

Augmentative Biological Control Using Predators Against Coffee Berry Borer



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World coffee production

- Worth \$90 billion globally
- Brazil and Vietnam produce >50% of world's coffee
- Americans drink 400 million cups/day
- U.S. consumption increasing 3% per year



Hawaii coffee production



Coffee is an important industry in Hawaii

- Statewide, estimated 8.6 million lbs harvested on 6,300 acres for a total farm revenue of about \$100 million
- On Hawaii island, there were about 800 farms with 2,900 acres
- Kona “coffee belt” – 700’ to 2,000’
- 7 months from flowering to ripe berries—Feb flowers, April green berries, August red cherry
- Extended period of flowering results in berries of all maturities on tree, and multiple harvests (4-5)



Kauai Coffee

Waialua Coffee



Coffees of Hawaii

Kaanapali Coffee



Kona coffee belt



Coffee berry borer



CBB is the most serious pest of coffee worldwide

- New pest in Hawaii - discovered in 2010
- Causing significant damage to coffee berries of the Big Island - >90% damage if not controlled
- Taste difference above 5% damage
- Field control using fungus *Beauveria bassiana*
- Few natural enemies



Entrance hole

Predatory flat bark beetles

Background

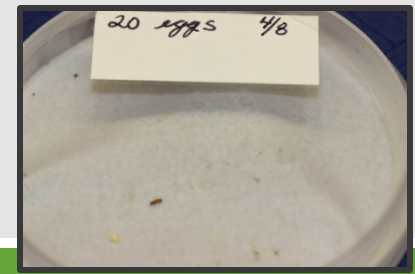
- Primarily 2 predator species in coffee berries
 - *Leptophloeus* sp.
 - *Cathartus quadricollis*
- Not susceptible to Beauveria
- Feed on immature CBB
- Found throughout Big Island
- Found mostly in 'raisins' on the tree
- Easy to raise and release



