Living dangerously: an orb-weaving spider potentially exploits an ant-acacia mutualism for enemy-free space

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- 3rd-party exploitation
  - individuals of a species outside of a mutualism obtain a benefit offered to one of the mutualists, but do not reciprocate

exploitation of a mutualism: nectar-robbing

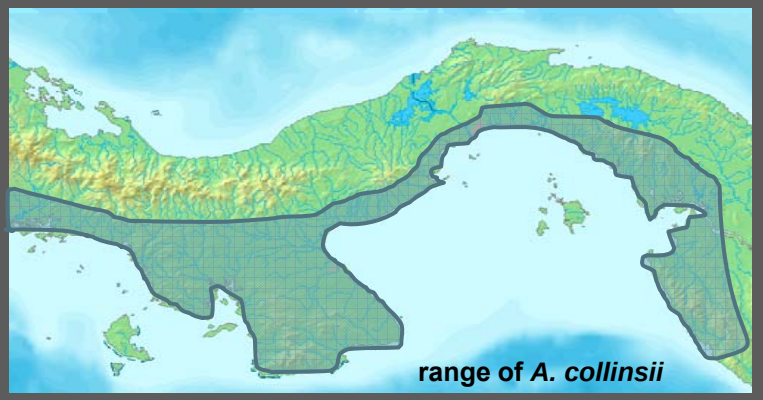
Ant-acacia mutualisms of Central America

- *Acacia* plants provide *Pseudomyrmex* ants with food and living space
- patrolling ants protect acacias from herbivores

