Invasive pest and host plant dynamics across a heterogenous landscape: Insights from area-wide monitoring of Coffee Berry Borer on Hawaii Island

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IPM Challenges

- Hawaii's landscape is extremely variable
- Cultural practices vary among farms
- Costs are high
- Severe labor shortage

Ka'u, SE Hawaii Island

Kona, West Hawaii Island

Area-Wide Monitoring on Hawaii Island

Flight Activity

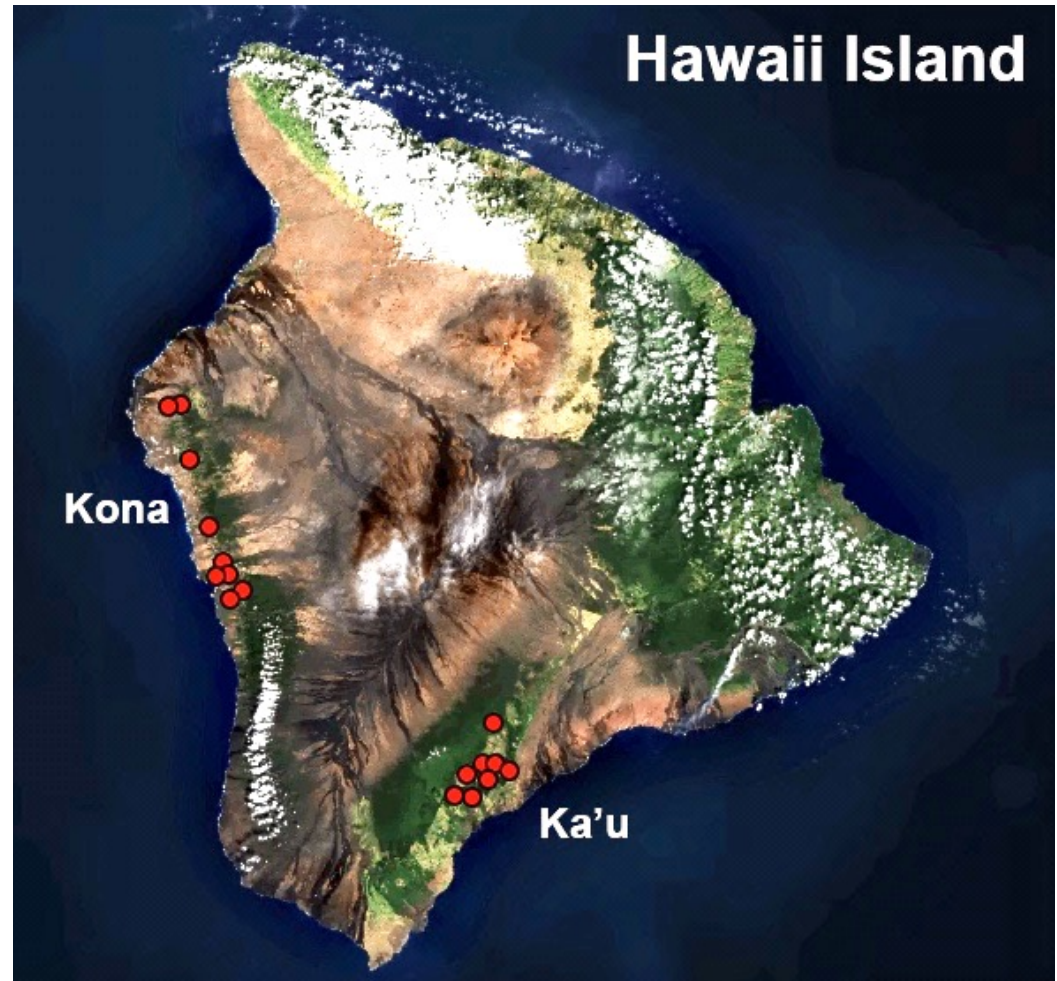Infestation

Mortality
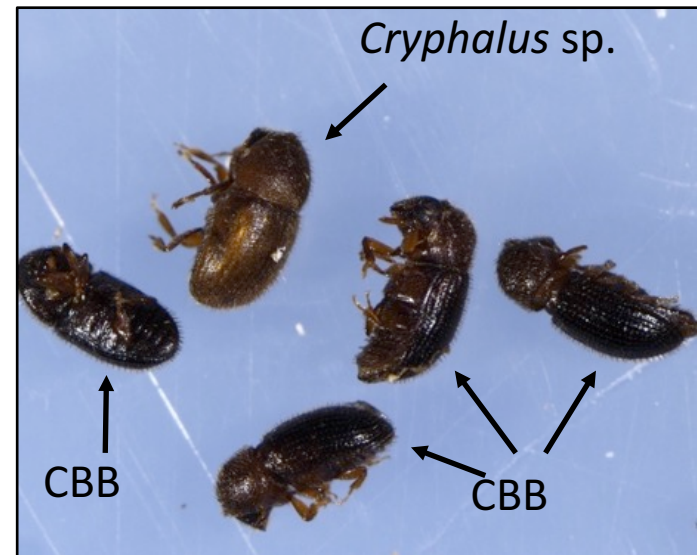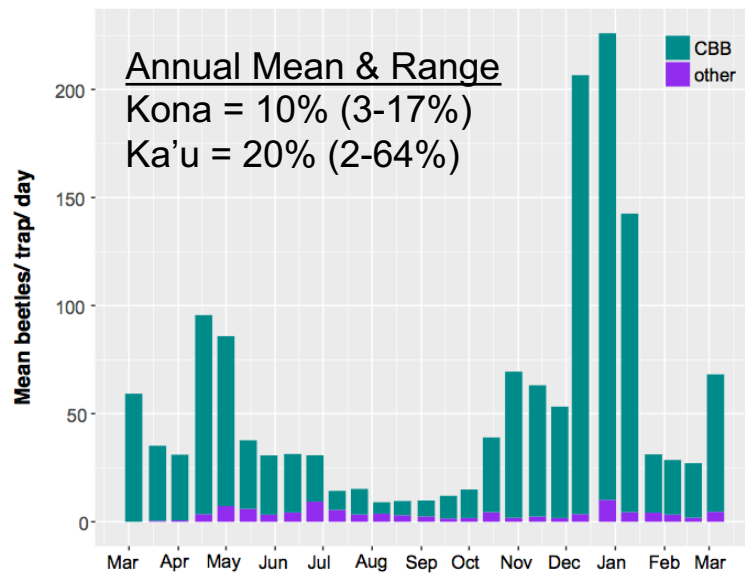
Management