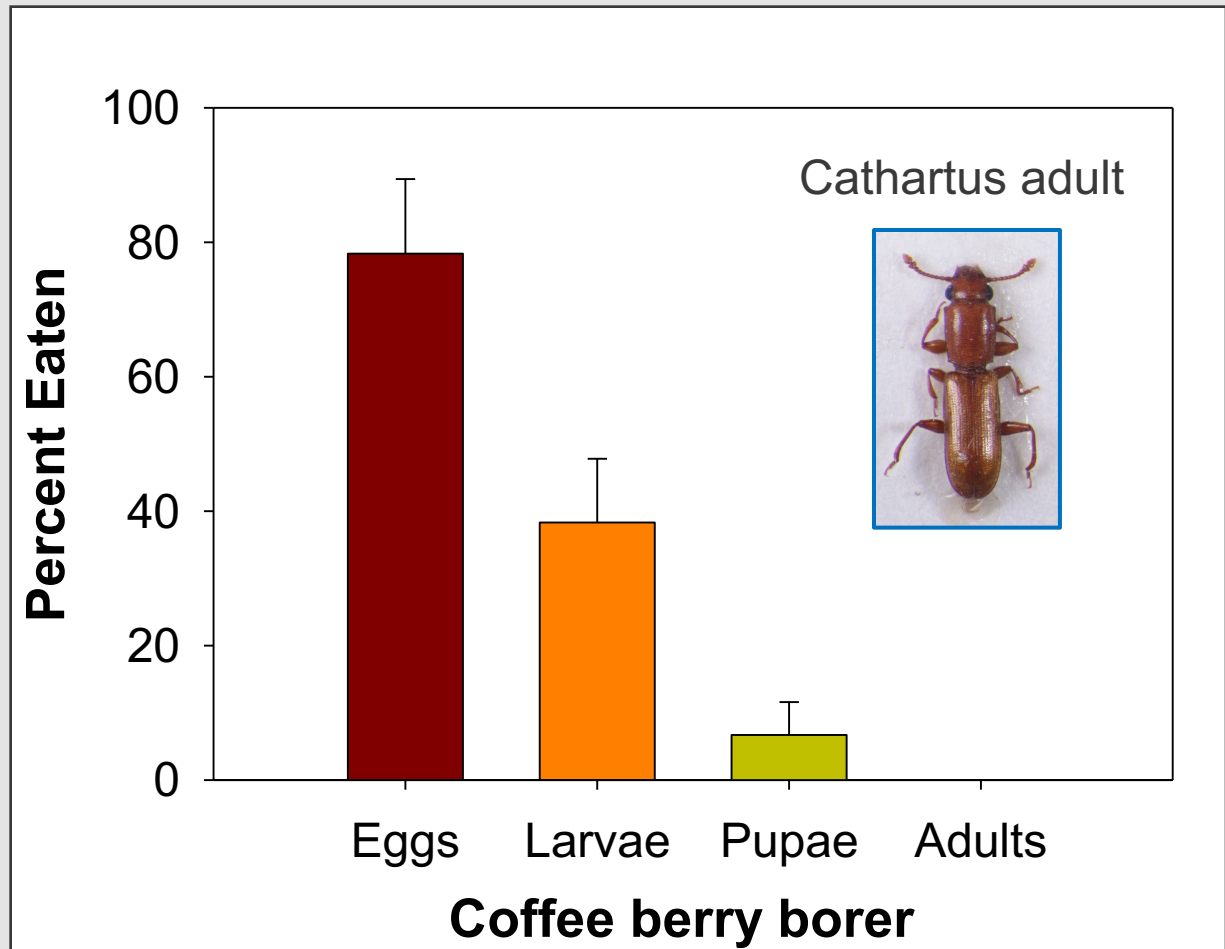
Cracked corn diet

Preliminary studies:

Cathartus choice test

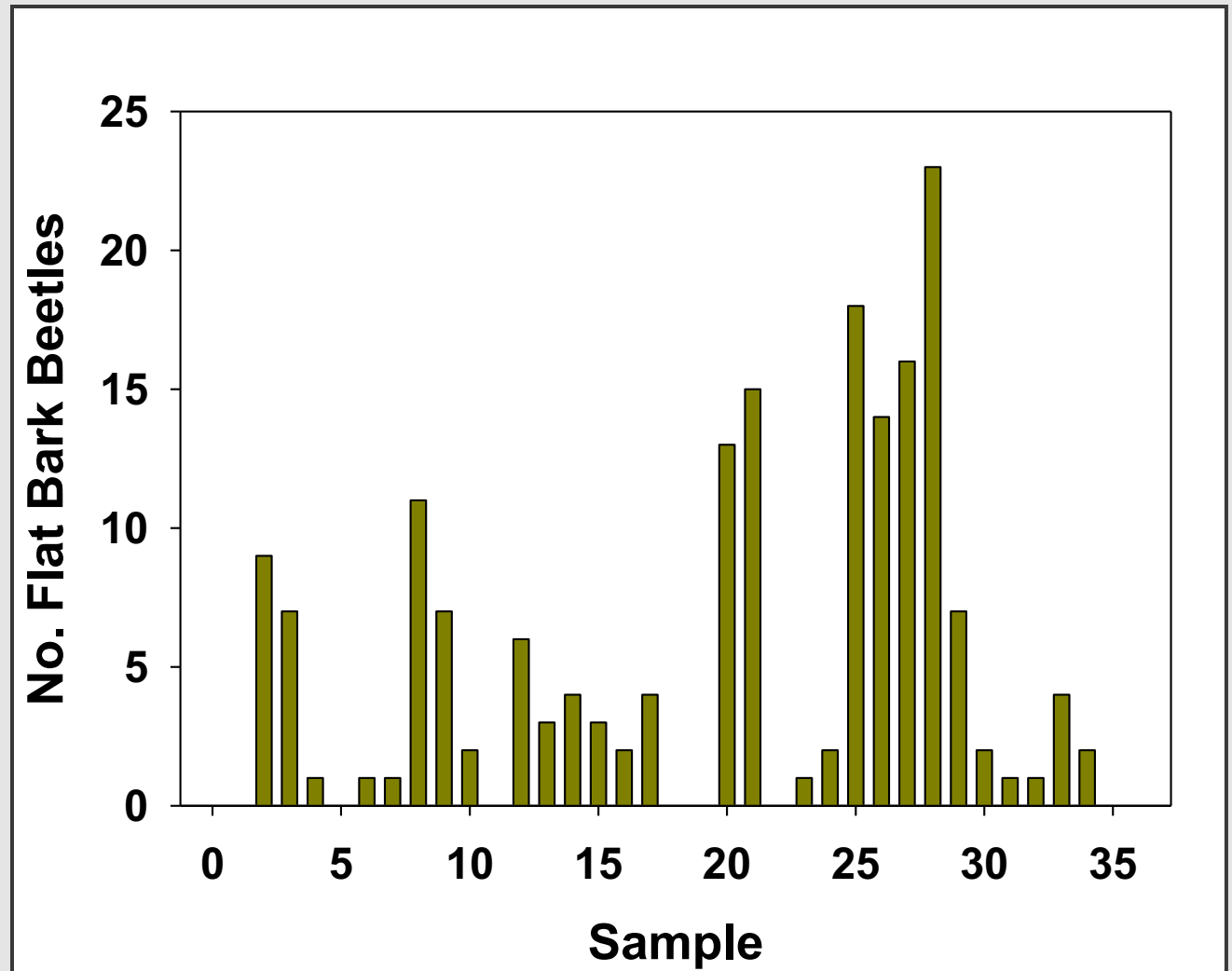


- 40 prey items -10 each life stage
- Petri dish
- 3 *Cathartus* adults or larvae
- 24 h in dark

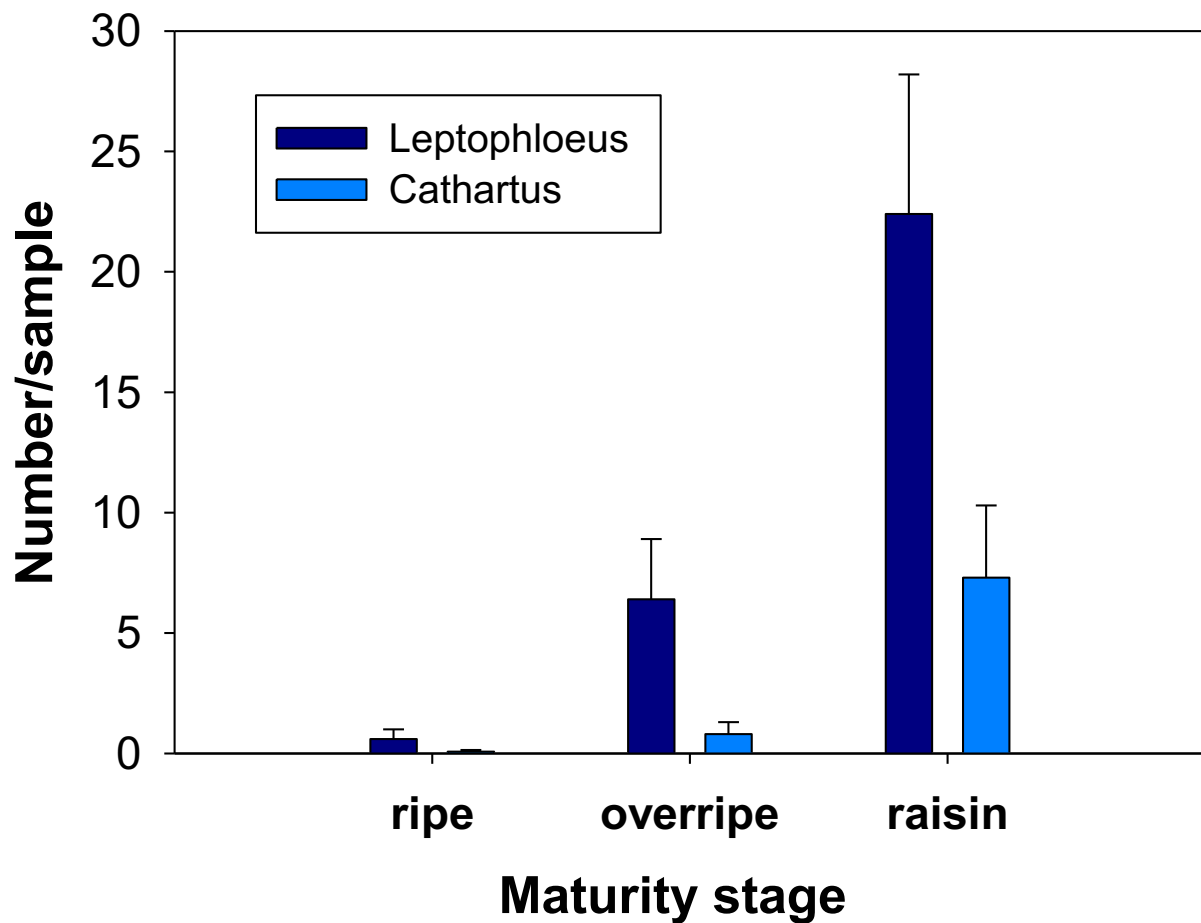


How common are flat bark beetles in coffee?

