

Developing Trap and Kill Technologies
to Improve Management of the
Western Spotted and Striped
Cucumber Beetles (*Diabrotica
undecimpunctata*) and (*Acalymma
trivittatum*)


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Western Spotted Cucumber Beetle

* Wide
host
range





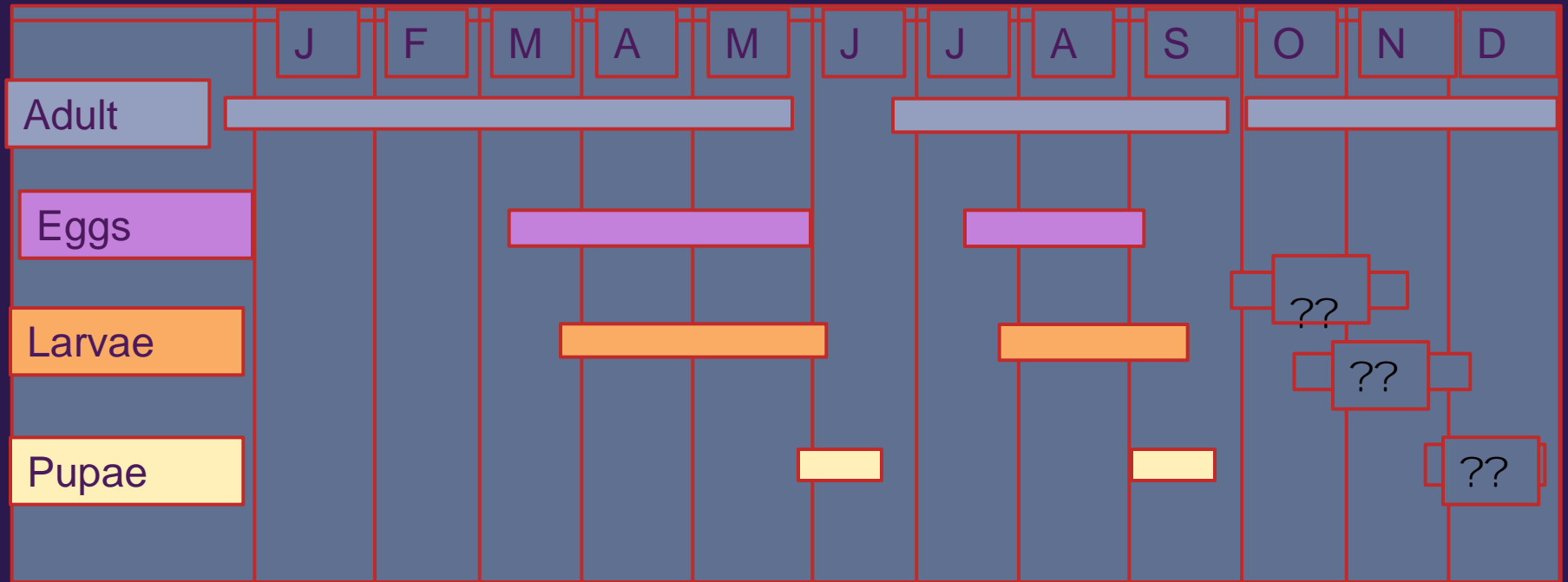
G304-22







Lifecycle



Western Striped Cucumber Beetle





Current Beetle Control

*Insecticide



www.ipm.iastate.edu/ipm/icm/files/images/spra.

Alternative Beetle Control

* Trap cropping

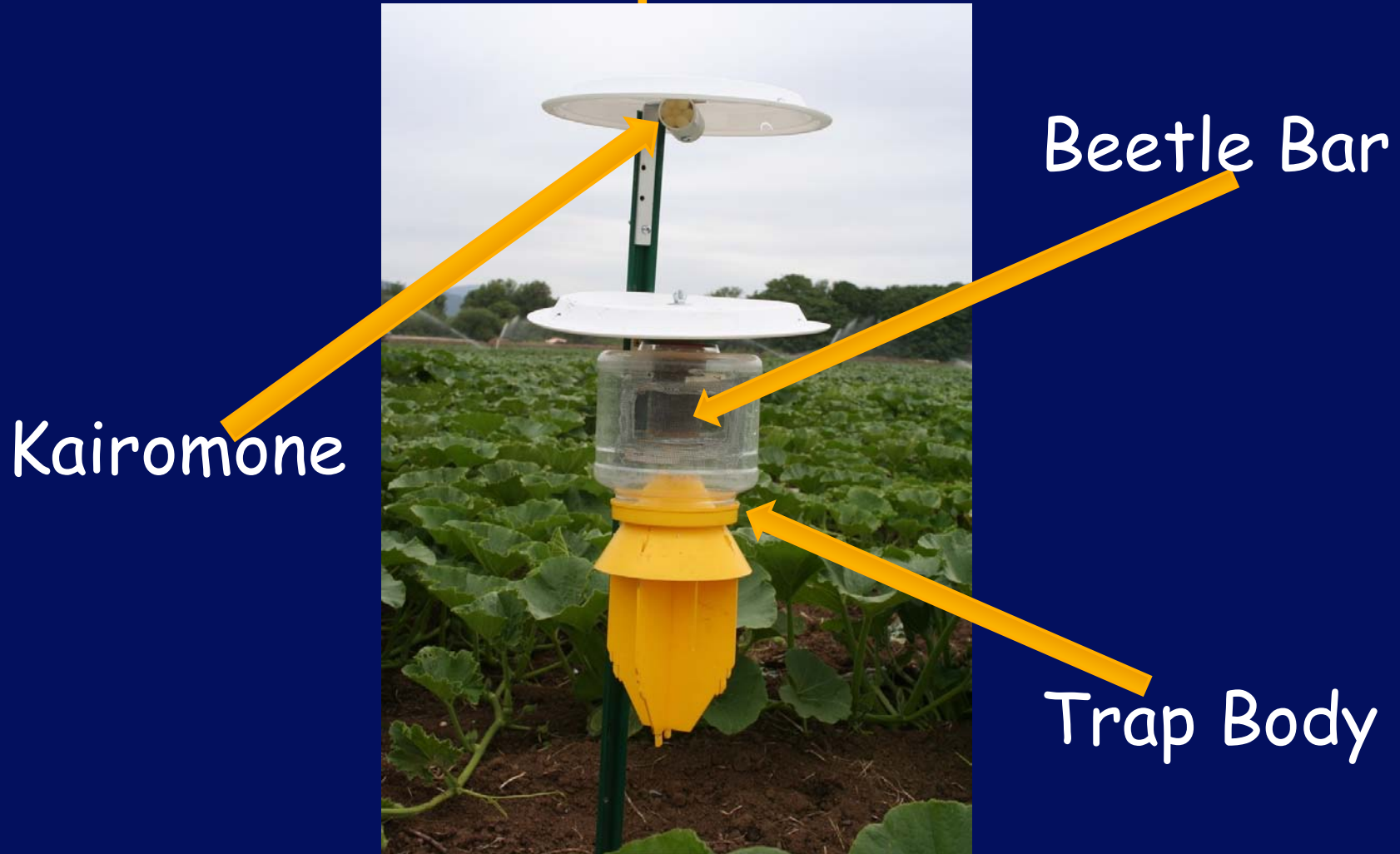


Alternative Beetle Control

*Exclusion



OSU Lab Trap



*Limits and contains pesticides.

