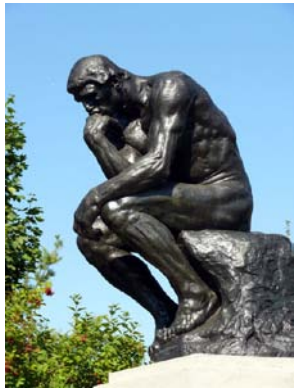
# Enhancing BC in organic orchards: Using HIPV lures to characterize, monitor, and manipulate natural enemies

Vincent P. Jones, Shawn A. Steffan, David R. Horton, Nicholas J. Mills and Peter W. Shearer

Washington State University
World Class. Face to Face.
Agricultural Research Service
Oregon State University OSU
Berkeley University of California

# Cogent Thoughts and Platitudes



- Biological control is only noticed by IPM consultants and growers by its absence
- What you don't know can hurt you
- Perception influences management
- It's never as easy as it looks
- Timing is everything
- Location, location, location
- Size matters
- There is no such thing as a free lunch

# What are HIPVs?

- Herbivore Induced Plant Volatiles
  - As plants are damaged, volatile bouquet changes
    - Signals changes in secondary plant chemistry
    - Act as a kairomone to attract natural enemies
- Studies in the literature typically address
  - Behavior and chemistry
  - Use HIPVs to concentrate natural enemies in a particular area to improve BC

# *What you don't know can hurt you…*

- NE monitoring methods are inefficient
- Beating Trays
  - Samples insects only from the part of the plant disturbed by the beat
  - Snapshot of the population at one particular point in time
  - Highly affected by diel activity patterns
  - Particularly poor for good fliers

# HIPV traps: *We have the technology…..*

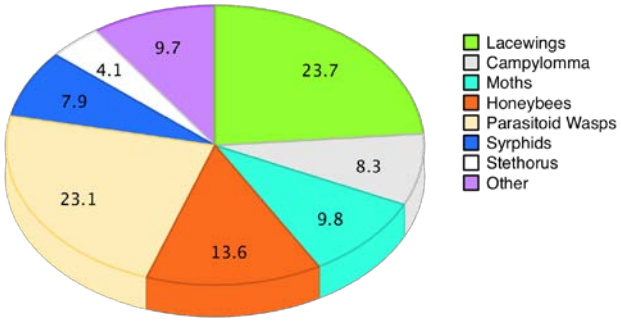
- Accumulate captures over time
  - Not sensitive to diel activity patterns
- Draw from entire active space
  - Within tree or between trees
- Can have very specific or very broad taxonomic response depending on lure/trap
- Primarily good for adult stages

# *Monitoring Dictates Perception and Management*


**46 vs 153 days**

| Same 5 Orchards Sampled | Beating Tray | Attractant Traps |
|---|---|---|
| Sampling Frequency | 2-3 times/wk | 1 time per week |
| Sample Period | March-October | March-October |
| No. Samples per orchard | 50 trees | 4 traps |

