

Rice Protection from Invertebrate Pests

Ian Grettenberger¹, Luis Espino², Kevin Goding¹

¹UC Davis, Dept. of Entomology and Nematology

²UC Cooperative Extension, Colusa, CA



Rice invertebrate pests

- Rice seed midge
- Tadpole shrimp
- Crayfish
- Rice water weevil
- Armyworms
- Stink bugs
- Armyworms



Seeding to 4-leaf



4-leaf to flowering

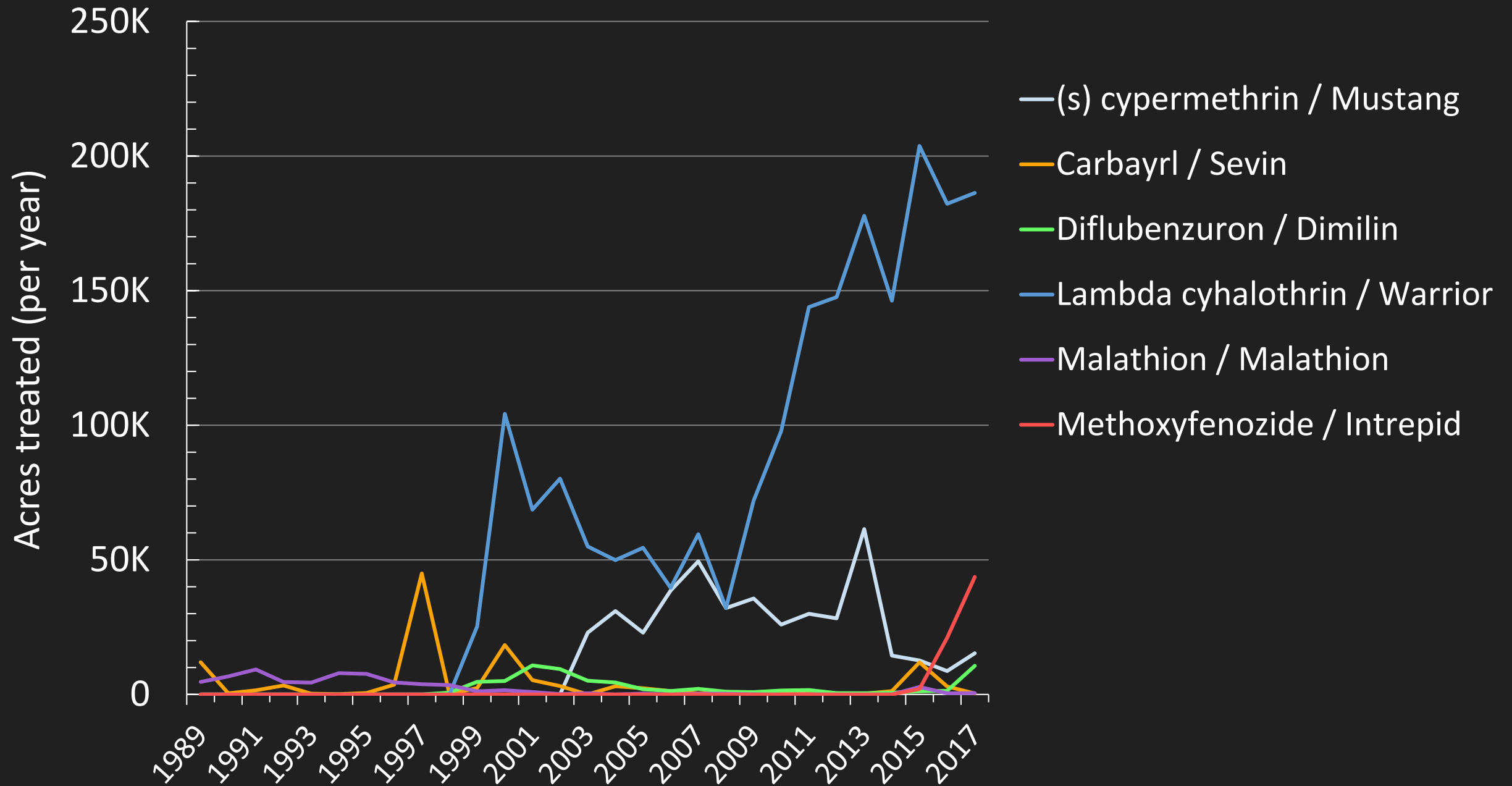


Flowering to harvest



Photo by Bugwood.org

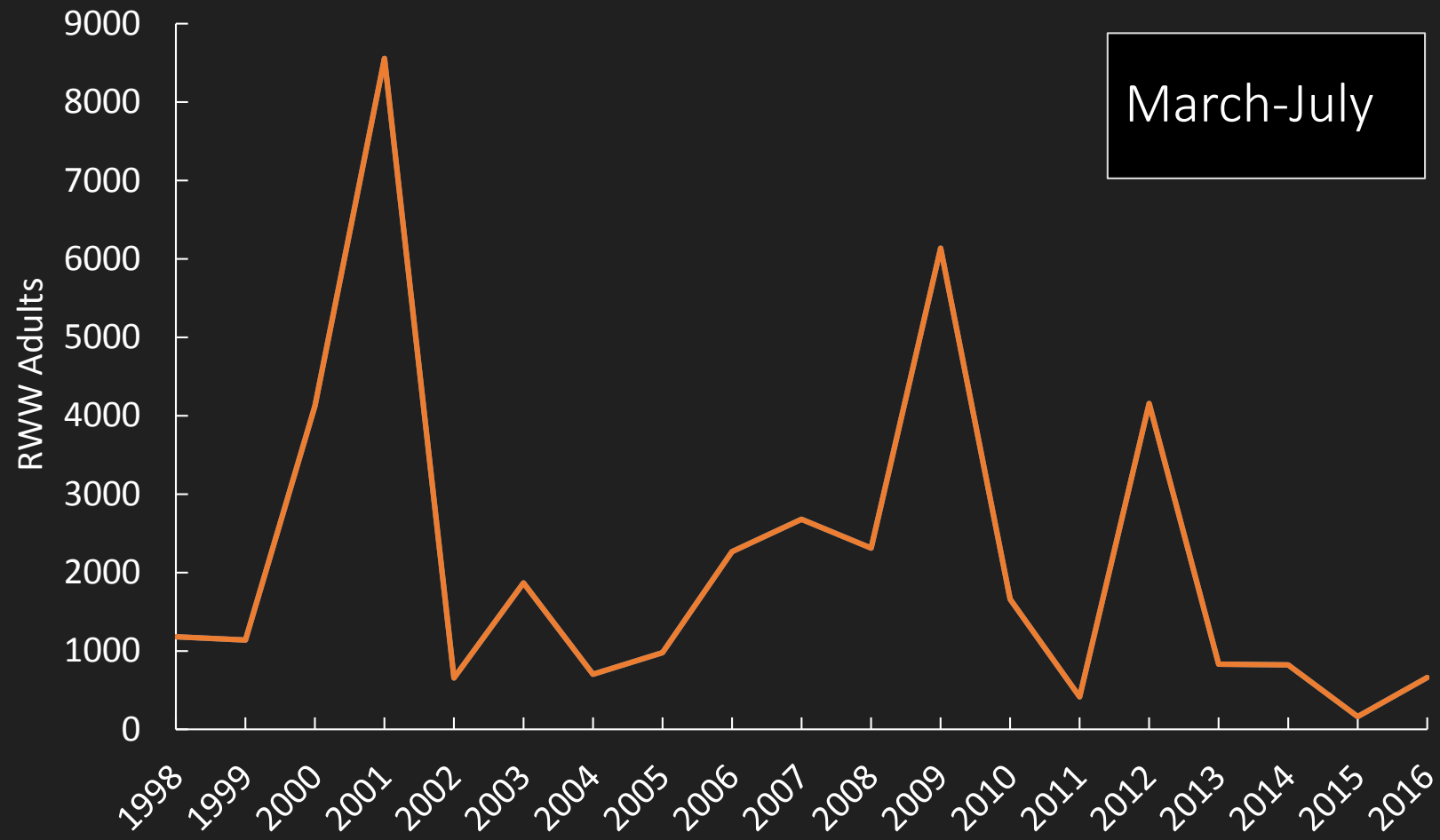




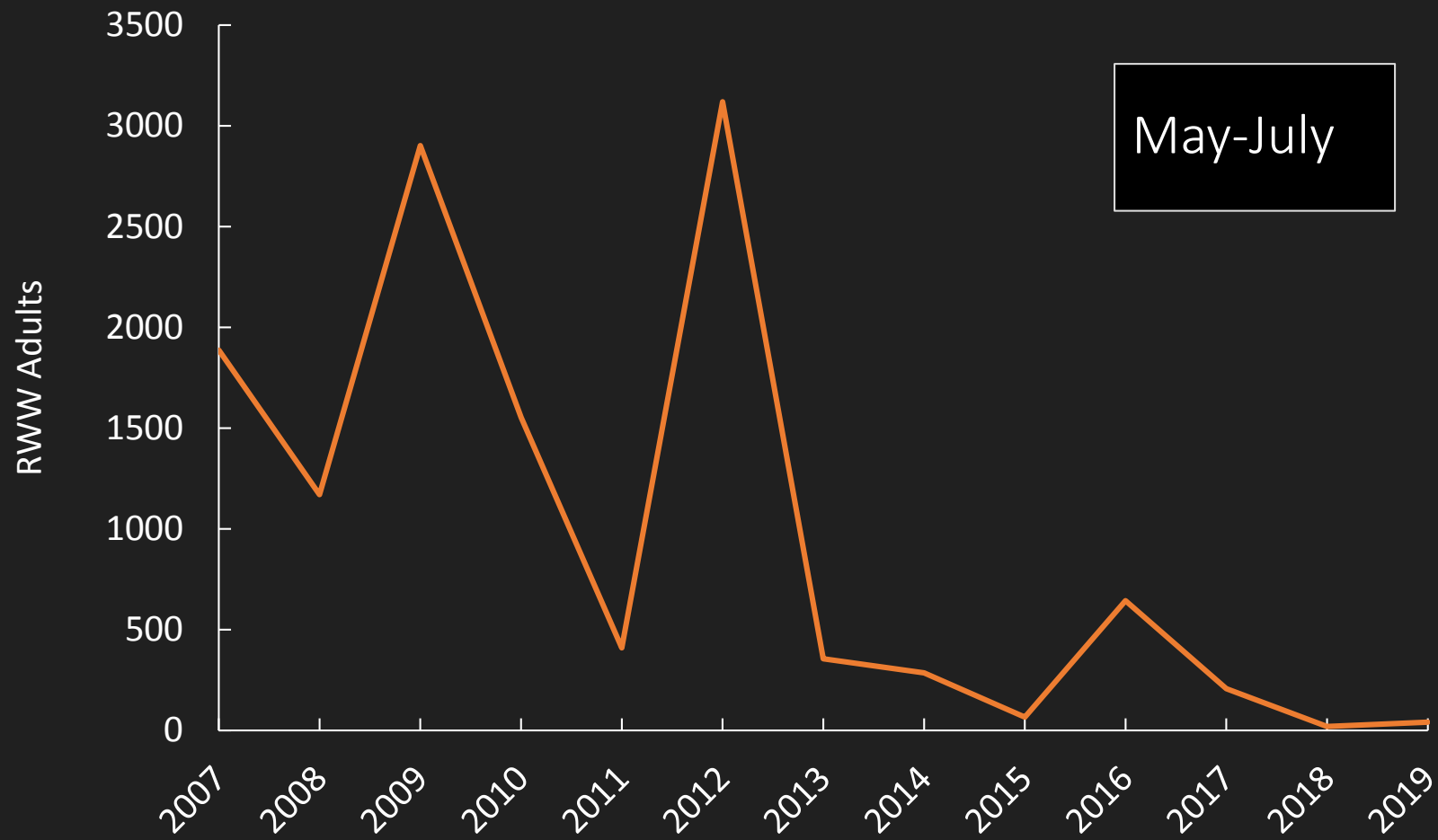
Rice water weevil



Pest status of RWW



Pest status of RWW





Tadpole shrimp

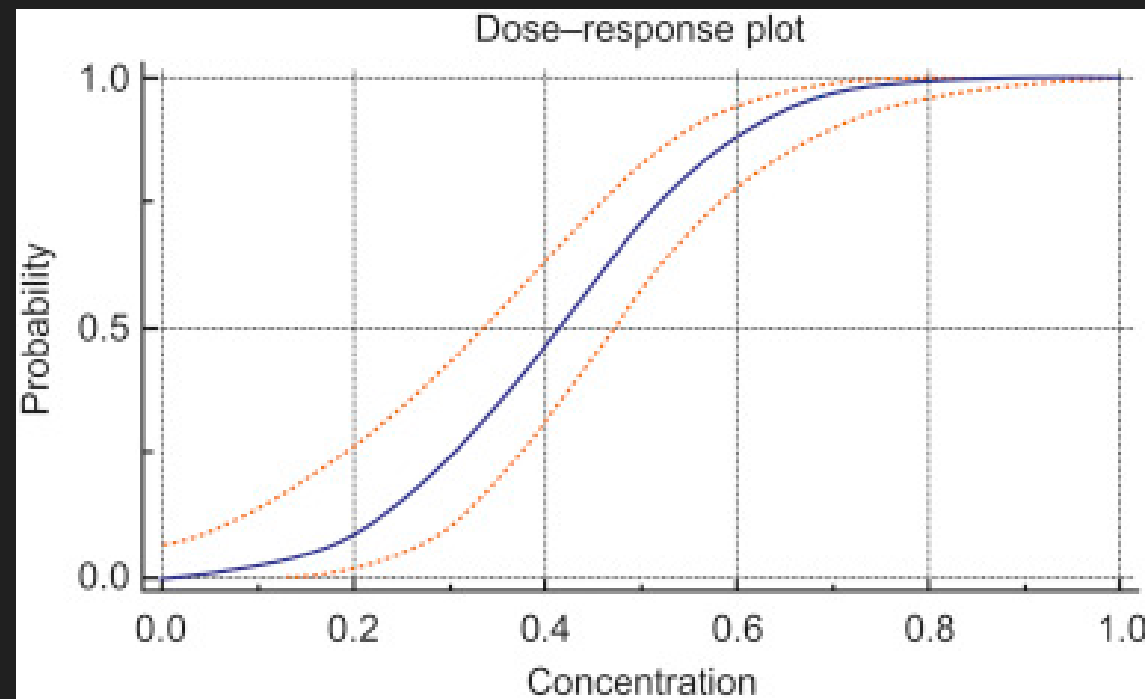
