis bacteriophora	42
Heterorhabditis indica	40
Heterorhabditis marelatus	24

Are nematodes capable of controlling scale populations on the trunk, crown and roots?

ENTOMOPATHOGENIC FUNGI?

Aschersonia aleyrodis

PENDING RESEARCH:

- developmental biology, fecundity, and cold tolerance of *Coccobius fulvus, Arrhenophagus chionaspidis*, and *Aprostocetus* sp.
- exploration for and study of new exotic parasitoids from Asia
- feeding studies of select coccinellids
- experimental releases of *Rhyzobius*
- field applications of nematodes
- testing of *Aschersonia*