Eustala spiders inhabit two ant-acacia species in Panama

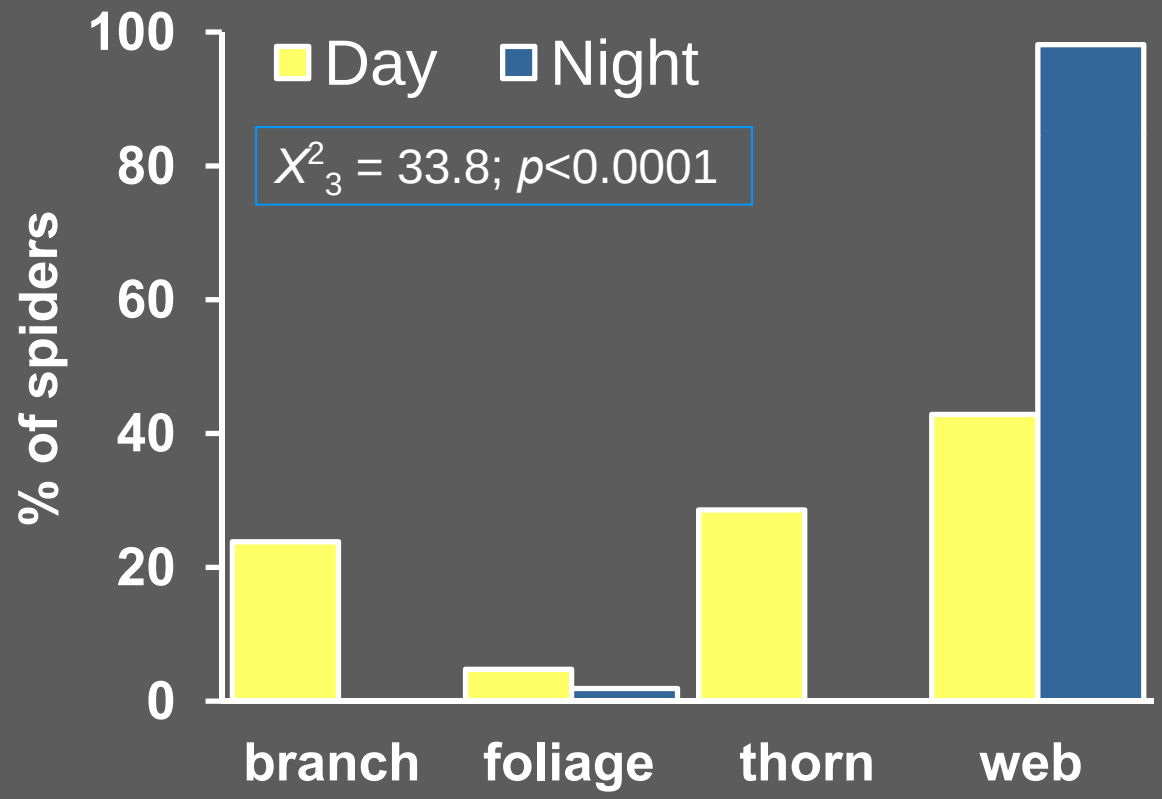
Eustala oblonga* on *Acacia melanocerus

Eustala illicita* on *Acacia collinsii



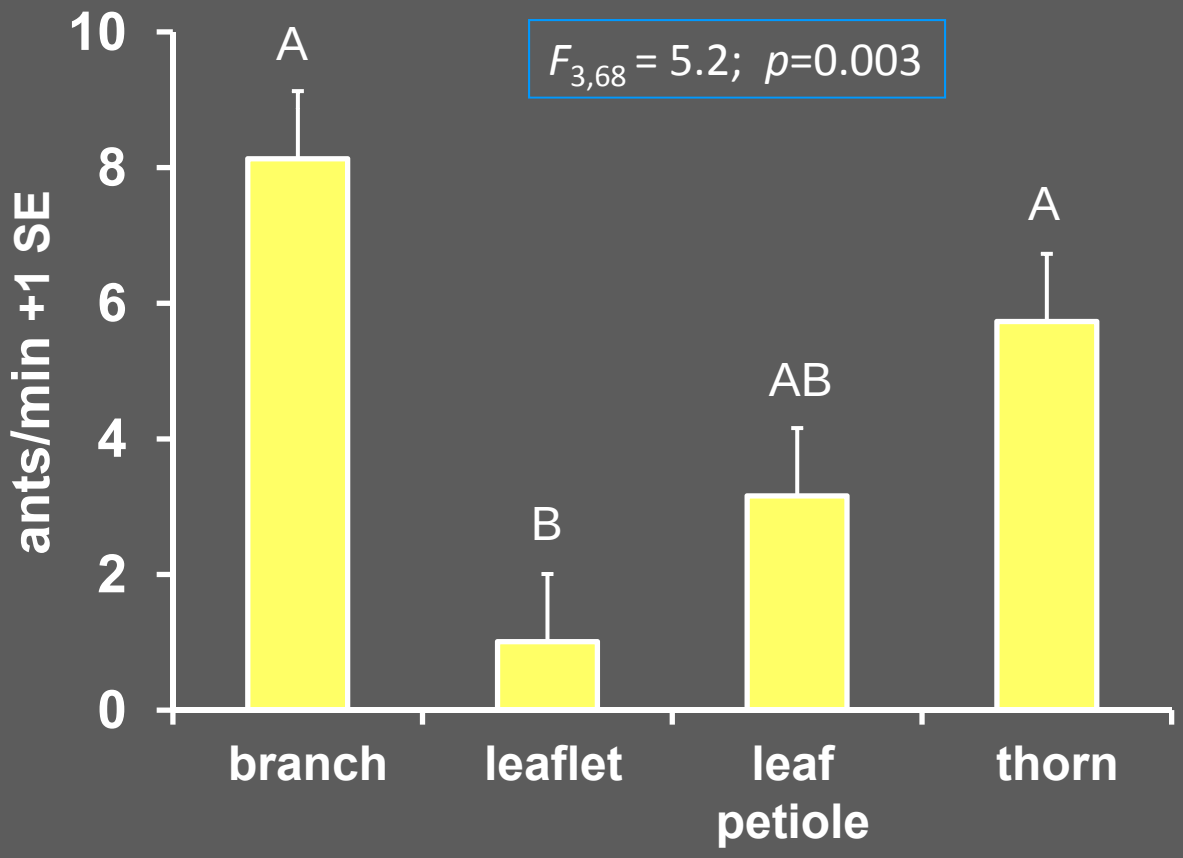
E. oblonga spiders often occupy plant surface

Percent of adult *E. oblonga* at four locations on 20 *A. melanocerus* plants



E. oblonga spiders do not avoid areas with high frequency of patrolling ants

Patrolling frequency of *P. satanicus* at four locations on 20 *A. melanocerus* plants



