

## Introduction:

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

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Herman Lehman



*The*  
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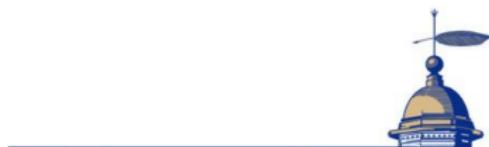
# Acknowledgments

## Co-Authors:

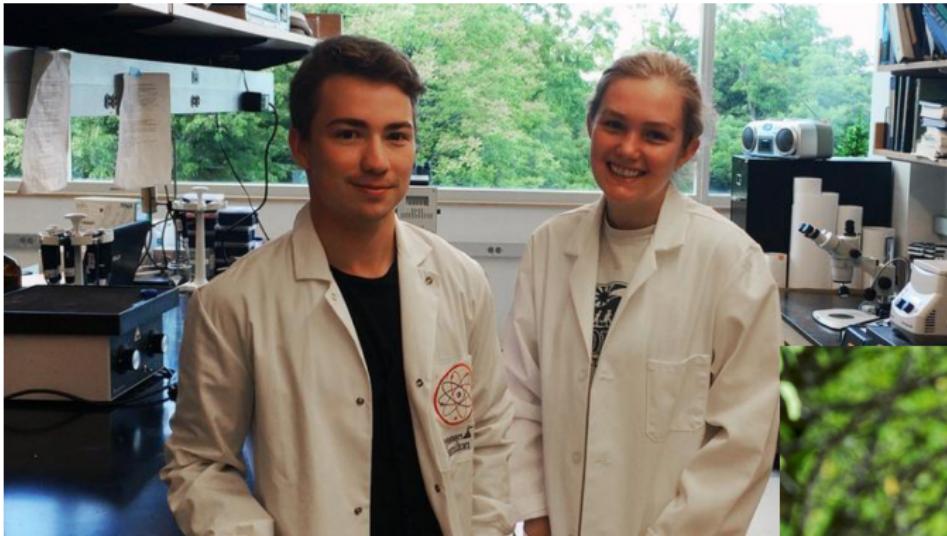
- ▶ Andre Burnham
- ▶ Fiona McLaughlin
- ▶ Dr. Herman Lehman

## 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



Deformed wing Virus  
University of Florida,  
Entomology Dept.

## PARASITES:

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



*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



## The question:

*“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

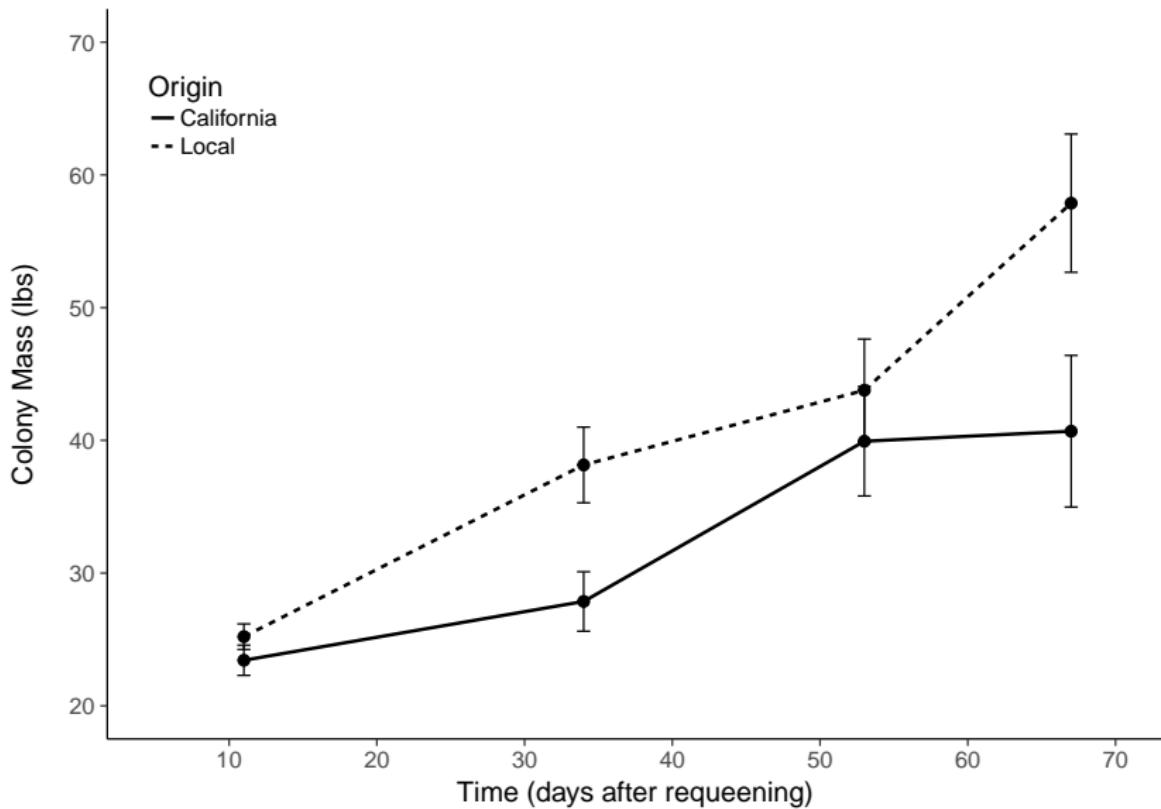
# Data Analysis

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

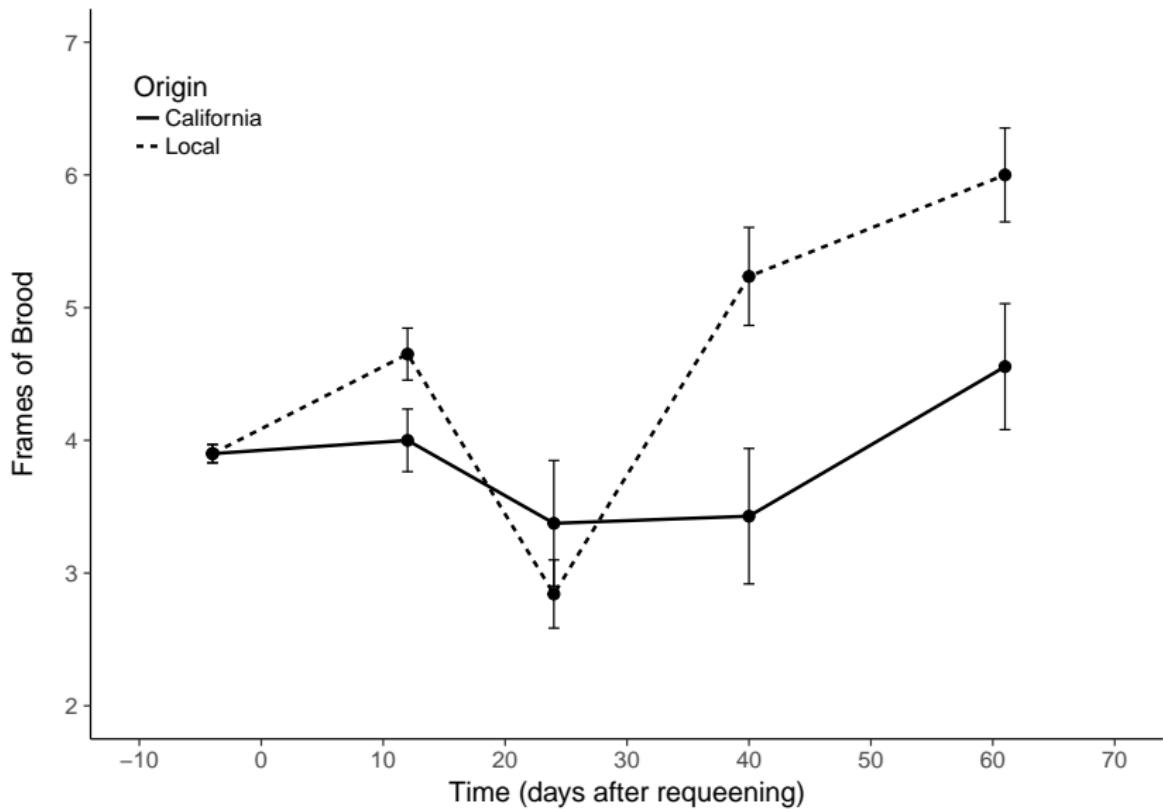
# Repeated Measures ANOVA output

```
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 ***
---
```