Kairomone

* Kairomone

* (Ibb)

* indole,

* beta-ionone,

* and benzyl alcohol.



Beetle Bar - Cucurbitacin E

- * Bitter Hawkesbury Melon (BHM)
- * Ingredients
 - * BHM pulp,
 - * BHM juice,
 - * sodium benzoate,
 - * xanthum gum,
 - * entrust.



Objectives

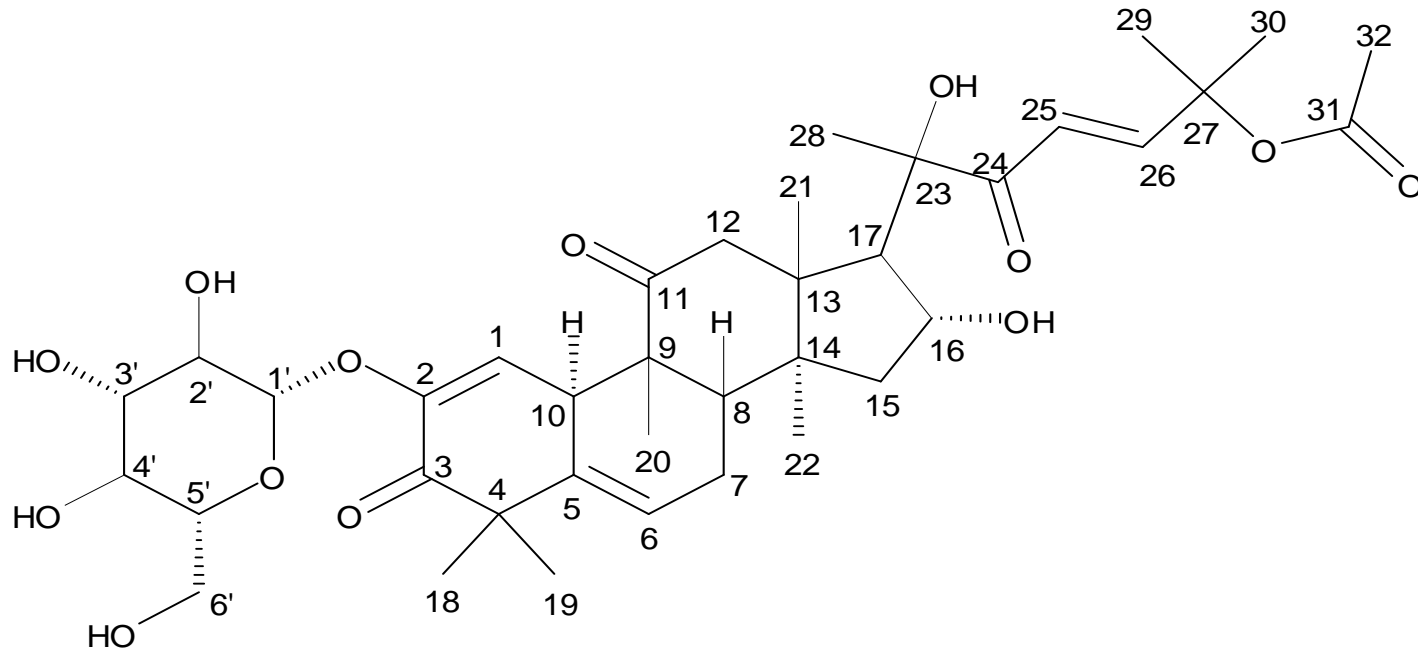
- * 1. Evaluate the effect of temperature on the degradation of the cucurbitacin in BHM components of the beetle bar.
- * 2. Evaluate kairomone lure longevity under field conditions.
- * 3. Evaluate effectiveness of alternative trap designs on beetle capture rate.

Cucurbitacin E glycoside Isolation

- * Fred Stevens lab.
- * BHM juice was isolated and ran on Mass Spec and NMR.



Cucurbitacin E glycoside Isolation



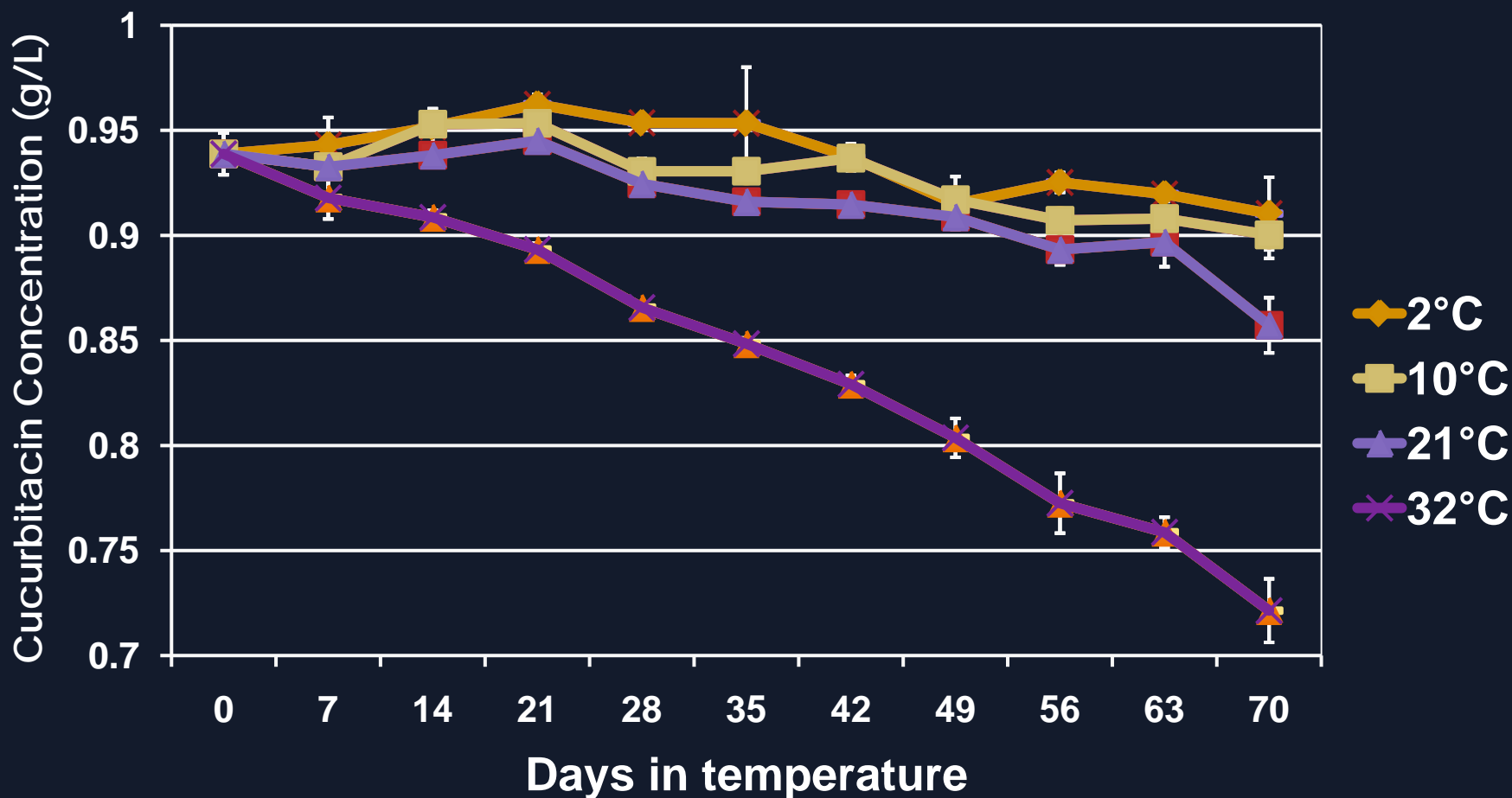
Chemical Formula: $C_{38}H_{54}O_{13}$
Exact Mass: 718.3564

