

Home sick: Effects of migratory beekeeping on honey bee disease

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www.experiment.com/beekeeping

By Samantha Alger, Alex Burnham, Leif Richardson, and Zachary Lamas

Backed by VT Beekeepers Association, NH Beekeepers Association, Edward Alger, Betterbee, Bailey Bee Supply, Charles M Edens, Lee Trainer, David Tremblay, Robert Merkert, Tina Sekimi, and 56 other backers▼



\$5,970

Raised

101%

Funded on 12/08/16

Successfully Funded

How does this work?

University of Vermont

Burlington, Vermont

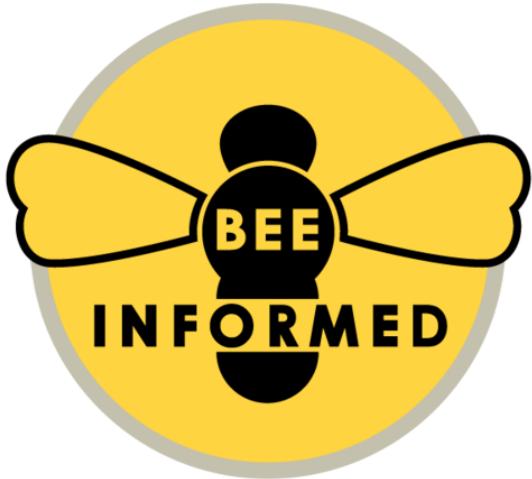
Biology

Ecology

DOI: 10.18258/8208

Grant: Bees

Acknowledgments



experiment



And Most of all, our Backers...

VT Beekeepers Association, NH Beekeepers Association, Edward Alger, Betterbee, Bailey Bee Supply, Charles M Edens, Lee Trainer, David Tremblay, Robert Merkert, Tina Sekimi, Mike Kiernan, Sandra Tomlinson, Amy Handy, Joe Perry, Luke Manlove, Dan Boisvert, Jacqueline Alger, Dan O'Hanlon, Patrick Gillen, Alison K Brody,Daniel Hall Lipke, Beth Sawyer, Cathy Wilson, Allison Malloy, Richard Reid, Nicole Berthiaume, Heather Achilles, Phyllis E Burnham, Yeager Anderson, Bill Castro, Luke Tilley,Jonathan Alger, Peter Gatehouse, Amy Parachnowitsch, Trevor Brandt, Katie Iles, JESSICA PAGANO, Kate Protagonist, Andrea Stanley, Robert Zywno, Helmut Besser, Allen Turechek,Adrian Adam Zywno, Kirsten Shoshanna Traynor, Meghan O'Rourke, Jean McCartin, Ben Ritchie, Vicki Anne, Hollis Woodard, James DeRosia, The Backyard Farm, Malcolm Hobbs,Aaron Schwartz, Linda Battista, Lauren Ash, Raphaël Royauté, Kay Newhouse, Maggie Davern, Joanne Bryan, Sarah Rommelfanger, Pureum Kim, Luke McCartin, Kendall Johnson,Sara Held, Eric Damon Walters, and Bo Sprotte Kofod

Two Main Types of Bee Operations...

Stationary Apiaries:



bedillionhoneyfarm.com

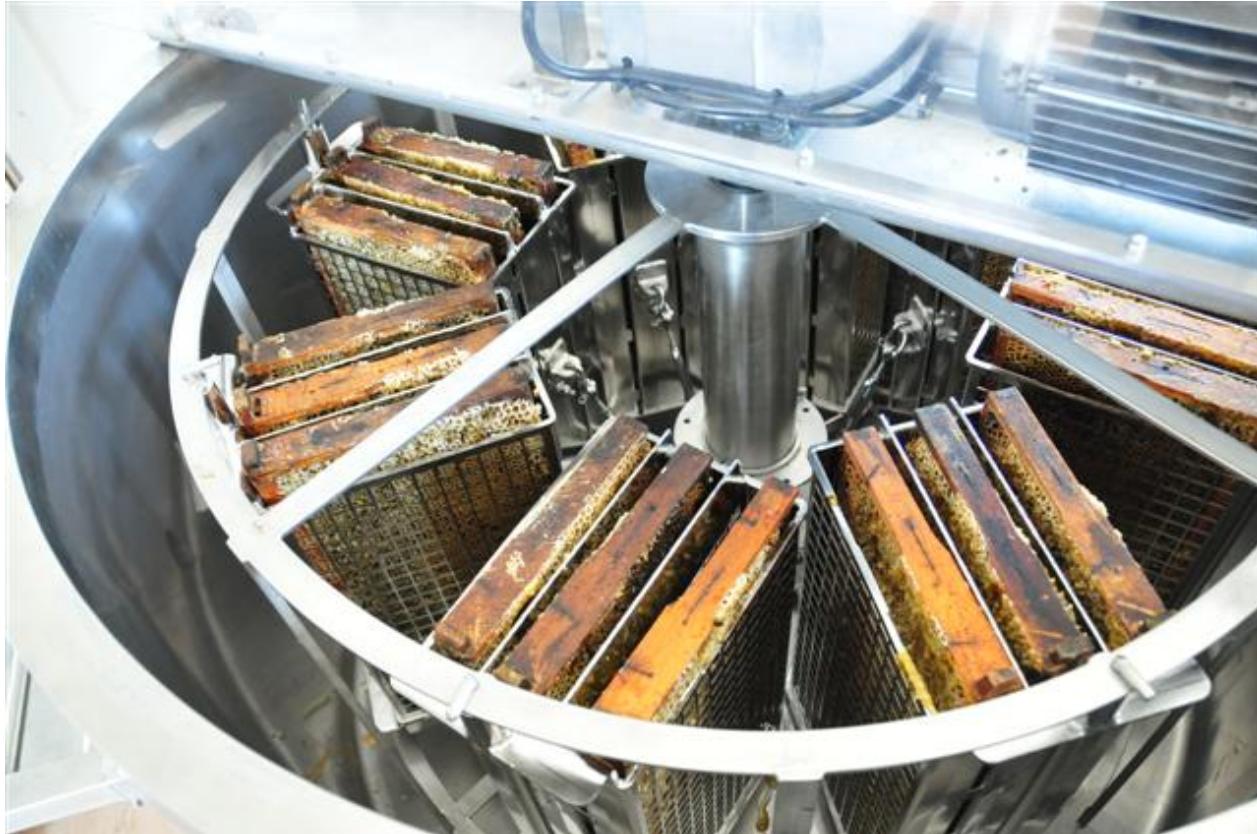
Migratory Apiaries:

&



waywardspark.com

Stationary



- Honey Production
- Queen Breeding
- Selling Nucs
- Pollination

Migratory



Australian Broadcasting Co.

- Pollination Contracts
 - *Almonds*
 - *Canola*
 - *Blueberries etc.*
- ~60% of US colonies pollinate almonds
(Cavigli et al., 2016)
- \$14.6 Bil. industry

(Morse & Calderone, 2000)

Anecdotally, some people believe that migratory beekeeping leads to unhealthy bees

WHY?

Spread of Disease

Big Cities (migratory):

-high disease transmission



Small Towns (stationary):

-low disease transmission



Honey Bee Pathogens:

- VIRUSES:

- *Deformed Wing Virus (DWV)*
- *Black Queen Cell Virus (BQCV)*
- *Israeli Acute Paralysis Virus (IAPV)*



Deformed wing Virus
University of Florida,
Entomology Dept.

- PARASITES:

- *Nosema (ceranae & apis)*
- *Varroa Mite*



Varroa destructor
North Carolina State University,
Cooperative Extension

- OTHER PATHOGENS & Pests:

- *American Foulbrood (AFB)*
- *European Foulbrood (EFB)*
- *Chalk Brood*
- *Black shiny bee*
- *Small Hive Beetle*