Both *Eustala* species apparently 'host plant' specific

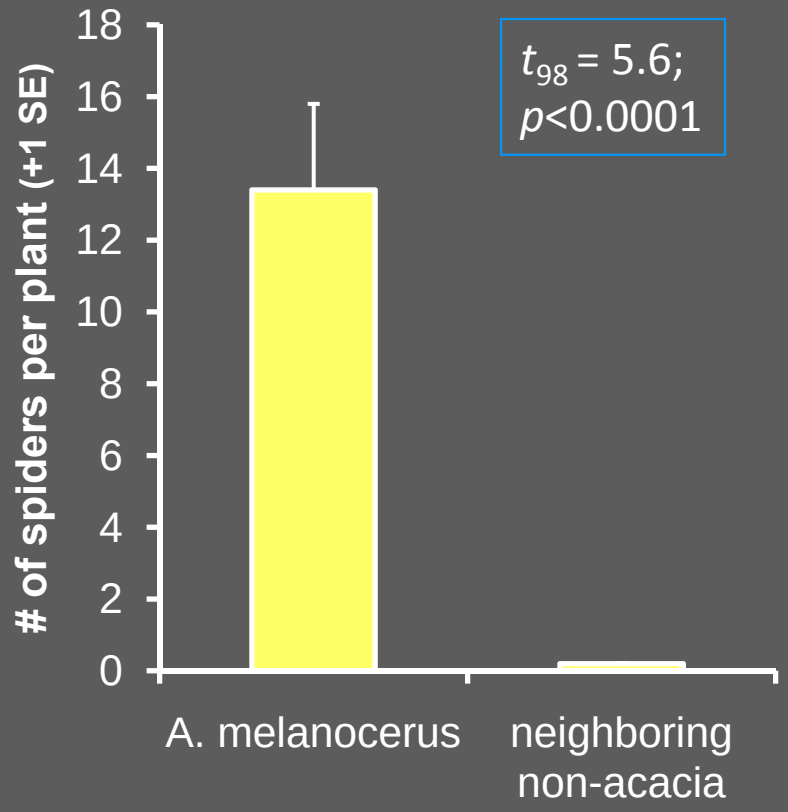
E. oblonga

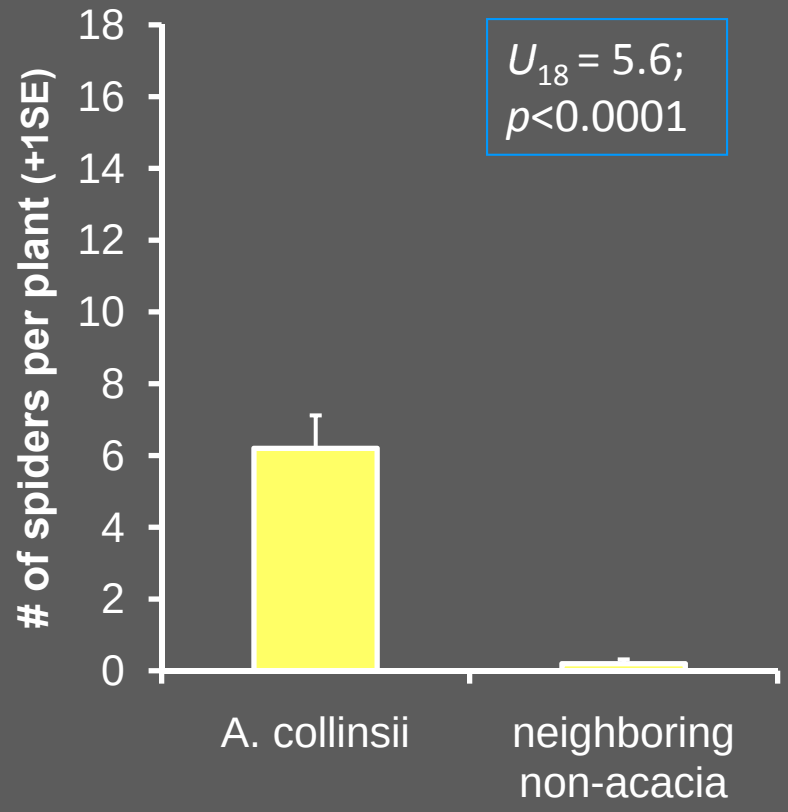
sample size: 50 acacias and 50 neighboring non-acacias