Weather

Phenology

Study sites

- Kona
  - 8 managed
  - 3 unmanaged
  - 2 feral

- Ka'u
  - 6 managed
  - 1 unmanaged
  - 1 feral
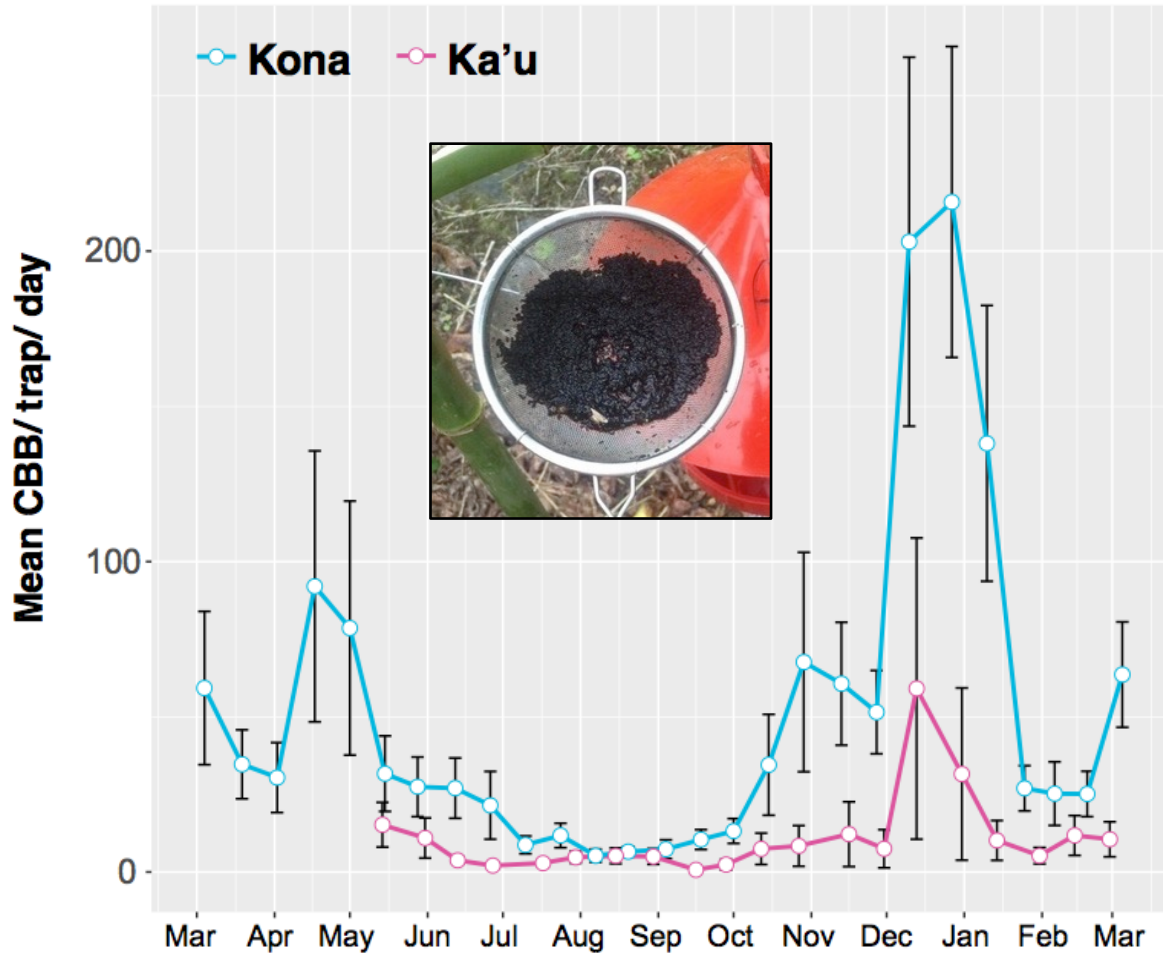

- Elevational range: 204-778 m

Methods: Traps

Annual Mean & Range
Kona = 10% (3-17%)
Ka'u = 20% (2-64%)