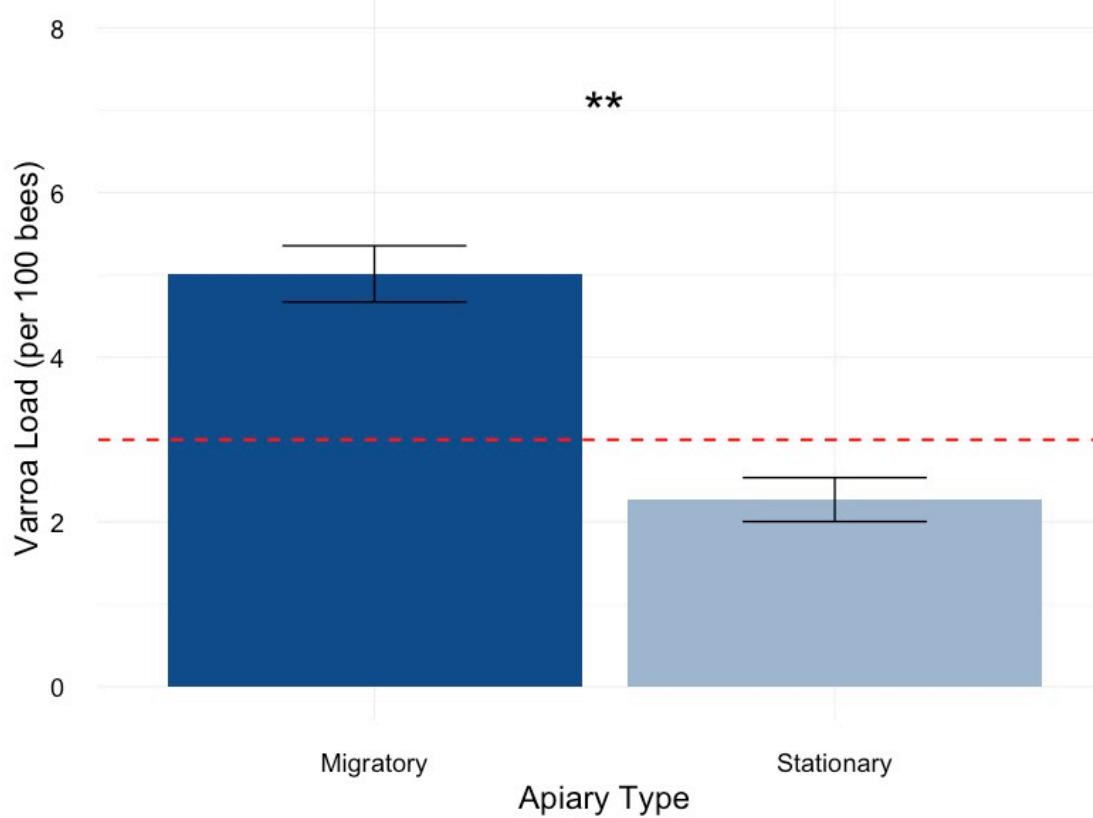
American Foulbrood
Bee Informed Partnership

The big question!

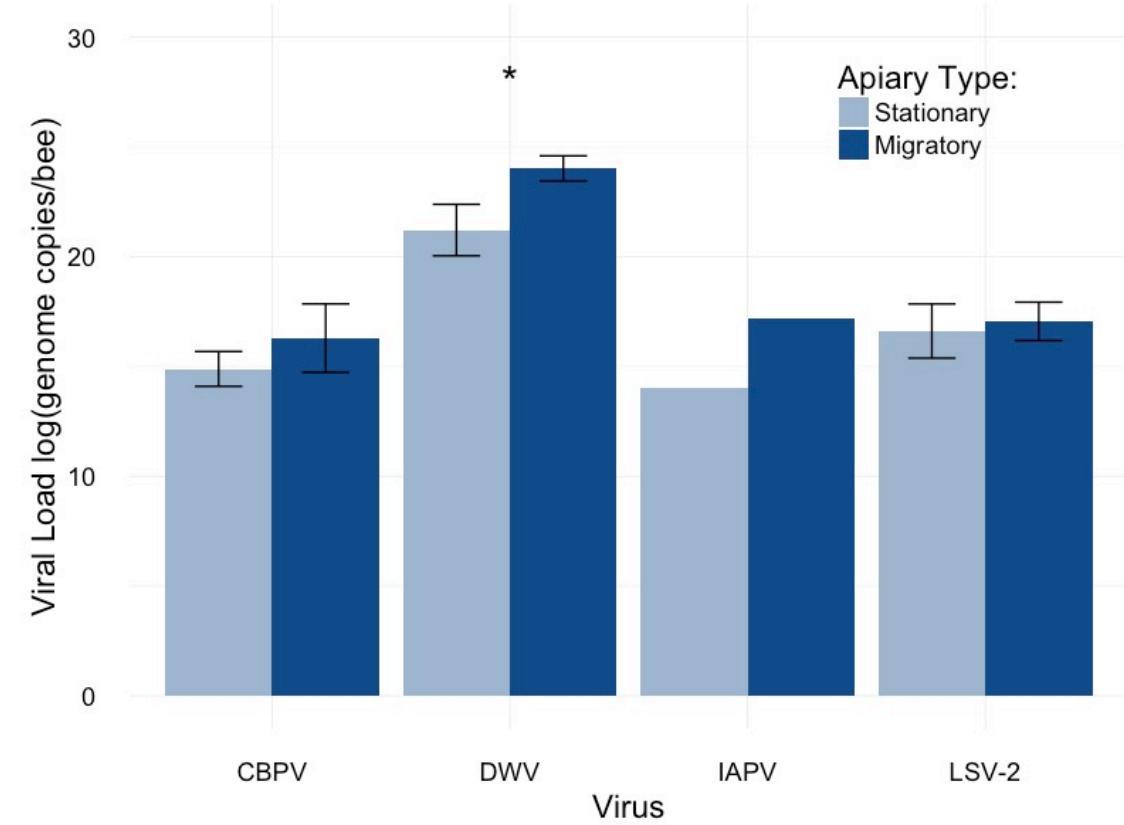
*“Do migratory operations
contribute to the spread of
honeybee disease?”*

Preliminary Data from the National Honey Bee Survey in Vermont...

Varroa Mites:



RNA Viruses:



What other people have found:

- Migratory operations can have high disease loads

(Welch et al., 2009; Cavigli et al., 2016)

- Infected hives may transmit disease to other bees

(Fürst et al., 2014)

- Varroa loads can be lower in migratory bees

(NHBS report, 2016)

- These data are correlative:

- *Surveys*
- *Observational studies*

Our Hypotheses

- Two parts to this experiment:
 - Part I: Do migratory colonies have higher pathogen levels than stationary colonies?
 - Part II: Can migratory colonies infect stationary colonies upon their return?

Purpose

- The purpose of this study is **NOT** to assign blame to migratory beekeeping.
- Migratory beekeeping is very important for our agriculture and economy.
- We hope to learn more about how beekeeping practices play into transmission and bee health.

Experimental Design

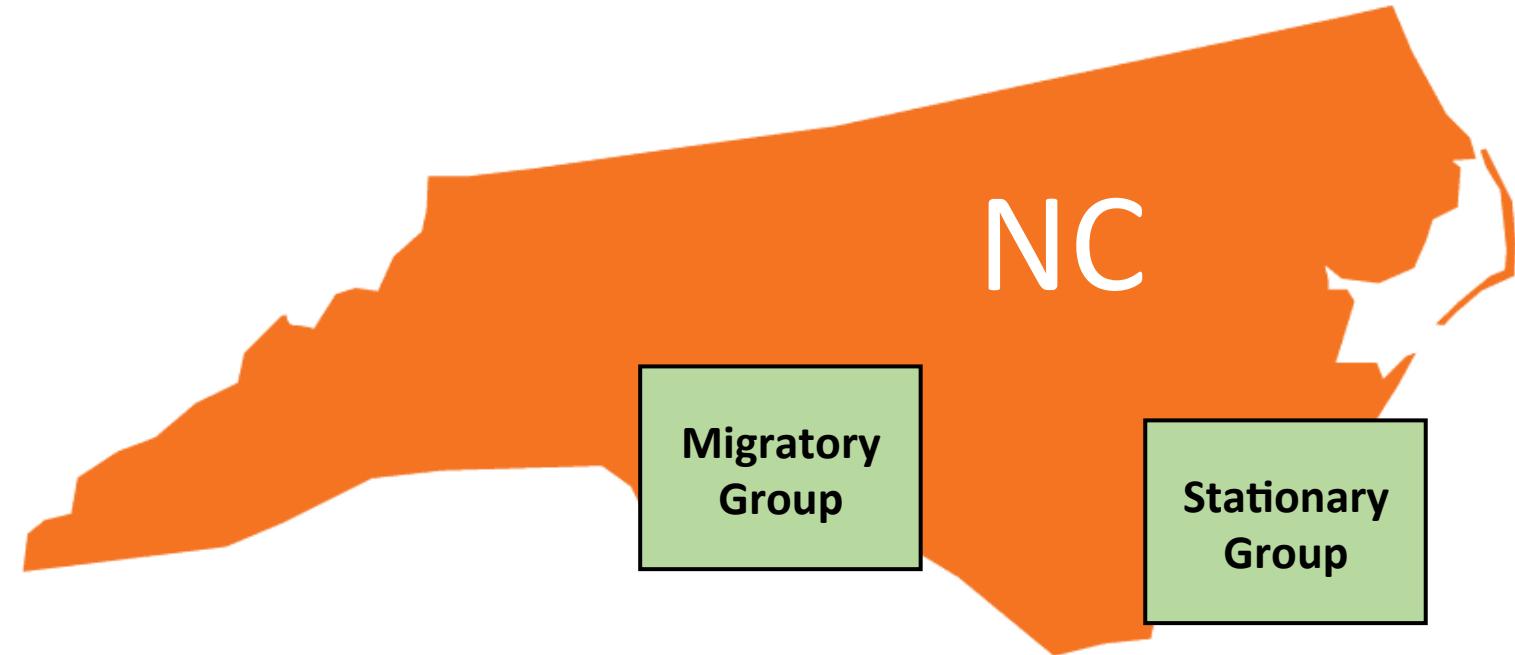
- Three groups of colonies:
 - *Migratory*
 - *Stationary (control)*
 - *Stationary (exposed)*
- Each group contained 16 colonies
- Sampled at three different times

Experimental Design

- Field inspection:
 - Common brood diseases
 - Frames of brood
 - Brood pattern
- Laboratory Analysis:
 - Varroa load
 - Nosema load
 - Viruses: DWV, BQCV, IAPV



Experimental Design for Migratory/Stationary Honey Bee Experiment Part I



- Do migratory colonies have higher pathogen levels than stationary colonies?