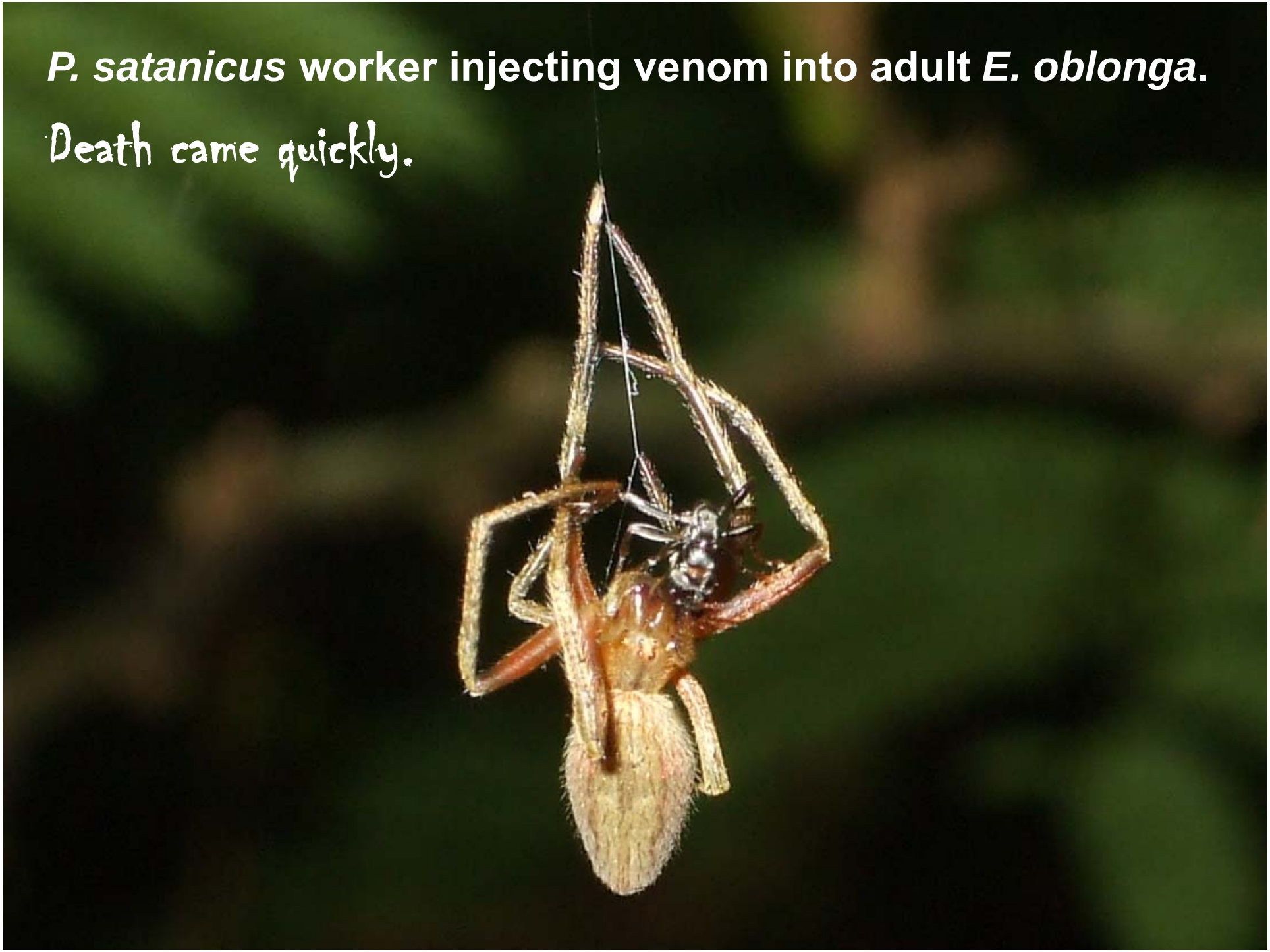
E. illicita

sample size: 18 acacias and 18 neighboring non-acacias

Hesselberg, pers. comm.







Hypothesis:

- ***Eustala*** **spiders exploit ant-acacia mutualisms for enemy-free space (EFS)**
  - EFS = ‘ways of living that reduce or eliminate a species’ vulnerability to one or more species of natural enemies’ (Jeffries and Lawton 1984)

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Experiment:

- **remove ant colonies from one group of acacias (*A. melanocerus*)**
- **compare *E. oblonga* spider densities over time between acacias with and without patrolling ants**

