



M. Hauser, CDFA

# SWD RESEARCH OBJECTIVES & PROGRESS IN LOEB PROGRAM

---

**Greg Loeb, Anna Wallingford & Steve Hesler**  
**Department of Entomology, NYSAES, Geneva, NY**



Cornell University



# RESEARCH GOALS

- **Better understanding of SWD biology in Northeast and testing management alternatives**

# SWD BIOLOGY

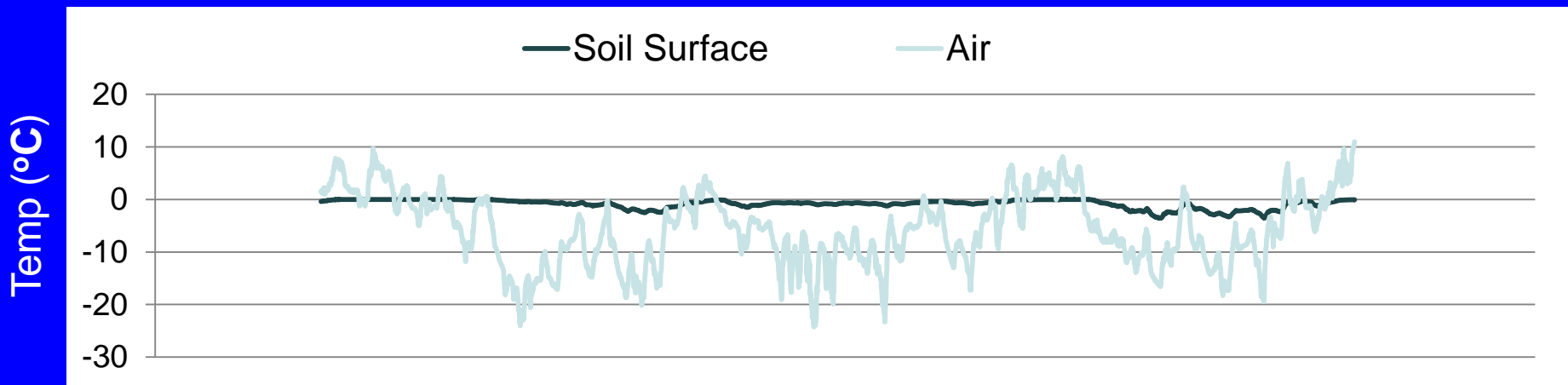
- **Overwintering biology (Anna)**
- **Cold tolerance (Anna)**
- **Reproductive diapause (Anna)**
- **Use of non-crop hosts**
- **Local dispersal and long-distance movement**
- **Interactions with microbes and other *Drosophila***

# **SWD MANAGEMENT**

- **Repellents (Anna)**
- **Attractants, adult monitoring, warning of risk (Greg)**
- **Attract and kill**
- **Insecticide efficacy**
- **Insecticide programs and rotation**
- **Fixed spray system applications**
- **Exclusion netting**
- **Microbial control**

# SWD Overwintering Biology

- **Field experiment**
  - **Participant conditioning**
    - Reared from wild hosts and held at 10°C 8:16 L:D
    - Large, dark “wintermorphs”
  - **Proper habitat**
    - Logs, leaves, access to soil surface
  - **Potential food sources?**
  - **Air and soil temperatures**





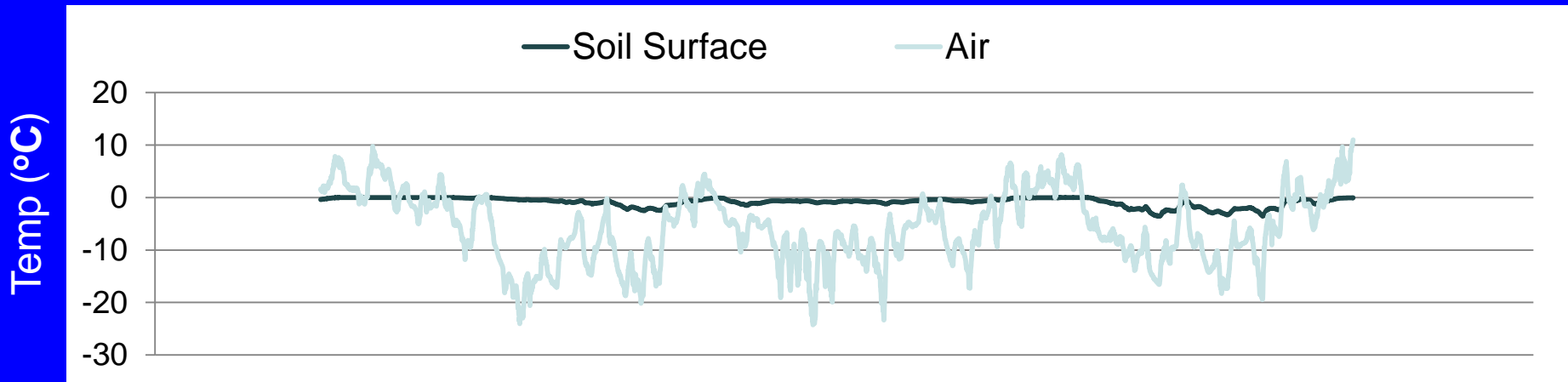


# SWD Overwintering Biology

- Lethal temperature ( $LT_{50}$ ) 24 h exposure  
-1.6°C females - 0.1°C males (Kimura 2004)

Role of conditioning, diapause?