- Sample of 150 infested 'raisins'
- 2 acre blocks
- Berlese funnel
- Count



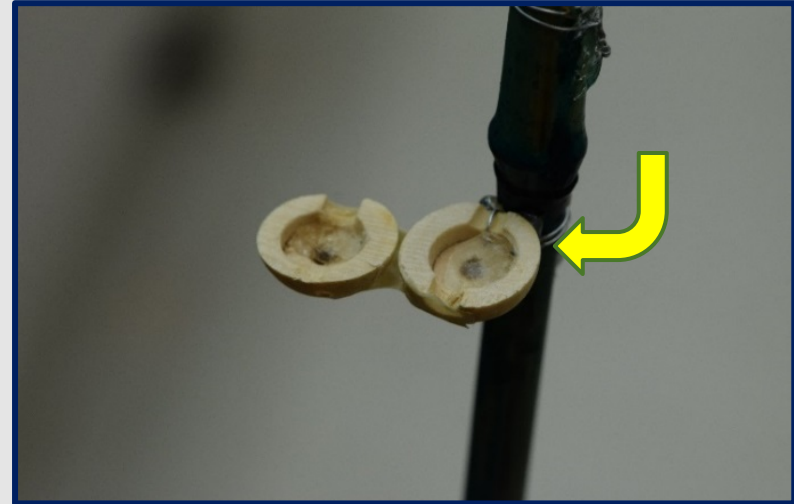
What stage of infested coffee berries do predators like?



How many CBB do predators eat?

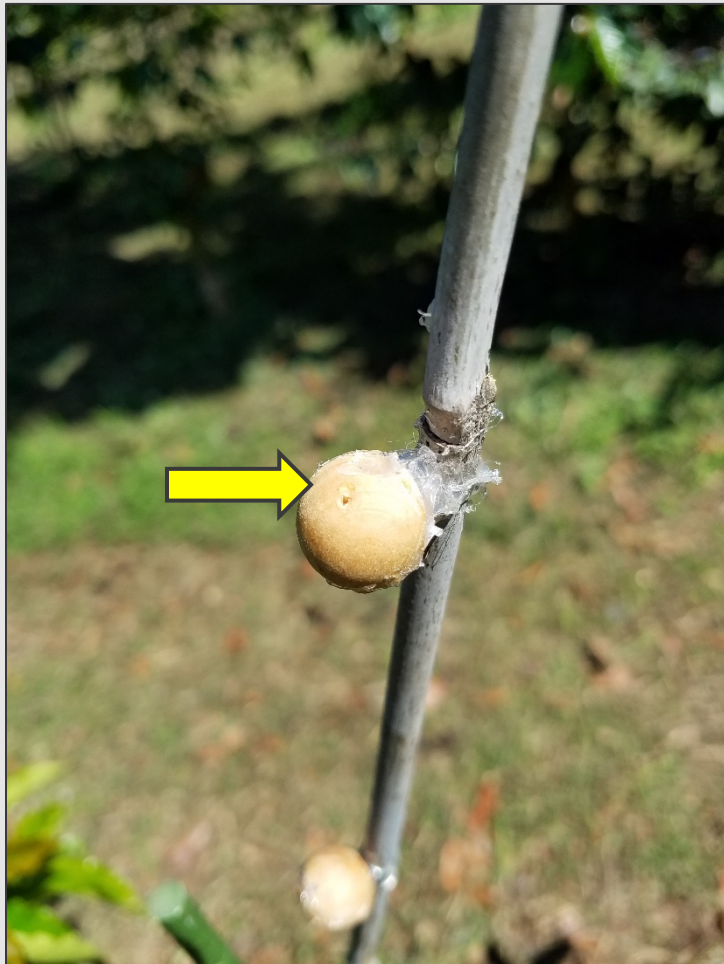
Artificial berries

- Place 20 CBB eggs inside and close
- Hang in coffee farms for 48 hours
- Open and count the eggs that remain