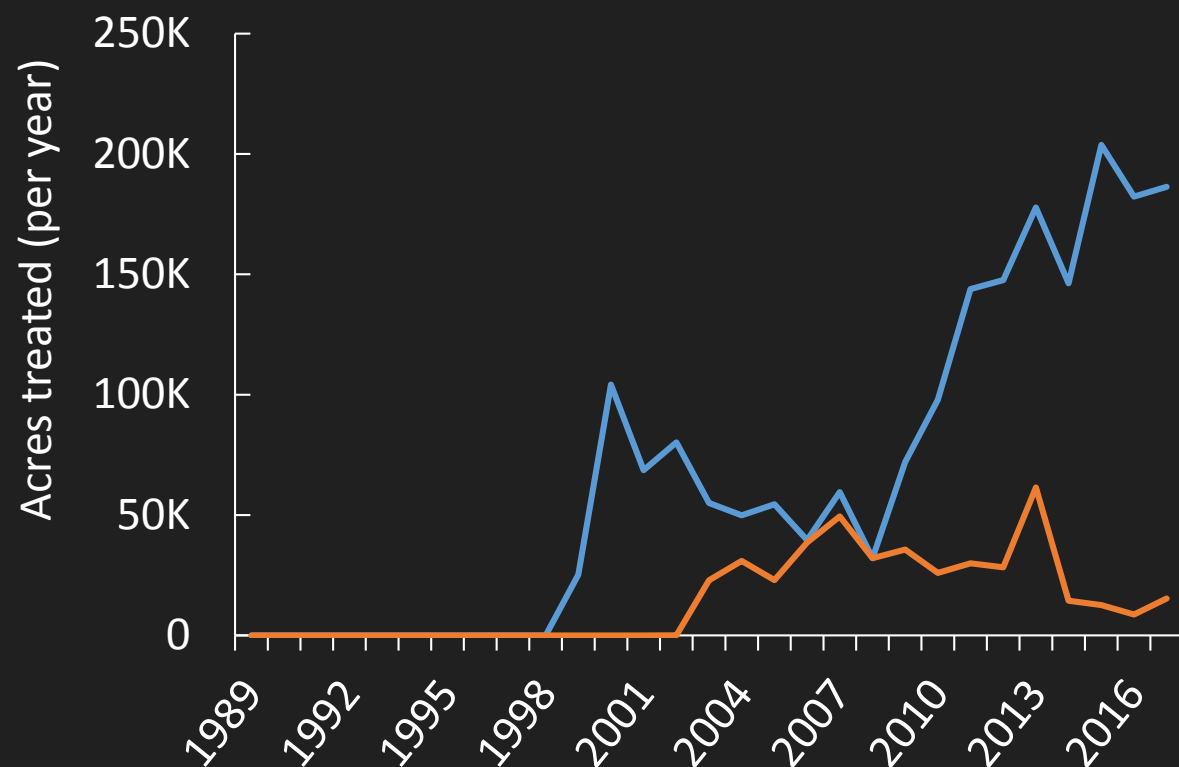


Tadpole shrimp pesticide screening

Treatment	Active Ingredient	Rate/ac	Pre-trt	1 DAT	2 DAT	3 DAT	% reduction
Untreated	--	--	10.50	10.00 a	10.83 a	7.50 a	--
Dimilin	Diflubenzuron	4 oz	8.83	0 b	0 c	0 b	100
Dimilin	Diflubenzuron	8 oz	11.00	0 b	0 c	0 b	100
Ferrox	Sodium ferric EDTA	10 lbs	9.50	7.67 a	3.83 b	2.50 b	67
Sevin	Carbaryl	1.5 qt	8.83	0 b	0 c	0 b	100
Belay	Clothianidin	2 oz	10.00	0 b	0 c	0 b	100
Warrior	Lambda-cyhalothrin	2.56 oz	9.17	0 b	0 c	0 b	100

Insecticide resistance

- Scattered reports of pyrethroid resistance
- Collecting populations (touch base with us!)