Fred Stevens and lab confirmed the compound to be
Cucurbitacin E glycoside

Cucurbitacin E glycoside Degradation

- * Quantified with high-pressure liquid chromatography (HPLC)
- * Temperatures of 2, 10, 21, and 32° C
- * Ten week period, sampling at 1 week intervals.

Cucurbitacin E-glycoside Degradation



Treatment: Temp (C)	10	21	32
2	0.09	<0.01	<0.01
10		0.11	<0.01
21			<0.01

Objectives

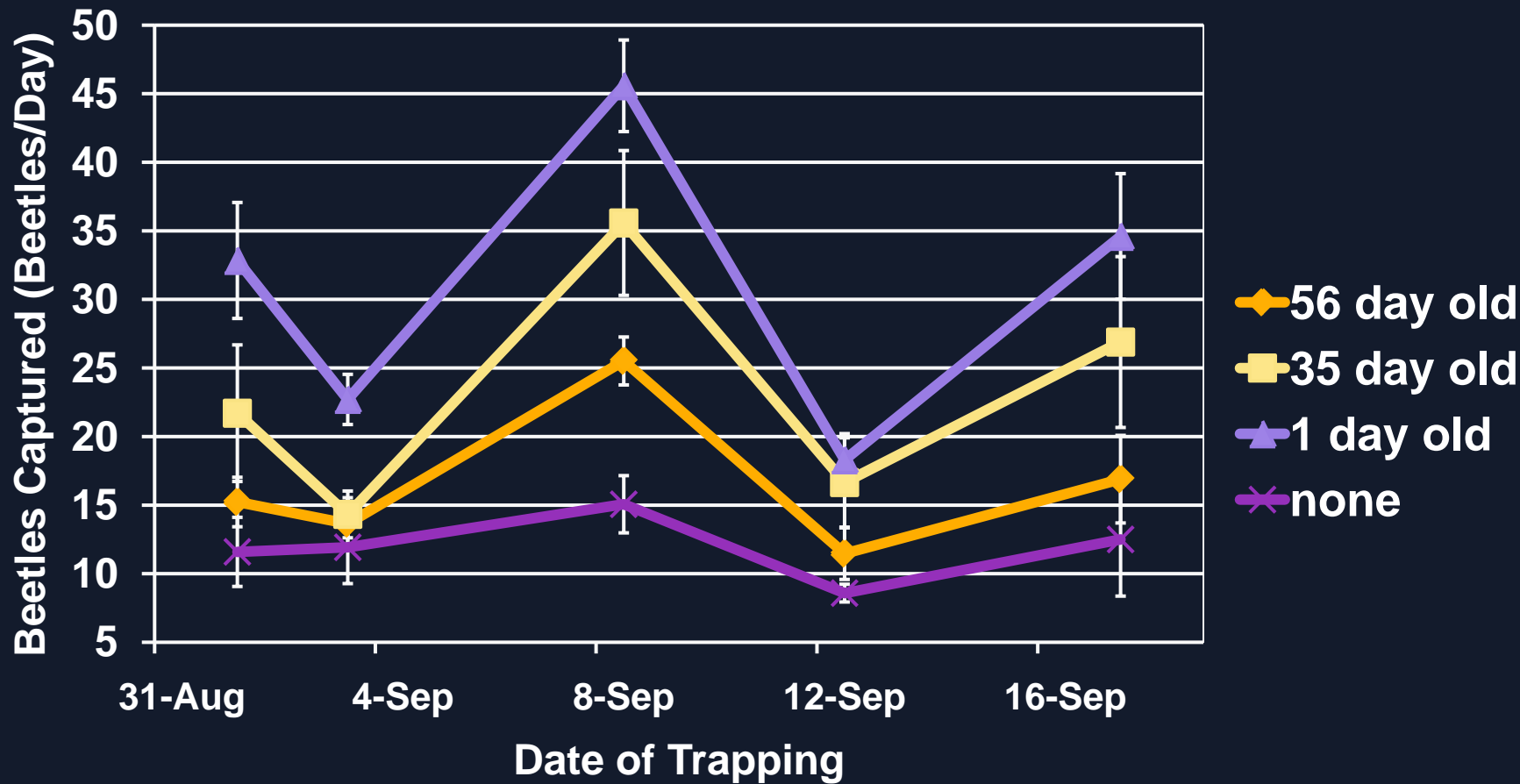
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Kairomone Degradation

- * Kairomones prepared 56 days, 35 days, and 1 day prior to the experiment.
- * control of no kairomone lure.