# Diversity of NE Attracted



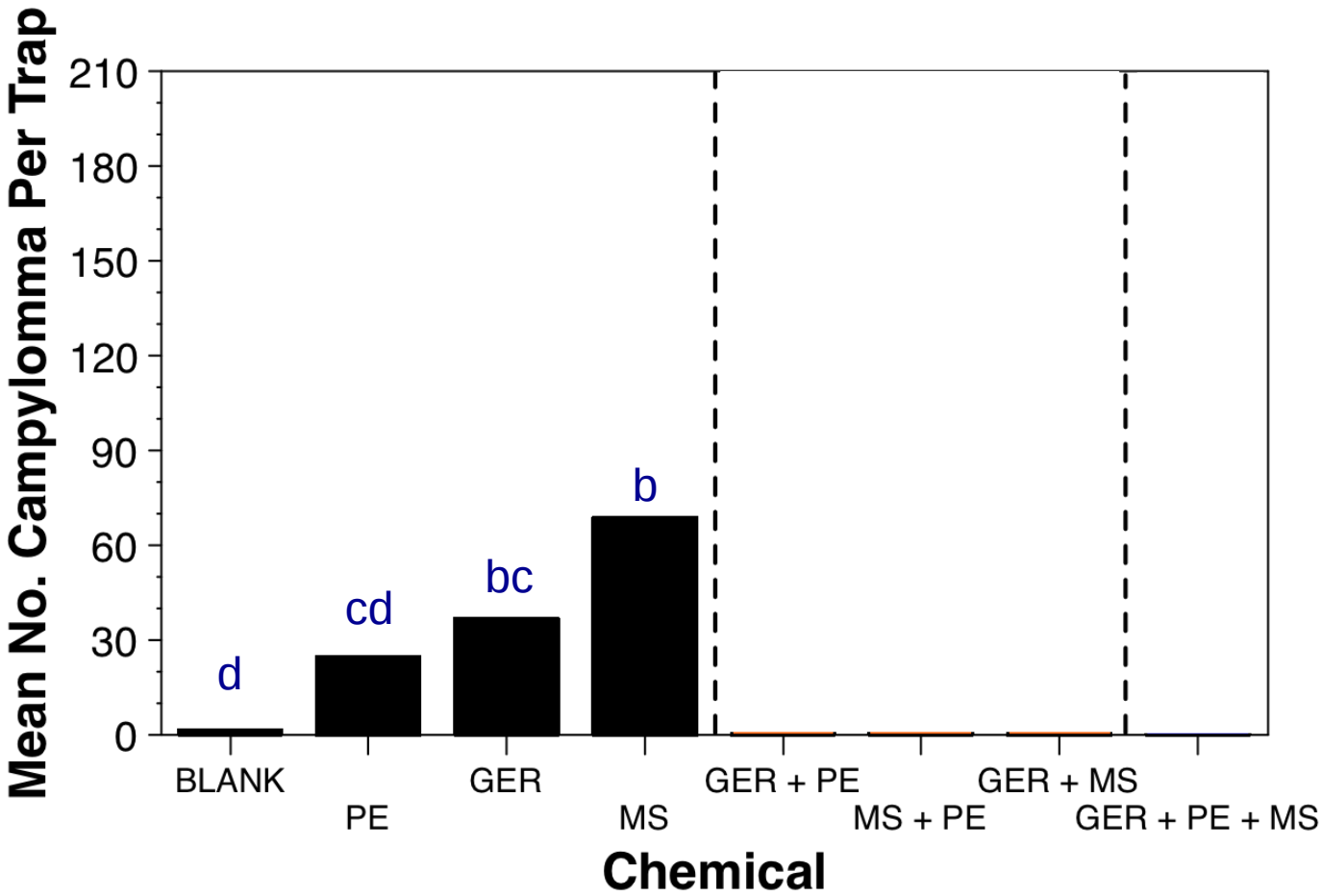

- Attractant effects
  - Must be replicated over time, space, and crops
    - NE presence is driven by availability of suitable prey/hosts
  - Some very specific, some broad range species attracted

Lacewings*
- Syrphid flies*
- *Campylomma* bug
- *Stethorus*
- Western Flower thrips
- Wide range of parasitoids