— Lambda cyhalothrin/ Warrior
— (s) cypermethrin/ Mustang

Armyworms





Luis Espino

Armyworms 2019

- Similar pressure as 2018
- Intrepid available June 18
- No reports of heavy defoliation in July
- Larvae pressure low in August, but a bit of injury late in the season

True



Yellowstriped



Armyworm Insecticide Usage

Year	Intrepid	Dimilin	Lambda-cyhalothrin
2015	2,009	666	31,148
2016	21,015	812	13,644
2017	43,659	10,533	44,450
2018	30,276	256	15,125

Pheromone Trapping

- 15 sites
- 2 species, 3 traps/species
- Information emailed and posted weekly



Armyworm Pheromone Traps 2019

Species

TA

WYA

Moths/trap/day

40.00

30.00

20.00

10.00

0.00

05/05/19

05/19/19

06/02/19

06/16/19

06/30/19

07/14/19

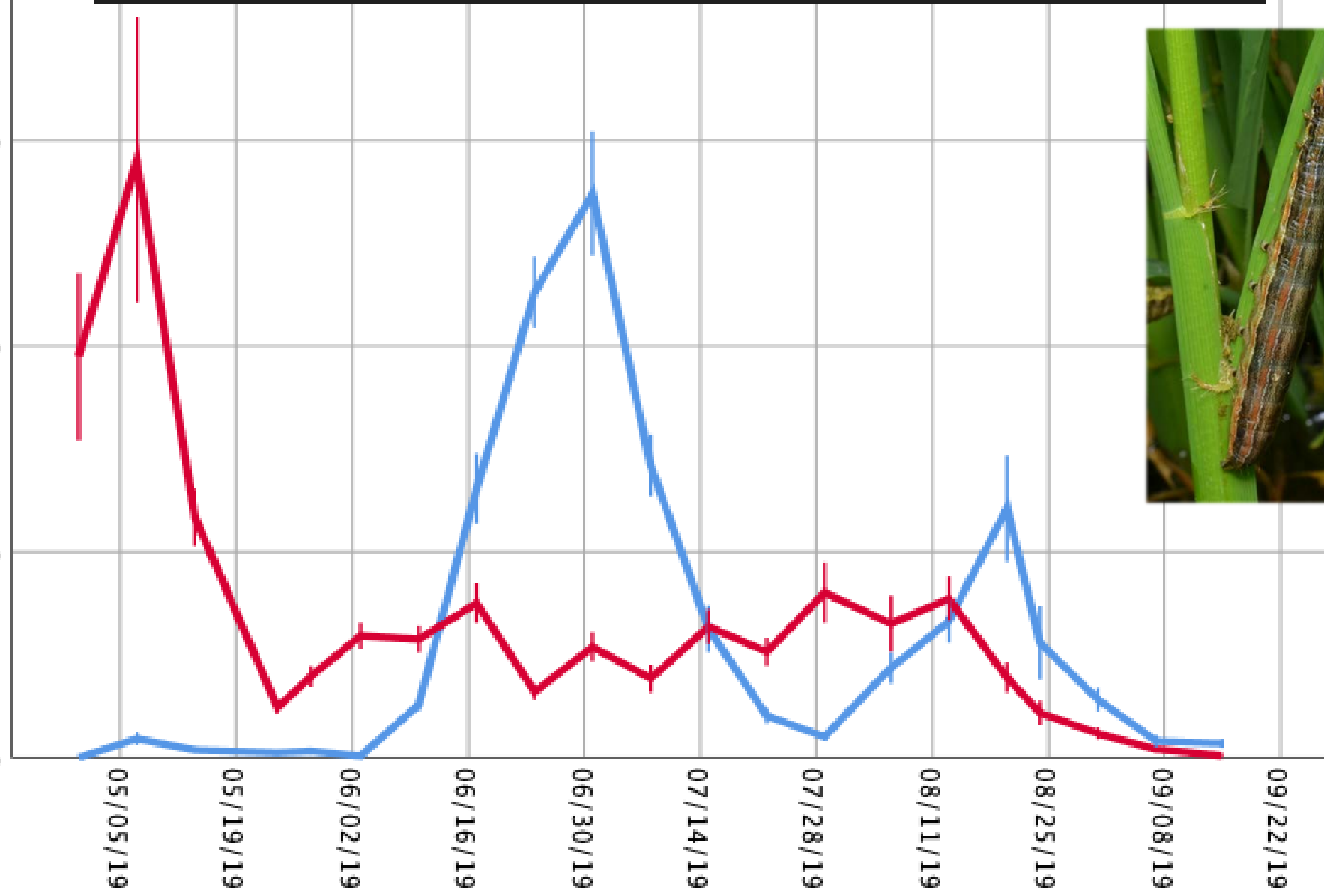
07/28/19

08/11/19

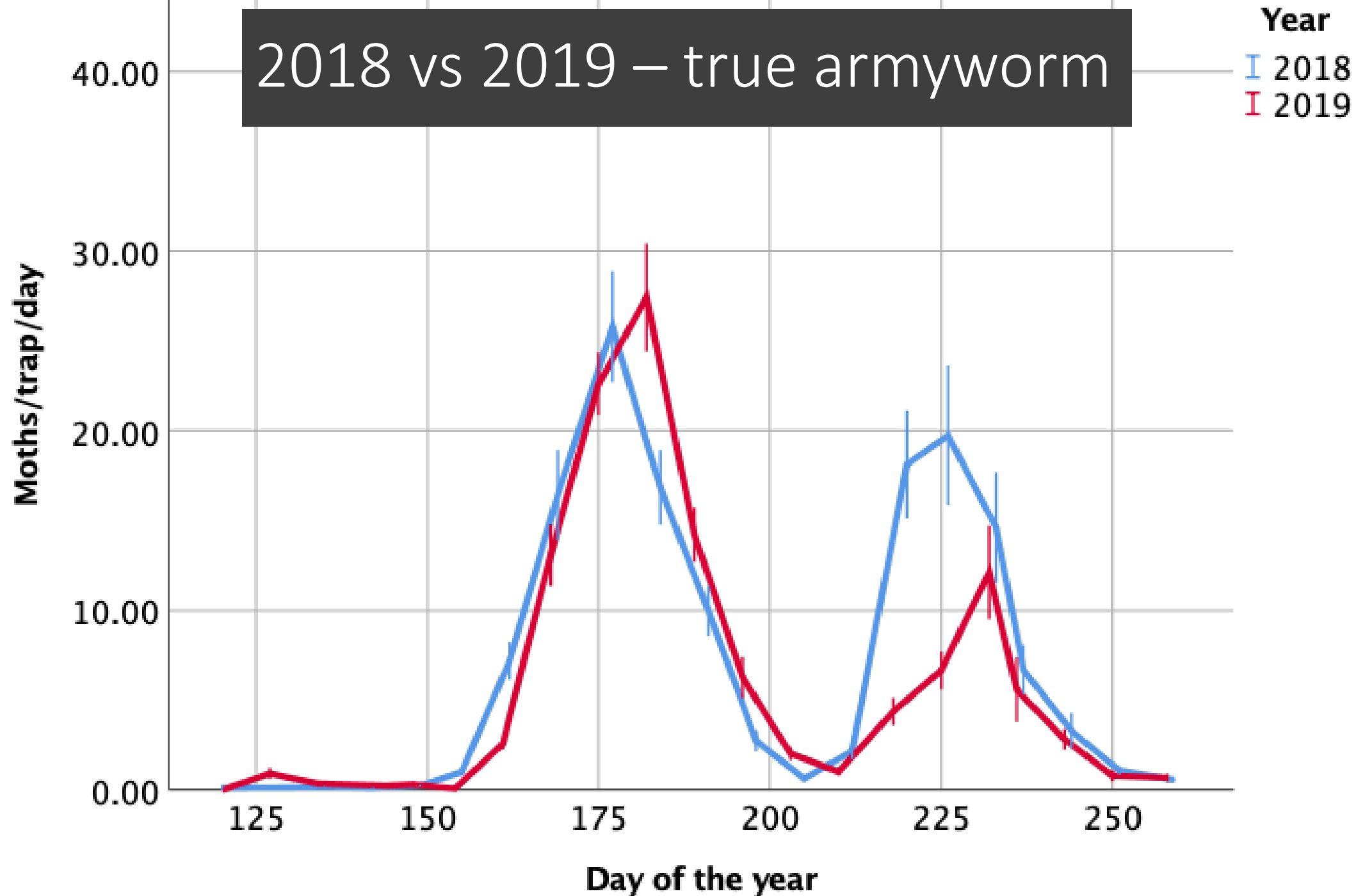
08/25/19

09/08/19

09/22/19



2018 vs 2019 – true armyworm



Location

AFTON

PELGER

SS

KNIGHTS

AGUASF

FARRIS

MAXWELL

RICHVALE

W

Mean Moths/trap/day

60
50
40
30
20
10
0

05/05

06/02

06/30

07/28

08/25

09/22

05/05

06/02

06/30

07/28

08/25

09/22

05/05

06/02

06/30

07/28

08/25

09/22

05/05

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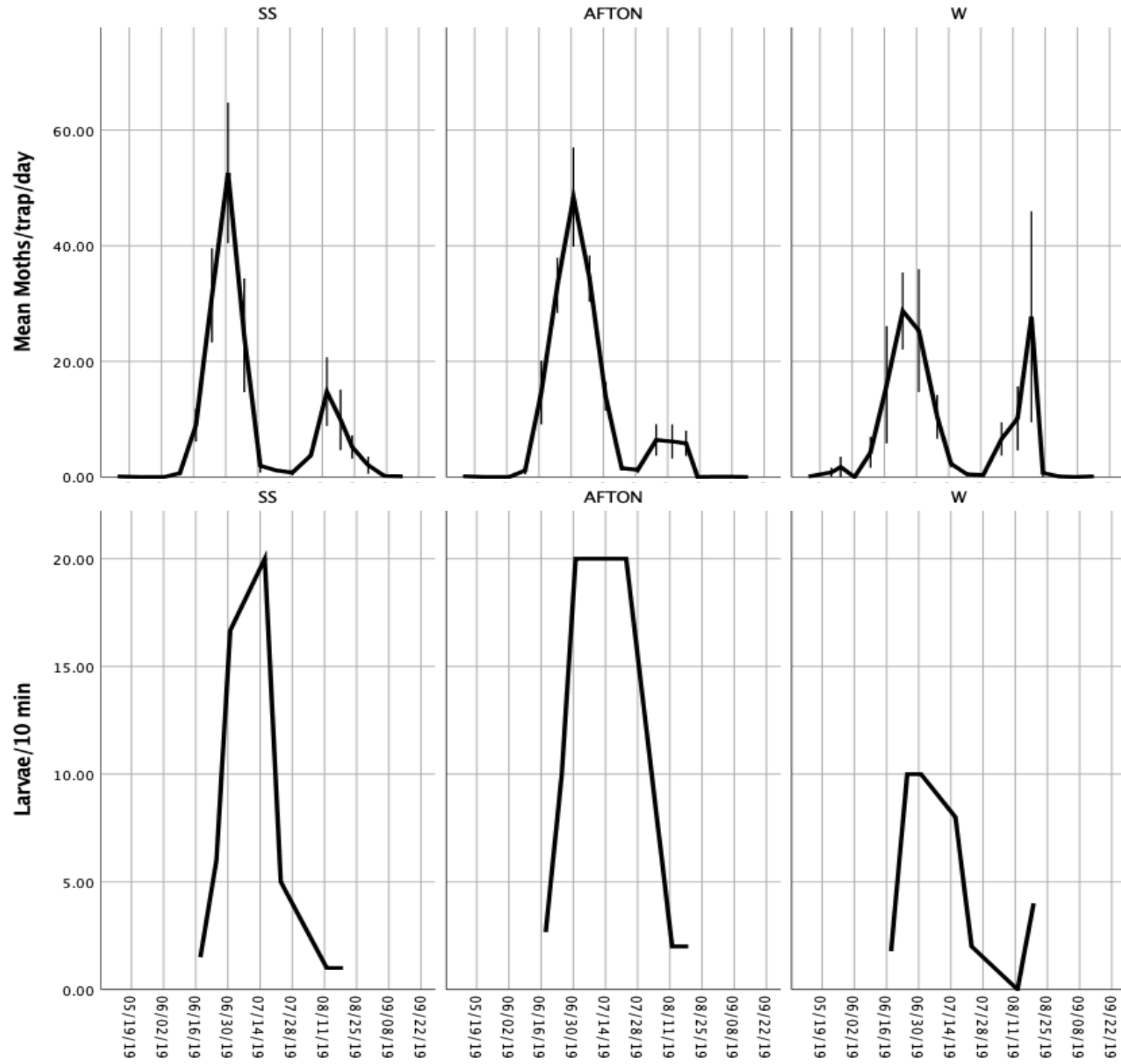
06/02

