Native Natural Enemies: Variation Among Regions and Habitats

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Specialty Crop Research Initiative

Collaborating Institutions

ars · NC State University · PennState · OSU Oregon State · University of Maryland · University of Georgia · Washington State University · Northeastern IPM Center · Cornell University · Utah State University · Rutgers University · The Ohio State University · University of Kentucky · UC Davis · University of Minnesota · Virginia Tech · Berkeley · Michigan State University · UC Riverside

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Brown Marmorated Stink Bug (BMSB)

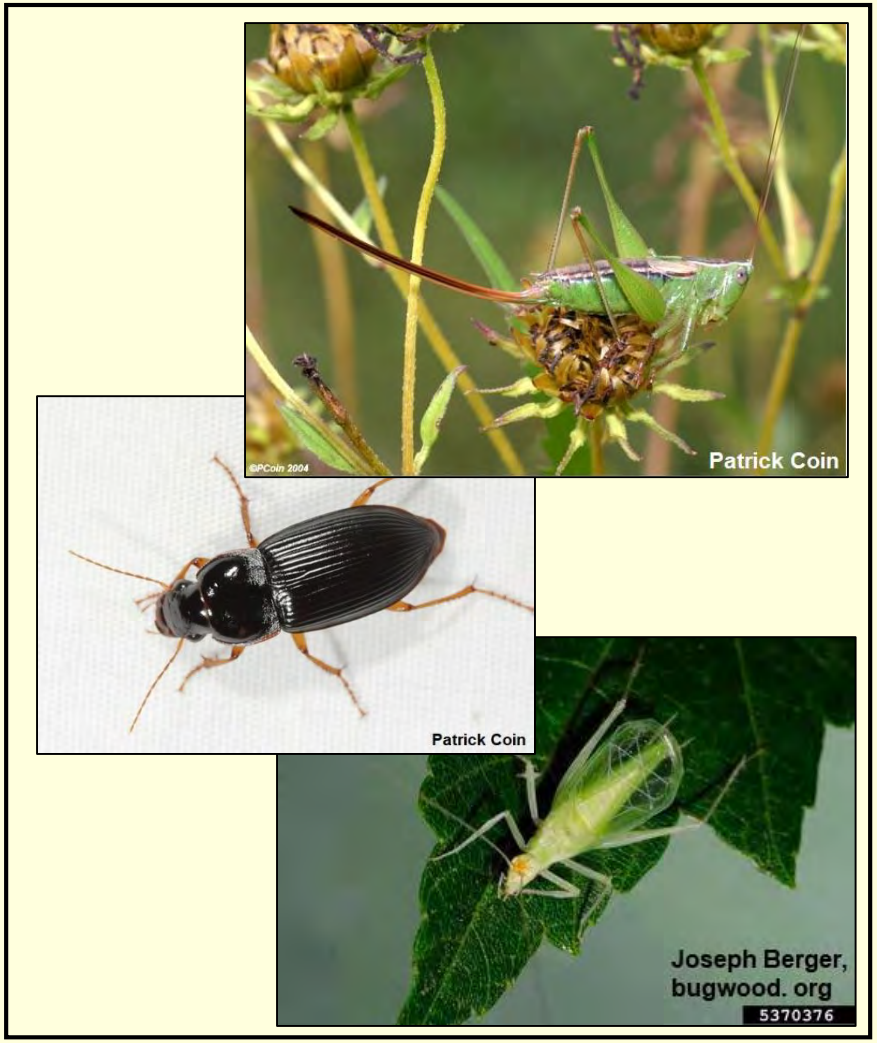
- Polyphagous pest
- Highly mobile
- Found in many managed and non-managed habitats
- Sustainable pest management is needed: Biological control

Biological Control Agents

Insects that attack BMSB eggs

Parasitoids

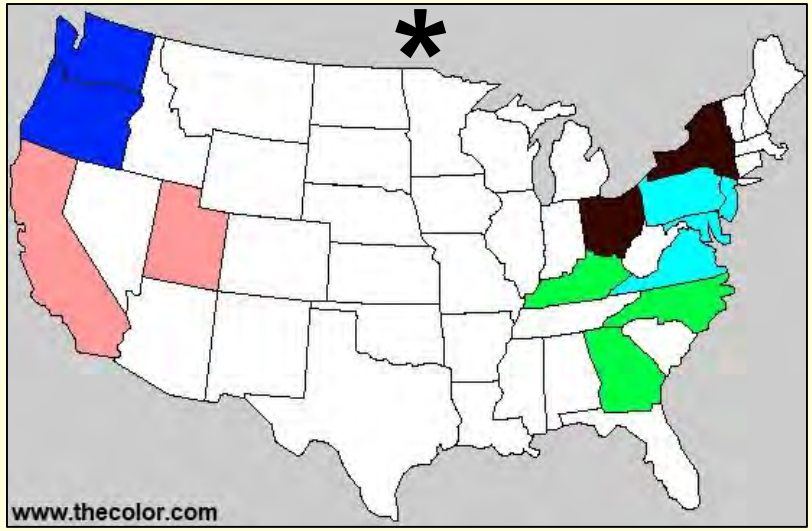
Predators



Project Objective

Regional complexes and habitat differences: Determine the impact of native natural enemies

Maximize impacts of natural enemies across agroecosystems



***States within regions that are part of this objective**

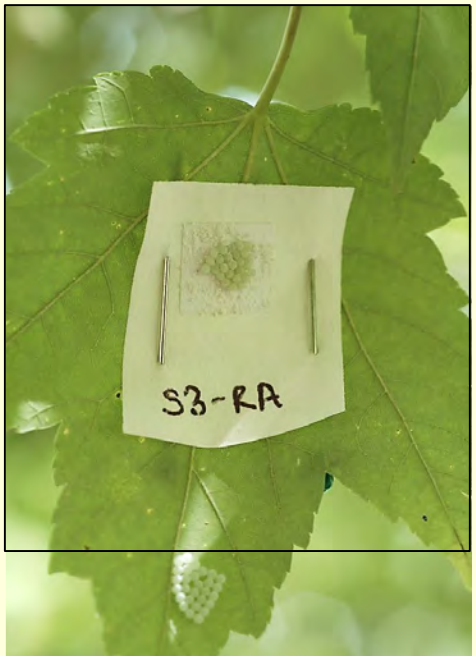
Project Methods

Sentinel BMSB egg mass:

- **<u>Fresh</u>: <24 hr after being laid**
- **<u>Frozen</u>: held at -80°C for less than 6 wk**