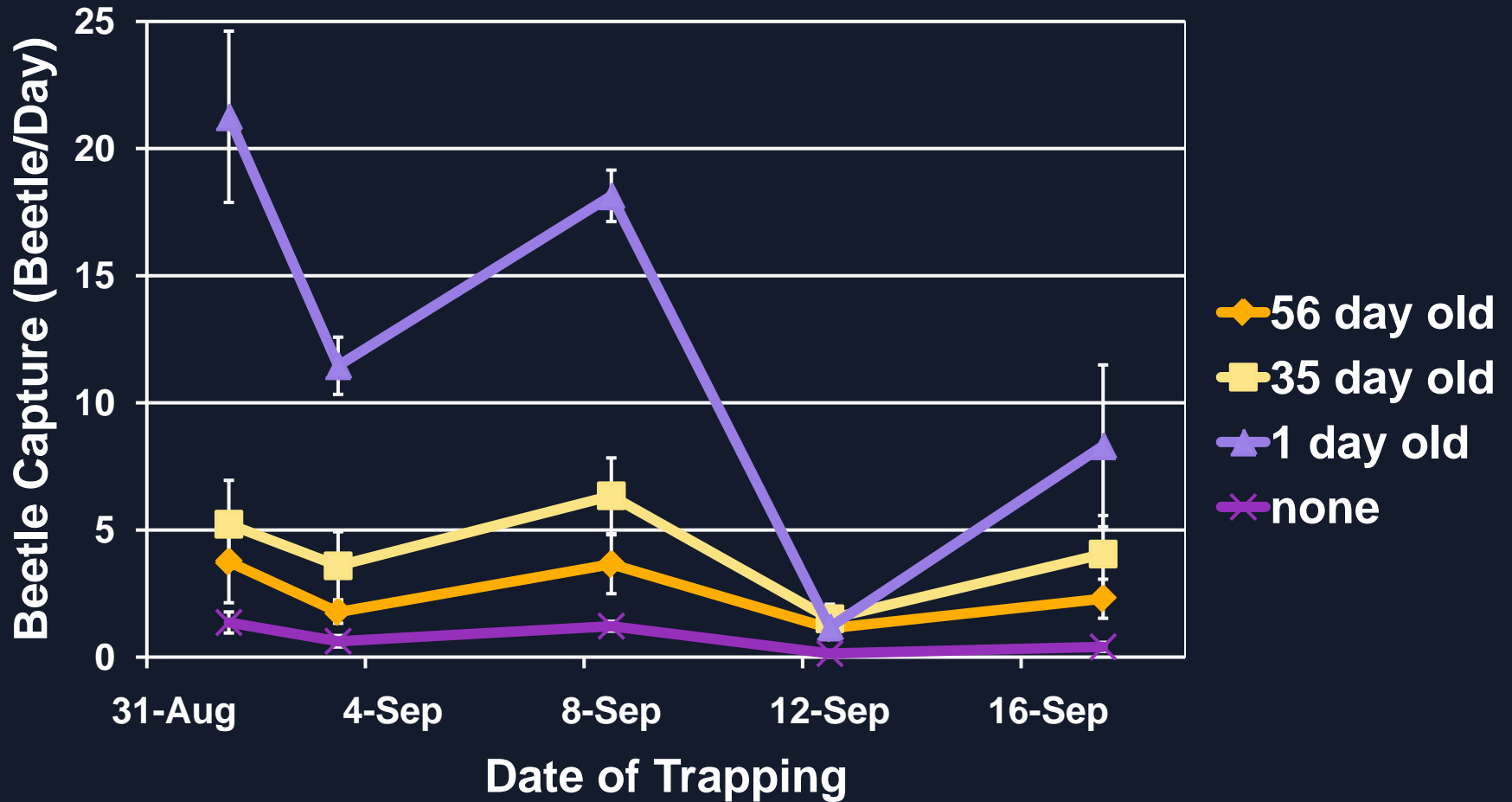


Kairomone Degradation: Spotted



Treatment: IBb Age (days)	56	35	1
Control/none	0.14	<0.01	<0.01
56		0.05	<0.01
35			0.02

Kairomone Degradation: Striped



Treatment: IBb Age (days)	56	35	1
Control/none	0.25	0.05	<0.01
56		0.31	<0.01
35			<0.01

Objectives

- * 1. Evaluate the effect of temperature on the degradation of the cucurbitacin in BHM components of the beetle bar.
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- * 3. Evaluate effectiveness of alternative trap designs on beetle capture rate.