Part I: Results

Do migratory colonies have higher pathogen levels than stationary colonies?

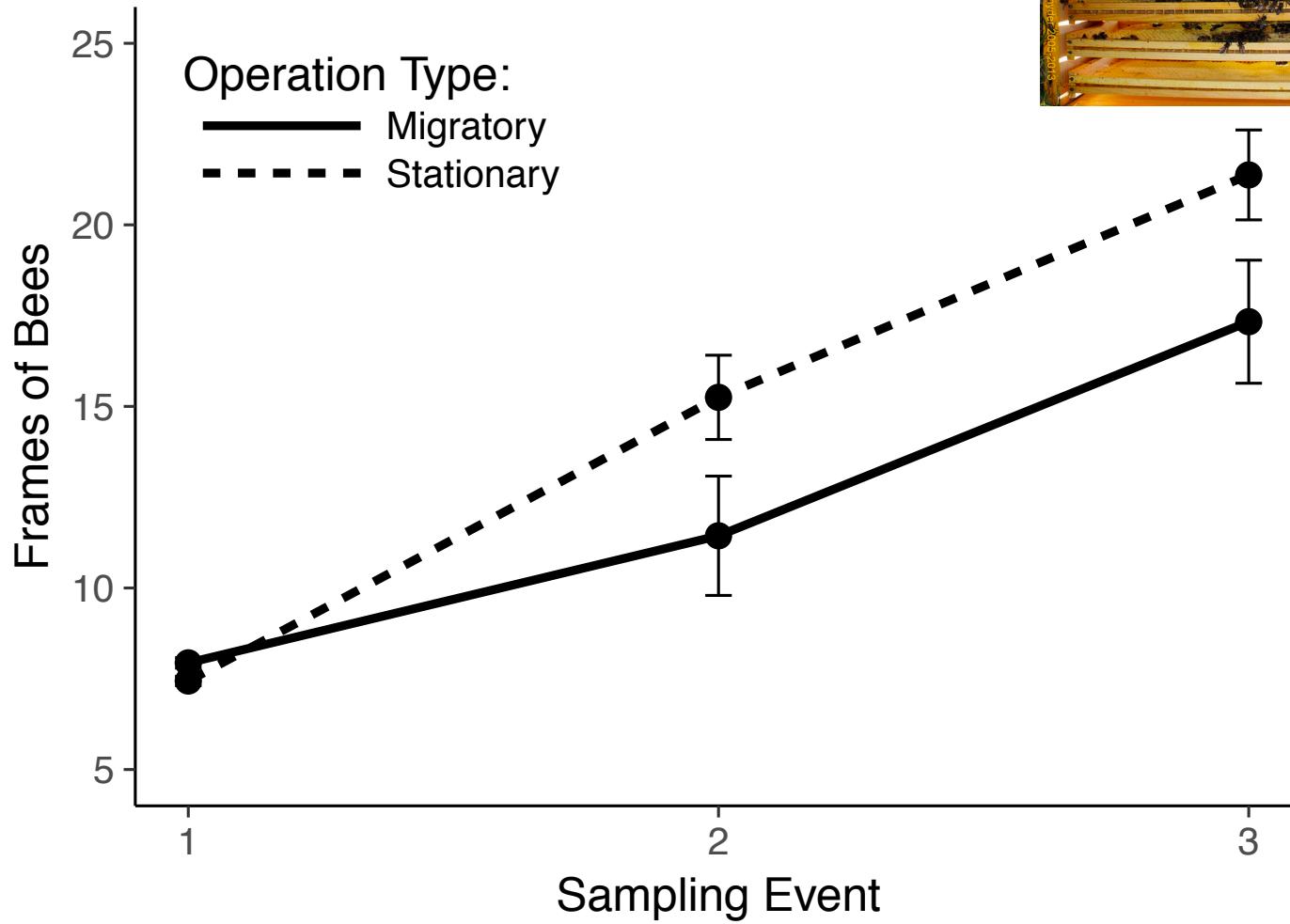
Part I: Results

Frames of Bees

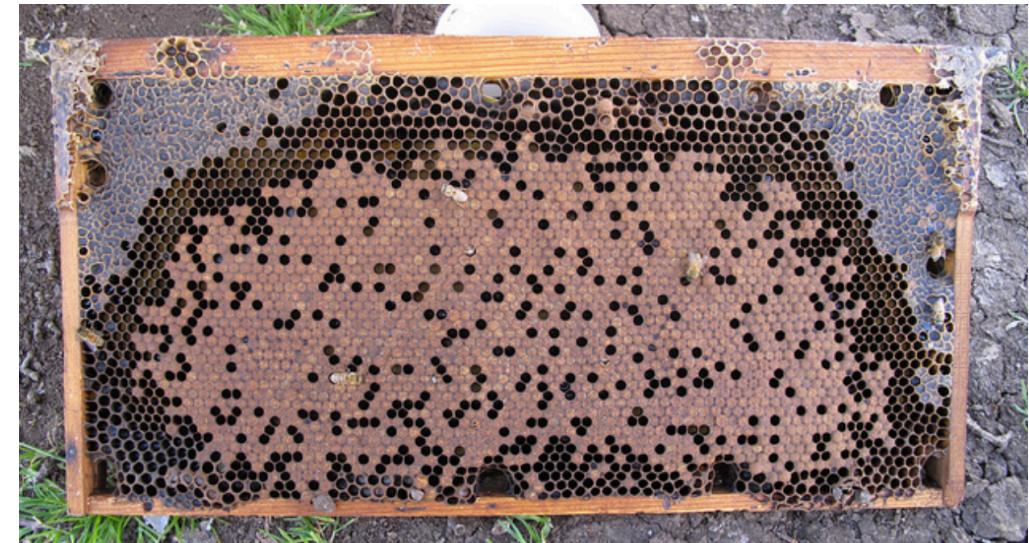


Part I: Results

Frames of Bees

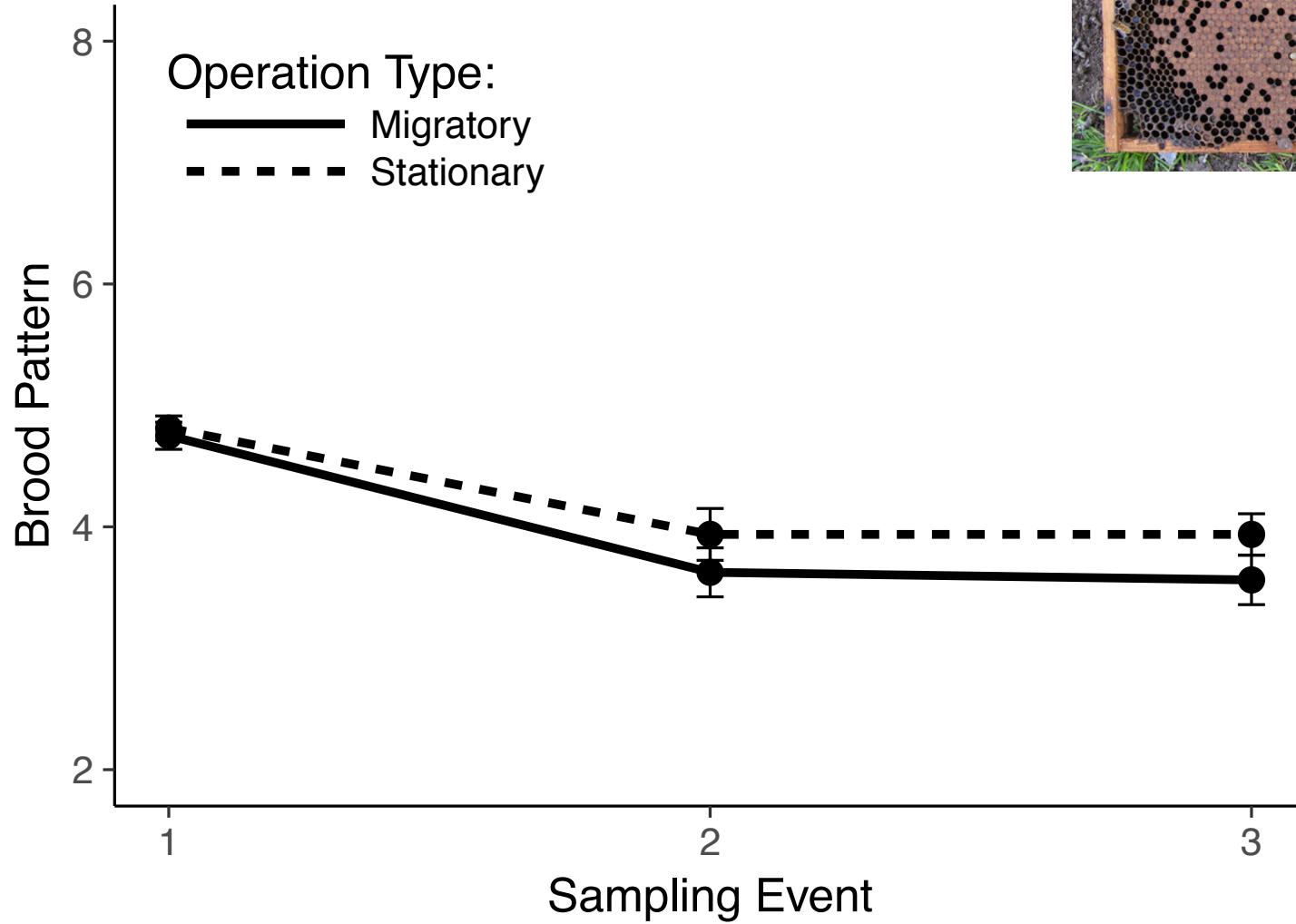


