Introduction:

Bee local: A comparison of productivity and pathogen load in local vs. California re-queened colonies

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Acknowledgments

Co-Authors:

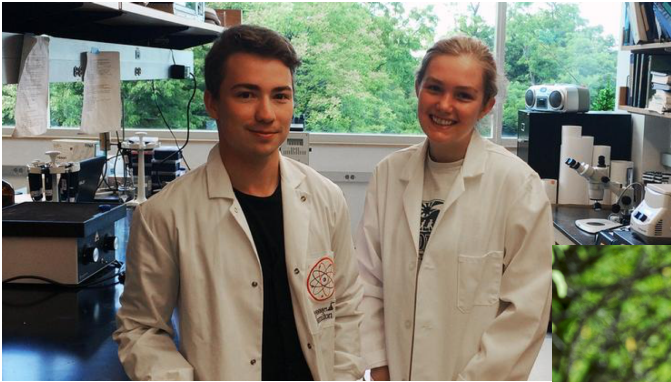- Andre Burnham
- Fiona McLaughlin
- Dr. Herman Lehman

Thank you to:

- The Casstevens Family
- Nancy Thompson
- Samantha Alger

The Bee Team

Honey Bees are Important

- 30% of the world's food is derived from pollination (Aizen et al., 2009)
- Pollinators are responsible for between $235-577 billion (Gallai et al., 2009)
- Honeybees are responsible for $14 Billion in the USA (Morse & Calderone, 2000)

Honey Bee Pathogens

VIRUSES:

- ► Deformed Wing
- ► Black Queen Cell
- ► Israeli Acute Paralysis

PARASITES:

- ► Nosema (ceranae/apis)
- ► Varroa Mite

Deformed wing Virus
University of Florida,
Entomology Dept.

Varroa destructor
North Carolina State University,
Cooperative Extension

American Foulbrood
Bee Informed Partnership

Troubles for Beekeepers (re-queening)

The basic premises behind this study

- ▶ Imported VS Local
- ▶ Local Adapation

The basic premises behind this study

- Mass-Produced VS Handmade
- Selection by the Breeder

"Are locally-bred queens more successful than imported queens?"

Our Predictions

- Local queens (colonies) will have higher growth through the season
- Local queens will be better foragers
- Local queens (colonies) will have lower pathogen loads

Experimental Design

- 20 colonies re-queened with Californian-bred queens
- 20 colonies re-queened local-bred (Vermont) queens
- 2 sites, 10 Local and 10 California for each
- Sampled for pathogens and productivity measures
- Sampled at different time points for 3 months

Pictures of the Yards

What we sampled

- Growth:
    - Colony Mass
    - Brood Production
- Foraging:
    - Pollen Production
- Pathogens:
    - Varroa
    - Nosema spp.
    - RNA Viruses