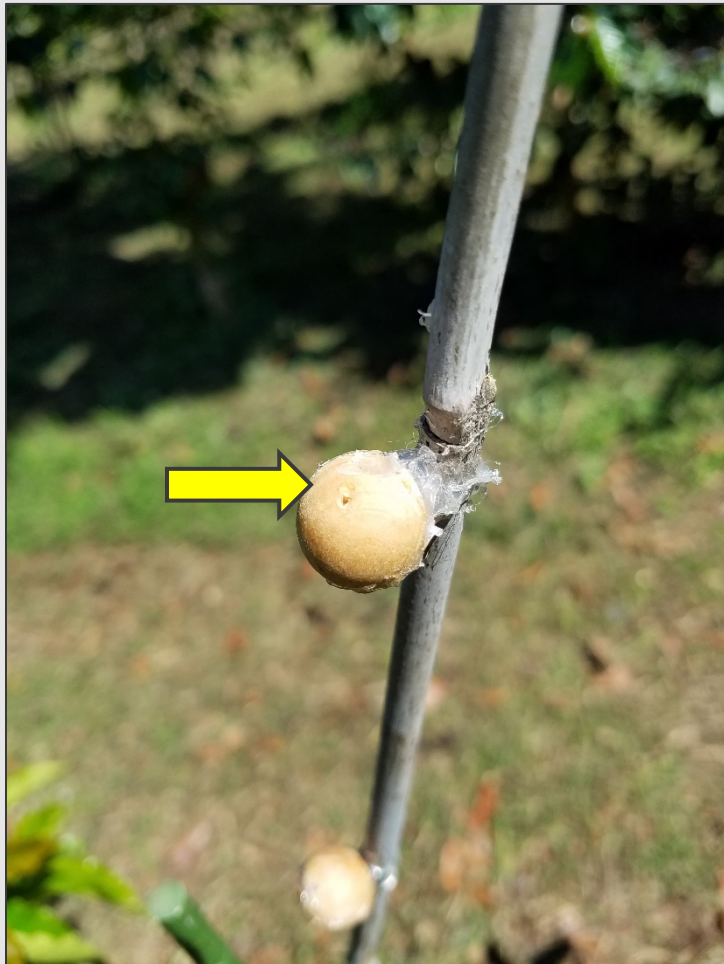
Artificial coffee berries

6 farms – 150 artificial berries = 3000 eggs



Artificial coffee berries

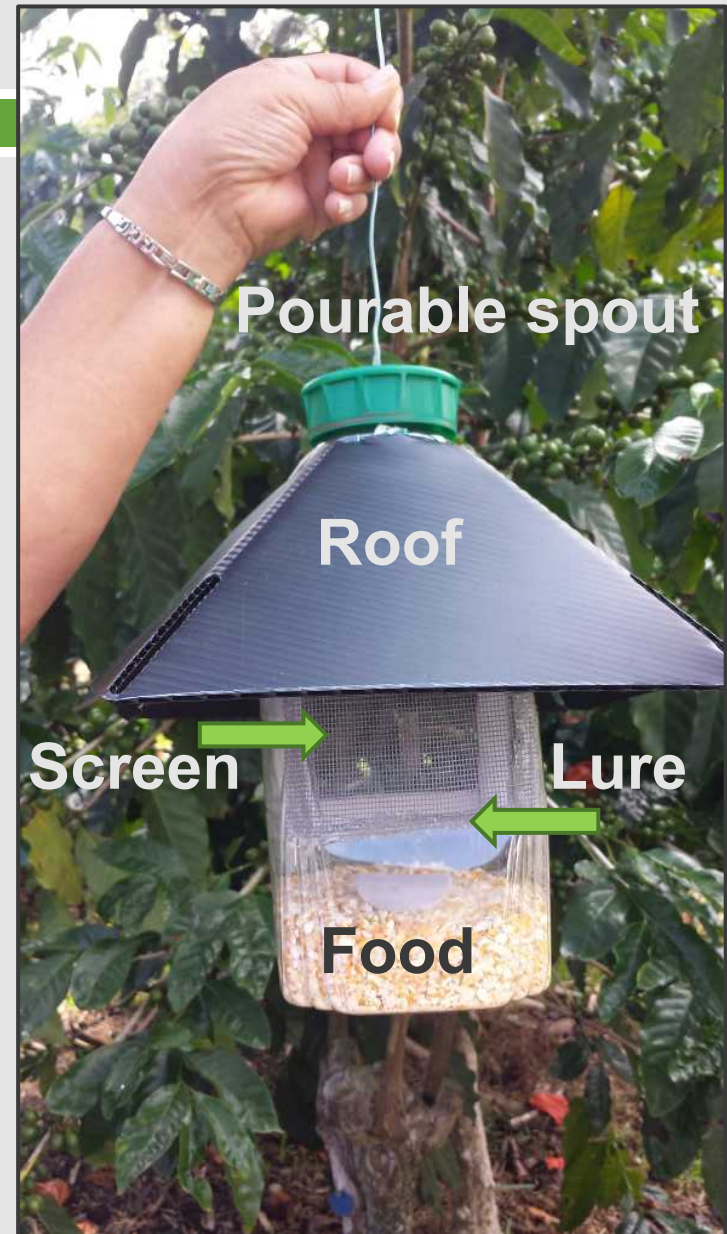
On average **40%** eggs eaten after 48 h