Methods: Infestation, Mortality & Phenology

CBB entrance hole

Beauveria bassiana

endosperm

Johnson et al. 2018,
Journal of Visualized Experiments

Results: Flight Activity

- Major flight peaks:
  1. March – May
  2. Oct – Jan

- Significant positive correlation between trap catch and infestation

- For most farms, as trap catch increases infestation also increases

Results: Infestation

- Higher infestation in 2017 relative to 2016

- 2016 drier than 2017

- Fewer *Beauveria* sprays on average in 2017 vs. 2016

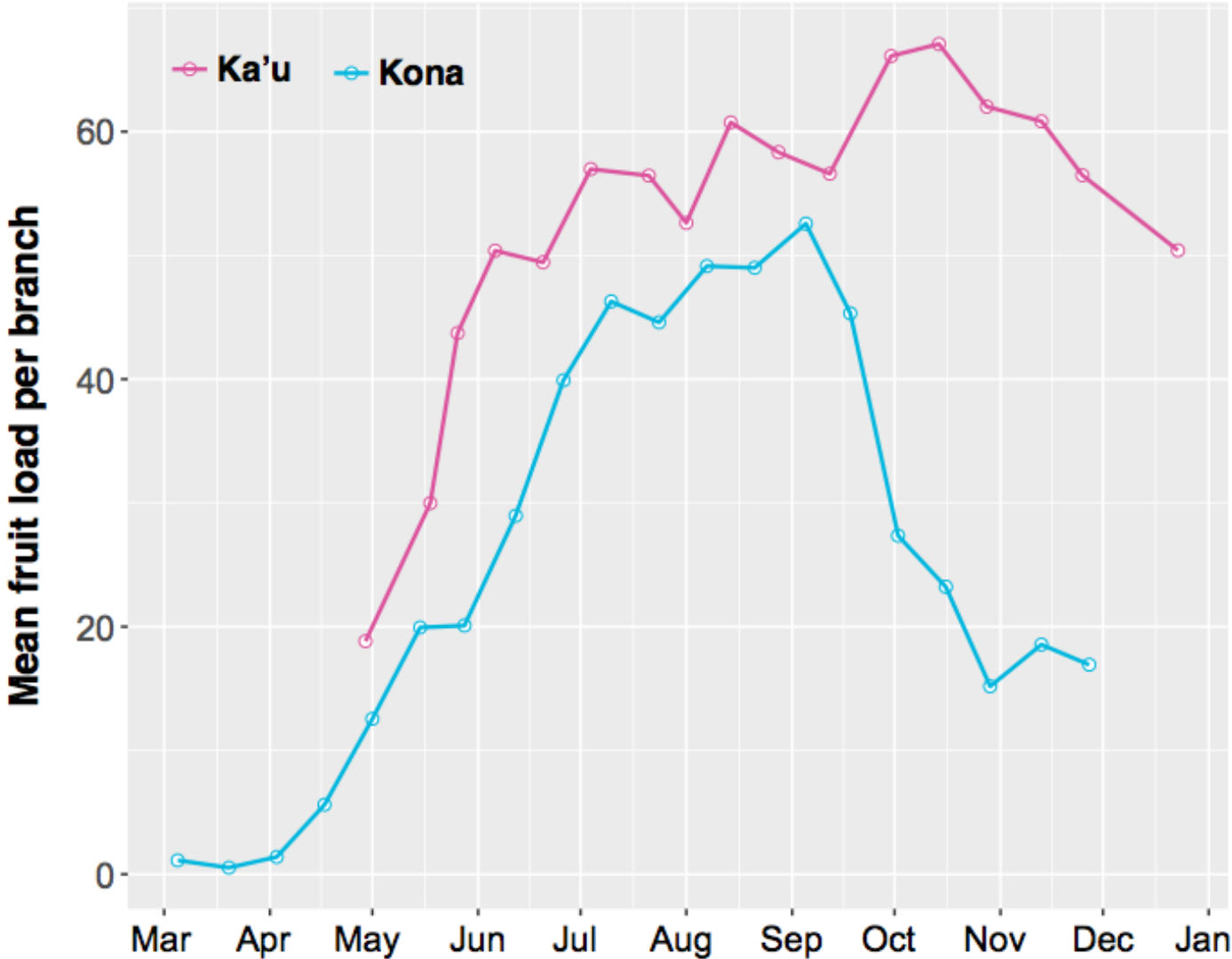
Kona

Mean Number of *Beauveria* Sprays
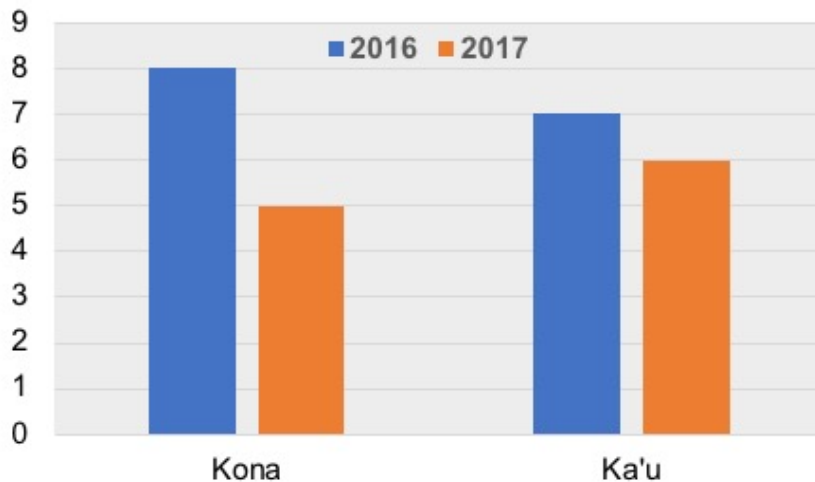
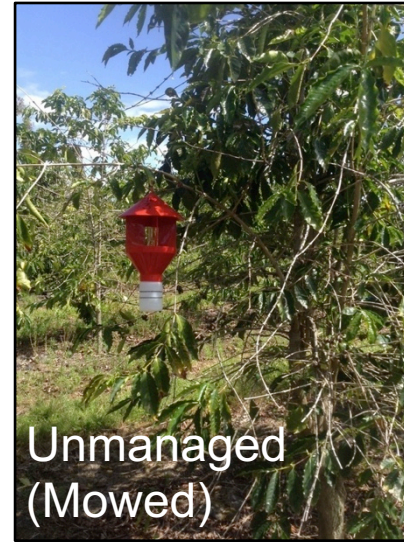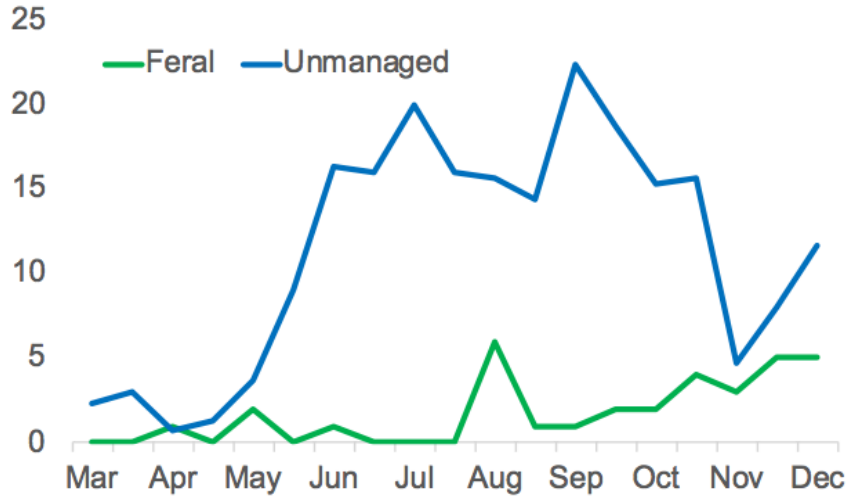**Ka'u**

Results: Fruiting Phenology

Ka'u has larger number of berries available year-round

Results: Feral & Unmanaged Sites

Average fruit load per branch

Unmanaged (Mowed)
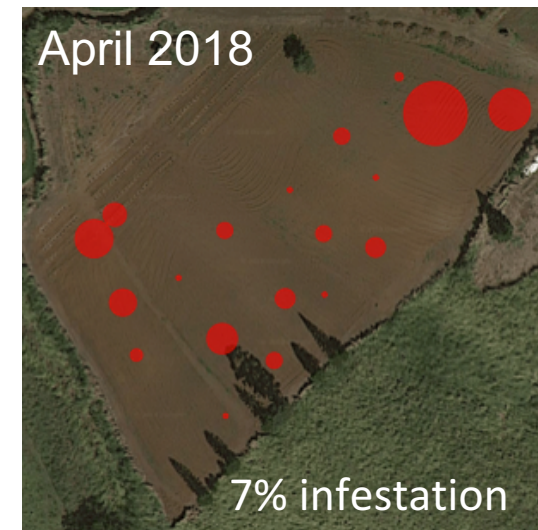

Feral (Forest)