Data Analysis

```
aov.out <- aov(Nosema ~ Origin * Time + Error(FieldID),
      data=QueenDF)

summary(aov.out)
```
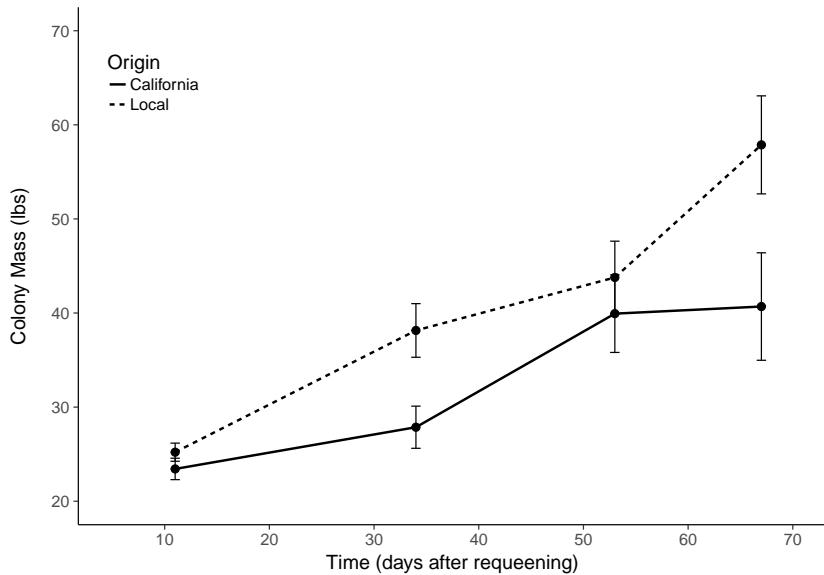
Repeated Measures ANOVA output

```
Error: FieldID
            Df    Sum Sq   Mean Sq  F value  Pr(>F)
Origin       1 3.156e+13 3.156e+13   7.972 0.00779 **
Time         1 2.589e+12 2.589e+12   0.654 0.42413
Origin:Time  1 9.223e+11 9.223e+11   0.233 0.63234
Residuals   35 1.386e+14 3.959e+12
---

Error: Within
            Df    Sum Sq   Mean Sq  F value  Pr(>F)
Time         1 5.620e+10 5.620e+10   0.017 0.896098
Origin:Time  1 4.934e+13 4.934e+13  15.111 0.000275 ***
---
```
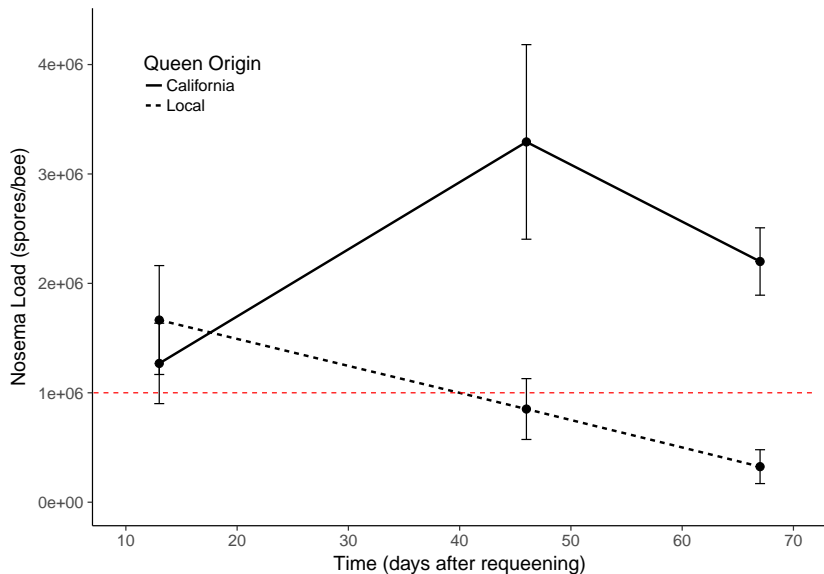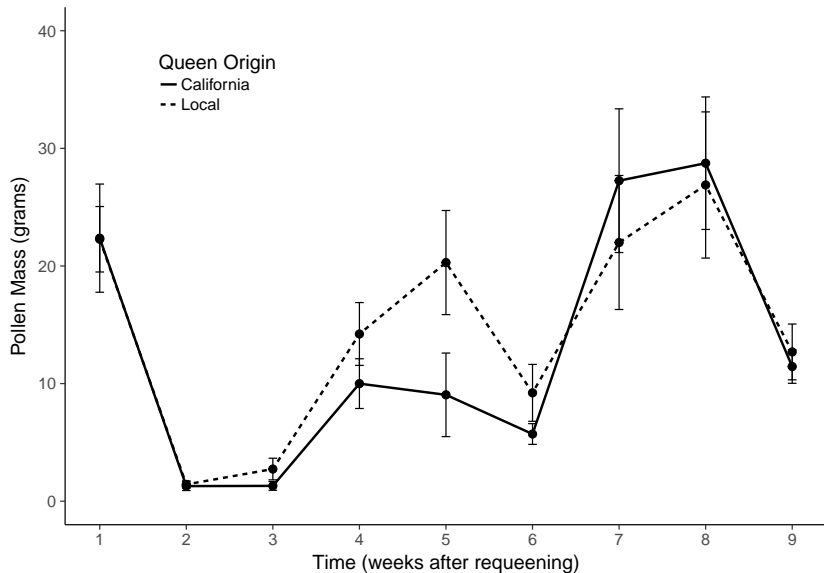
Colony Mass (growth)

Frames of Brood (growth)
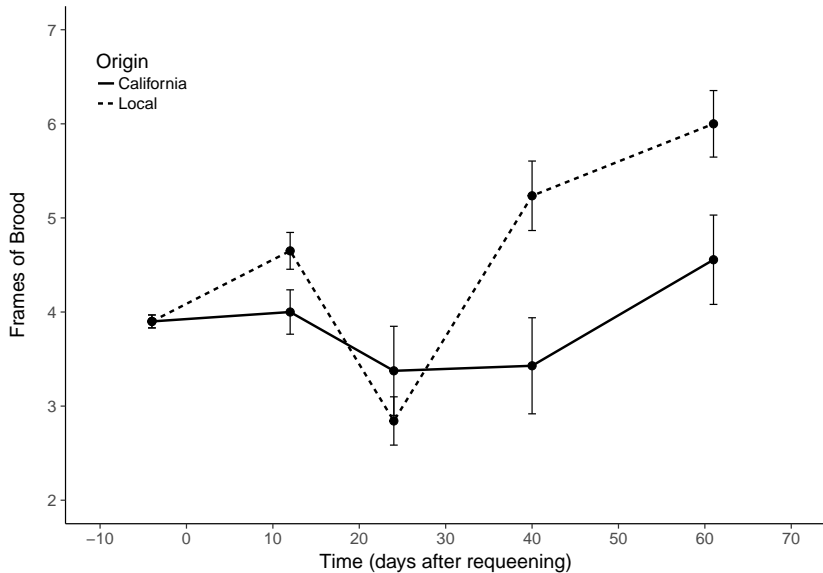
Varroa Load (pathogens)

Nosema Load (pathogens)

In Summary

- Colony Mass = **Higher in Local**
- Amount of Brood = **Higher in Local**
- Varroa Load = **No Difference**
- Nosema Load = **Lower in Local**

Implications

- Locally-raised queens outperform mass-produced, California queens in their northern environment.
- This could be evidence for the importance of care in breeding stocks (mass produced vs handmade)
- **And/Or** This could be evidence for local (genetic) adaptation (imported vs. local)

Thank you!

Questions?