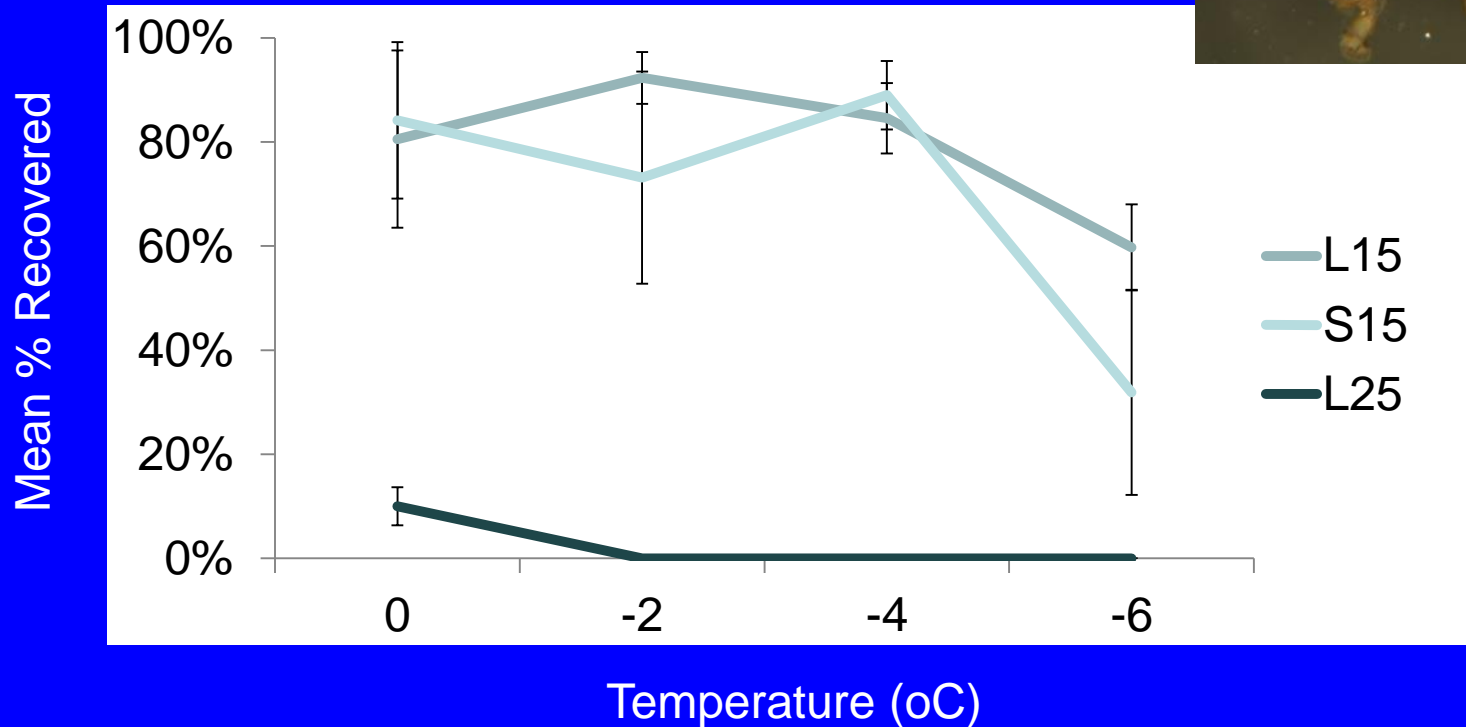
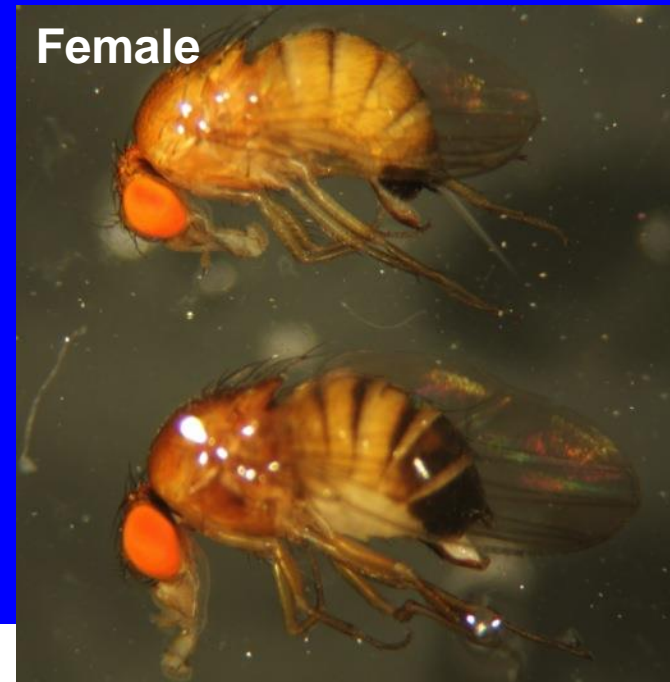
Do they chose to go to the soil surface?



