













Inventory of bees on the farm

Jason Gibbs **Research Associate** Department of Entomology Michigan State University







This talk: Blueberries and cherries

Elizabeth Elle, Kyle Bobiwash, Tiia Haapalainen

Sujaya Rao, George Hoffman Nikki Rothwell, Mike Haas, Peter McGee, Karen Powers, Larry Gut, Julianna Wilson



Rufus Isaacs, Keith Mason, Knute Gundersen

Cory Stanley-Stahr, Jamie Ellis, Jaret Daniels

Specialty Crop Research Initiative





- Part 1 Variation in bee diversity in specialty crops
- Part 2 Nets or traps? Collecting bees in crop fields
- Part 3 Planning for bee identification





Sites

Experimental design Replicated across regions

Measurements Pollinator collections Pollinator observations

honey bees



bumble bees



other bees



Plot design

Example from 17 blueberry fields in west Michigan Duplicated at other sites



Bee abundance

Variability across regions











Bee abundance

Variability across farms



Bee abundance correlates with fruit set, fruit weight and seed set



Bee abundance

Variability within farms





Species richness

Variability across regions

Fewer species in BC than MI

Blueberry is native to MI







Phylogenetic diversity

Variability across regions

Phylogenetic distances estimated using mtDNA sequence data

Significantly less phylogenetic diversity in BC blueberry fields than MI blueberry fields





Sequence data courtesy of Cory Sheffield



ICP bee inventories on farms Part 1 summary



• Broader understanding of bee diversity

Factors affecting bee abundance

 Local and landscape scale land use
 Farm management

More circumspect conclusions
 – Results from one region may not apply to others



Sampling methods for bees Part 2



- Common methods
 - Observations
 - Netting
 - Pan traps (ground or elevated)
 - Malaise traps
 - Vane traps (ground or elevated)

All have biases and limitations



Blue vane traps vs. netting

- Cherry
- Ten sites sampled
- 2 hr net collecting per site
- Blue vane traps deployed ~ 10 days









Blue vane traps vs. netting

Richness & Diversity

Species Richness *t*-test: *p* = 0.069

Shannon-Weaver Index







Blue vane traps vs. netting

Bray-Curtis Dissimilarity

PERMANOVA Method: *p* = 0.001 *** Region: *p* = 0.069 Site: *p* = 0.743







Blue vane traps vs. netting Community composition





Bumble bees





Blue vane traps vs. netting Community composition

• Individual species abundance









Sampling methods Part 2 summary

• Different methods address different questions

Many bees present on farms may not be pollinators of crops

 However, healthy bee communities on farms may be an indicator of native pollinators



Preparing to identify bees Part 3

Identifying bees is HARD

- Plan AHEAD!
 - 1) How will you identify your bees?
 - 2) Prepare bees carefully
 - 3) Label and database bees





Auto-bee dryers





Pinning bees

- Pinning is better than gluing except for tiny bees
- Plan ahead!
 - What characters are important for what bees?
 - Open mandibles, pull genitalia, expose sternites
- Plan for long-term preservation





Label and database bees



Patrick Bills

Country, State/Province, County Specific locality GPS coordinates Date, time, Collector Host plant, trap type Unique identifier



Pollinator specimen collection application for the Integrated Crop Pollination project

This application is private and requires authorization to use. If you are a member of the project please sign in. If you are a member of this project and need a user account or help, please <u>contact the project</u> <u>managers</u>

Crop Pollination project
Email
Password
Remember me
Sign in



US: MI, Van Buren Breedsville, 1 km SW 42.3406,-86.0819 2014-05-29 A. Adamczyk,et al trt:timed Vaccinium corymbosum





Multiple resources to identify bees

Use more than one!

- discoverlife.org/mp/20q?search=Apoidea
- **REVISIONS!**
 - Contain much more information than just keys
- Collections
 - Reference material
- Taxonomists





Report bee identification methods

- Taxonomy and nomenclature are fluid
- Report HOW you identified your bees
 (or how did your taxonomist do it?)





ICP bee inventories on farms Summary



 Shared study design in Project ICP allow for broader conclusions across regions and crops

 Sampling methods should be diverse and aligned with project goals

 Bee identification is crucial for careful analysis and long-term comparisons



Project ICP

ICP Team and Advisory Committee









USDA Specialty Crop Research Initiative, Coordinated Agricultural Project Developing Sustainable Pollination Strategies for U.S. Specialty Crops (Award 2012-51181-20105)

THANKS FOR LISTENING