Alternative Trap Design

OSU Lab
Trap



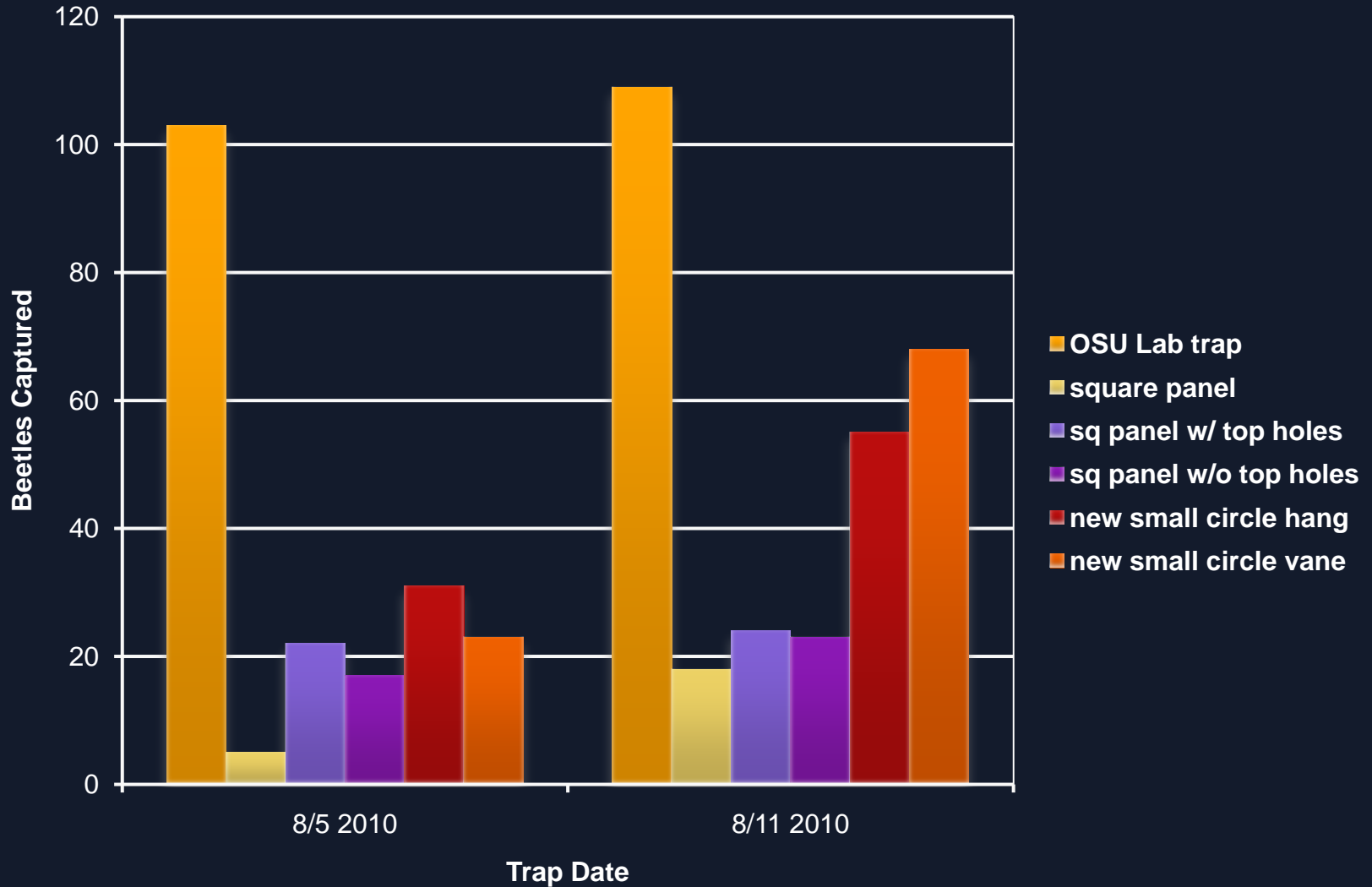
Alternative Trap Design



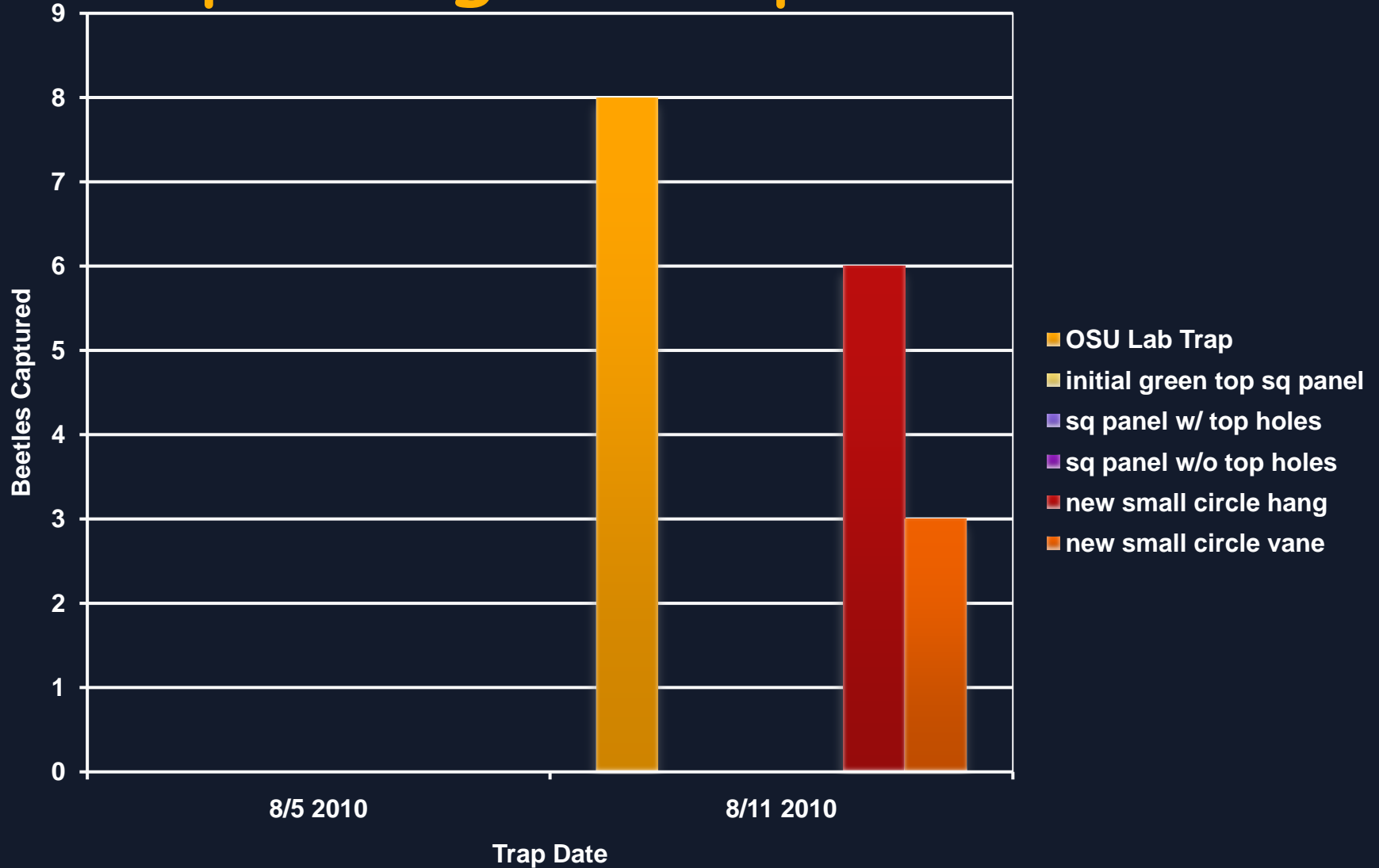
Alternative Trap Design



Trap Design: Spotted



Trap Design: Striped



Trap Modifications

- * Trap Modifications

- * Kairomone "Mini-lure" modification.

- * Beetle Bar dilution modification.

- * Vent modification.