Naturally-laid BMSB egg masses

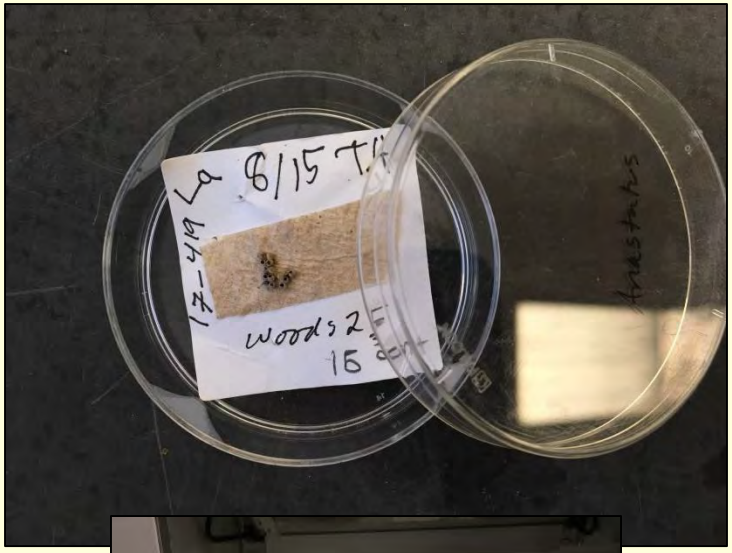
Sentinel egg mass of other species



In the field:

- **Egg mass pinned to the underside of a host leaf**
- **Remain in the field for ~3 days**

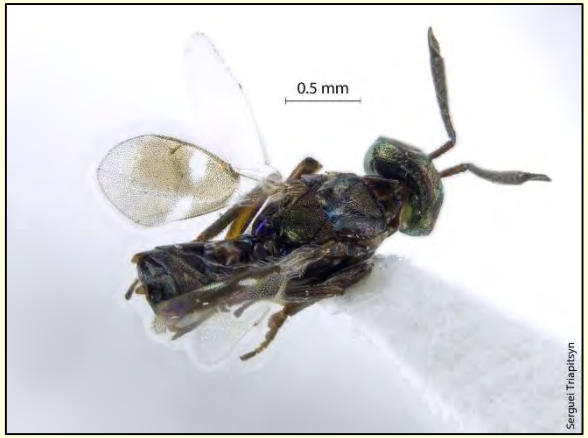
Project Methods



In the lab:

- Storage
- Parasitoid collection and curation
- Egg mass dissections

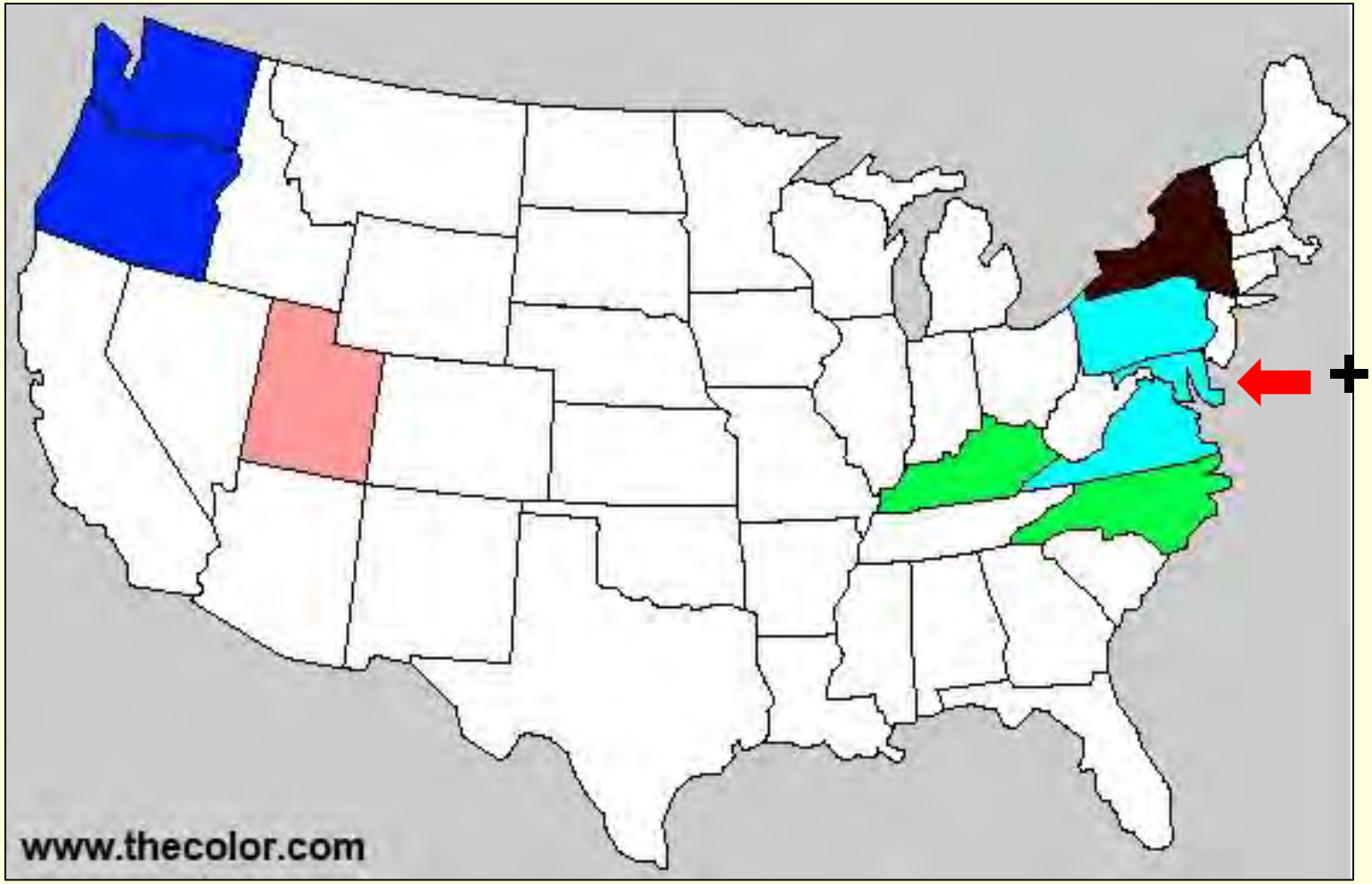
Curated parasitoid



From Lara et al. 2016, Photo: S. Triapitsyn

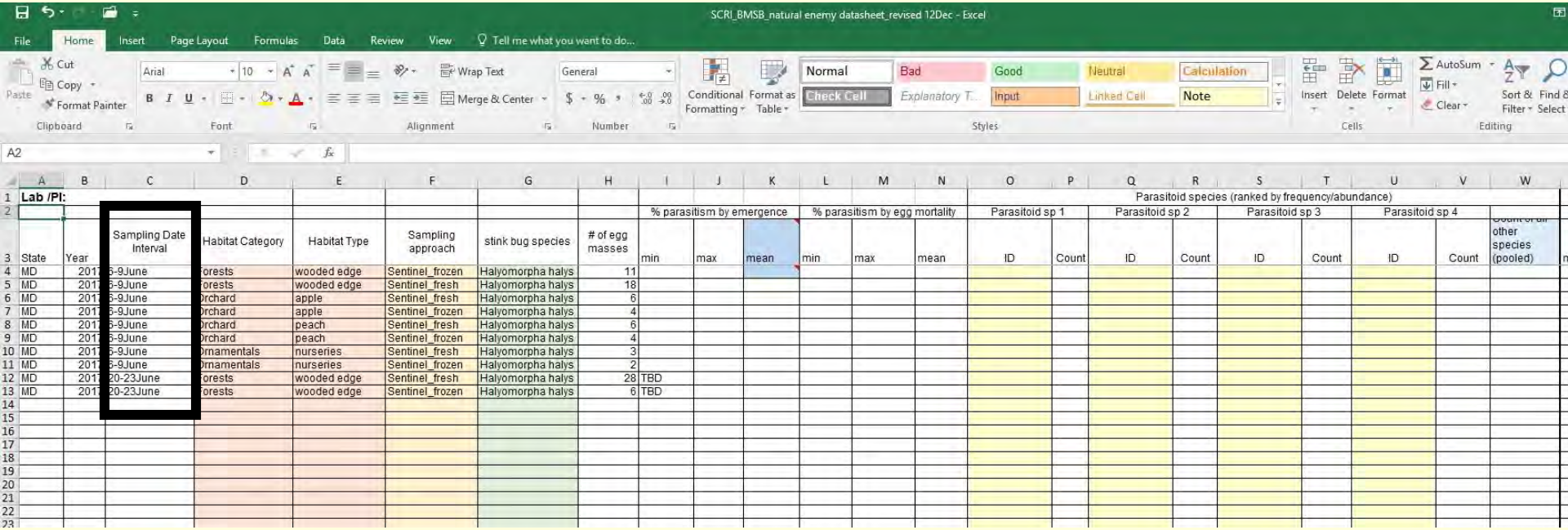
Data Summary

Contributing states to this dataset



+ DE!

Data Summary



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Lab /PI:														Parasitoid species (ranked by frequency/abundance)								
2	1								% parasitism by emergence			% parasitism by egg mortality			Parasitoid sp 1		Parasitoid sp 2		Parasitoid sp 3		Parasitoid sp 4		
3	State	Year	Sampling Date Interval	Habitat Category	Habitat Type	Sampling approach	stink bug species	# of egg masses	min	max	mean	min	max	mean	ID	Count	ID	Count	ID	Count	ID	Count	other species (pooled)
4	MD	201	6-9June	Forests	wooded edge	Sentinel_frozen	Halyomorpha halys	11															
5	MD	201	6-9June	Forests	wooded edge	Sentinel_fresh	Halyomorpha halys	18															
6	MD	201	6-9June	Orchard	apple	Sentinel_fresh	Halyomorpha halys	6															
7	MD	201	6-9June	Orchard	apple	Sentinel_frozen	Halyomorpha halys	4															
8	MD	201	6-9June	Orchard	peach	Sentinel_fresh	Halyomorpha halys	6															
9	MD	201	6-9June	Orchard	peach	Sentinel_frozen	Halyomorpha halys	4															
10	MD	201	6-9June	Ornamentals	nurseries	Sentinel_fresh	Halyomorpha halys	3															
11	MD	201	6-9June	Ornamentals	nurseries	Sentinel_frozen	Halyomorpha halys	2															
12	MD	201	20-23June	Forests	wooded edge	Sentinel_fresh	Halyomorpha halys	28	TBD														
13	MD	201	20-23June	Forests	wooded edge	Sentinel_frozen	Halyomorpha halys	6	TBD														
14																							
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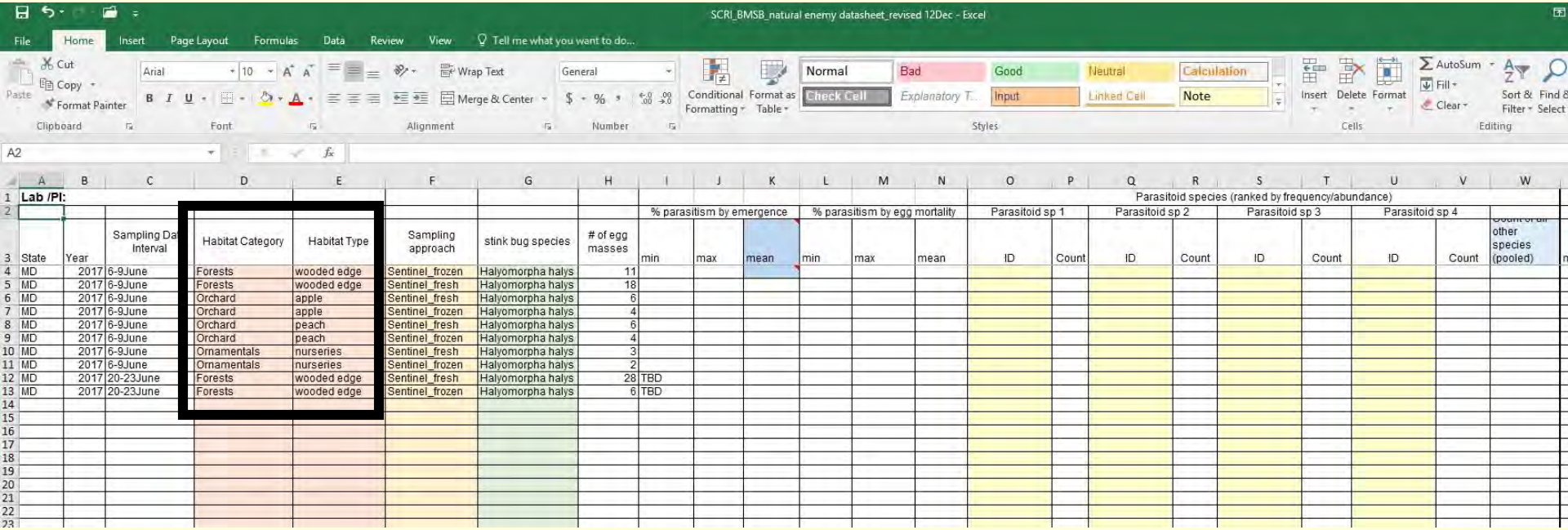
Sampling period