Part I: Results Brood Pattern



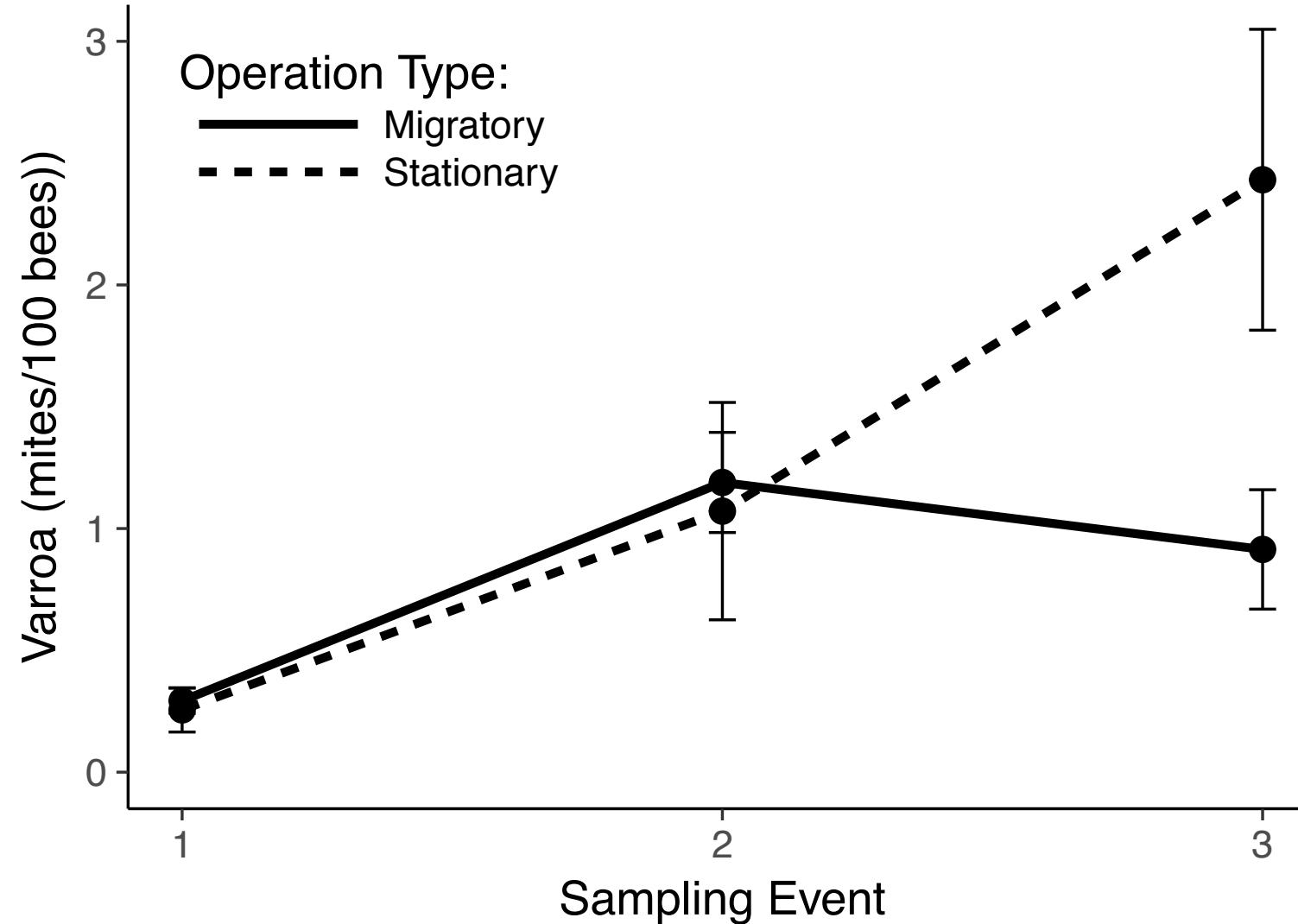
Part I: Results

Brood Pattern



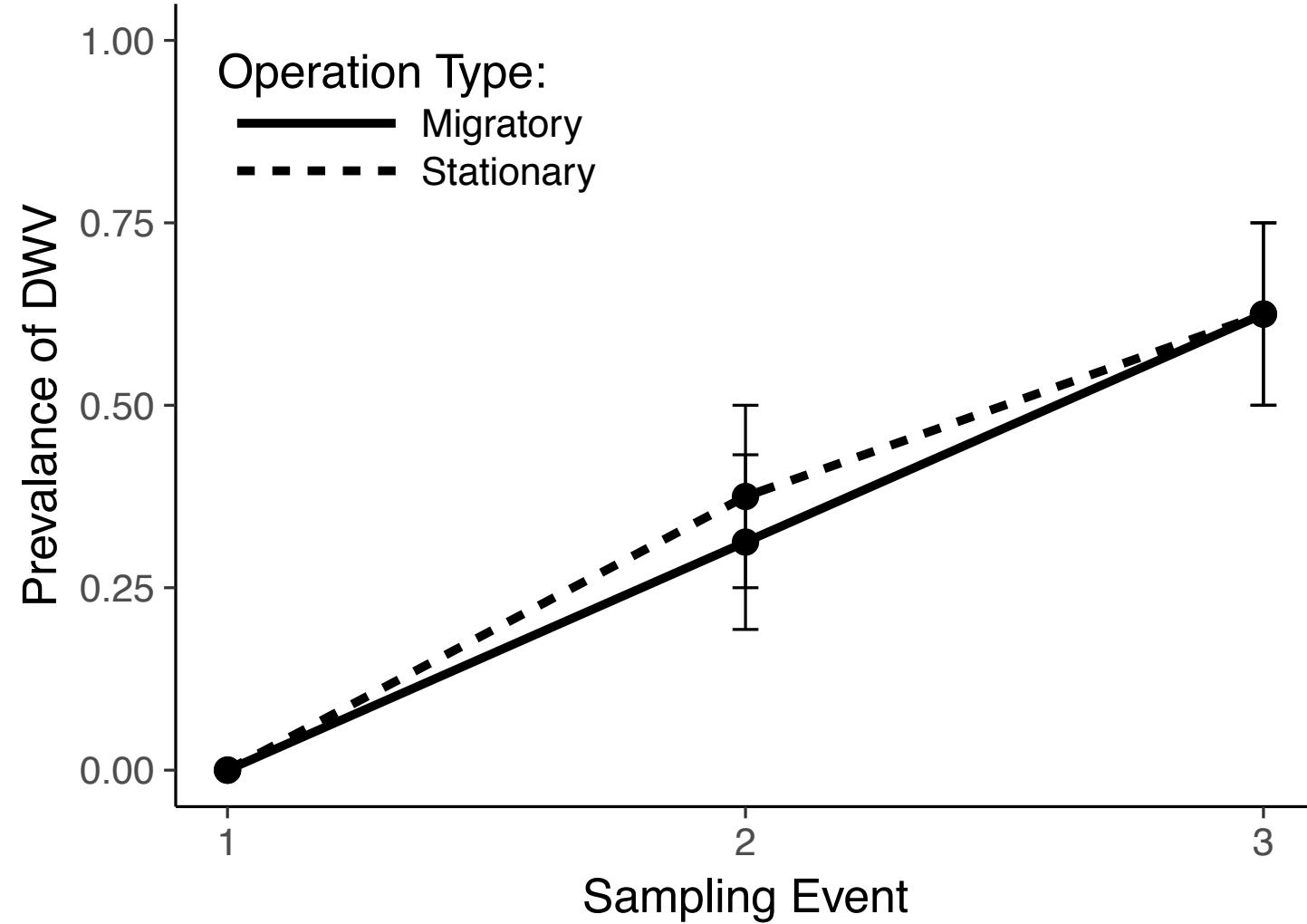
Part I: Results

Varroa load



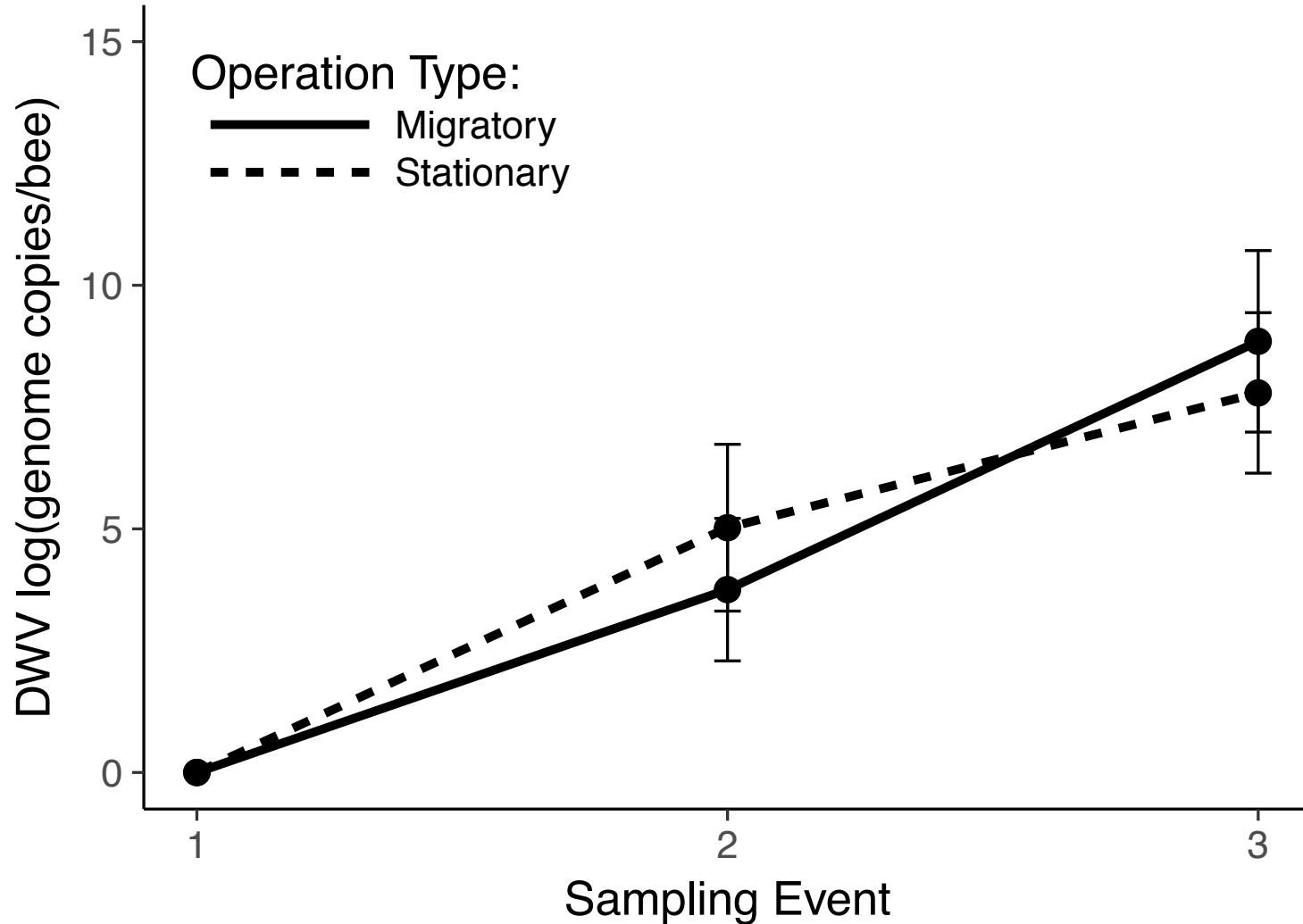
Part I: Results

Deformed Wing Virus Prevalence



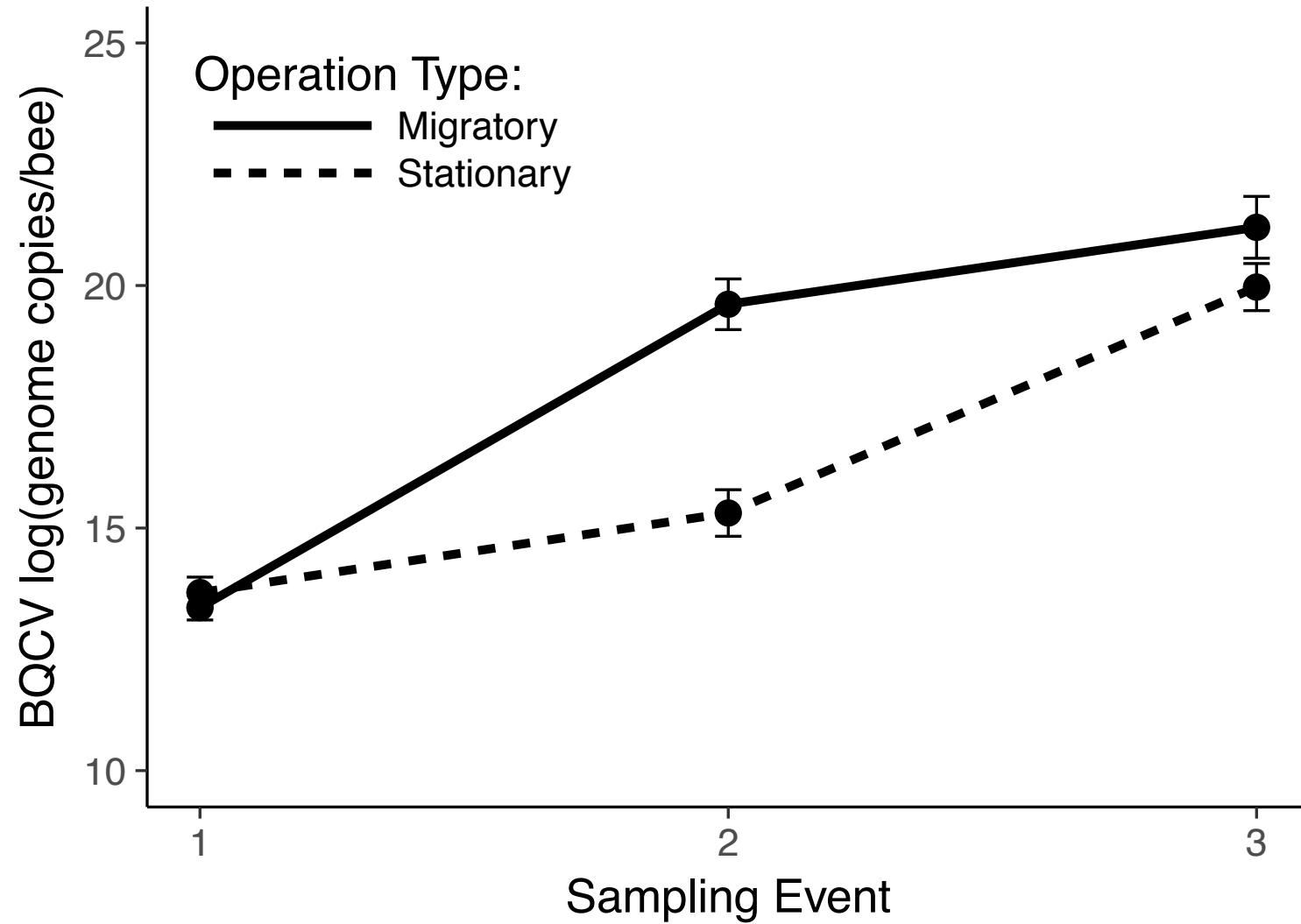
Part I: Results

Deformed Wing Virus Load



Part I: Results

Black Queen Cell Virus Load

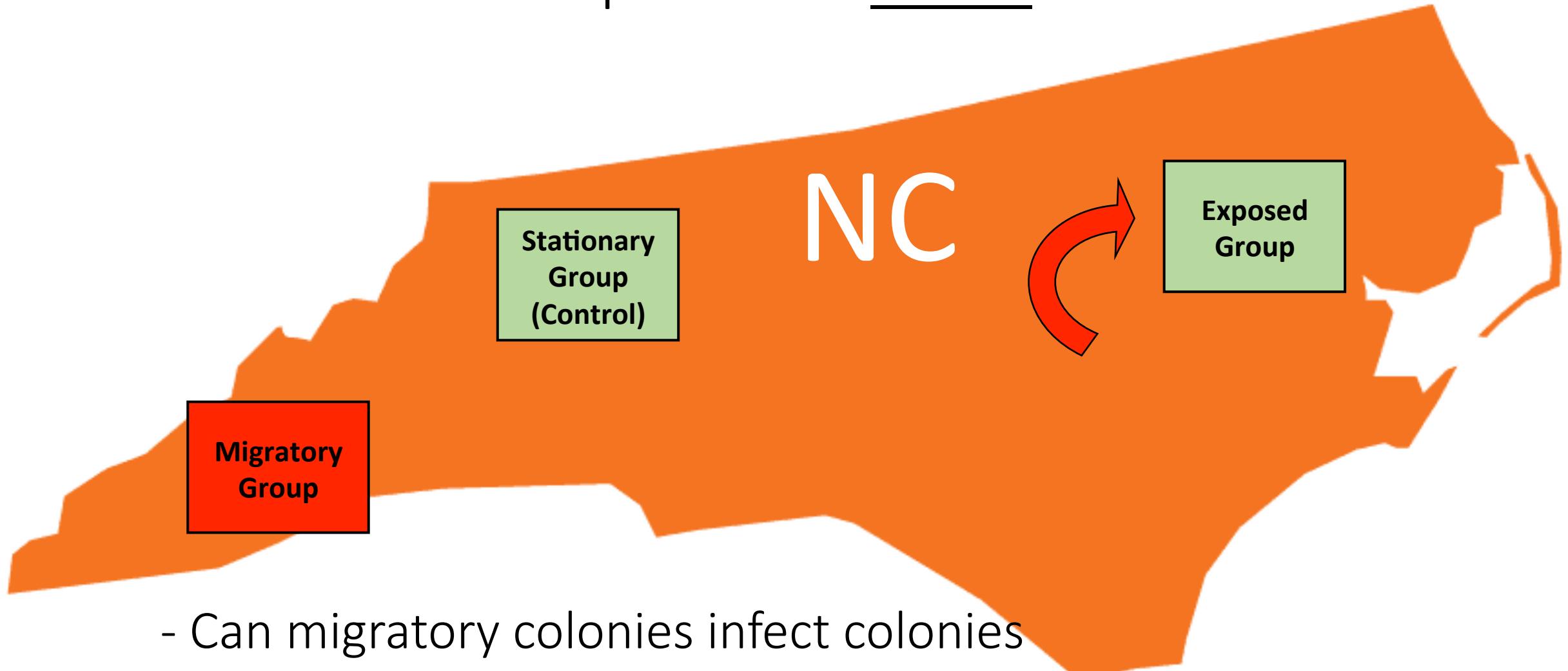


Part 1: Conclusions

Compared to Stationary hives Migratory hives had:

- Fewer frames of bees
- Lower Varroa loads
- Higher BQCV loads
- Similar brood pattern and DWV load

Experimental Design for Migratory/Stationary Honey Bee Experiment Part II



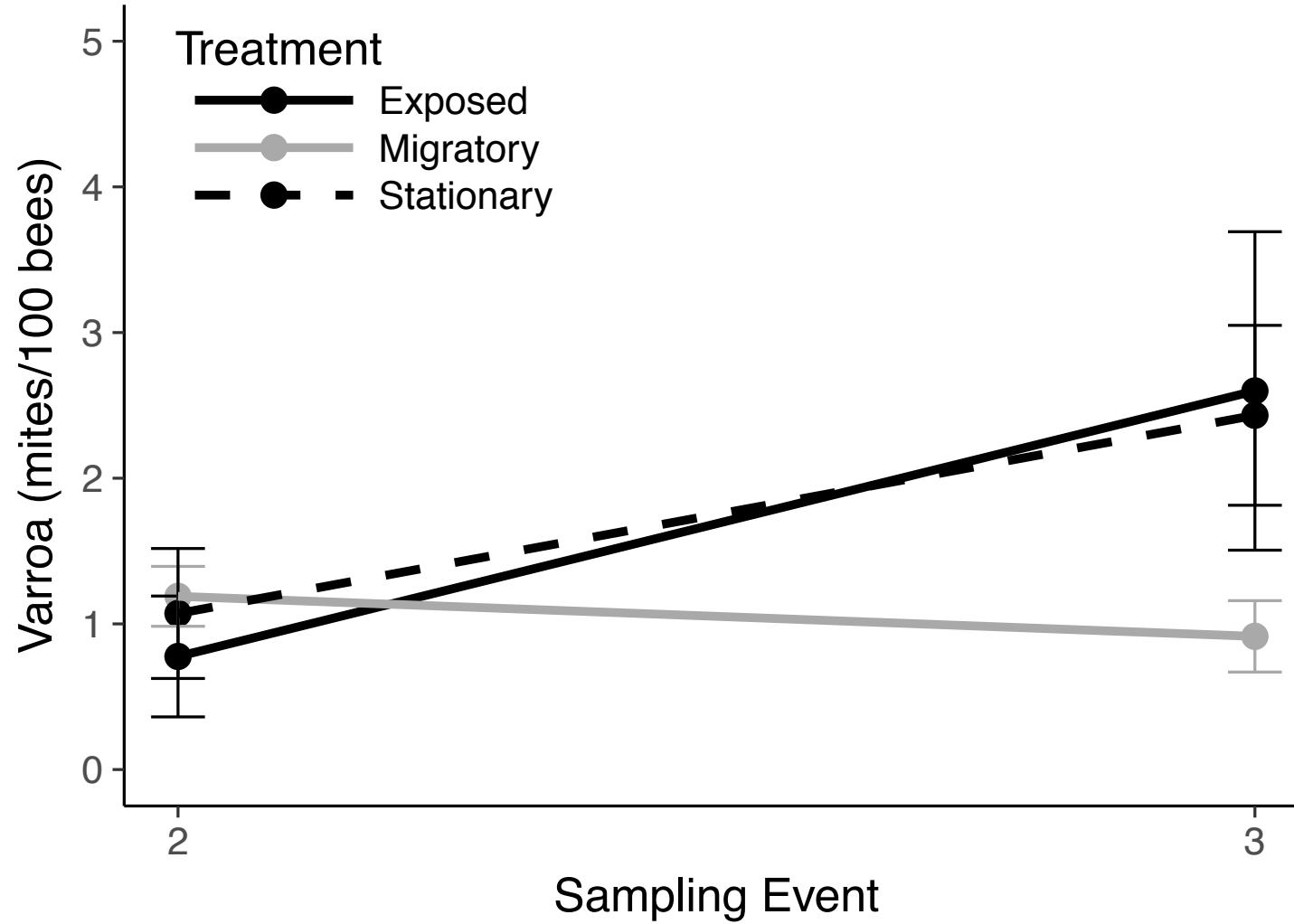
- Can migratory colonies infect colonies upon their return?

Part I: Results

Can migratory colonies infect colonies upon their return?