# SWD Overwintering Biology

Lethal temperature (LT<sub>50</sub>) 24 h exposure  
-1.6°C females - 0.1°C males (Kimura 2004)

Lab-reared “wintermorphs” from egg to adult  
@ 15°C, short and long day





# SWD Reproductive Diapause

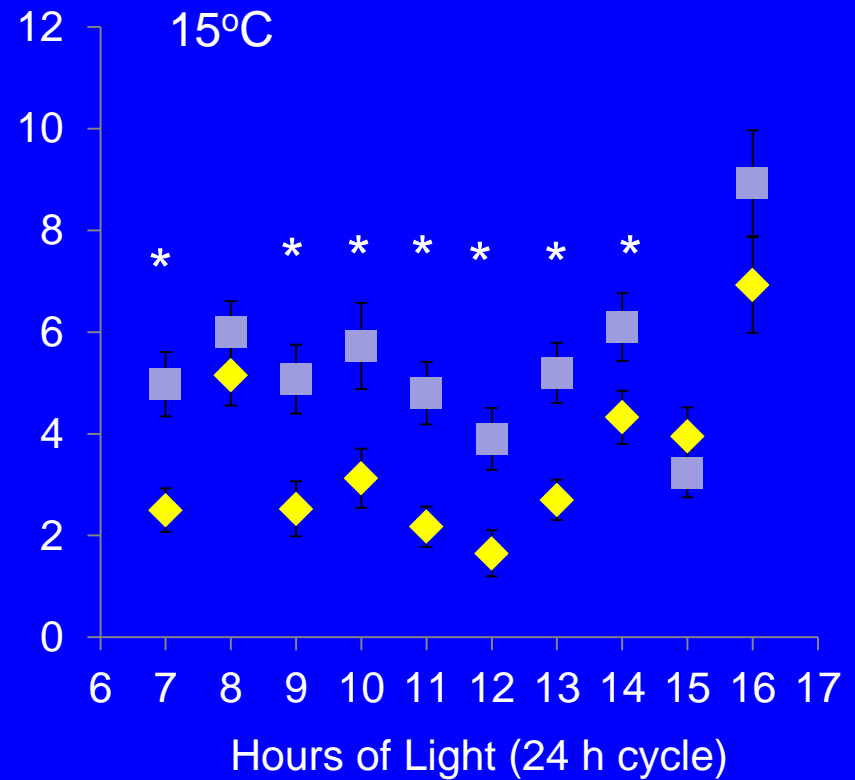
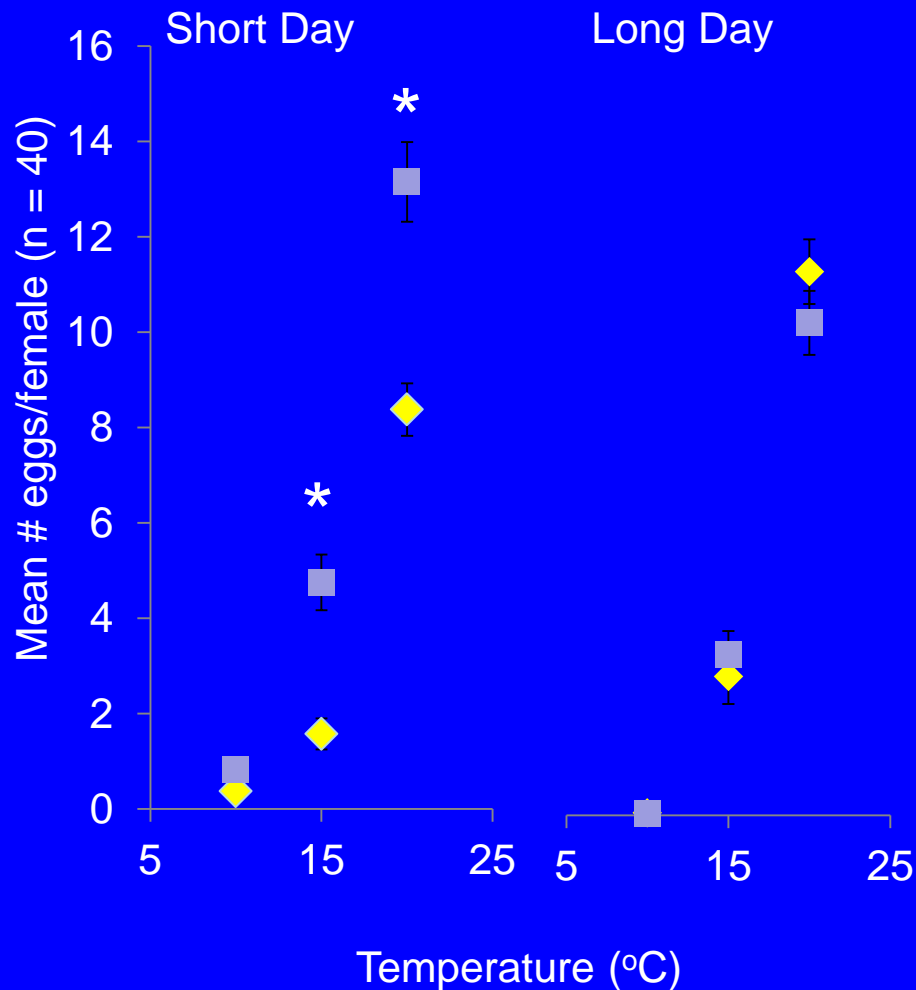
: a change in physiological state triggered by an environmental cue that precedes a stressor which would prepare the organism to better handle that stressor

**Adult diapause often attributable to high levels of Juvenile Hormone (JH)**  
(Denlinger 1985, 2002)

- cessation of egg maturation
- atrophy of accessory glands
- degeneration of flight muscles
- halt in mating activity
- redirection of nutritional resources to cryoprotectants?
- redirection of searching behavior from food/oviposition sites to overwintering sites?