Can we manipulate behavior?

Breeding stations

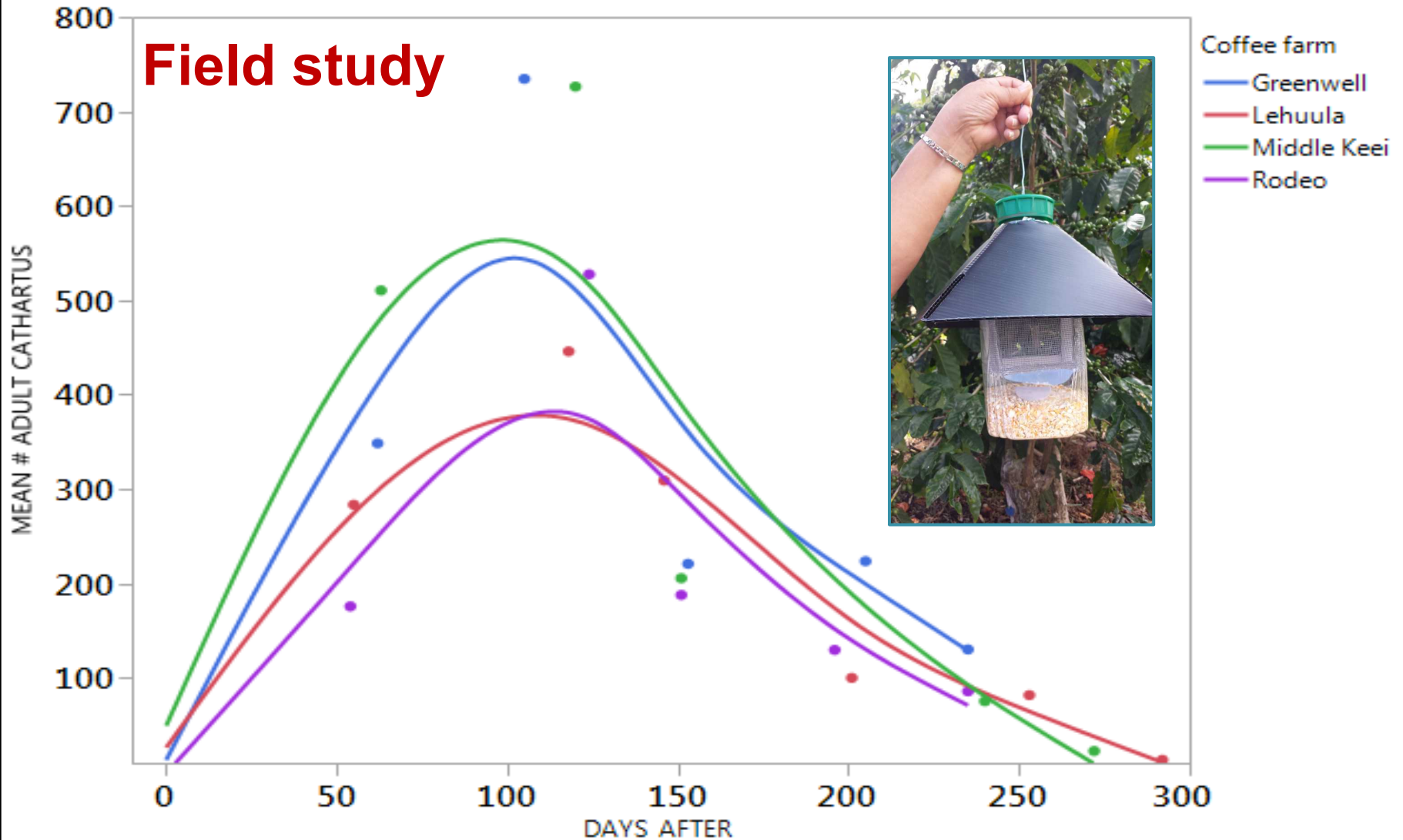
- Alpha Scents
- Cathartus lures
- Predators attracted to station with food
- Reproduce and multiply
- When food depleted, leave and move into coffee