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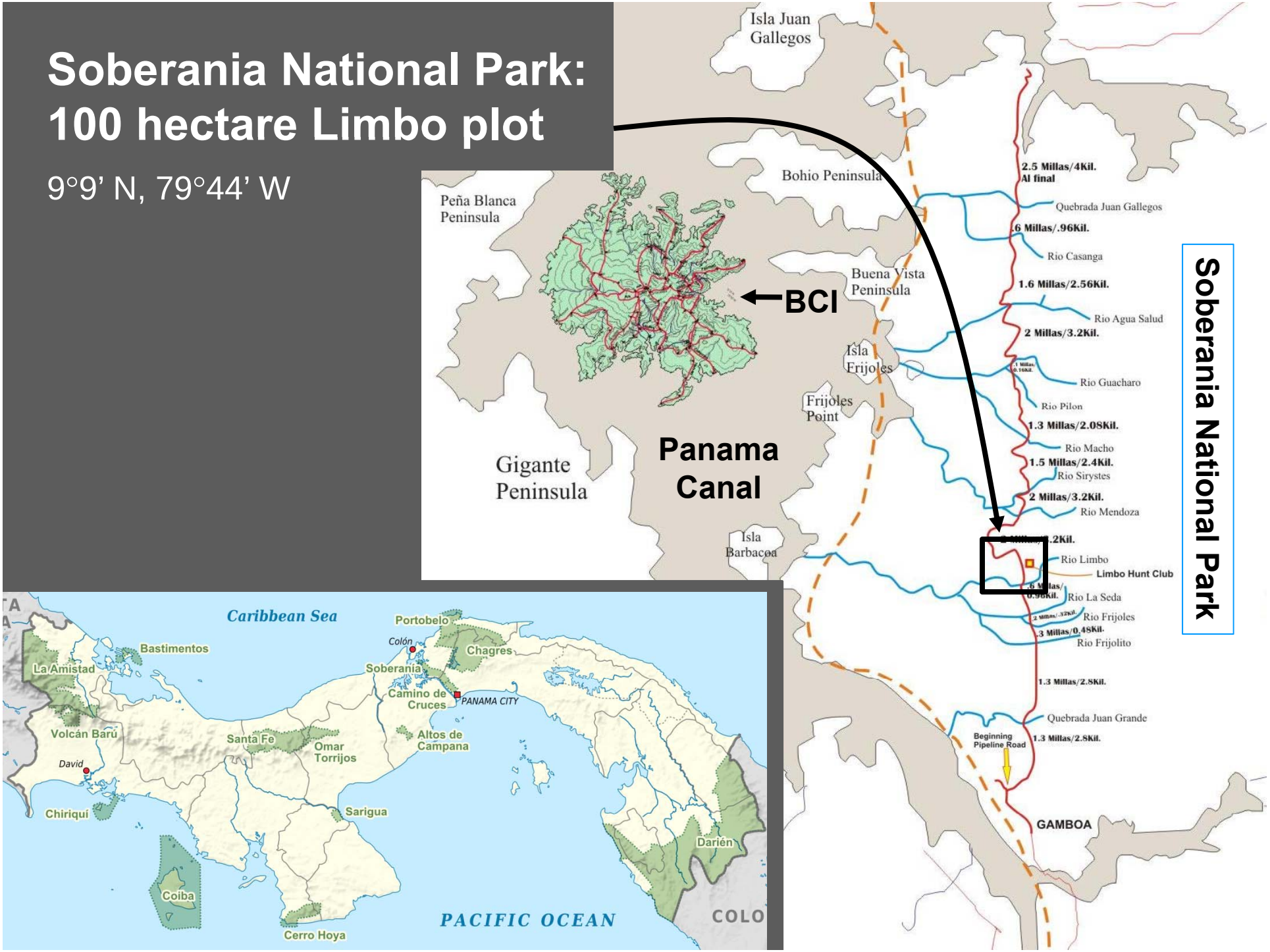
Soberania National Park: 100 hectare Limbo plot

9°9’ N, 79°44’ W



Design and methods:

two treatments:

- ants removed (*N* = 15)
- ants present (control; *N* = 15)