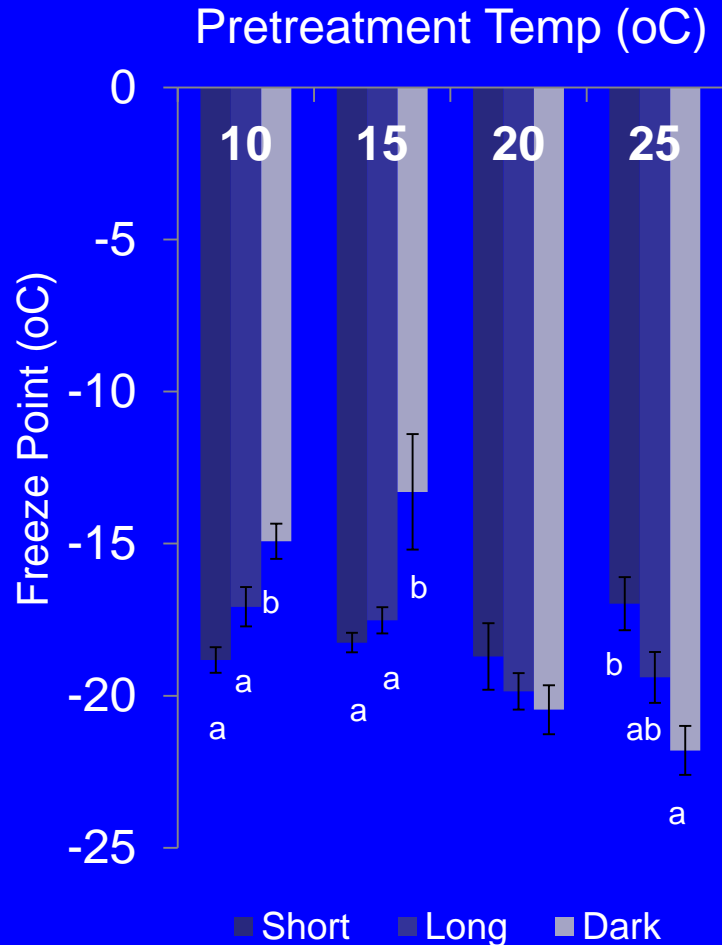
# SWD Reproductive Diapause

◆ Light Cycle    ■ Constant Dark

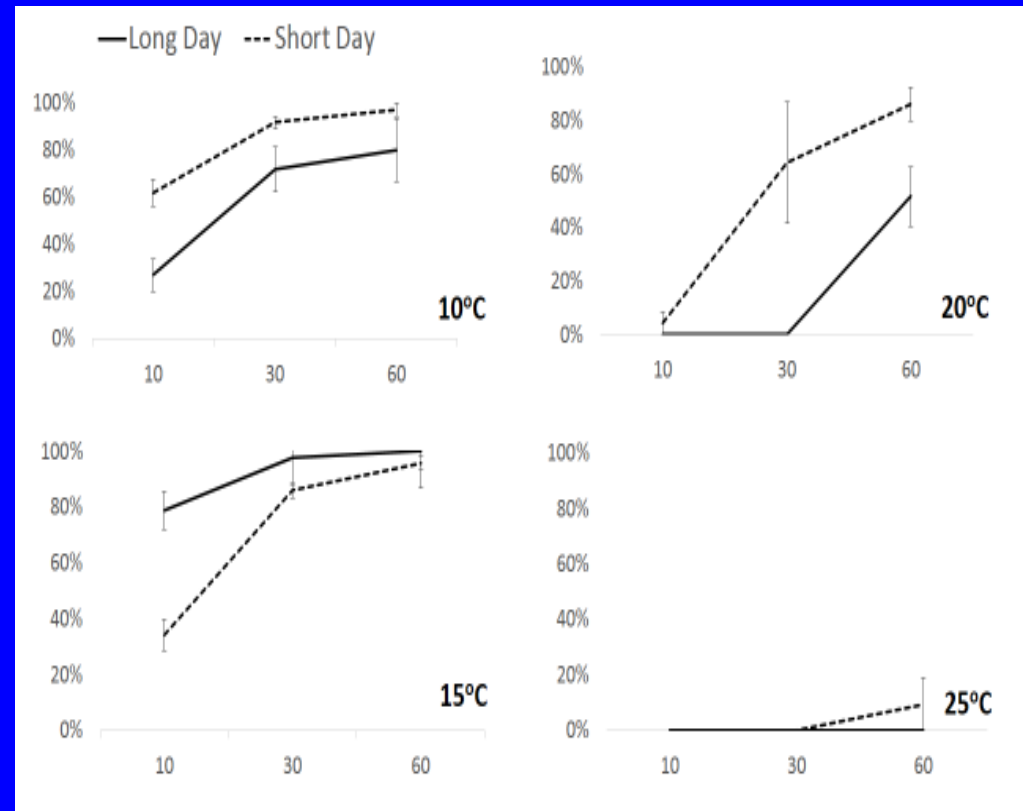


# SWD Cold tolerance

## Supercooling/Freeze Point Analysis



## Chill coma recovery



Short Day 12:12 L:D  
Long Day 16:8 L:D

# Repellant choice tests

Odorant (10%)