Kairomone Mini-lure

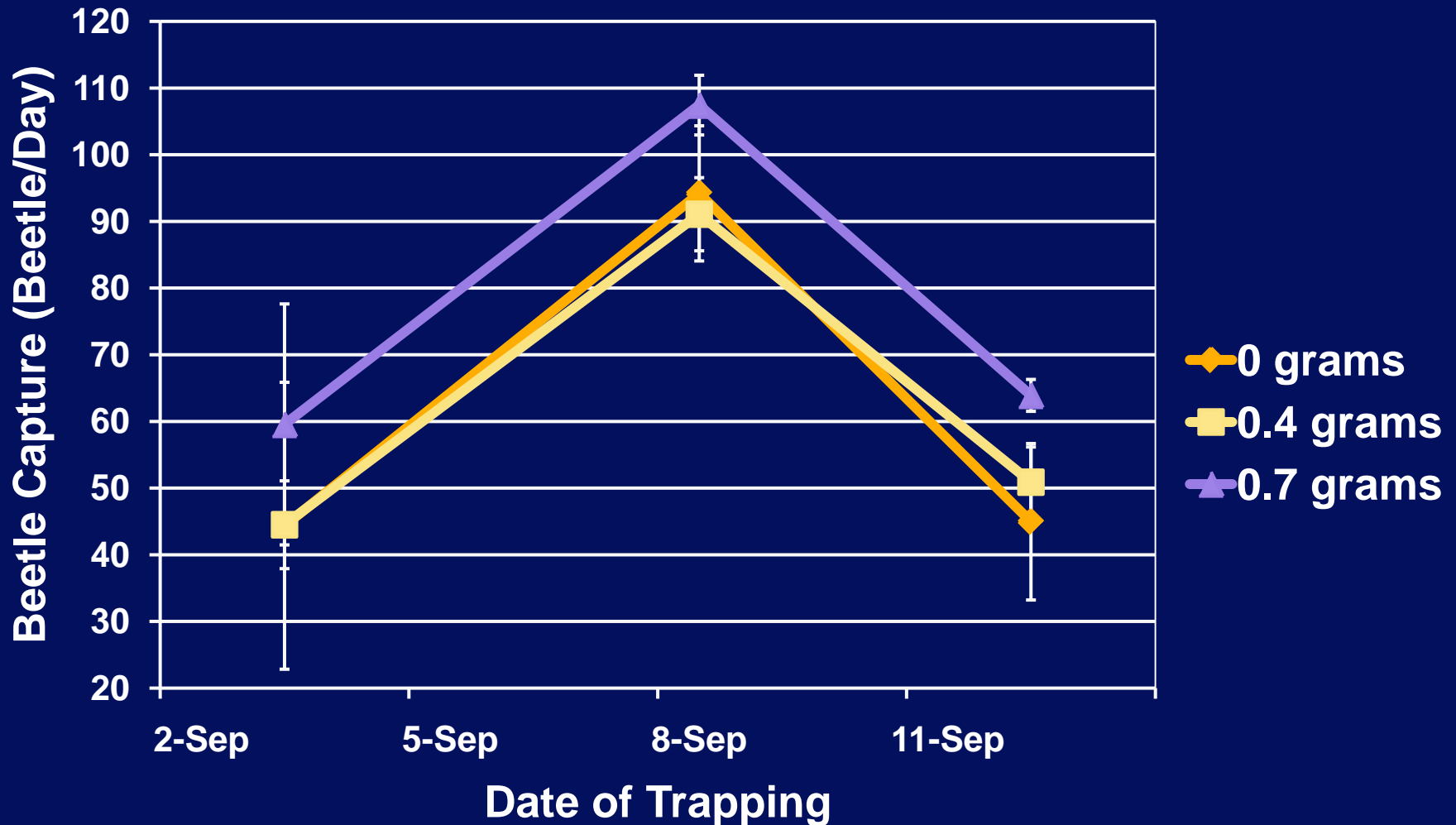
0 grams

0.4 grams

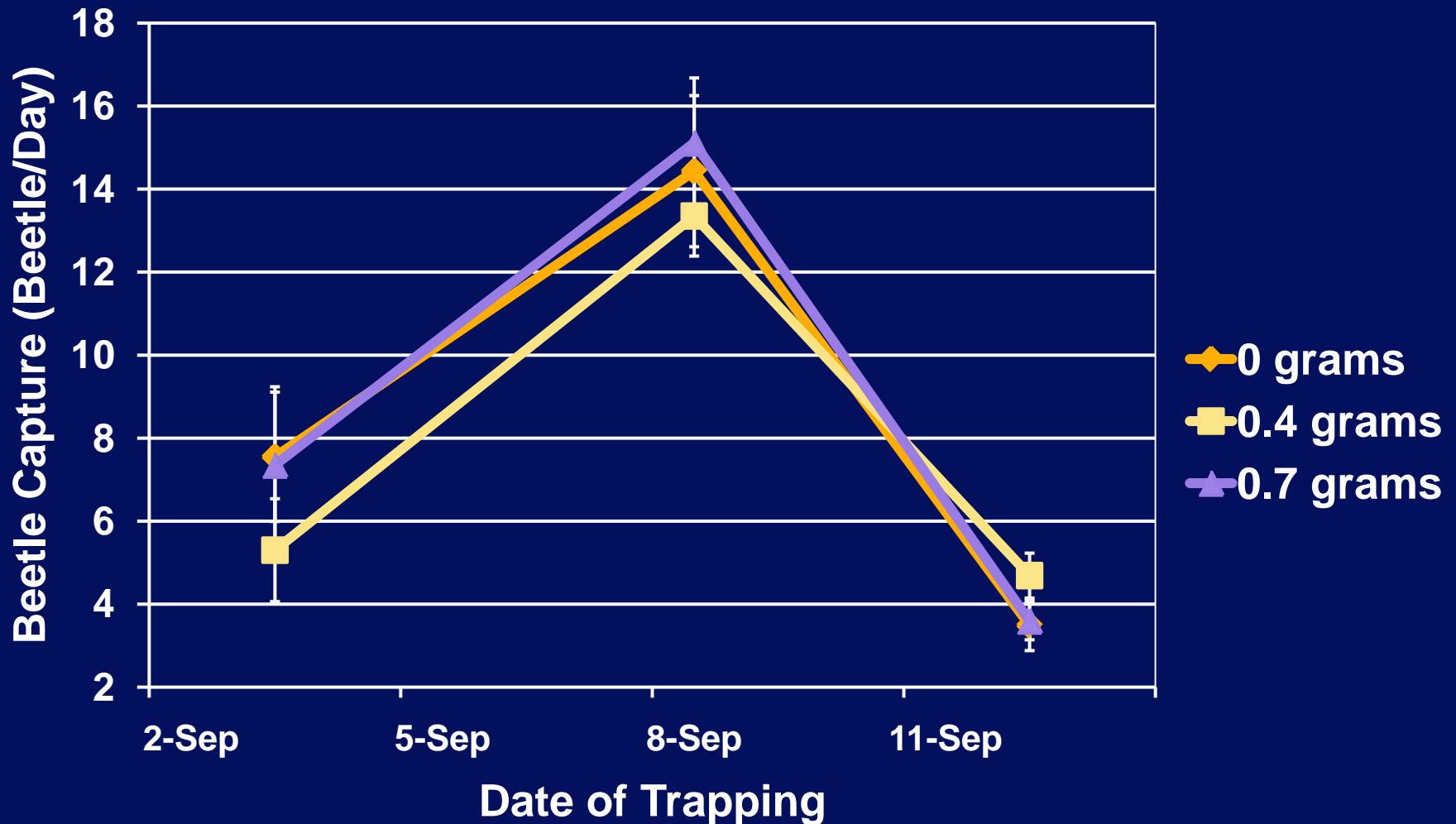
0.7 grams



Mini-lure: Spotted Beetles