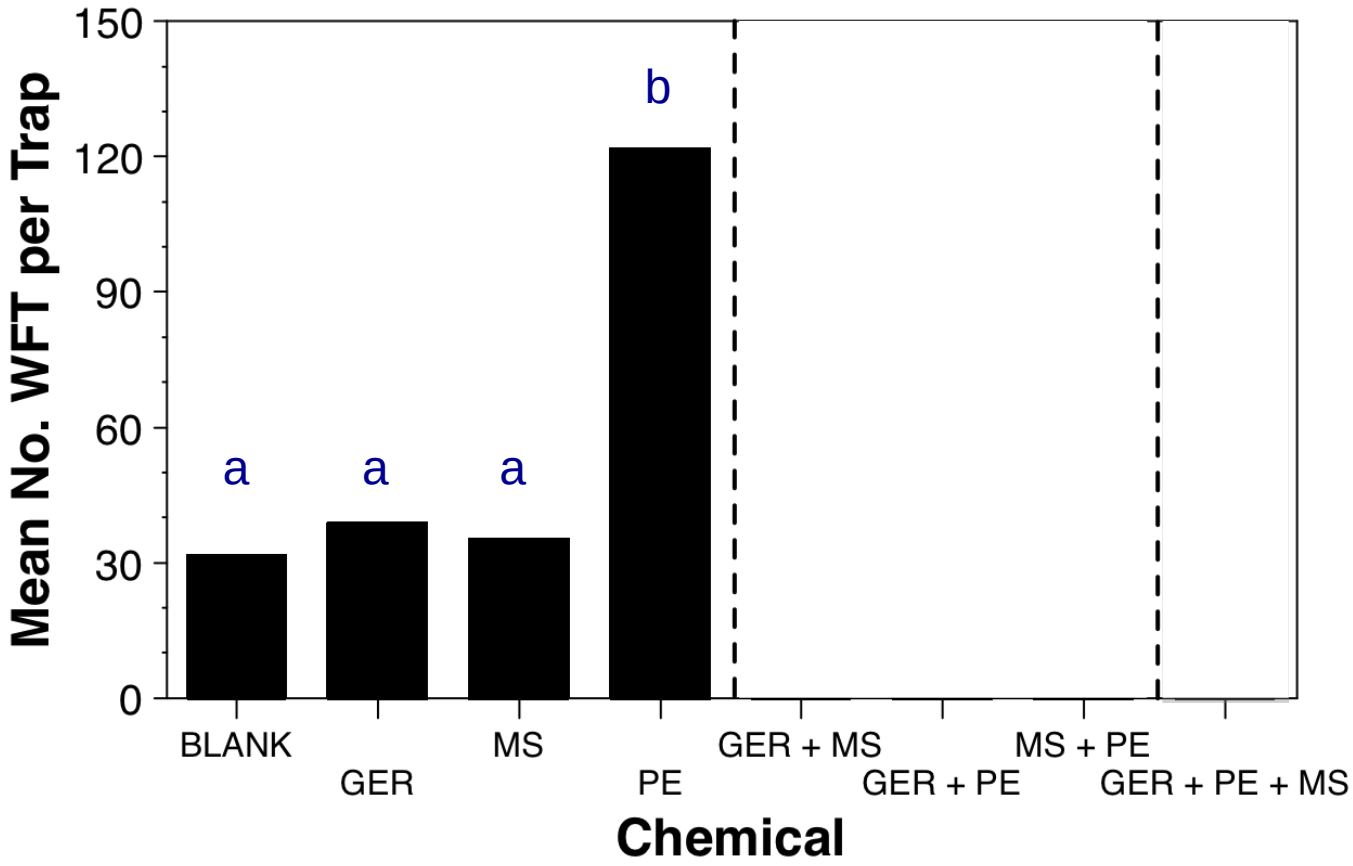
- 20 families
- 29 confirmed general
- >54 morpho species
- 15 confirmed species