Unmanaged (Overgrown)

Average CBB per trap per day
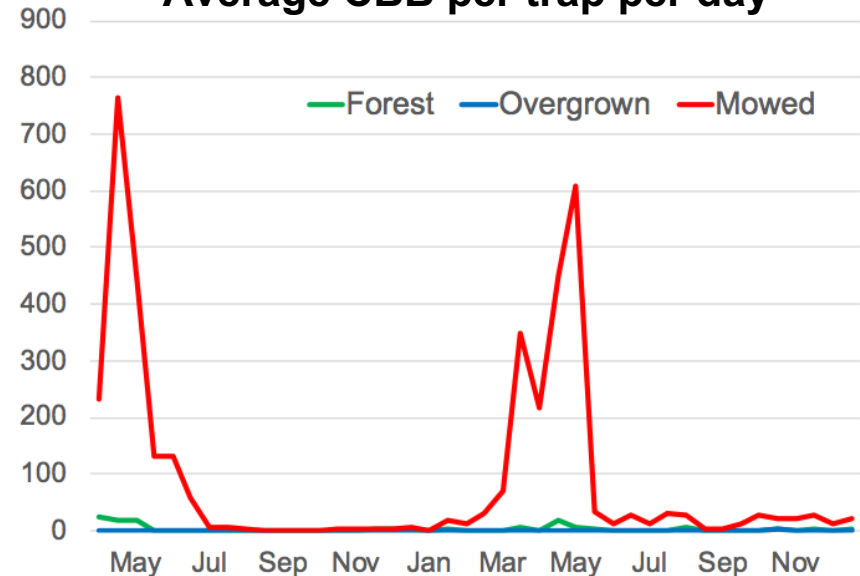
Results: Management
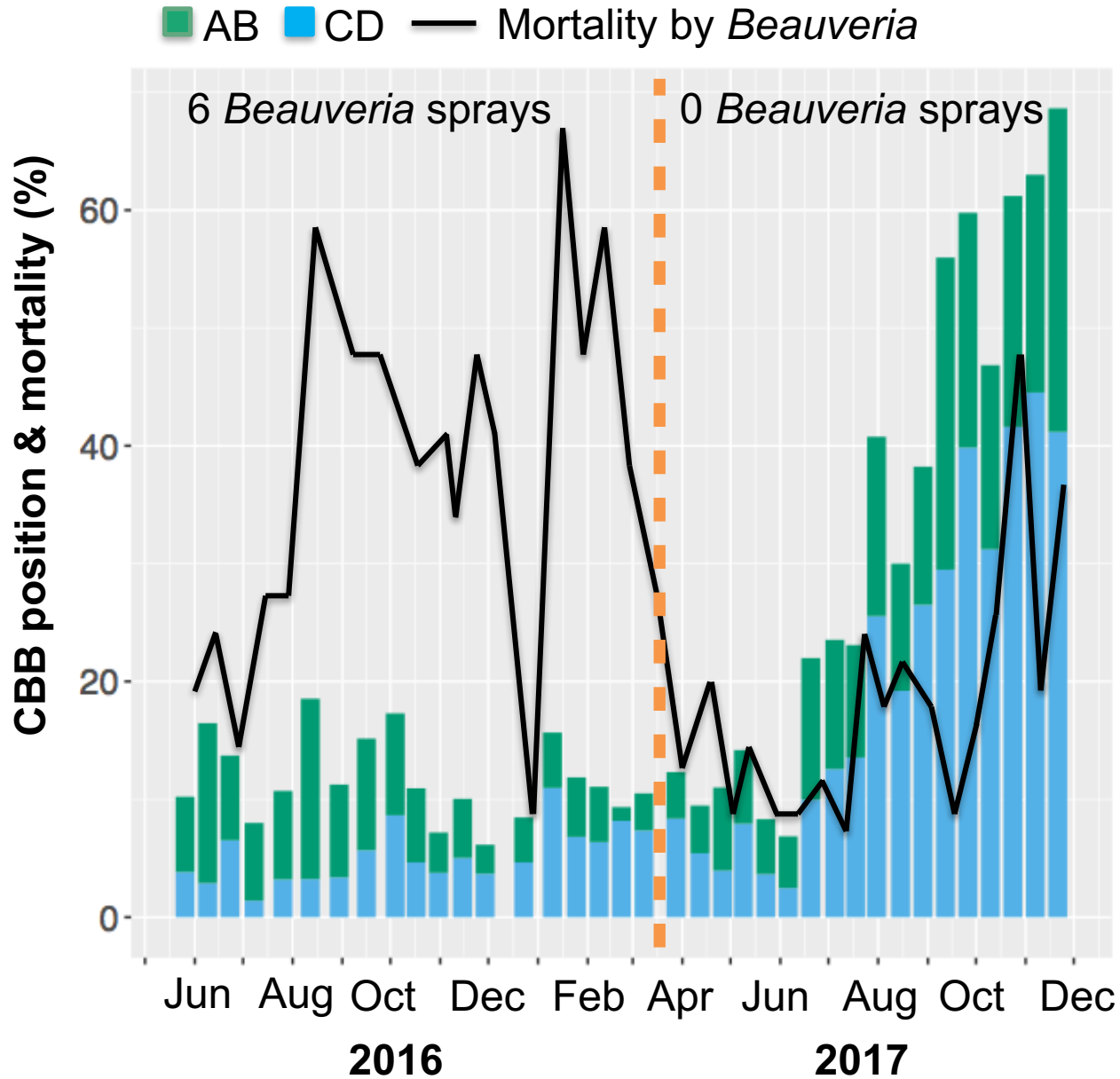
Results: Management

