## Integrating phenology, trap models, and data to manage fruit fly risk

Matt Hill



## Phenology modelling overview

- Empirical data to determine thresholds for development and survival
- Measured across different hosts
- Medfly has international models
- Qfly has had some attempts:
- Code of Practice
- Yonow et al. (2004) Ecol Modelling 173(1) 9-30


## Current Challenges

- Limited transferability across all regions when Qfly occurs
- Assumptions


Merkel et al. 2019 J Appl. Entomol.

- initial date of activity \& overwintering
- adult maturity and time to produce eggs again


Source

- Cop

A Jessup

- Yonow


## Phenology models

- A reliable phenology model allows for risk to be quantified:
- Orchard management
- Regional assessments
- Risk to market access
- Pathway to a better model:
- Life history traits (lab) (ongoing)
- Field-cage experiments
- Data-mining?

QFF development


Data and models at work

- Prototype app developed to explore data
- Open-source models and R packages
- Aim to integrate with new models and standards for reporting data
- Example: completely made-up orchard
- Temperate fruit producer
- Three traps on 14 ha



Weather data pulled in, calculates flight thresholds

## Using models for management

- Orchard management
- Timing of applying sprays and baits
- Biofixes
- Overwinter (still poorly understood - host vs environment)


## Trap Arrangement

- Optimise orchard trapping strategies
- Traps per hectare
- Traps at minimum distance from


Agriculture Victoria trees

- Early vs late season fly movement
- Aim to swap in different trap models
- Account for different trap types

Trapping strategies in a 10 hectare block


## TrapGrid

- Developed by USDA (Manoukis et al. 2015)
- Collaborating to improve upon
- Calculating escape prob
- Dispersal model

| Species | 1/lambda value |
| ---: | ---: |
| Ceratitis capitata (Medfly) | 14 m |
| Bactrocera dorsalis (Oriental fruit fly) | 34 m |
| Bactrocera tryoni (Qfly) | ? 14-50m |

Block layout - size $=14.67$ ha



Data reuse \& privacy


## CSIRO objectives

- Putting data to best use
- Trade as well as a Production problem
- Industry partners and ongoing work
- Systems Approach project

Phytosanitary
Systems
Approaches


- Aligning with CSIRO Missions
- Trusted Agrifood Exports


## Health \& Biosecurity

Matt Hill
Research Scientist
e Matt.Hill@csiro.au

## Data61

Peter Caley
Senior Research Scientist
e Peter.Caley@data61.csiro.au

## Health \& Biosecurity

Rieks van Klinken
Principal Research Scientist
e Rieks.Vanklinken@@csiro.au
"Developing Systems Approaches to Achieve Market Access for Australian Horticulture is funded by the Hort Frontiers Asian Markets fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from partners below, and contributions from the Australian Government."

Department of
Primary Industries