# *It's never as easy as it looks….*

## Mixtures can add power

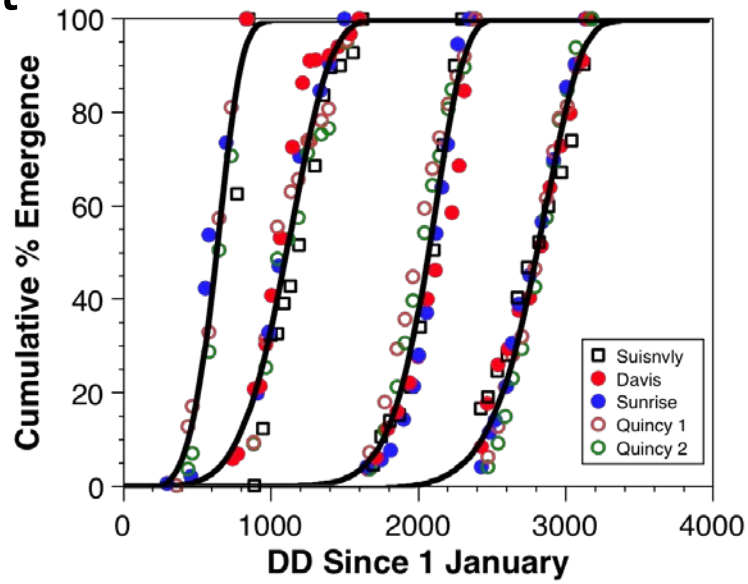


# Or not…..

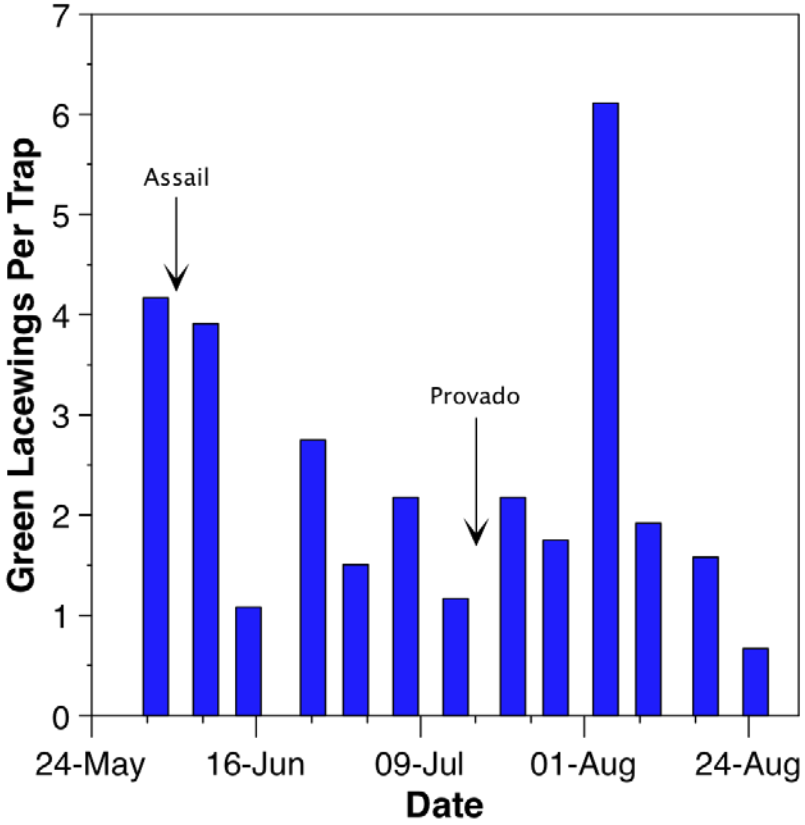

Mean No. WFT per Trap
150
120
90
60
30
0
a
a
a
b
BLANK
GER
MS
PE
GER + MS
GER + PE
MS + PE
GER + PE + MS
Chemical

# *Timing is everything…….*

- Minimize disruptive management tactics during key periods
- If absolutely needed, during periods without NE present, can use harsher tactics
- Provides a tool to optimize management programs
- Working on NE phenology in apple, pear, walnut, and sweet cherry