Control (mineral oil)

**Propionic Acid**

$\chi^2 = 10.01$   
 $p = 0.0016$

**Linalool**

$\chi^2 = 8.689$   
 $p = 0.0032$

**Geosmin**

$\chi^2 = 19.91$   
 $p < 0.0001$

**1-Octen-3-ol**

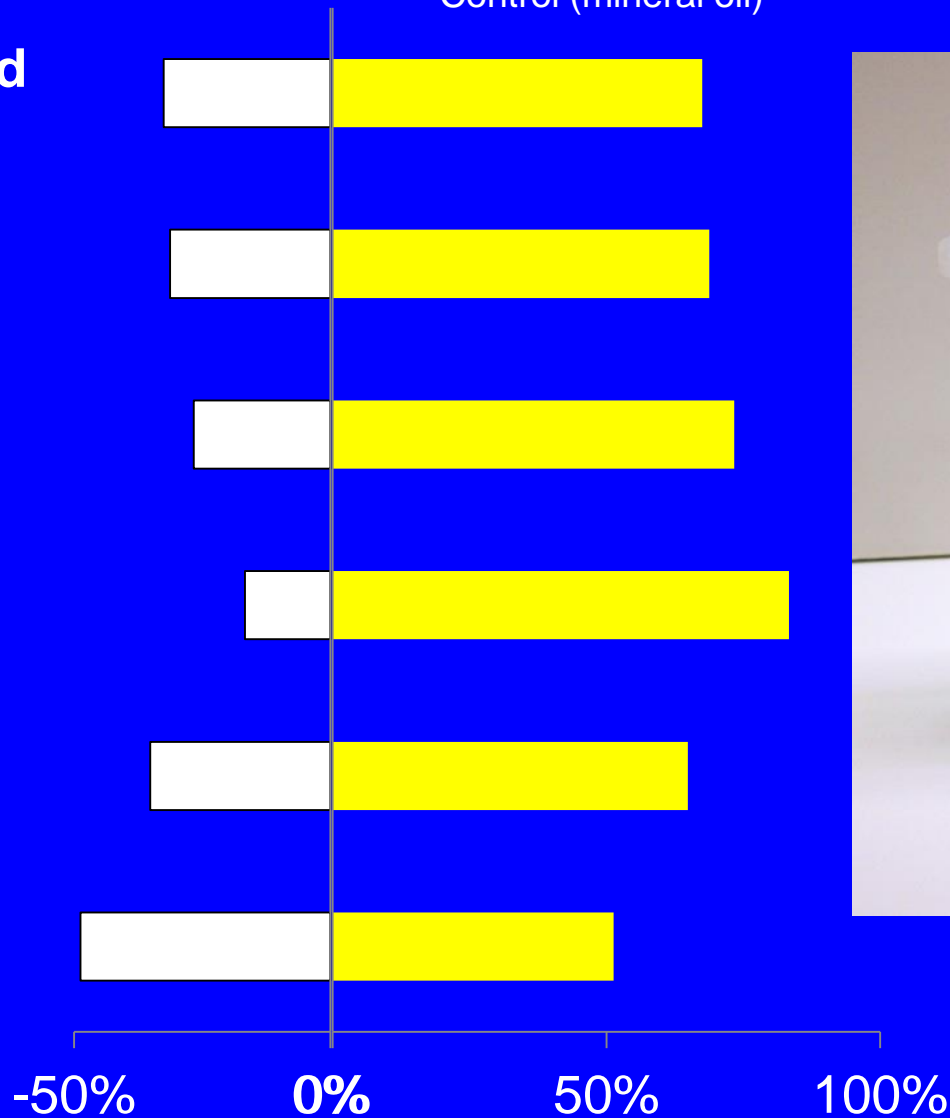
$\chi^2 = 34.93$   
 $p < 0.0001$

**Ethyl Butyrate**

nsd