Data Summary



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4	MD	2017	6-9June	Forests	wooded edge	Sentinel_frozen	Halyomorpha halys	11															
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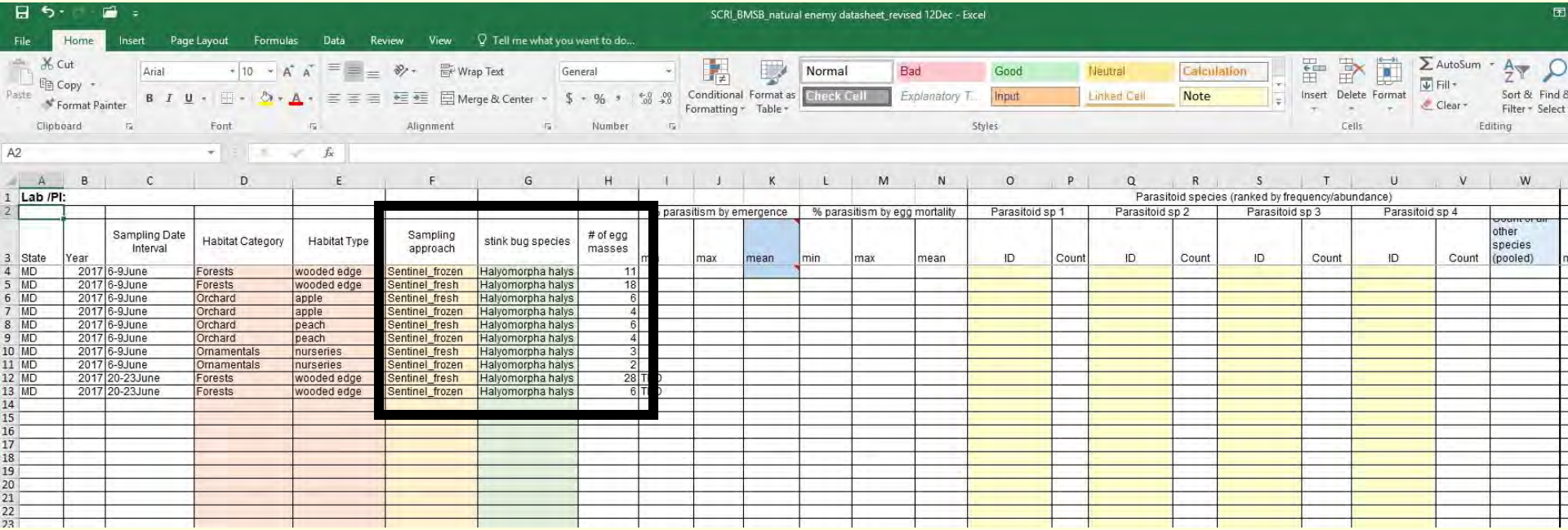
Habitat Category:

1. Forests
2. Orchards
3. Ornamentals
4. Field/vegetable crops
5. Semi-natural
6. Mixed-unspecified

Habitat Type:

1. Wooded edges
2. Apple, peach, pear, hazelnut
3. Nurseries, urban landscapes
4. Corn, soybean, peppers
5. Campuses, parks, arboretum

Data Summary



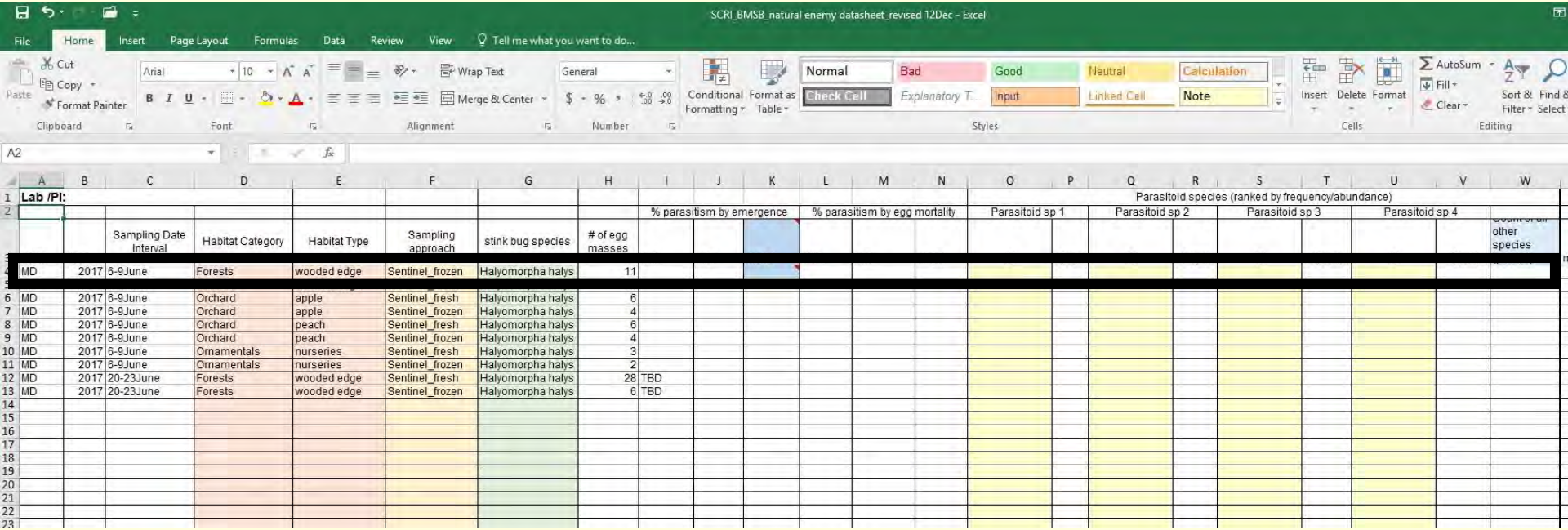
Sampling approach

1. **Sentinel fresh**
2. **Sentinel frozen**
3. **Naturally laid**

Stink bug species

# of egg masses used

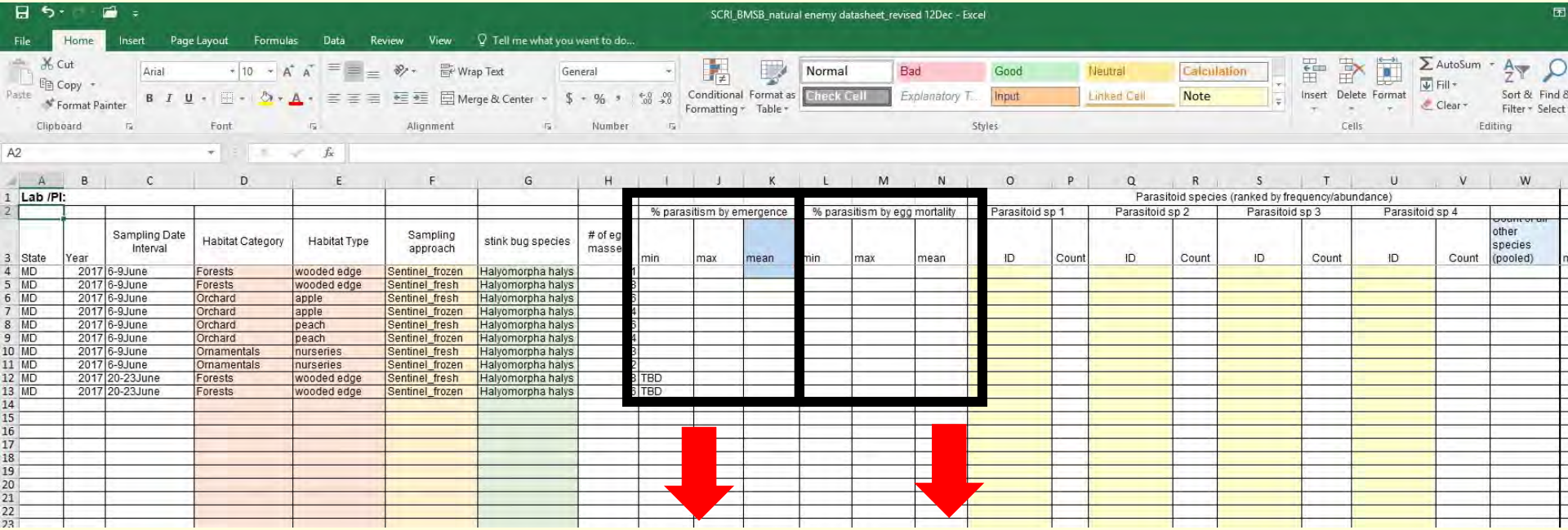
Data Summary



A survey (a row)- A unique combination of:

1. **Research team**
2. **Sampling period**
3. **Habitat category and type**
4. **Sampling approach**
5. **Stink bug species**

Data Summary

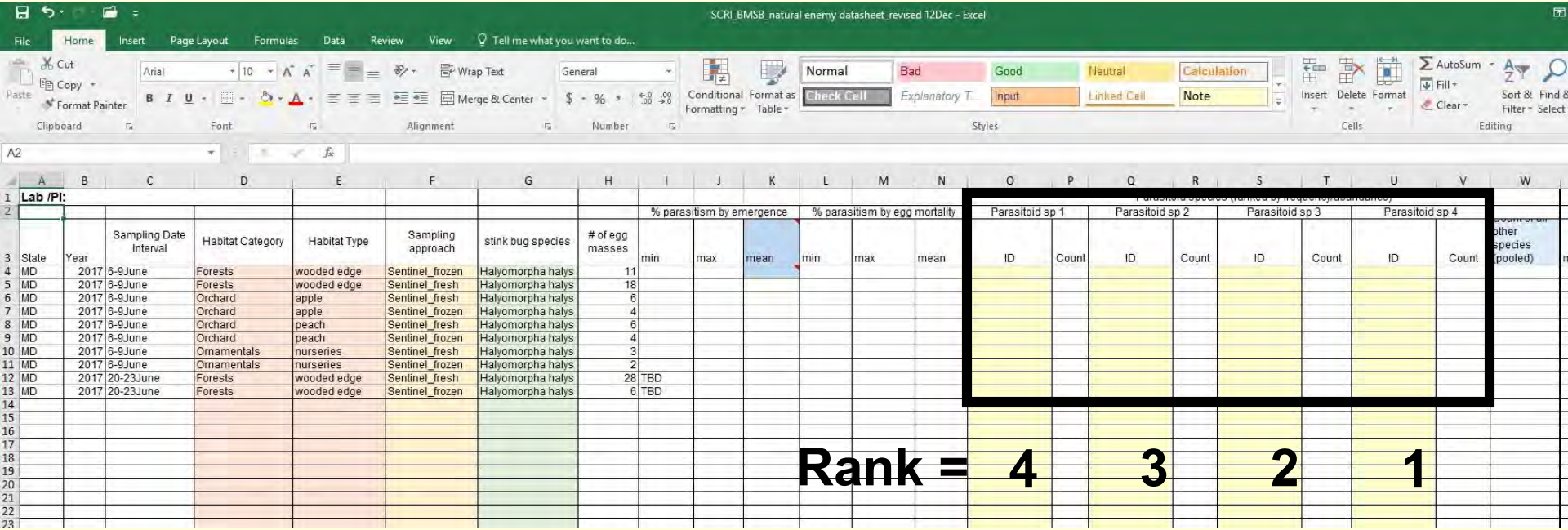


Parasitoids

% parasitism by emergence (Wasps emerged from stink bug eggs)

% partial parasitoid development (Unhatched eggs were dissected and evaluated for signs of parasitism)