# Estimating Management Effects using HIPVs

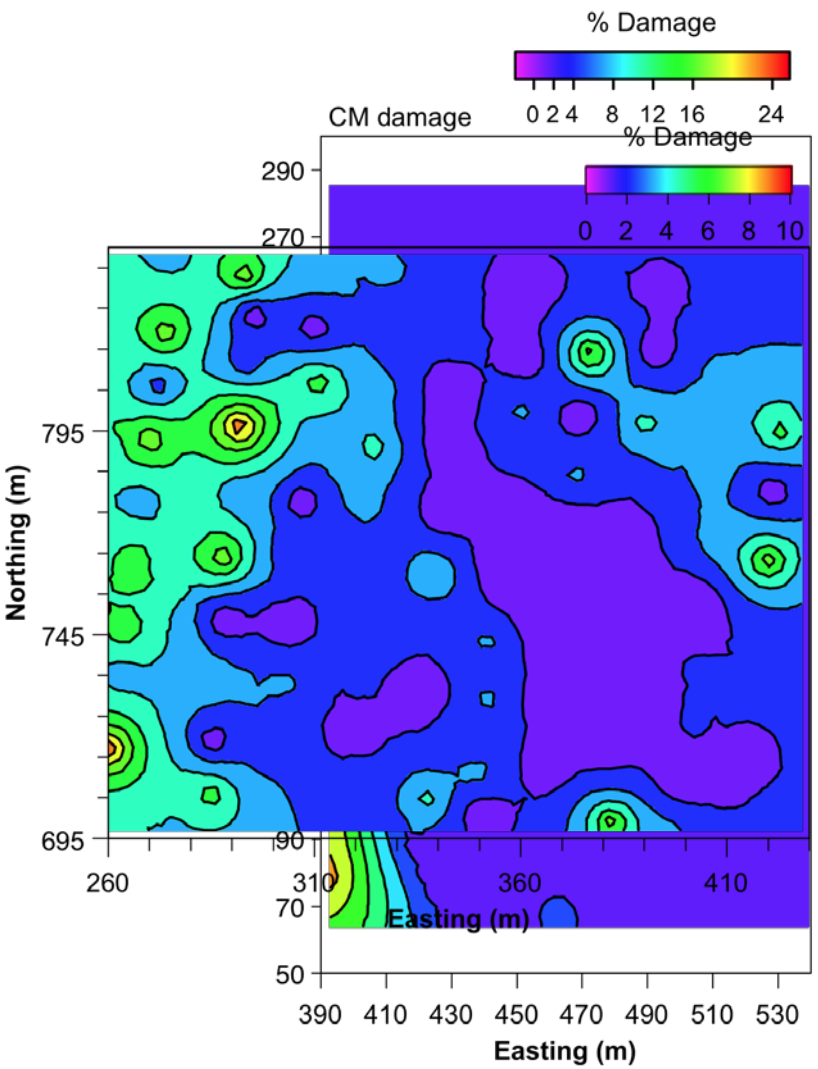


# Using HIPV to enhance BC by concentrating NE

- *Size Matters*
  - Small plots can potentially draw NE from surrounding habitat
  - What do you do when you are the major part of the landscape – blocks of 100+ acres?
- *There is no such thing as a free lunch:*
  - Where do natural enemies come from?
  - Are NE's the correct ones and will they feed on the pests in the tree?

# Why HIPV's are important to natural enemies

- Distribution of pests is clumped at lower densities
- The damaged areas are where HIPV's are released
  - NE search is concentrated in damaged area
- At high densities pests are broadly distributed
  - HIPV's are widely dispersed
  - NE search is not improved measurably by HIPV



# “Season- long dispenser in every tree” effects?

| Effect | Issues to consider |
| --- | --- |
| Increased overall mean NE density | |
| | |
| | |

# Alternatives to Season- Long Approaches

- Put the lures in a particular area for a short time only
  - Jump start functional and numerical response
    - Need to check the sex ratios attracted
    - Specificity of the lure
- Use lures to “herd” NEs from place to place
  - If treating certain areas, attract NE from those areas temporarily as a moveable refuge
    - Need to determine the active space of the lures

# Summary

- HIPV's provide the same potential for NE that pheromone traps for pests provide
  - Defining phenology
  - Status & complexity of NE food web
    - Potential for BC or disruption
    - Comparison of different tactics
  - Moving NE spatially to improve BC
- Still basic and applied work needed

# Acknowledgements


- This work funded by SCRI grant project number WNP07368 from USDA-NIFA
- Matching funds from
  - Washington Tree Fruit Research Commission
  - California Walnut Board
  - Washington State University
  - Oregon State University
  - UC Berkeley
  - USDA-ARS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