**Benzaldehyde**

nsd



# Repellant field tests

**Geosmin, 1-octen-3-ol v. mineral oil control**

40 clusters, randomly assigned odorant or control

4 days exposure

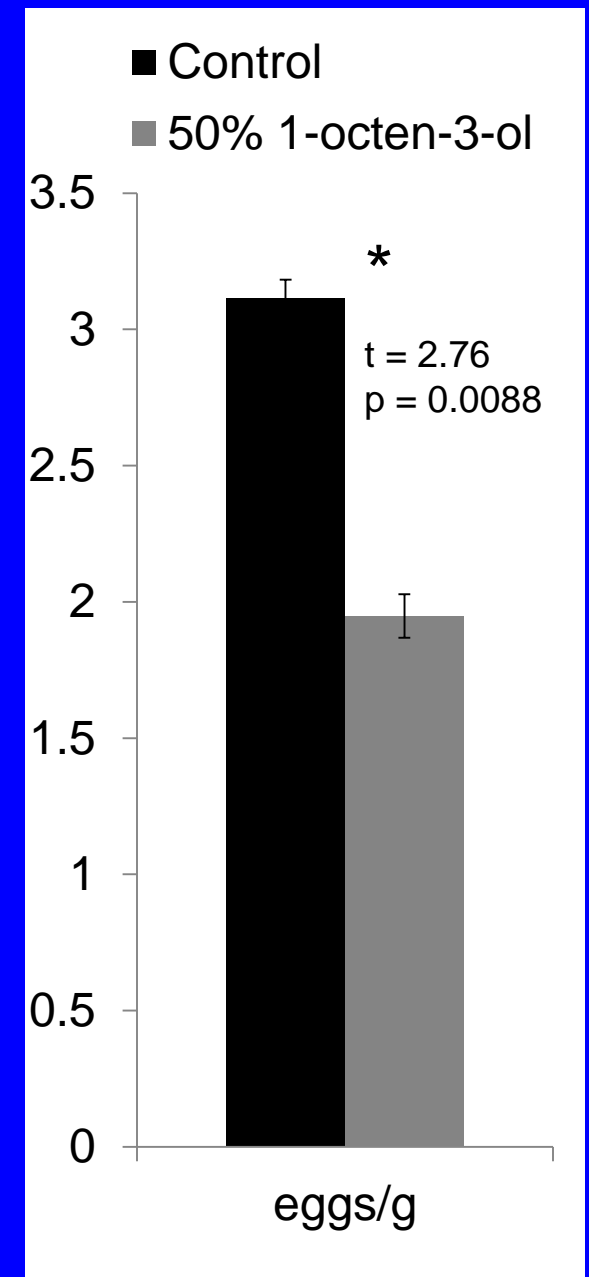
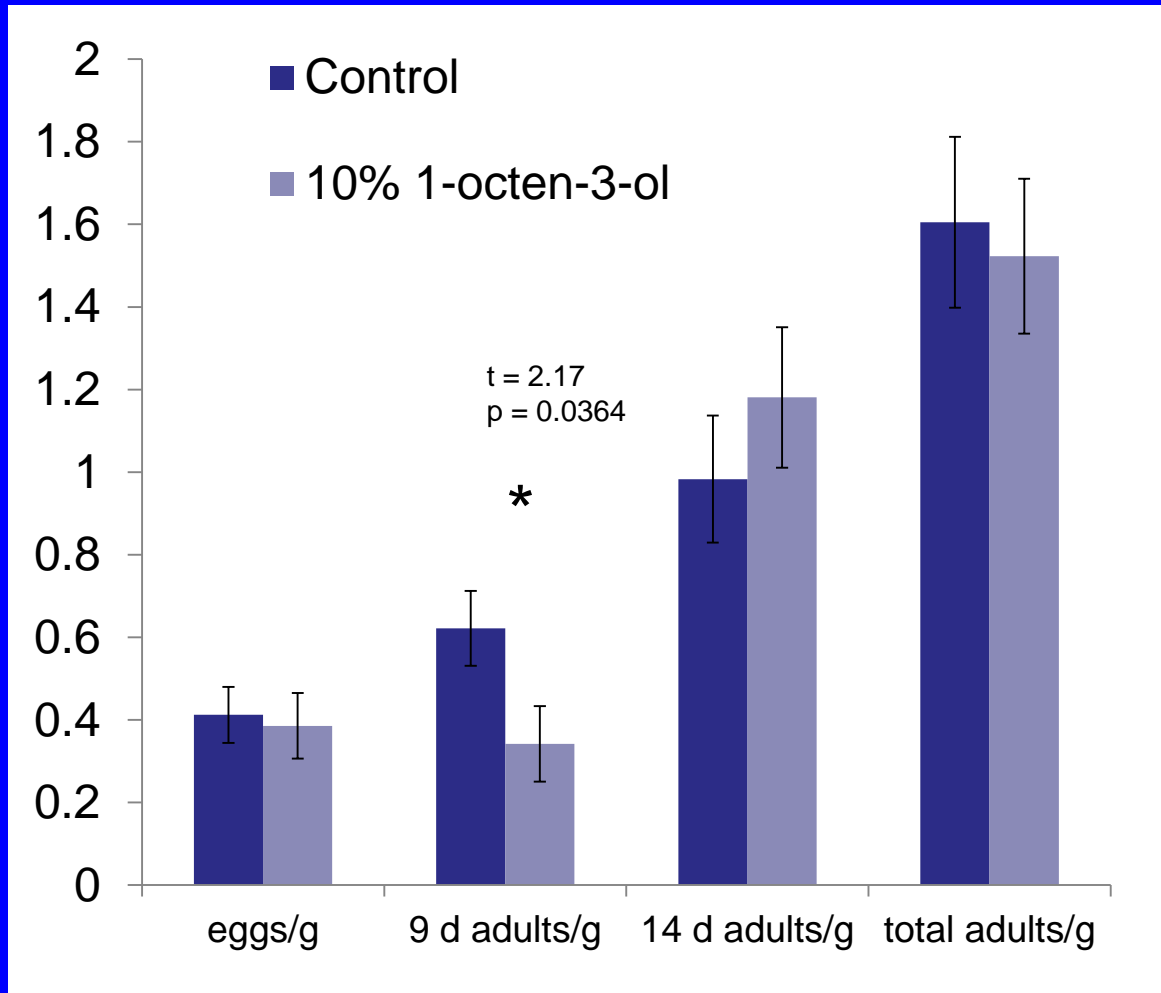
5 ripe fruit/cluster, examined for eggs