06/30

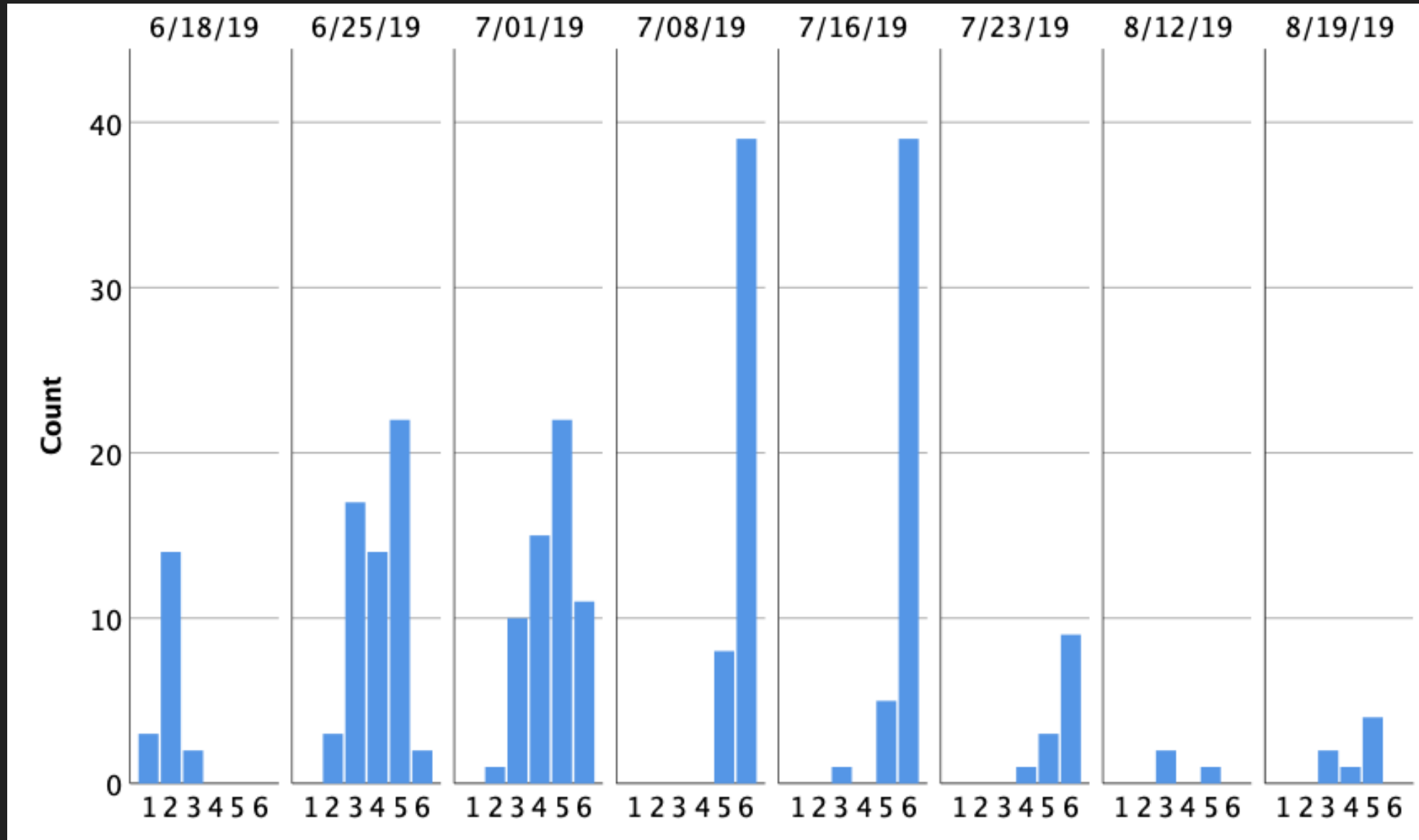
07/28

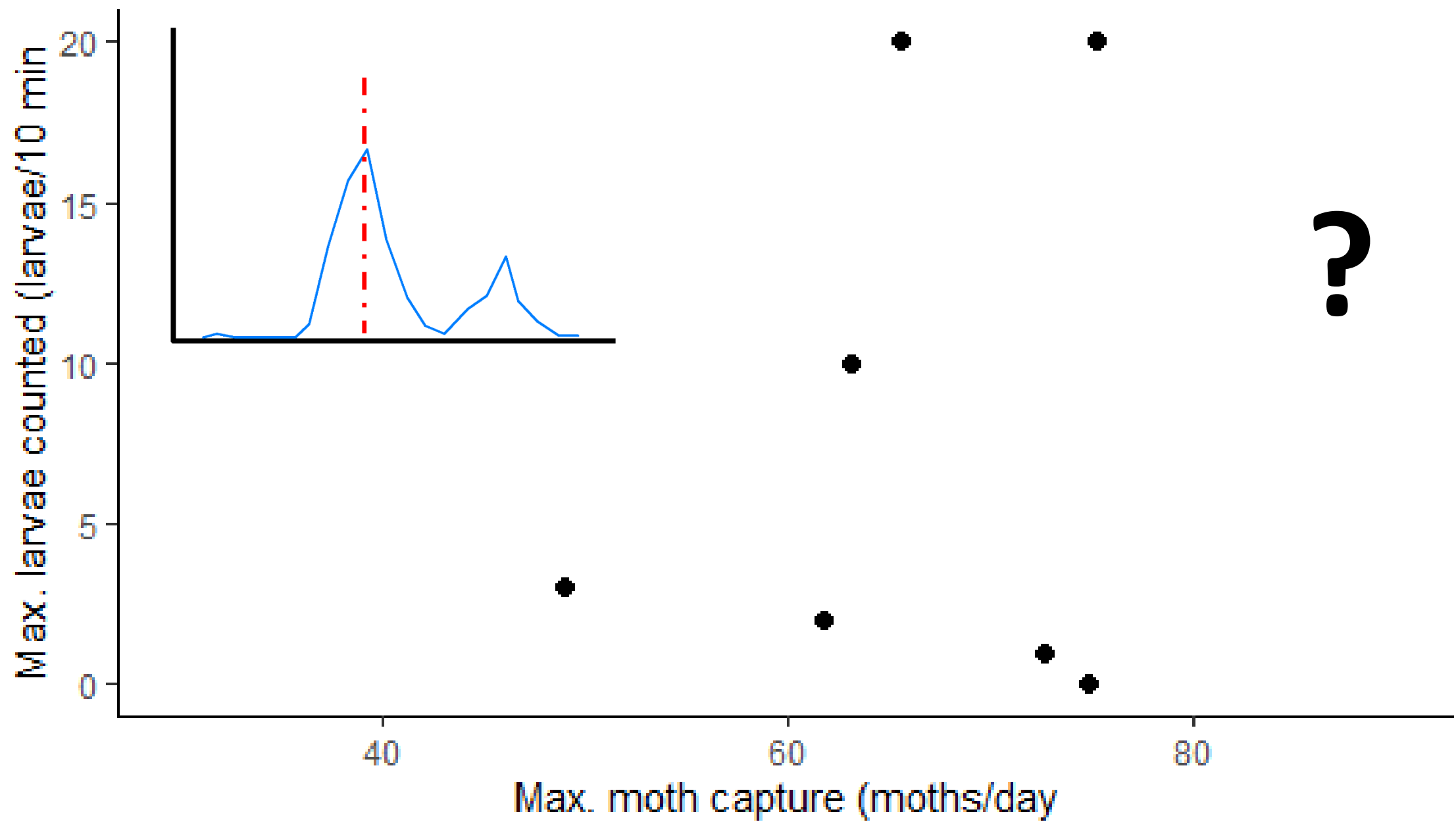
08/25

09/22



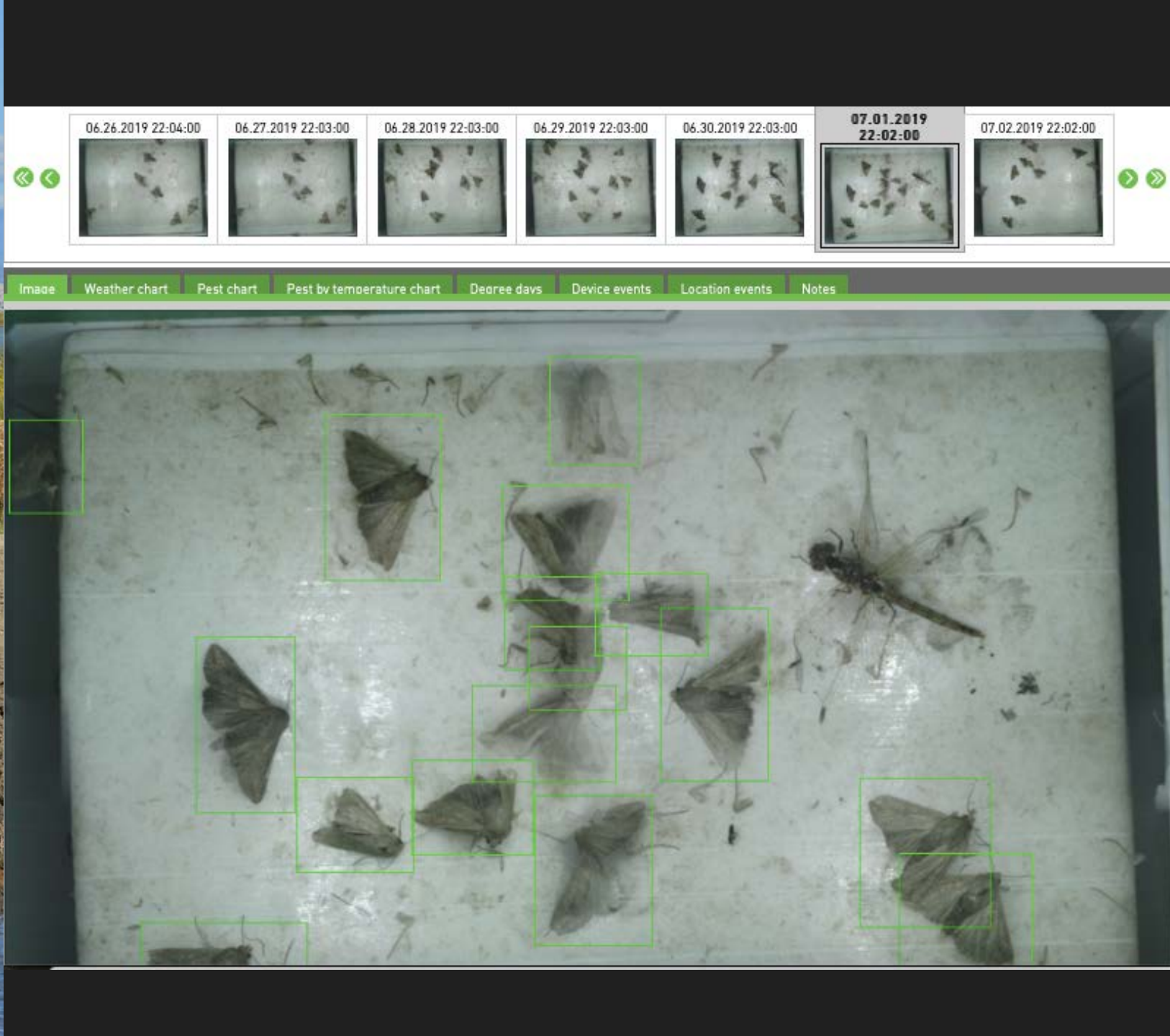
Number of larvae of each stage

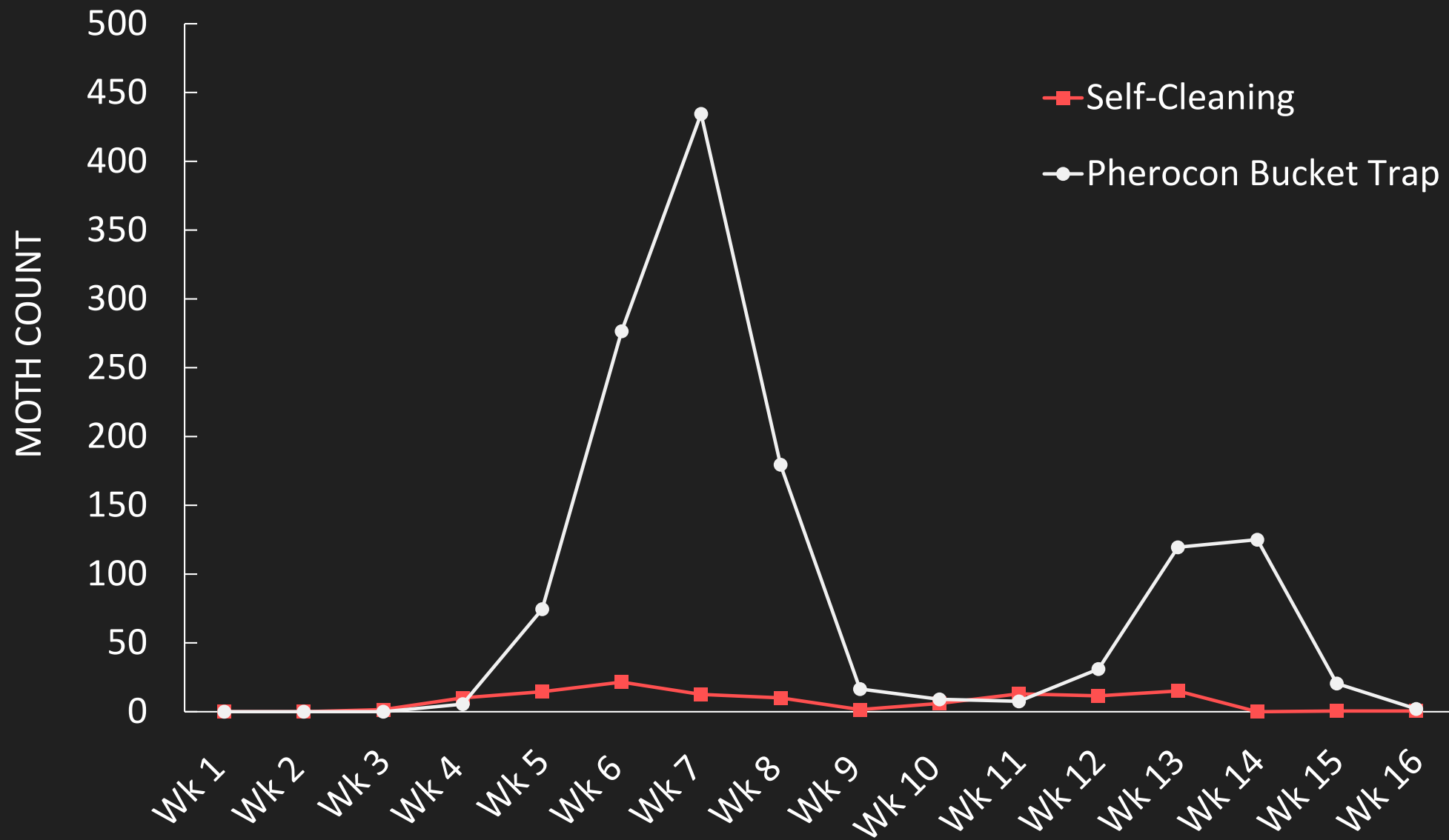












Insecticide screening – true armyworm

Treatment	Rate/ac	0 DAT	3 DAT	5 DAT	7 DAT	% reduction
Untreated	--	3.00	2.17	1.33	1.17	--
Dimilin	8 oz	2.83	1.58	1.42	0.25*	78.63
Intrepid	10 oz	2.08	1.17	0.17*	0.00*	100