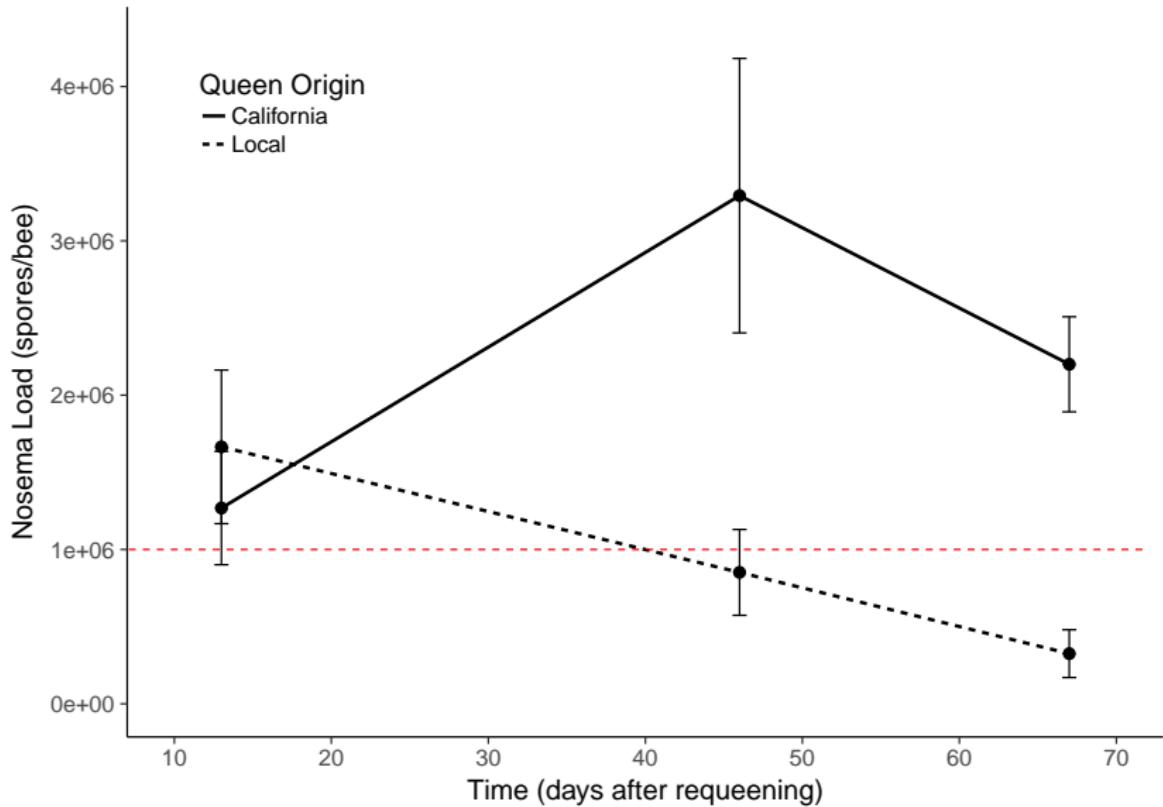
# Colony Mass (growth)



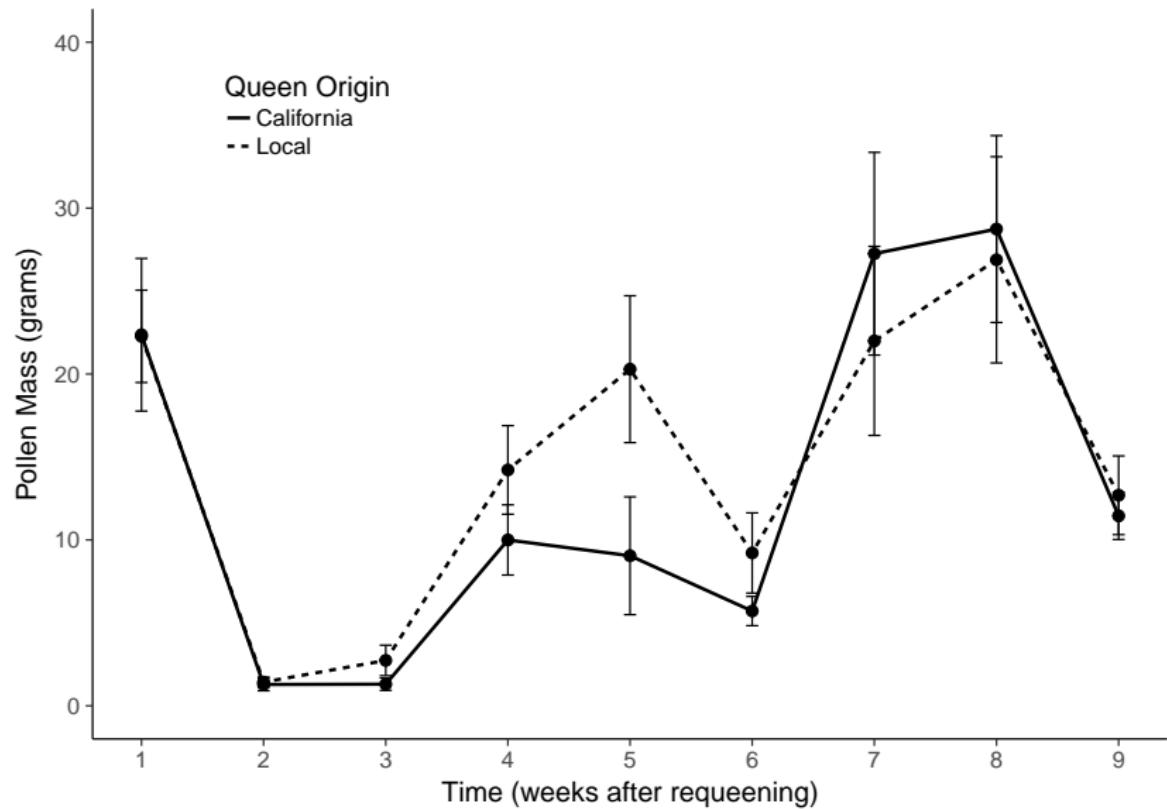
# Frames of Brood (growth)



# 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?