Fruit observed for adults after 7, 9, 14 d



10% ~0.23 mg/day  
50% ~0.80 mg/day

# Repellant field tests



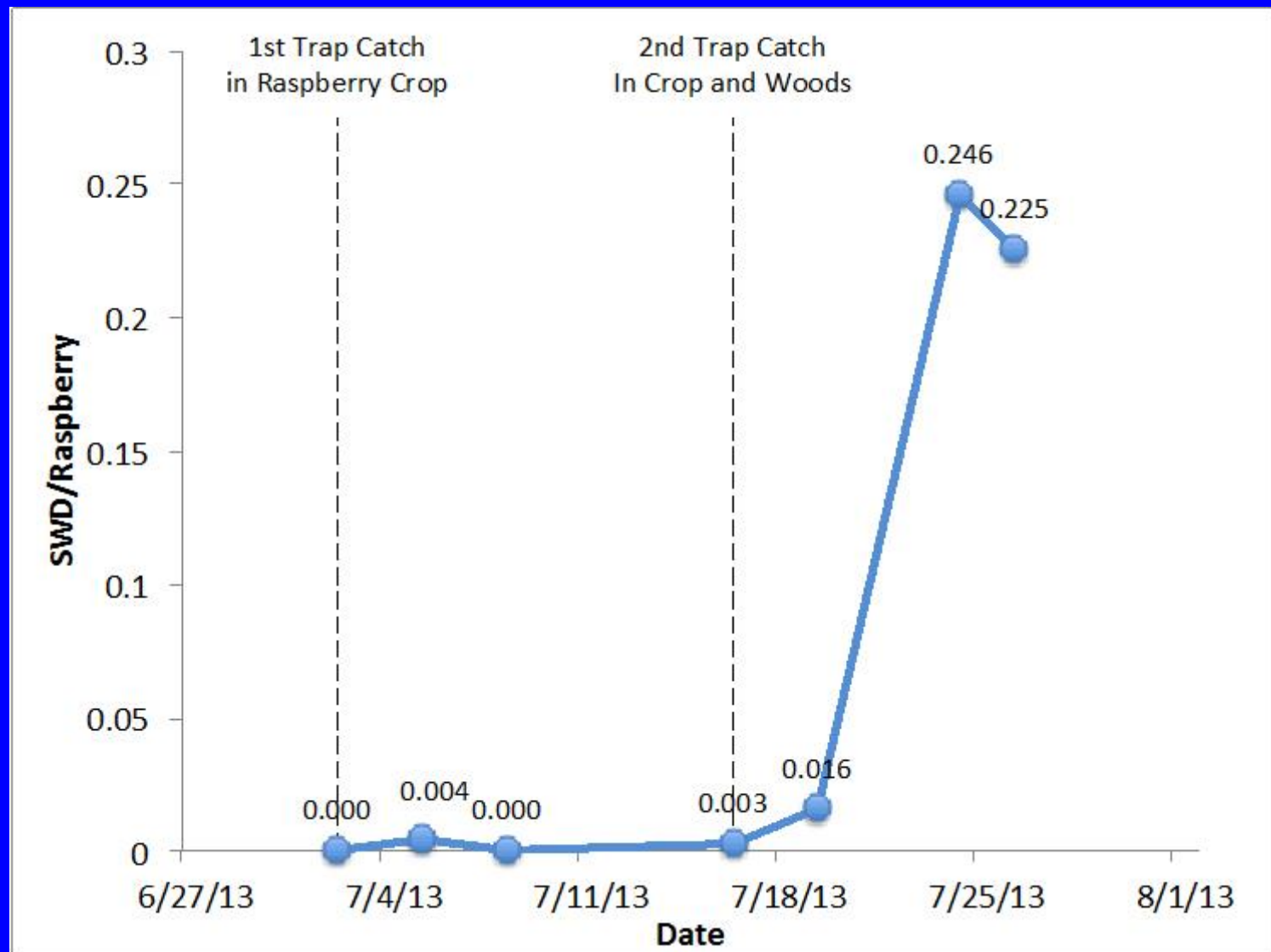
1-octen-3-ol



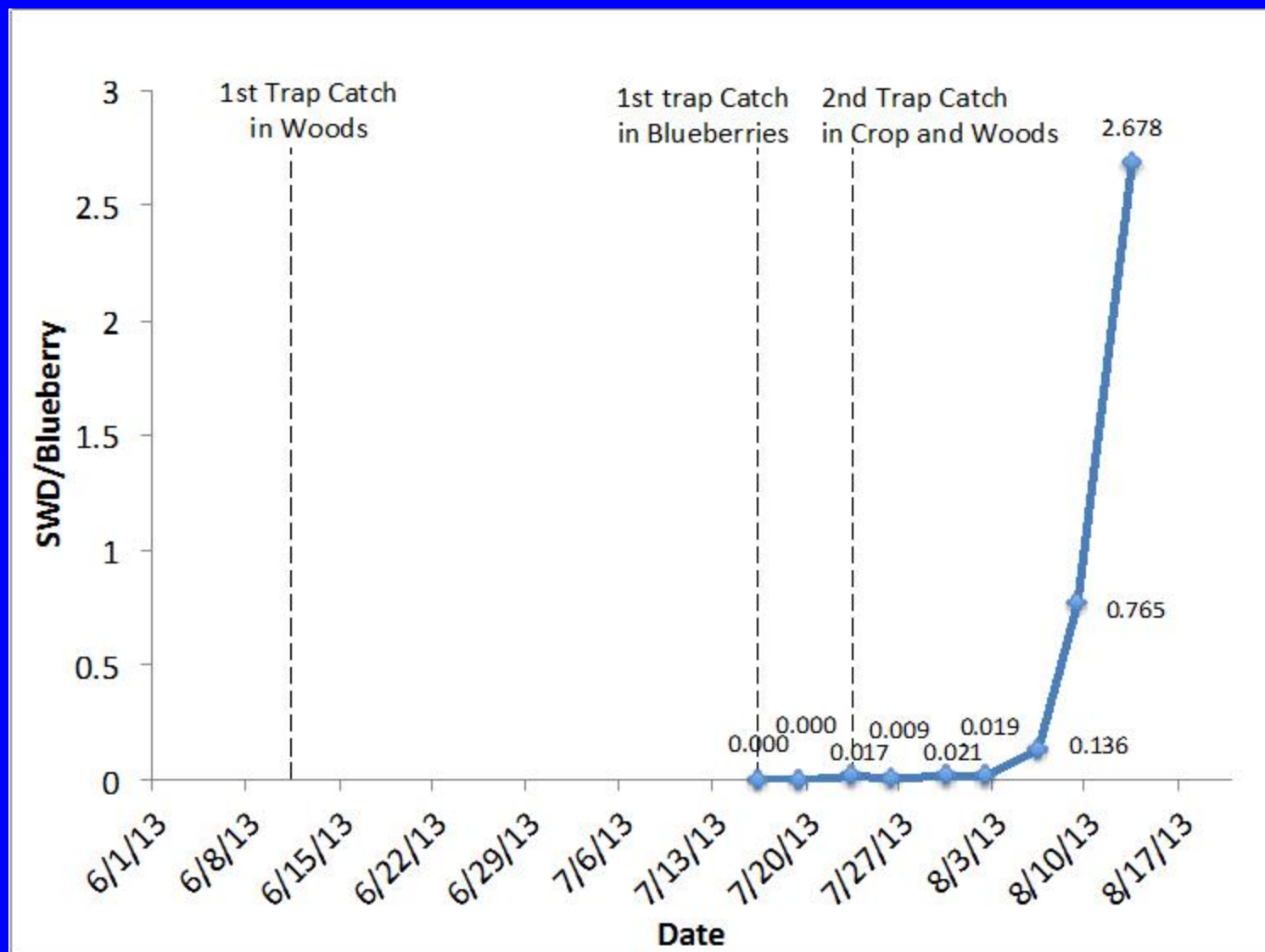
# Adult Monitoring for Early Warning of Infestation



# TRAPS & ECONOMIC THRESHOLDS?



# TRAPS & ECONOMIC THRESHOLDS?



# SWD Infestation in Relation to SWD Trap Catches Finger Lakes, 2014

Week	Blueberry Farm 1		Summer Raspberry Farm 2		Blueberry Farm 3		Blueberry Farm 4		Summer/Fall Raspberry Farm 5		Summer/Fall Raspberry Farm 6	
	SWD/4 Traps	SWD/Berry	SWD/4 Traps	SWD/Berry	SWD/4 Traps	SWD/Berry	SWD/4 Traps	SWD/Berry	SWD/4 Traps	SWD/Berry	SWD/4 Traps	SWD/Berry
6/10/2014	0		0		0		0		0		0	
6/17/2014	0		0		0		0		0		0	
6/24/2014	0		0		0		0		0		0	
7/1/2014	0		0		0		0		0		0	0/200
7/8/2014	0		0	0/393	0	0/387	0	0/401	0		0	0/405
7/15/2014	0		3	0/399	2	0/403	1	0/404	1	0/312	0	3/405
7/22/2014	0		4	0/401	5	0/413	0	0/402	0	0/288	7	19/401
7/29/2014	2	0/398	4	7/354	14	0/402	5	0/401	7	4/118	28	43/309
8/5/2014	0	0/400	7	47/294	29	2/400	2	0/404	10	1/44	98	98/327

\*PY


\*Red Jacket Home


\*Pre-Emption

\*SL did not treat?

\*SQ

\*TM

 : indicates detection of at least 1 SWD in whole wheat bread dough + ACV-ETOH monitoring traps

 : indicates detection of SWD infestation of fruit collected from monitoring site for that given week

Comments: Results indicate that in 5/6 sites we detected SWD in monitoring traps two - three weeks before picking up any indication of infestation from fruit.

# RESEARCH TEAM

## Geneva:

- Anna W., Steve H., Gabrielle Brind' Amour
- Julie Carroll, Art Agnello, Andrew Landers, Wayne Wilcox

## Cornell:

- Peter Jentsch, Laura McDermott, Faruque Zaman, Nicholas Buchon, Angela Douglas

## Region and nation:

- Rich Cowles, Cesar Rodriguez-Saona, Rufus Isaacs, Hannah Burrack, others

## Grower collaborators:



