Shared honeybee and bumble bee viruses: An experimental and computational approach to testing the dilution hypothesis

P. Alexander Burnham

University of Vermont

October 23, 2018

Introduction

Spillover:

Spillover is the process of disease transmission from an infected population to a naive population

- A multitude of factors influence spillover (biodiversity?)
- Biodiversity might dampen transmission (dilution hypothesis)

- Bumble bee disease system is ideal for testing this hypothesis
- Honeybee viruses have been spilling over into native bumble bee populations (through shared flowers?)

Questions and Aims

Question:
Can RNA viruses be transmitted from HB to BB through flowers and does floral diversity dilute this route?

Aim I
Monitor DWV through time in a survey of wild bumble bees

Aim II
Test the transmission route in the lab and estimate parameters

Aim III
Use parameters from these experiments to create an epidemiological model of the system and computationally test the dilution hypothesis

Methods

Completed Work:

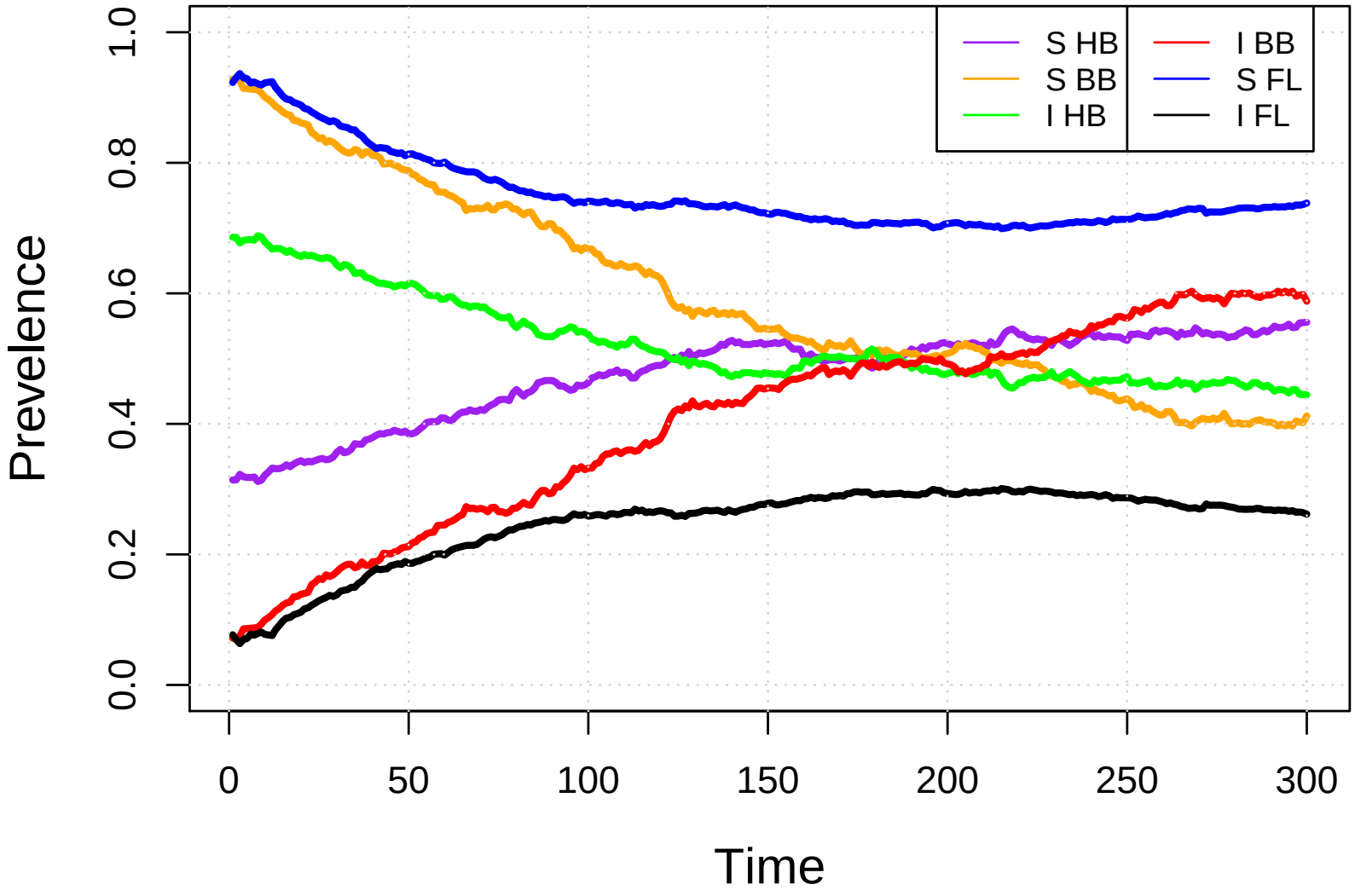
- Survey and experiments have been conducted
- Some RNA extractions have been completed
- A preliminary model has bee constructed

Work to Complete:

- Complete remaining RNA extractions and RT-qPCRs
- Analyze empirical data a derive parameter estimates
- Complete Cellular Automata model and test dilution hypothesis
- Analyze model data

Bumble Bee Micro Colonies

THANK YOU


S HB
S BB
I HB
I BB
S FL
I FL
Prevelence
0.0
0.2
0.4
0.6
0.8
1.0
0
50
100
150
200
250
300
Time