Bi-Weekly Trap Catch

November 2017

70% infestation

April 2018
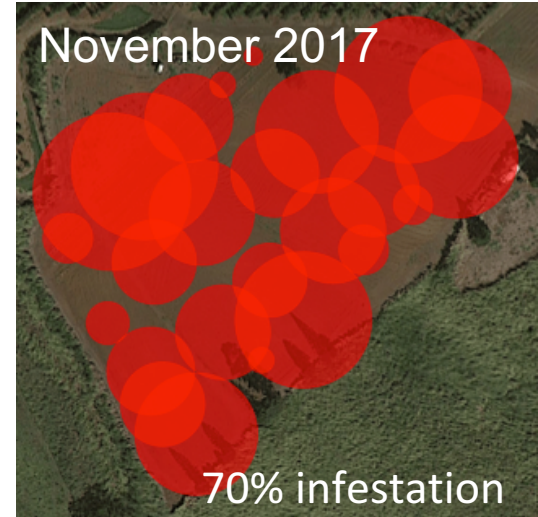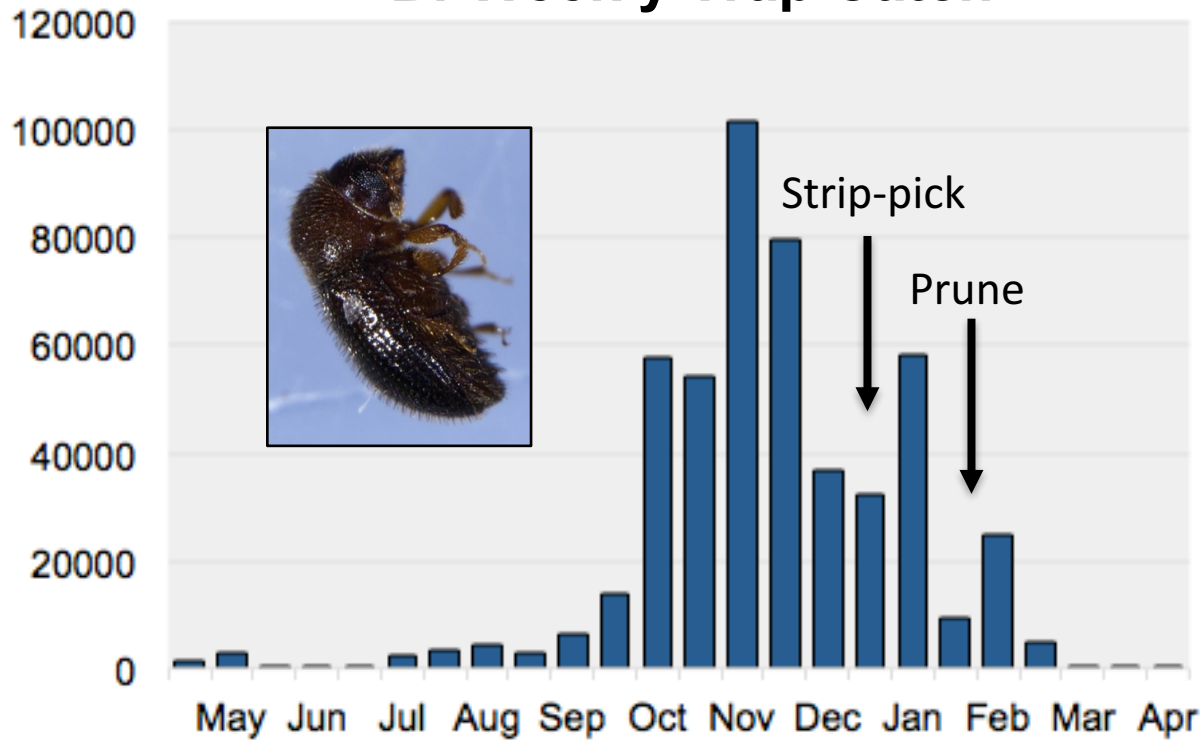
7% infestation

Conclusions

- Peak flight activity is from Mar-May and Oct-Jan

- Trap catch and infestation are often positively correlated

- Infestation was higher in 2017 compared to 2016

  - Likely related to weather conditions

- Feral and unmanaged sites typically have low production and high infestation

- Greatest reservoirs of CBB:

  - Unmanaged sites that are recently abandoned

  - Unmanaged sites that are mowed

Recommendations

- Traps can be used to determine peaks in CBB flight activity and best time to start spraying

  - 5 traps per 0.5 ha (1.2 acres)

- Sampling trees can be used to determine when CBB are most vulnerable to *Beauveria bassiana* (>5% in AB position)

  - 25 trees per 1 ha (2.5 acres)

  - 15 trees per 0.5 ha (1.2 acres)

- *B. bassiana* sprays in combination with sanitation can effectively control CBB

Future Work

- Collect multiple years of data to estimate inter-annual variation in infestation & flight activity patterns

- Develop management intensity index to estimate effectiveness of particular strategies on CBB infestation

- Distribute a mobile app that uses real-time data to recommend management actions to growers that are specific to their location

Acknowledgements

- Field & lab support: Thomas Mangine, Matthew Mueller, Sam Fortna, Ray Carruthers, Forest Bremer, Jacqueline Pitts, Austin Bloch, Lori Carvalho, Shannon Wilson, John Ross, Conner Rhyno, Lindsey Hamilton

- Outreach: Andrea Kawabata, Rob Curtiss, Gwendolyn Hicks, Luiz Aristizabal

- Growers: Tom Greenwell, Jim & Anita Kelleher, Campbell O'Neill, Tom Butler, John Koontz, Melvin Kunitake, Joaqin Oster, Sandra Scarr, Carolyn Witcover, John Ah San, Lorie & Joan Obra, Kili Matsui, Don & Milton Dacalio, Ka'u Coffee Mill

- Funding:

More CBB, please!