ants removed by injecting
0.1 to 0.2 cc dilute insecticide
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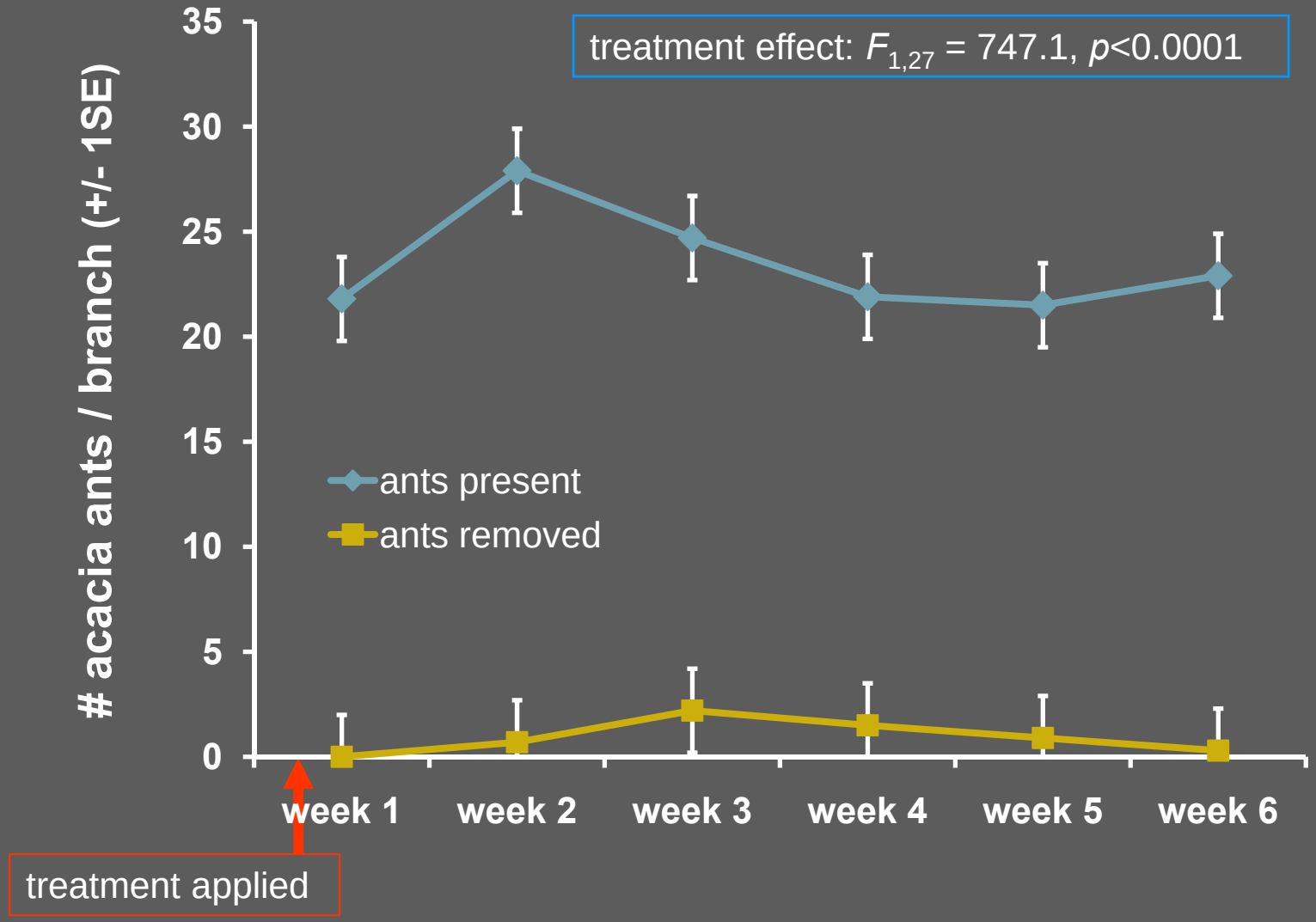
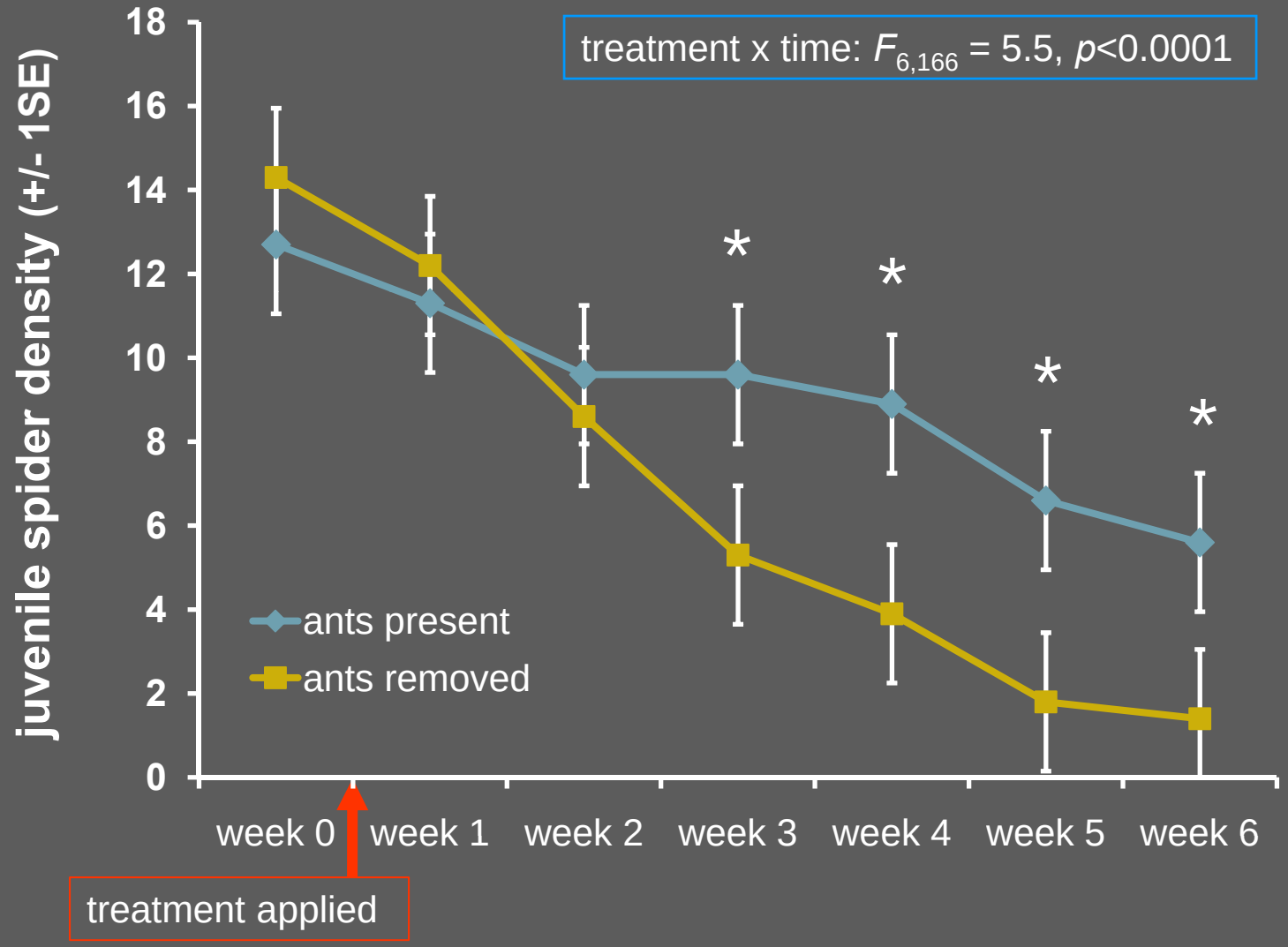
spiders censused before and once a week after for 6 weeks