Warrior	2.56 oz	3.42	1.33	1.67	0.33*	71.79
Prevathon	14 oz	4.92*	2.33	0.83	0.00*	100
SpearLep + DiPel	2 pints + 1 lb	3.83	1.50	1.00	0.50*	57.26
DiPel	1 lb	2.75	1.50	1.00	0.25*	78.63
Coragen	3.5 oz	2.67	0.92	0.50	0.08*	93.16



Defoliation Trial

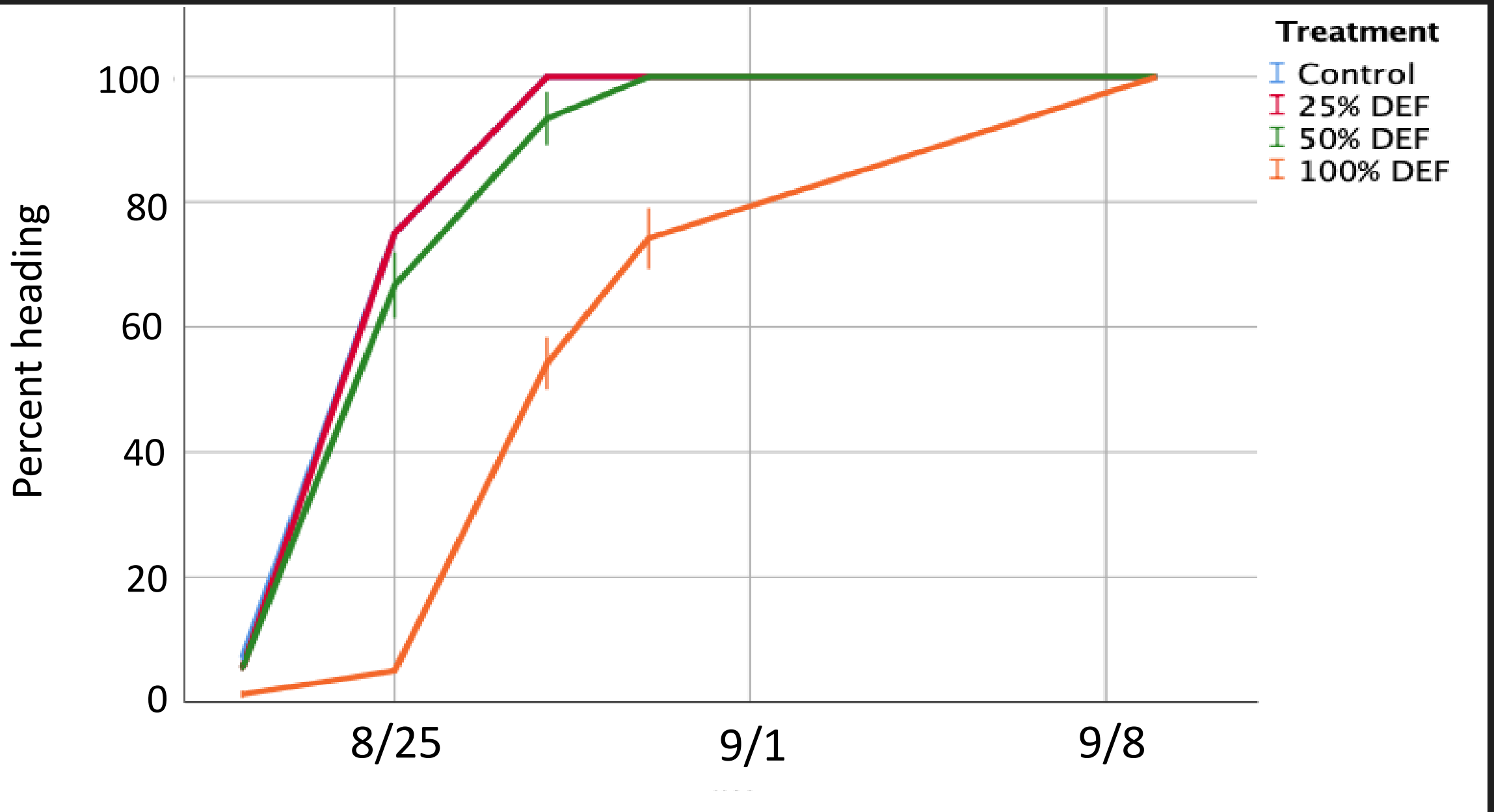
- M206, 6/15
- Treatments
 - No defoliation
 - 25% height above water
 - 50% height
 - 100% height
- 25% defoliated/day