Mini-lure: Striped Beetles

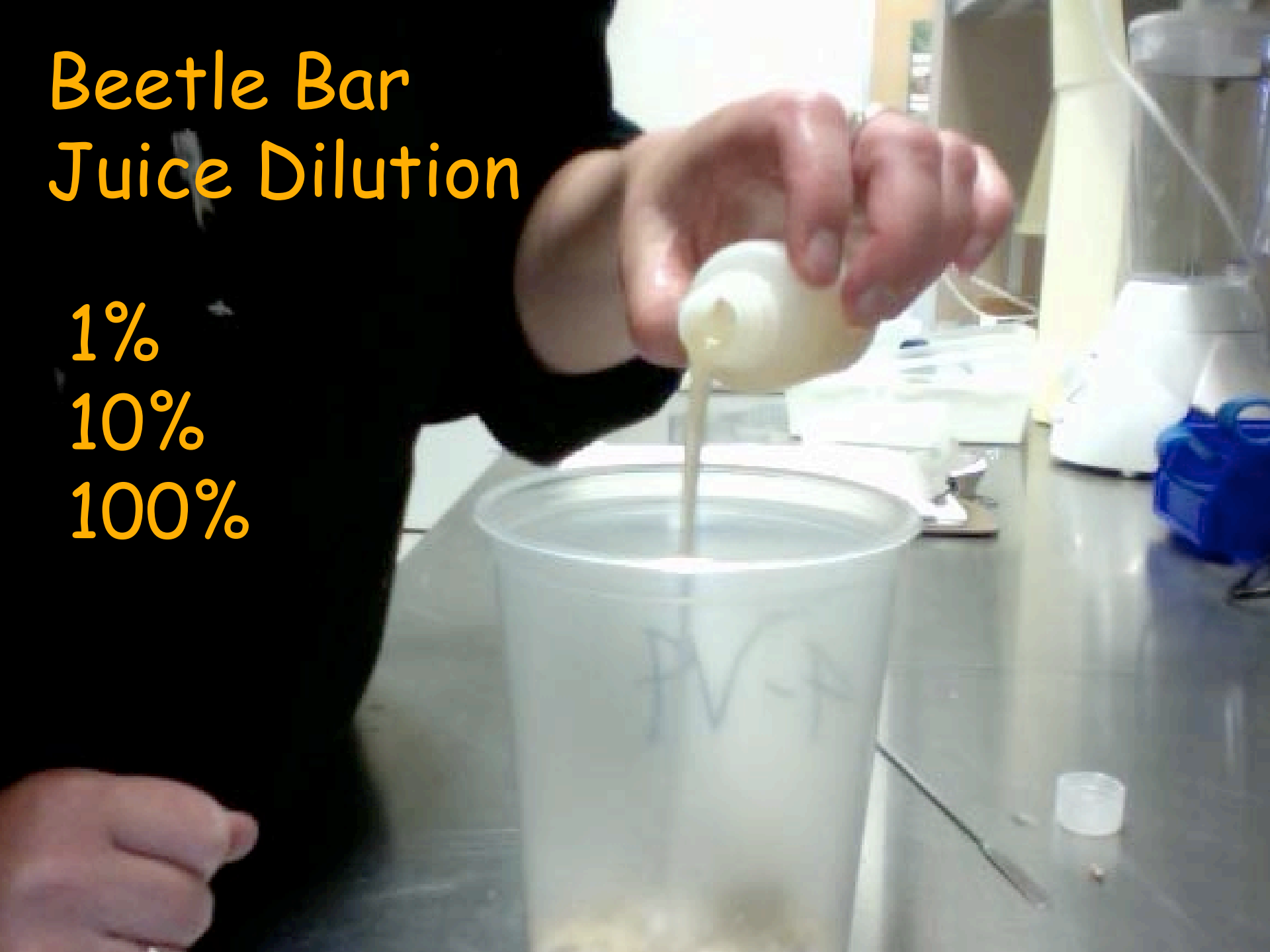


Beetle Bar Juice Dilution

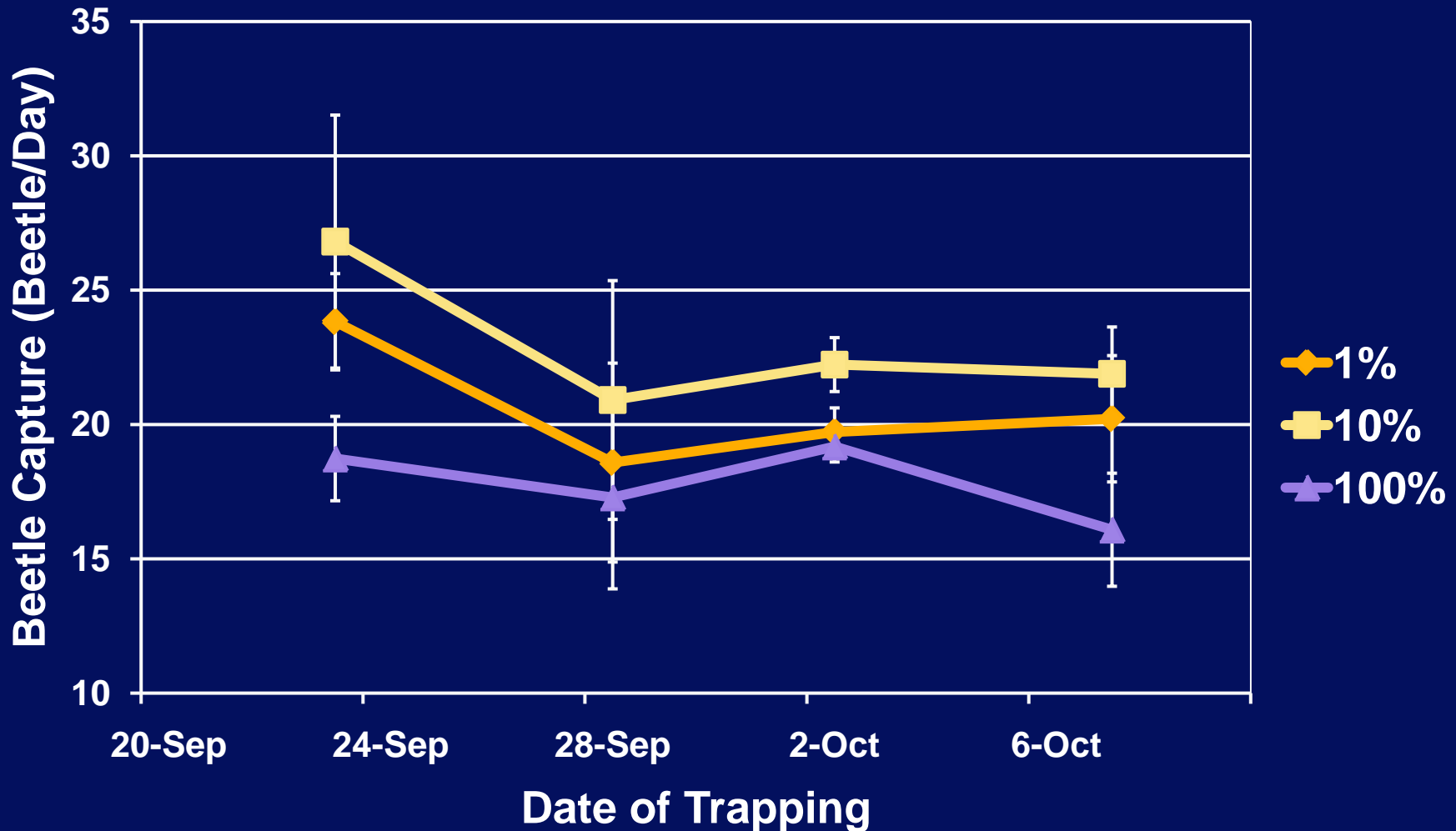
1%

10%