data analyzed using repeated measures ANOVA; # of leaves included as a covariate to control for acacia size

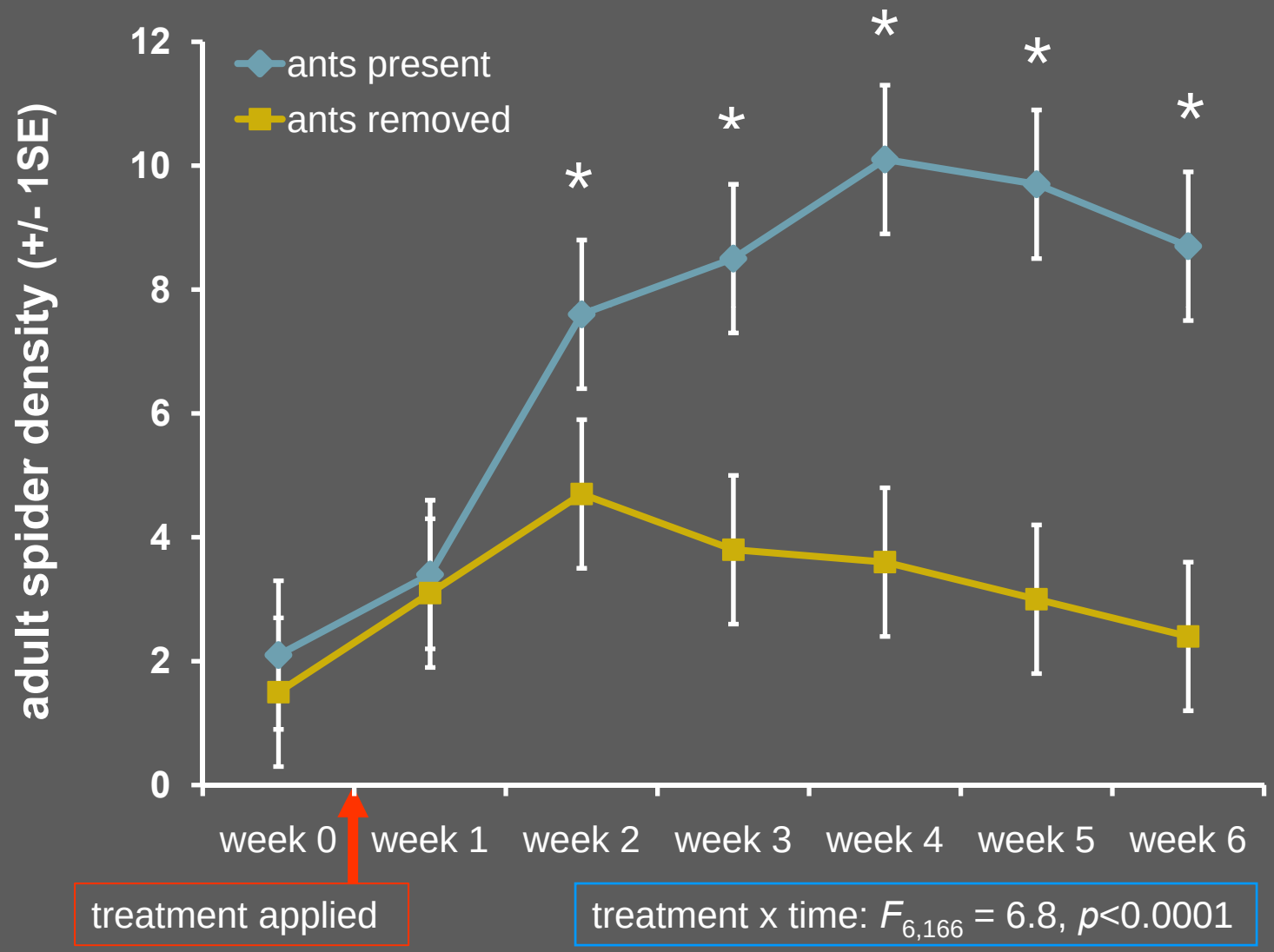
Ant removal treatment was successful



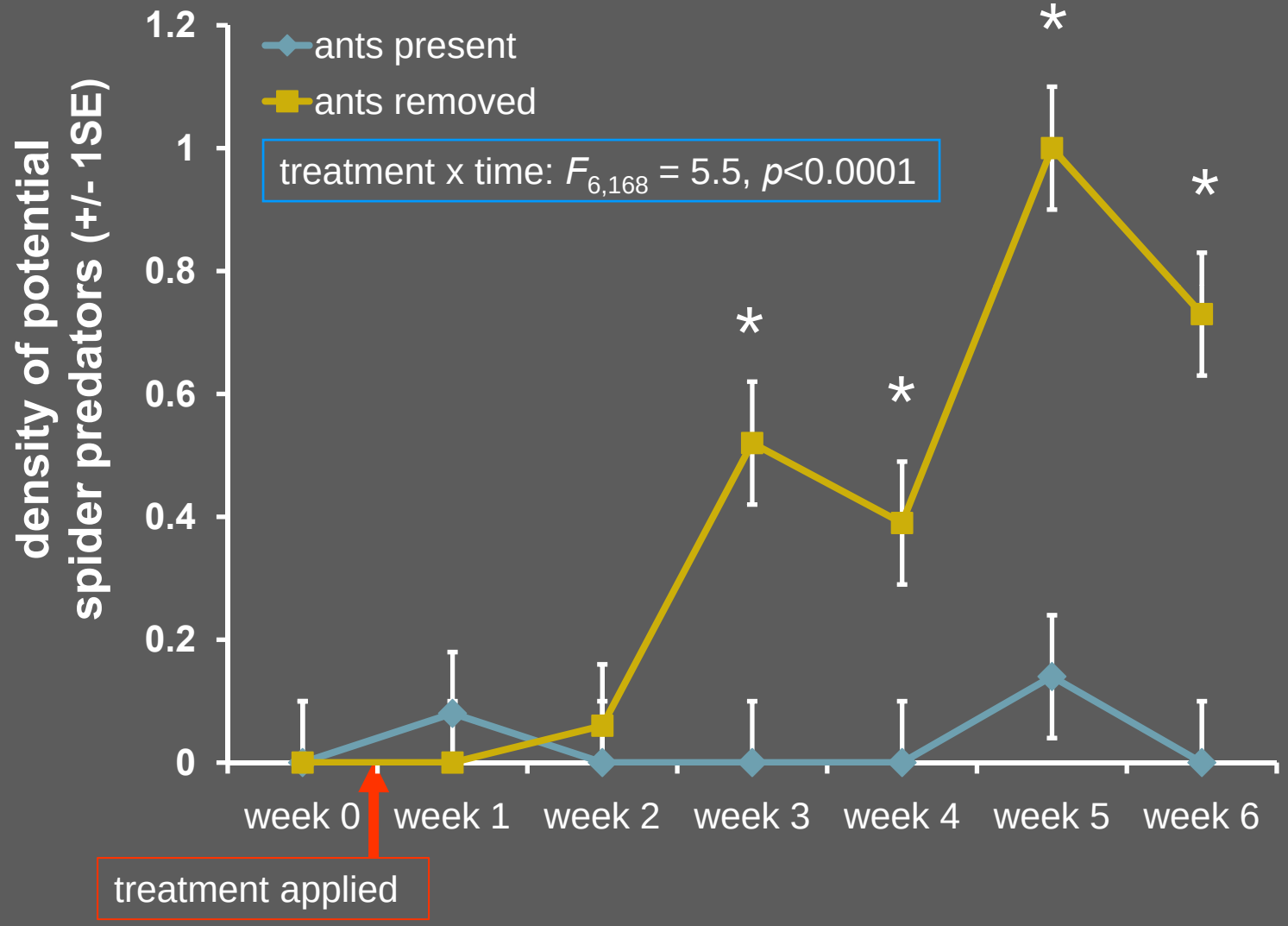
Reduced juvenile spider density over time in *absence* of acacia ants



Reduced adult spider density over time in *absence* of acacia ants



Spider predator density *increased* over time in *absence* of acacia ants



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- density of potential spider predators increased over time in absence of acacia ants
- consistent with hypothesis that *Eustala* spiders inhabit ant-defended acacias for protection from natural enemies

Significance

- myrmecophily in spiders little known / reported
- only one other example of a spider exploiting a mutualism
  - *Bagheera kiplingi* inhabits *A. collinsii* and consumes Beltian bodies (Meehan *et al*. 2009)

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- *E. oblonga* exploits a service; likely does not impose a cost
- example of how a mutualism can affect the ecology and evolution of other species that exploit a traded commodity

Eustala oblonga

Acknowledgments

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