Data Summary

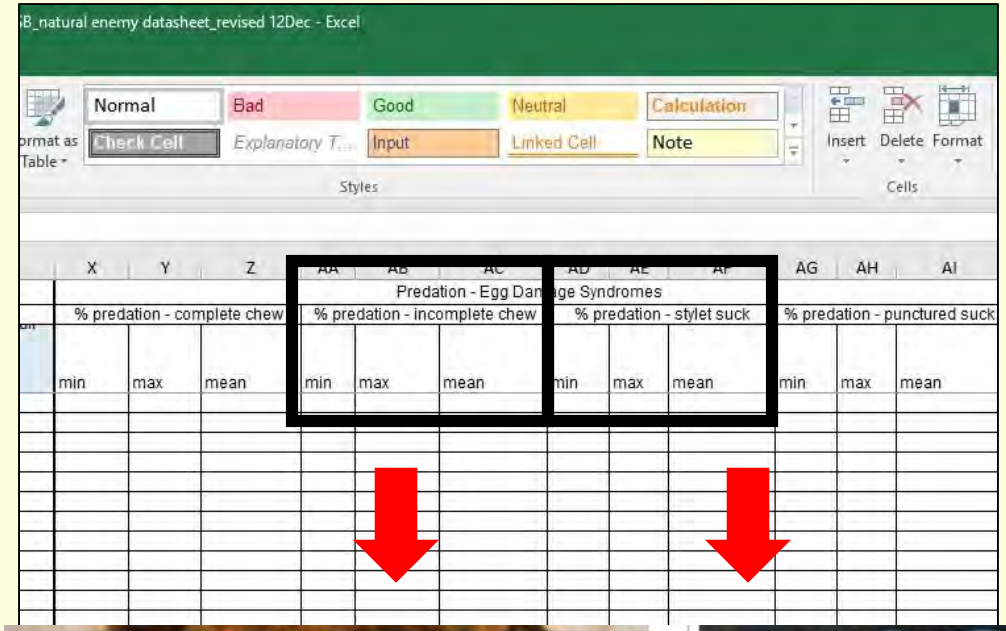


Parasitoids

Emerged parasitoid species

Most prevalent → **Least prevalent**

Data Summary



Predators

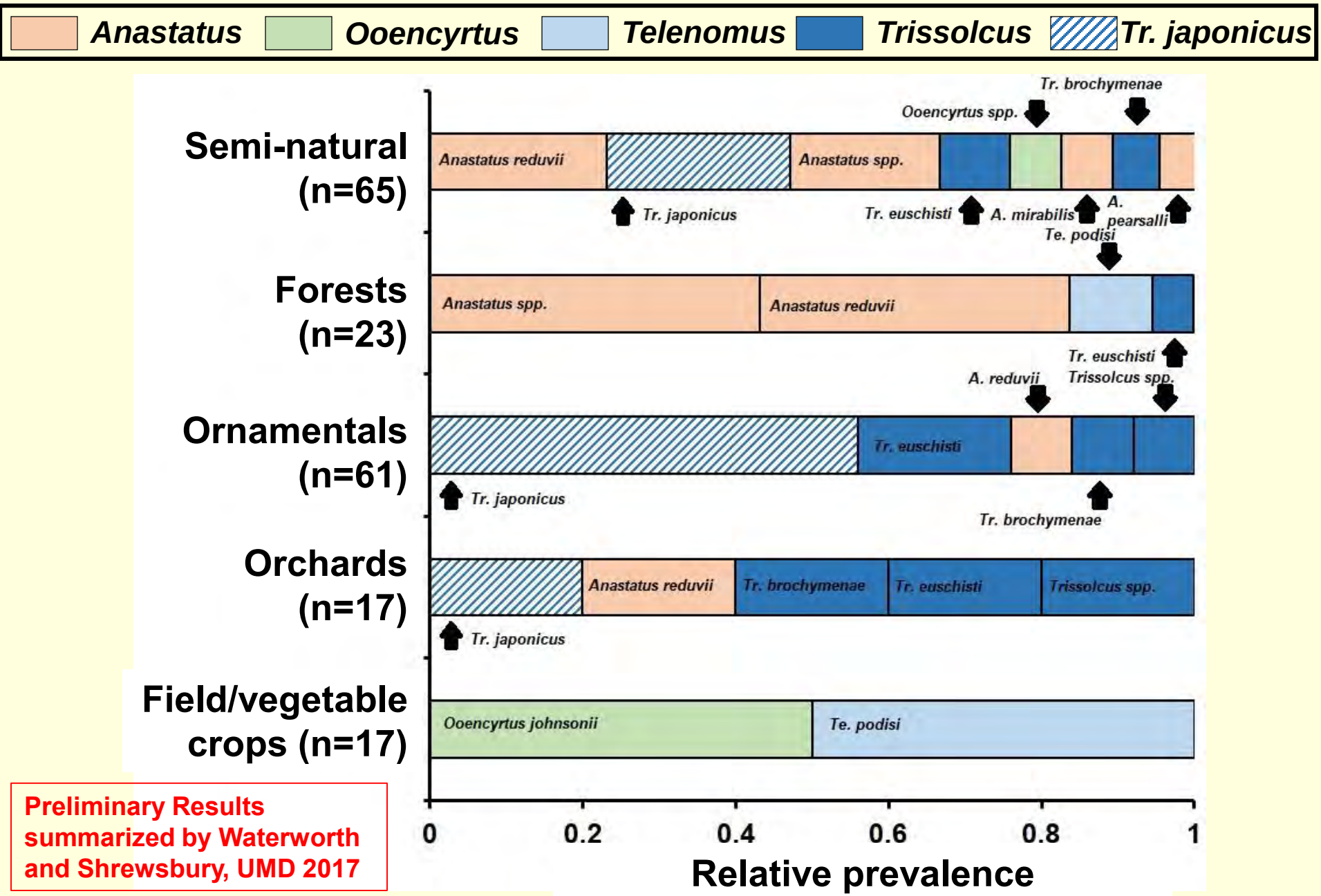
Four egg feeding syndromes
(described in Morrison et al. 2016):

1. **Complete chew**
2. **Incomplete chew**
3. **Stylet suck**
4. **Punctured suck**