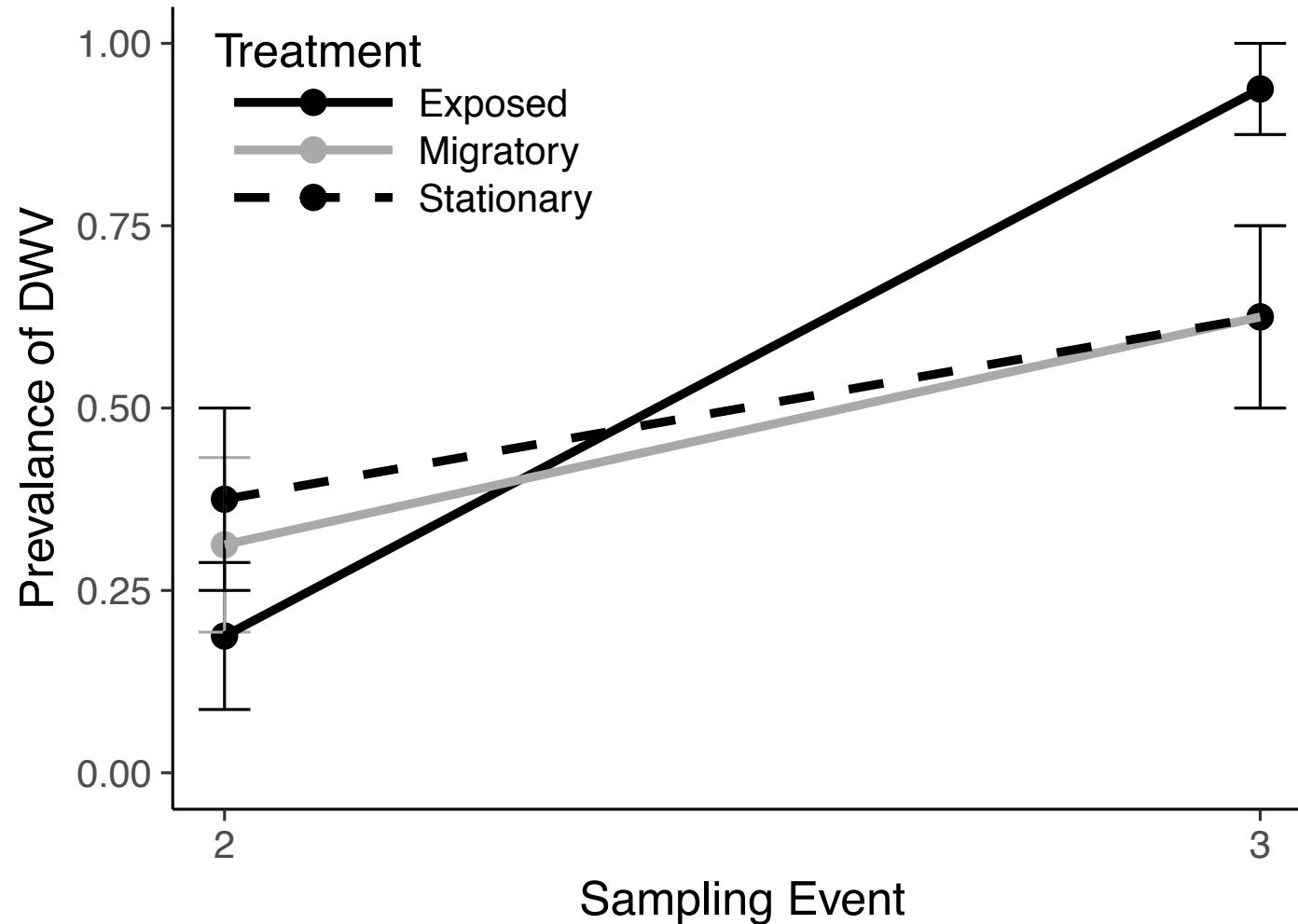
Part 2: Results

Varroa load



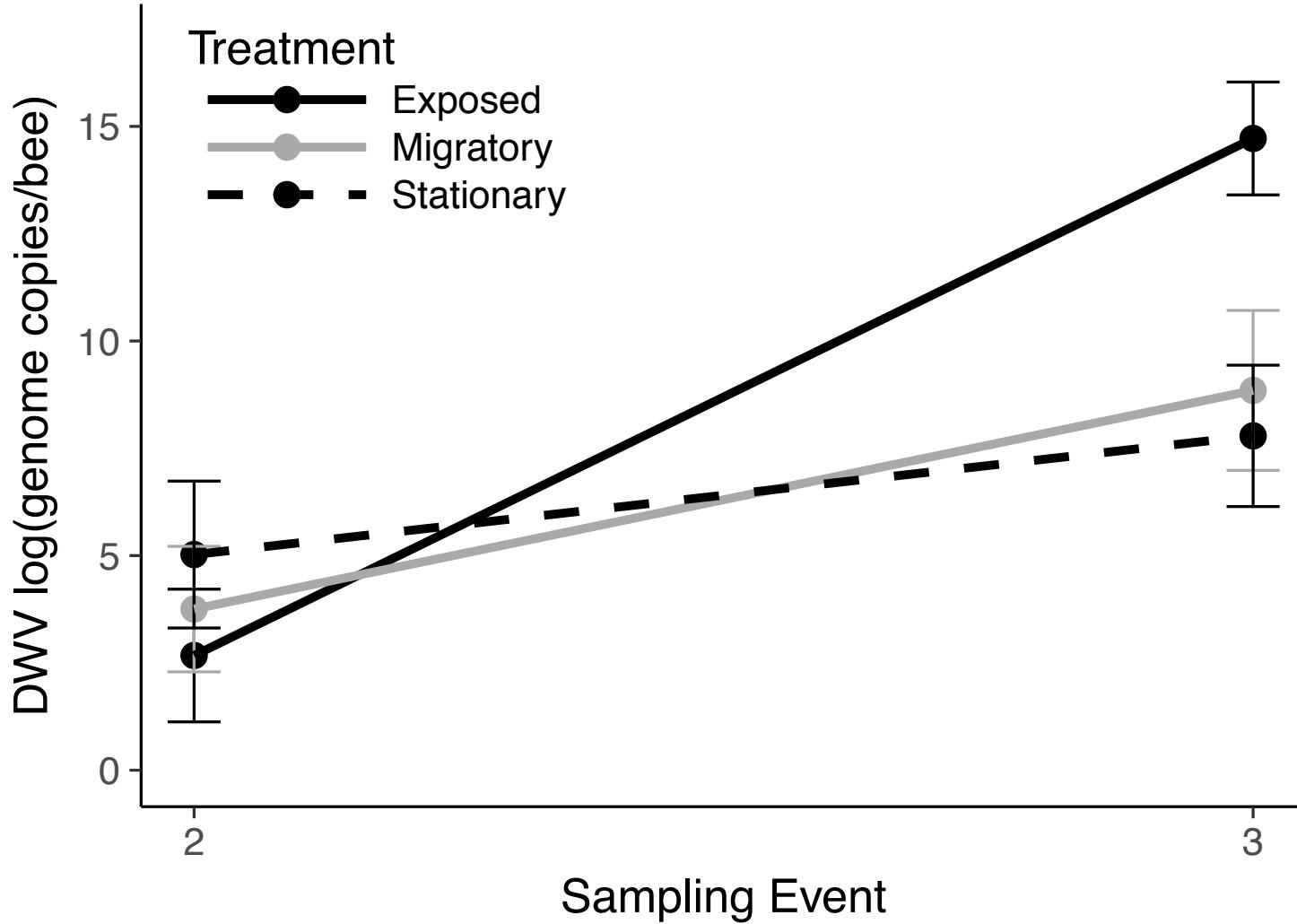
Part 2: Results

Deformed Wing Virus Prevalence



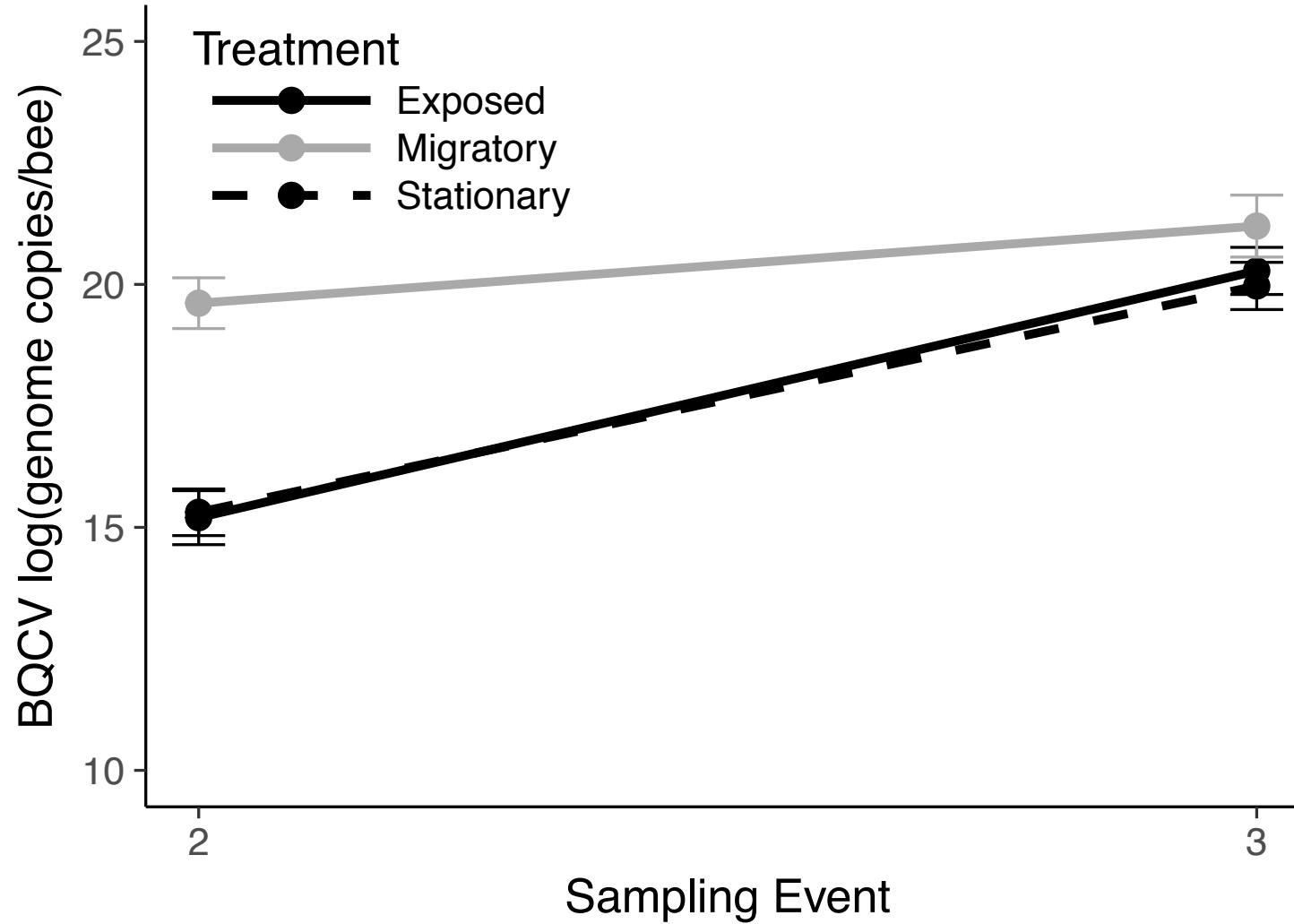
Part 2: Results

Deformed Wing Virus Load



Part 2: Results

Black Queen Cell Virus Load



Part 2: Conclusions

Compared to the Stationary (Control) hives,
Exposed hives had:

- Higher DWV load and prevalence
- More frames of bees
- Similar BQCV loads, Varroa loads, Brood pattern

Overall Conclusions

- No IAPV was detected
- Migratory conditions reduced the bee population as well as the Varroa population.
- Migratory conditions increased BQCV load but not DWV
- The DWV load increased in the exposed group after one month of exposure to the migratory group

Future Work

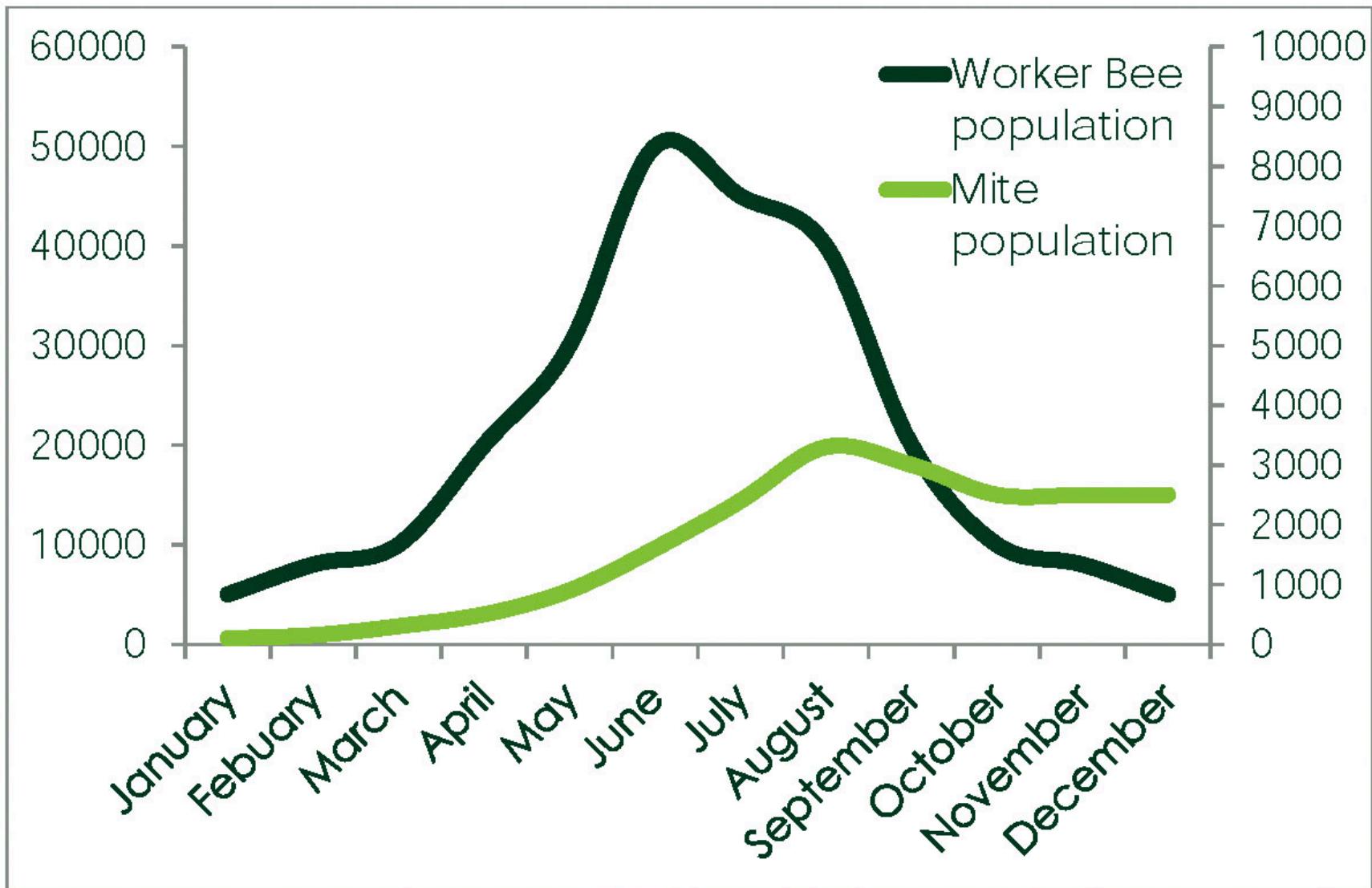
- Test samples for other viruses.
- Sequence viruses to see if strains are different between migratory and stationary hives.



Thank You!

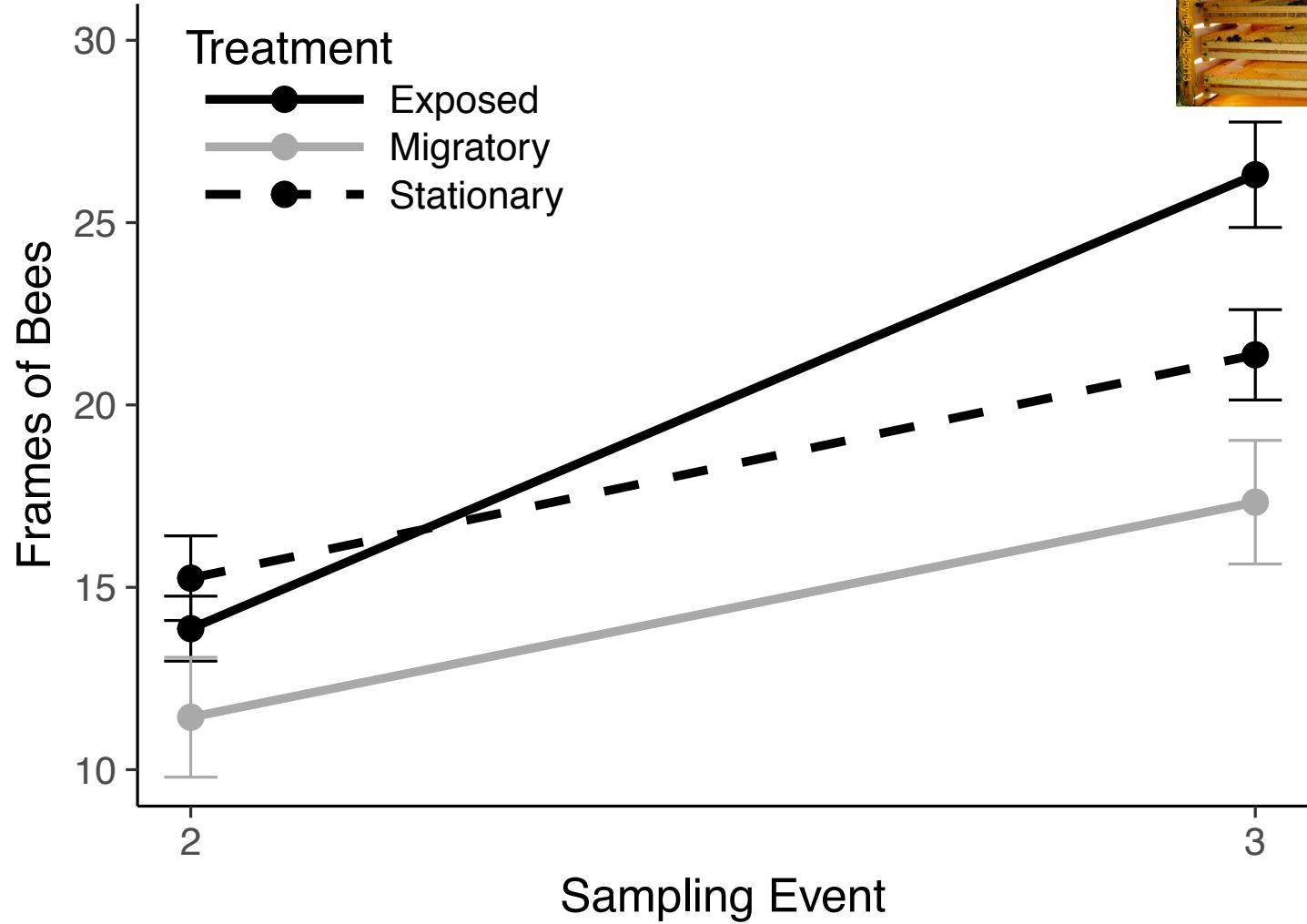


Questions?



Part 2: Results

Frames of Bees



Part 2: Results

Brood Pattern