Cathartus on corn



Field study



Predators were attracted to breeding stations, multiplied, then dispersed onto farms

But how many predators are produced? **Bucket test**

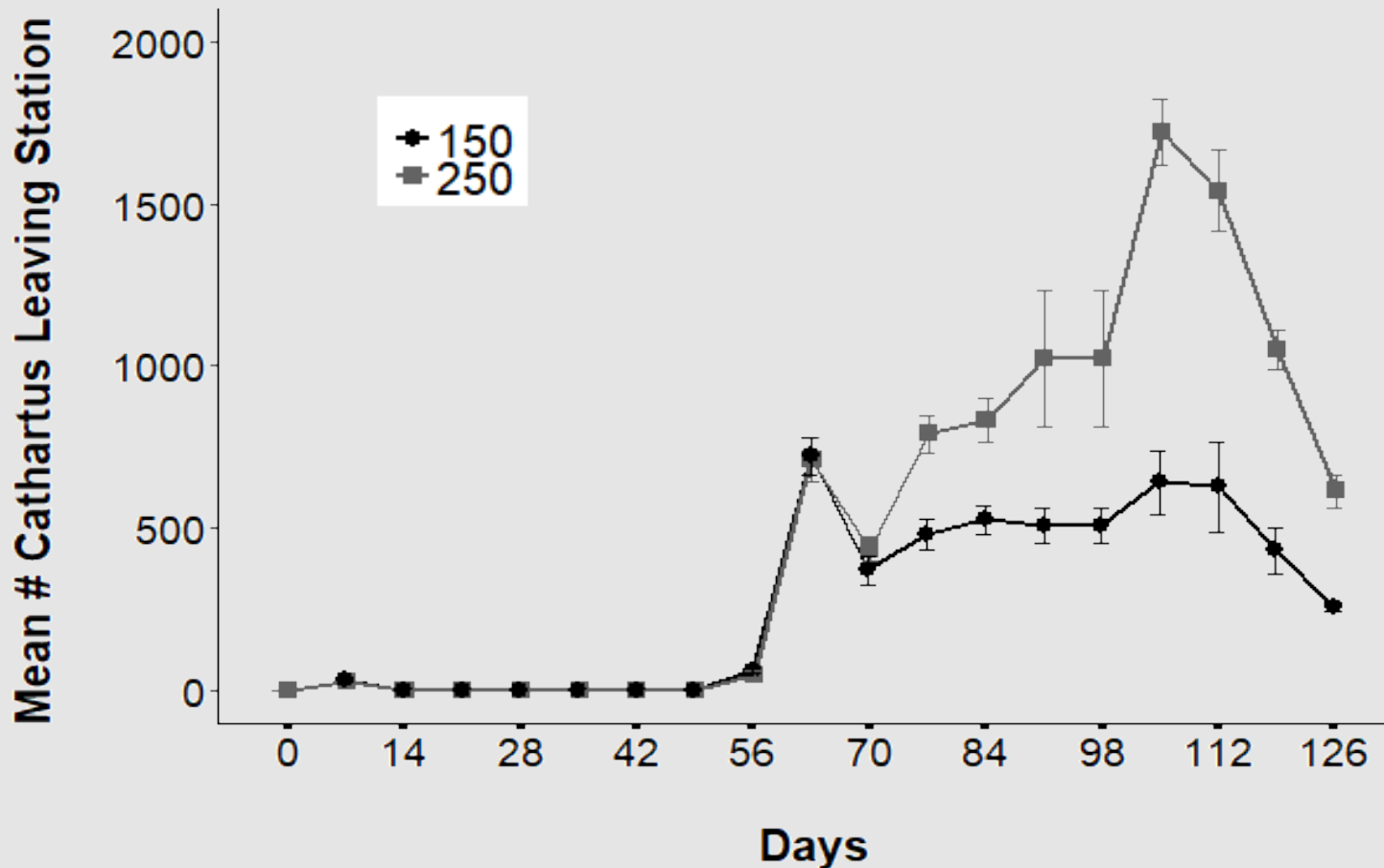
- Breeding station with 100 *Cathartus* adults
- Bucket lined with sticky panels
- Weekly counts of dispersing beetles
- 4 month test
- Compared 250 vs 150 g food



Bucket test



- Average 10,000 beetles per bucket !!