Rachel Suits

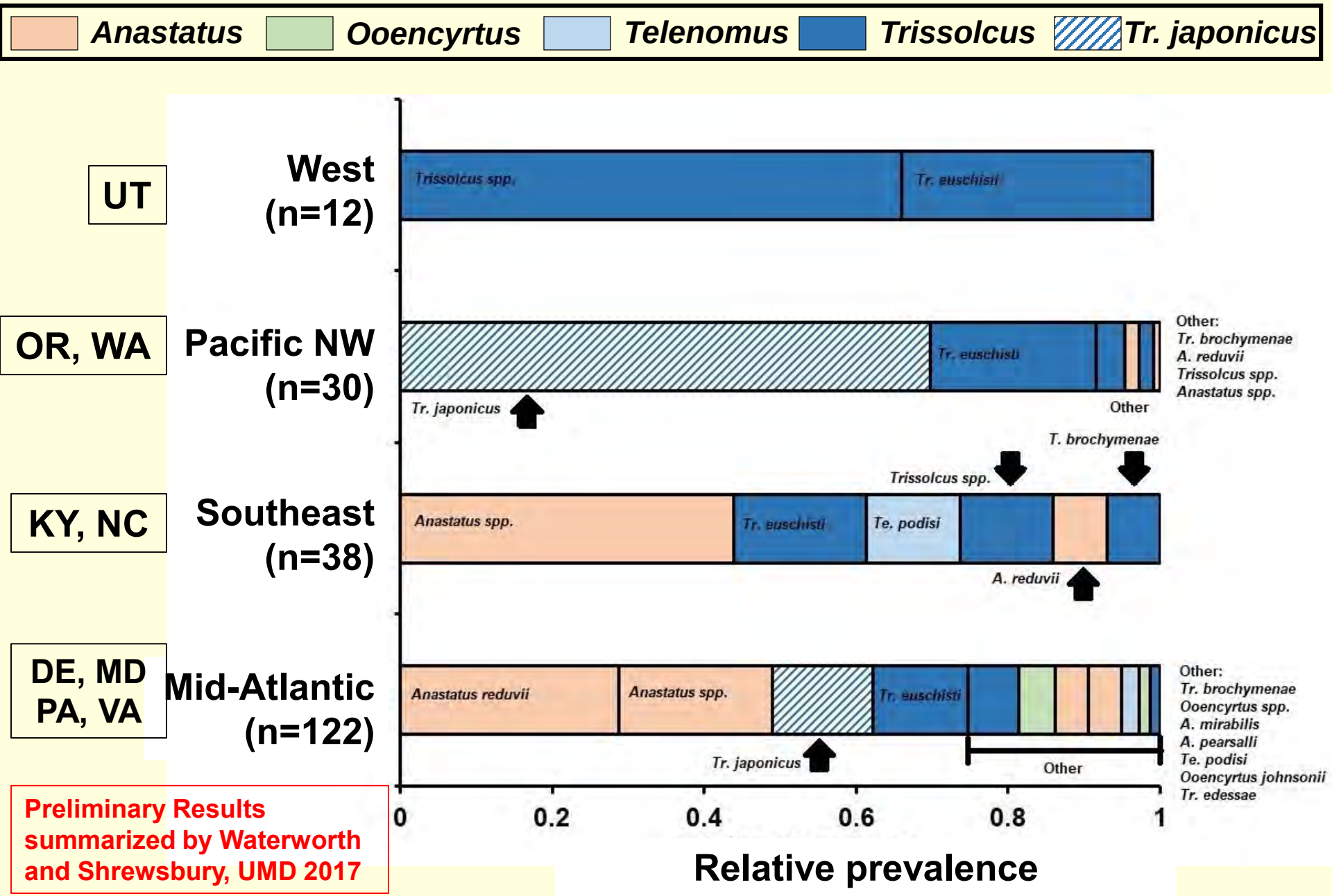
Walgenbach Lab

Prevalence of parasitoid species by habitat category



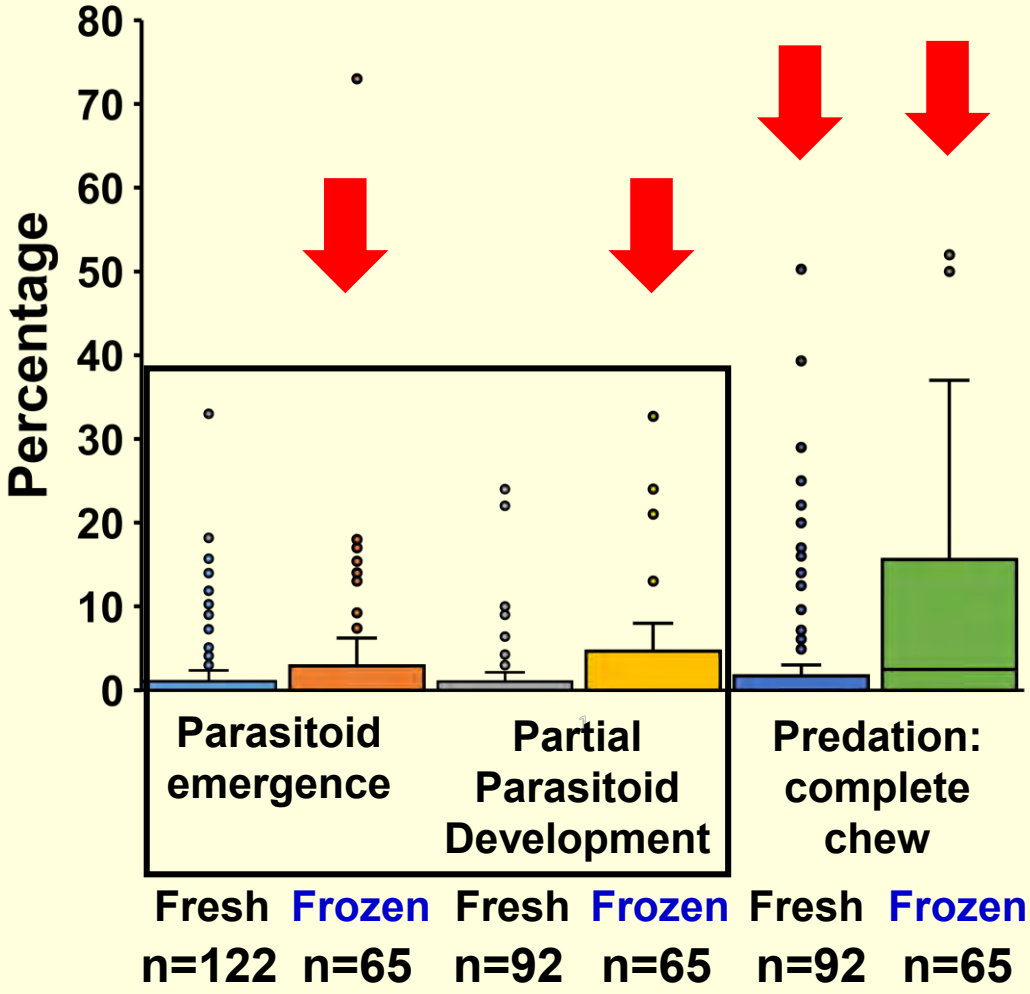
Preliminary Results summarized by Waterworth and Shrewsbury, UMD 2017

Prevalence of parasitoid species by region



Preliminary Results summarized by Waterworth and Shrewsbury, UMD 2017

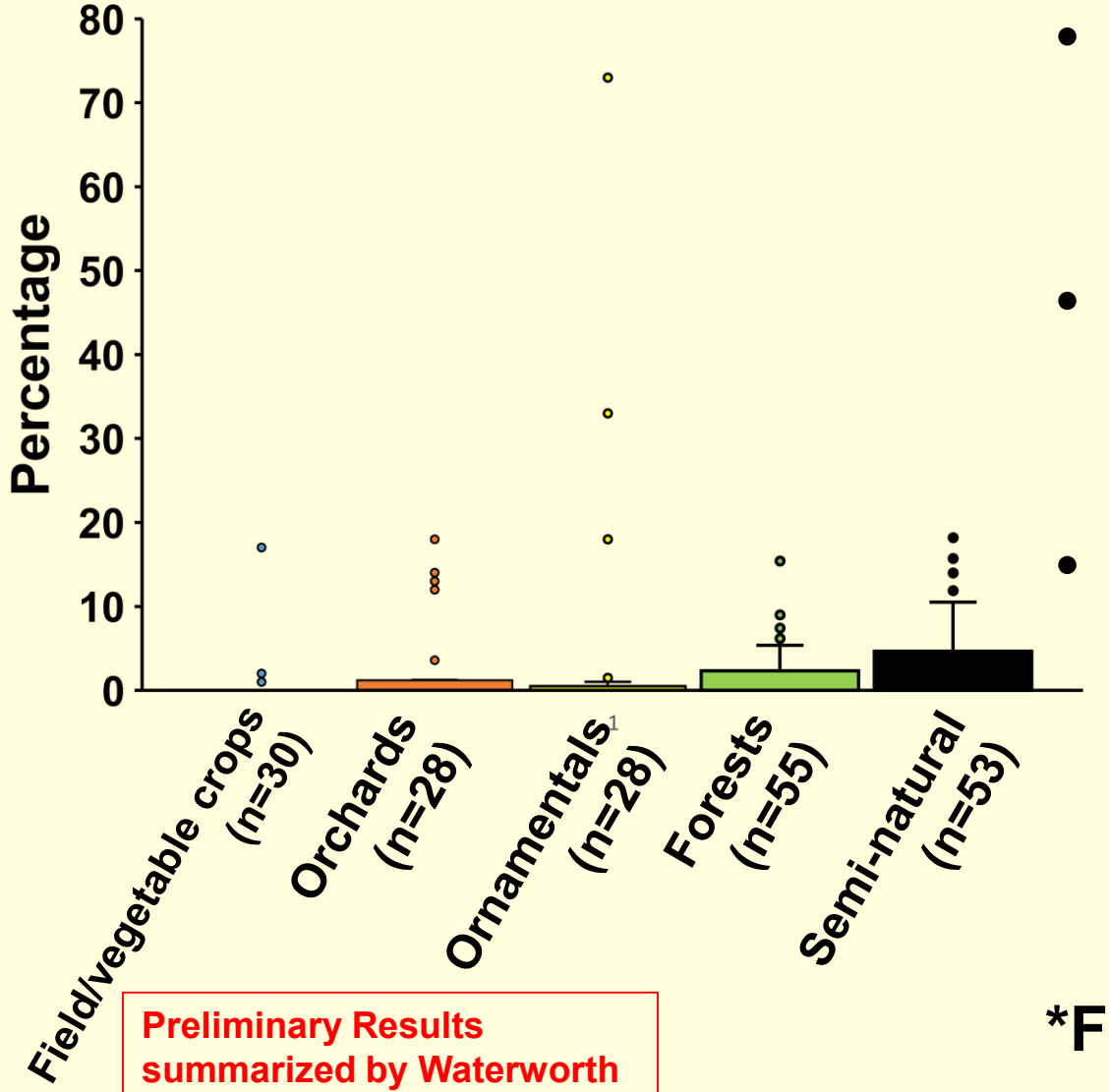
Parasitism and Predation Impacts on Eggs



- Surveys with any *Tr. japonicus* were excluded
- Parasitoid emergence and partial parasitoid development were low overall
- Predation by complete chewing of fresh egg masses was low
- Predation was higher on frozen egg masses

Preliminary Results summarized by Waterworth and Shrewsbury, UMD 2017

Parasitism Impacts on Eggs by Habitat Category

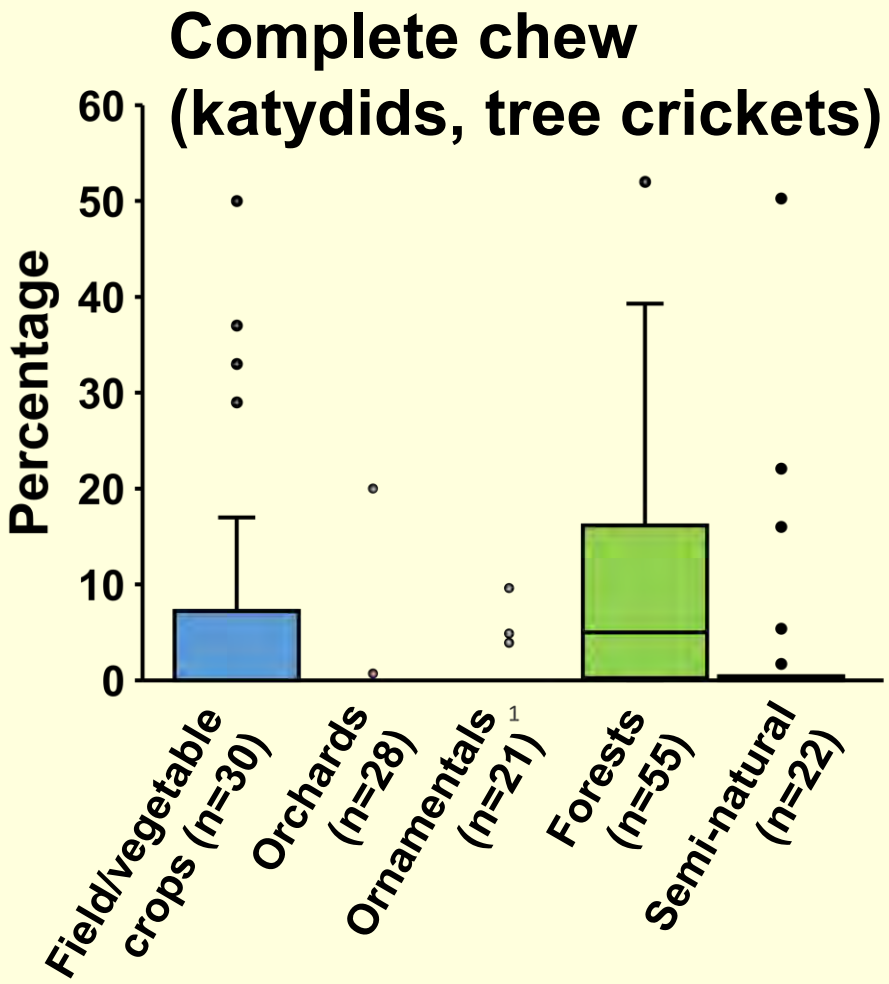


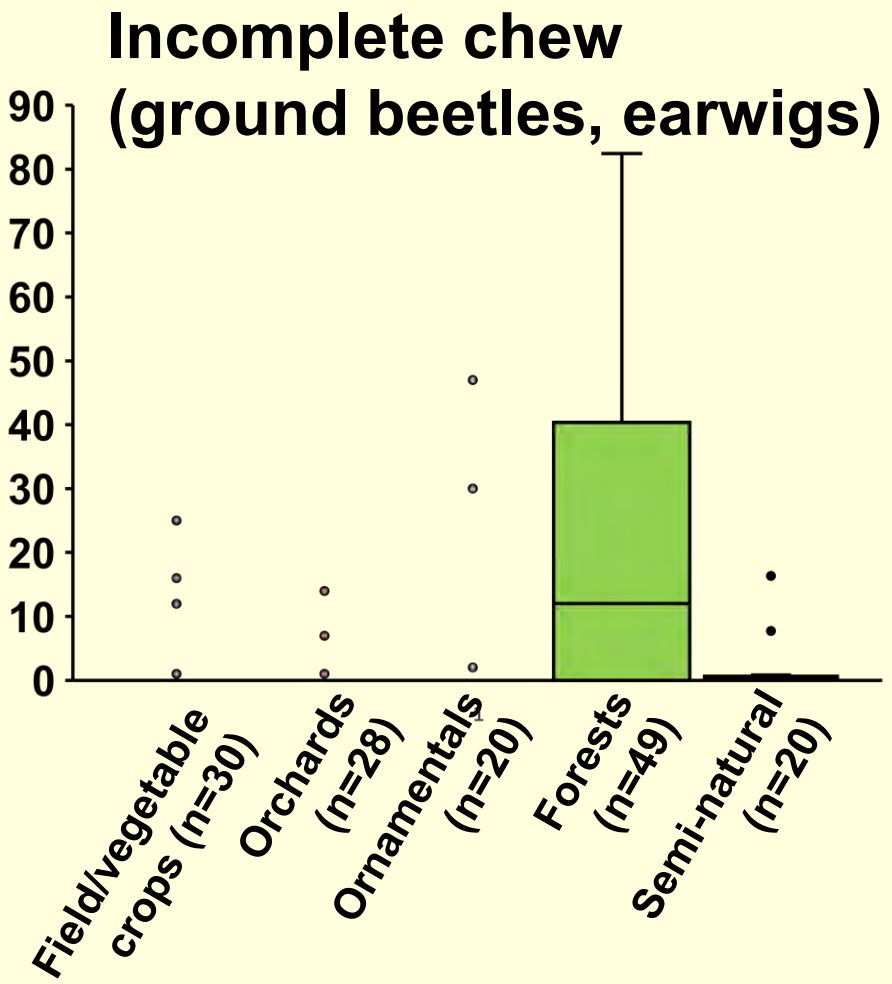
- % emerged parasitism of native species
- Low levels of parasitism across habitats
- Need more surveys included to see how these data change

Preliminary Results summarized by Waterworth and Shrewsbury, UMD 2017

*Fresh and frozen sentinel egg masses combined

Predation Impacts by Habitat Category





Preliminary Results summarized by Waterworth and Shrewsbury, UMD 2017

*Fresh and frozen sentinel egg masses combined

Conclusions

- **Preliminary results from the 2017 season support certain parasitoid species are more prevalent in specific habitats**
- **Natural enemies were heavily surveyed in the mid-Atlantic region**
- **With fresh sentinel egg masses, there was low overall parasitoid emergence, partial parasitoid development, and predation by native species**
- **Need to incorporate additional 2017 data and samples over multiple years to elucidate more robust patterns**

Acknowledgements

Delaware	Kim Hoelmer, Kathy Tatman
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Washington State	Betsy Beers, Joshua Milne