Luis Espino

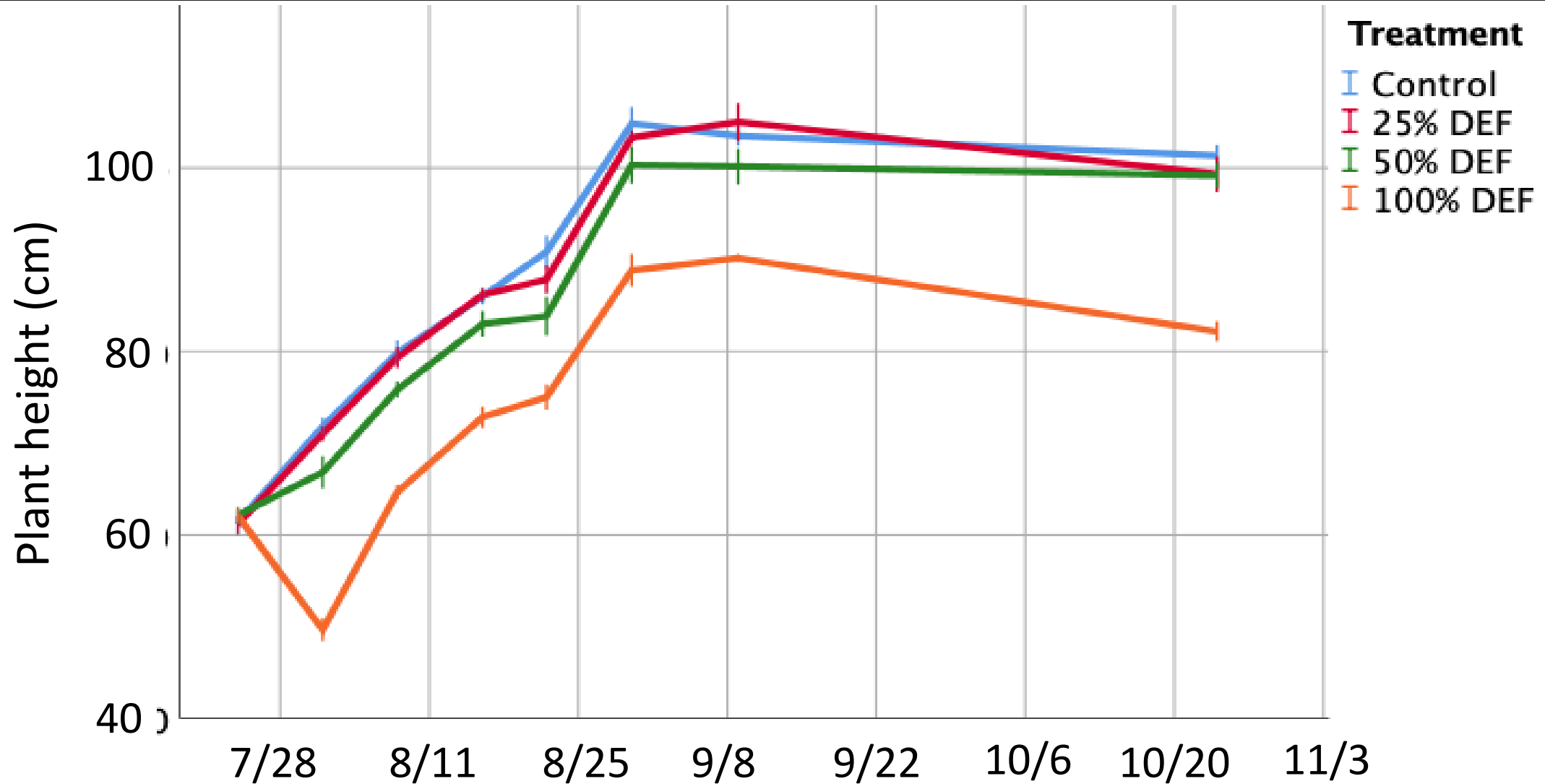
Defoliation Trial

Percent Heading



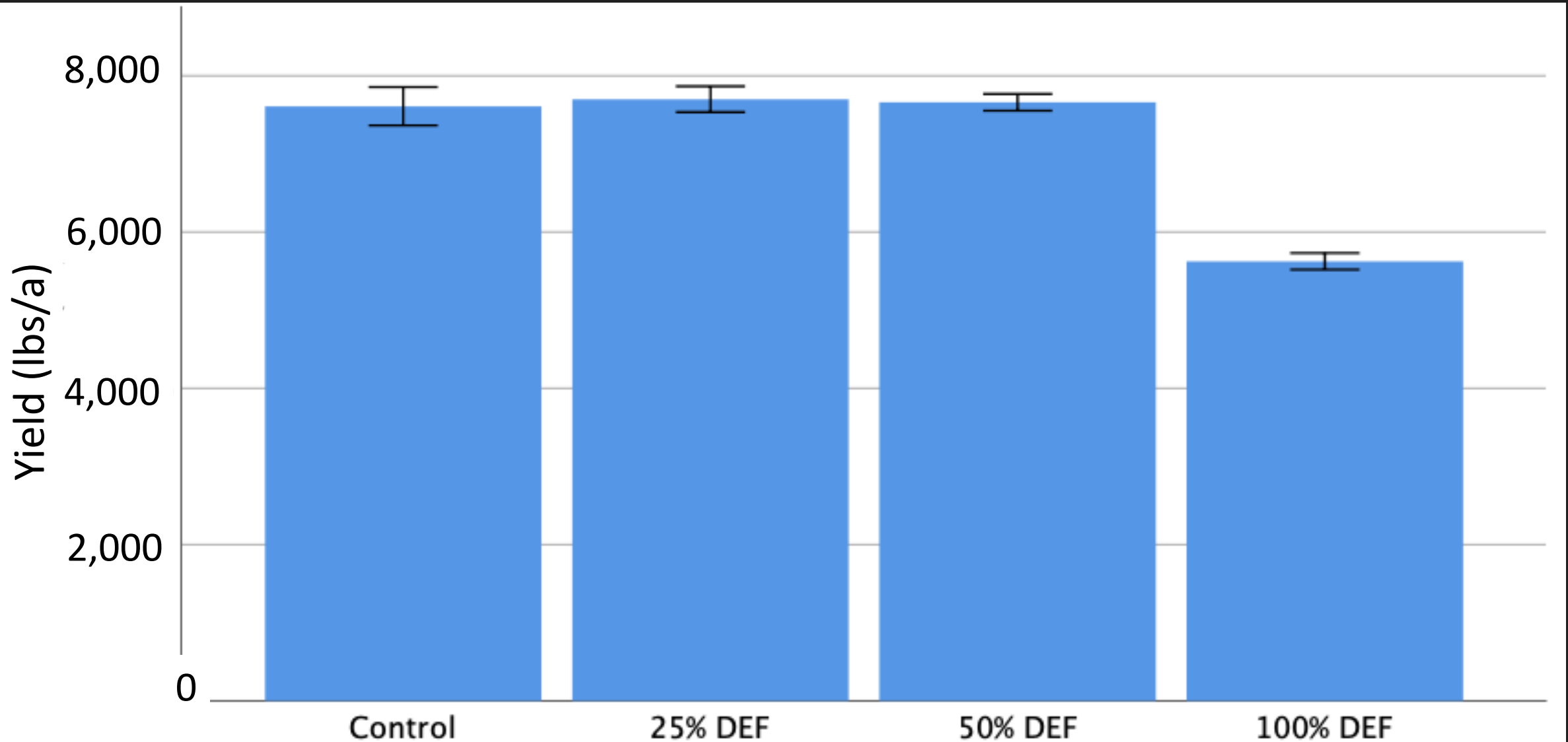
Defoliation Trial

Plant Height



Defoliation Trial

Yield



IPM for rice invertebrate pests

Severity of pests continues to change

- Decline of rice water weevil?
- How consistent of a problem will armyworms be?
- Issues with stink bugs and quality?
- Regulatory changes



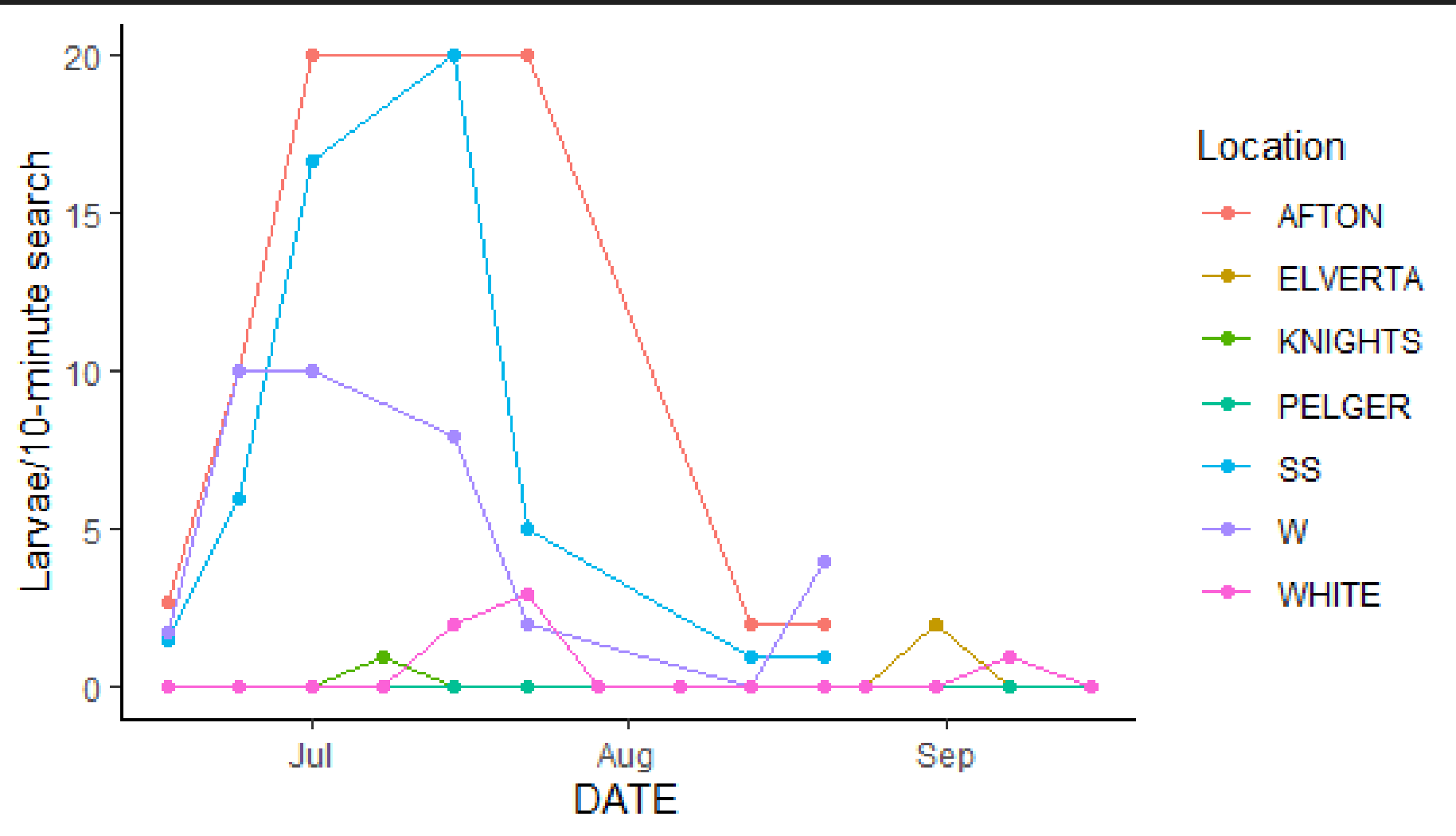
Acknowledgements

- California Rice Research Board
- Rice Experiment Station
- Kevin Goding
- Numerous other research assistants
- Corteva Agriscience



Questions/comments?





Improving Management of Rice Water Weevil: Insecticides

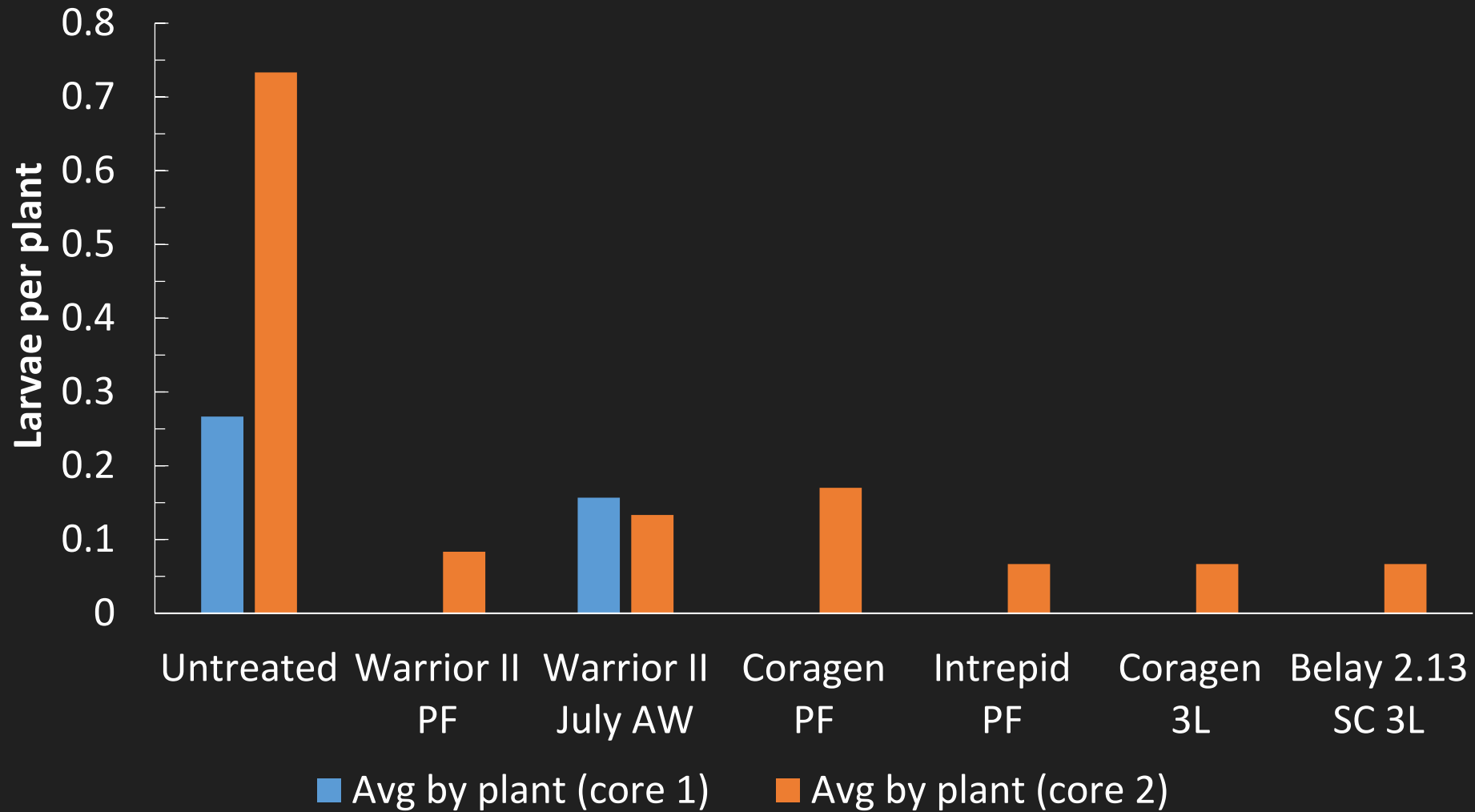
Screening in rings



Non-target large plot



Insecticides: Non-target plots



Insecticides: rings

	Treatment	Product/acre (fl. oz)	Timing	Larv/plant (core1)	Larv/plant (core2)
1	Untreated	---	---	0.15	0.20
2	Dimilin 2L	16	3 lsr	0	0.10
3	Dimilin 2L	8	3 lsr	0.13	
4	Warrior II	2.56	PF	0	0.25
5	Warrior II	2.56	3 lsr	0	0.25
6	Belay 2.13 SC	4.5	PF	0	
7	Belay 2.13 SC	4.5	3 lsr	0	0
8	Belay 2.13 SC	4.5	5-6 lsr	0	0.33
9	Mustang	4.3	3 lsr	0	
10	Coragen	6.1	PF	0	0.07
11	Coragen	6.1	3 lsr	0.27	0.06
12	Coragen	7.6	5-6 lsr	0	0



Insecticides: Non-target plots

Treatment	Rate (lbs AI/A)	Formulation per A (fl. oz./A)	Timing
Untreated	--	--	--
Warrior II	0.04	2.56	Pre flood
Warrior II	0.04	2.56	Late June-early July
Coragen	0.12	7.6	Pre flood
Intrepid	0.18	10	Pre flood
Coragen	0.12	7.6	3-leaf
Belay 2.13 SC	0.09 lbs	4.5	3-leaf

Host plant resistance

- A goal for improved RWW management
- Information on susceptibility for new varieties
- Previous work has indicated that “newer” varieties better withstand RWW

Trt.	Rice Variety	Infestation/Treatment
1	S-102	Treated pre-flood
2	M-105	Treated pre-flood
3	M-206	Treated pre-flood
4	M-209	Treated pre-flood
5	M-205	Treated pre-flood
6	L-207	Treated pre-flood
7	A-201	Treated pre-flood
8	S-102	Infested
9	M-105	Infested
10	M-206	Infested
11	M-209	Infested
12	M-205	Infested
13	L-207	Infested
14	A-201	Infested

Host plant resistance