Breeding stations

Cost \$\$

- 2 stations per acre
- 5 year cost = \$15/acre/yr
- Includes a station and 2 lures (Alpha Scents)

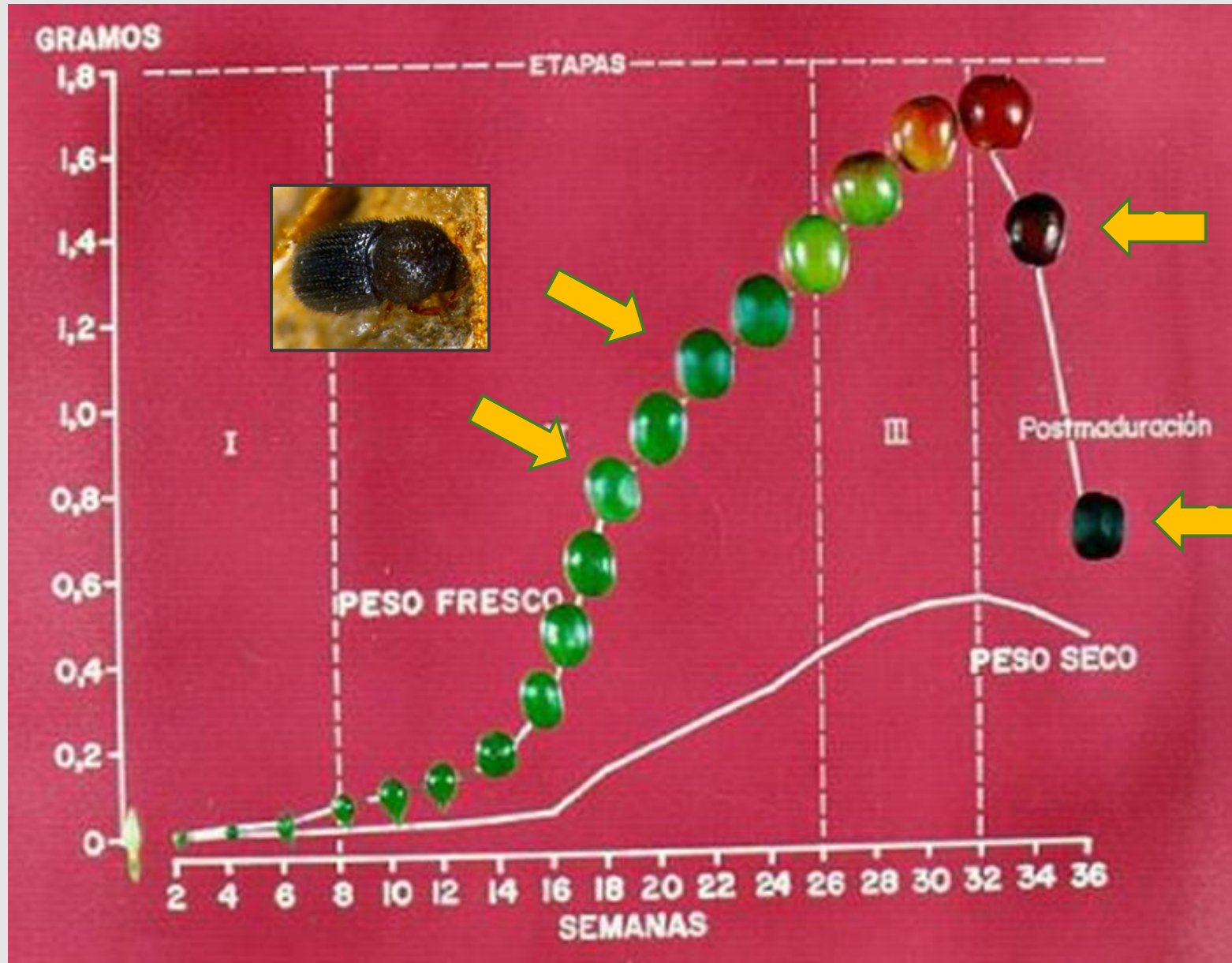
Pheromone lure



Fungal lure



Flat bark beetles not ideal biocontrol!



Questions?