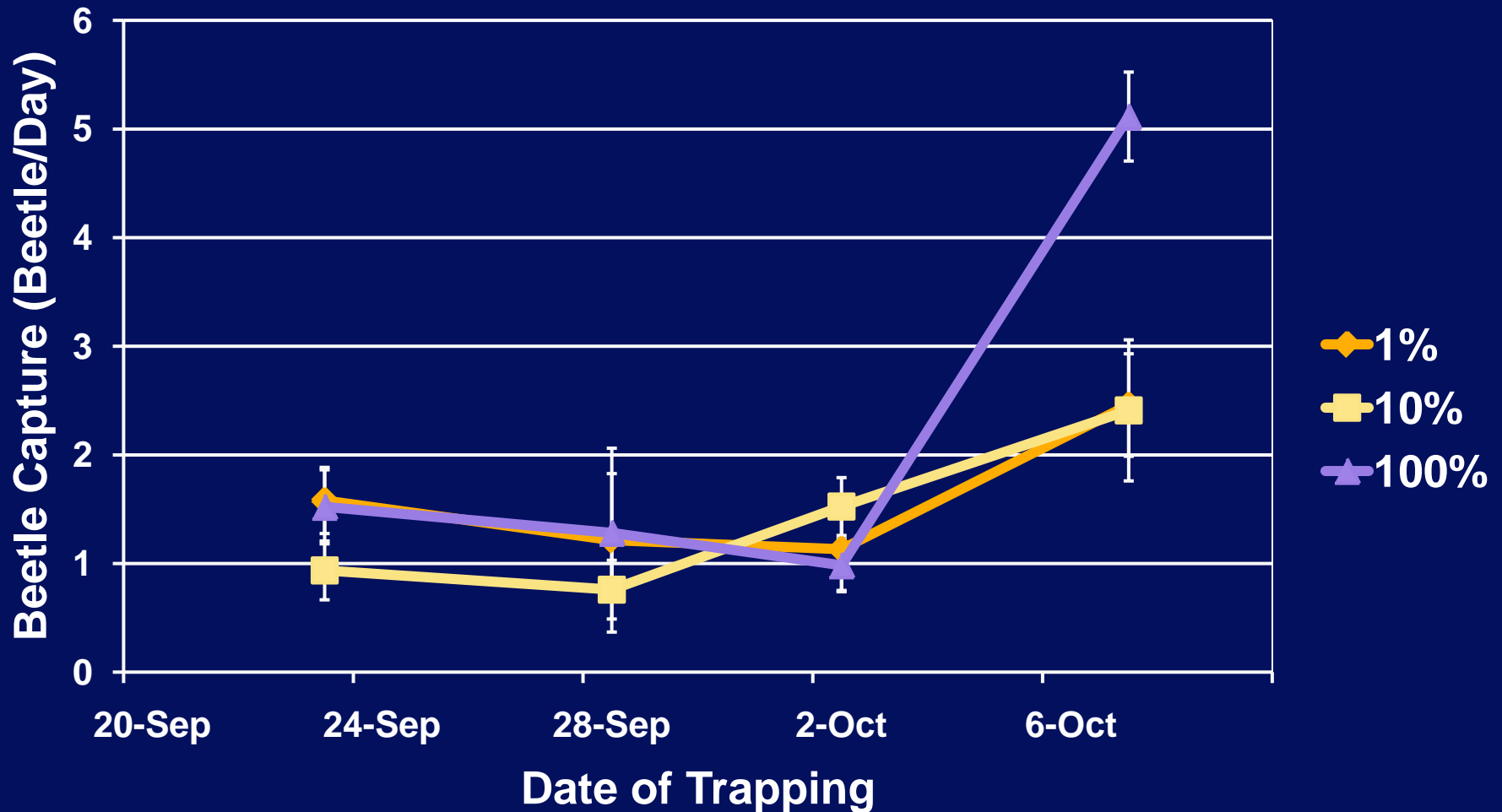
100%



Juice Dilution: Spotted Beetles



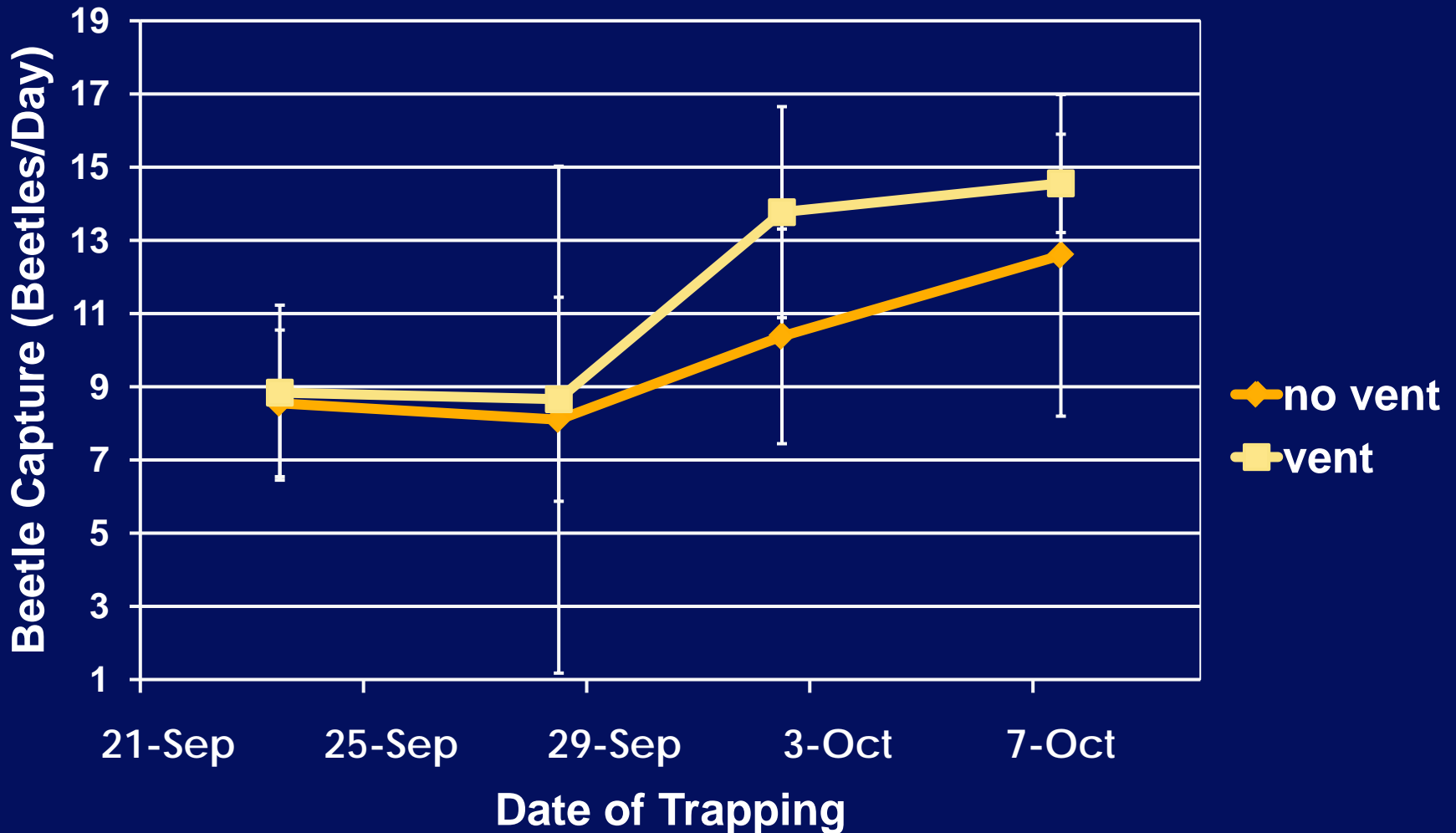
Juice Dilution: Striped Beetles



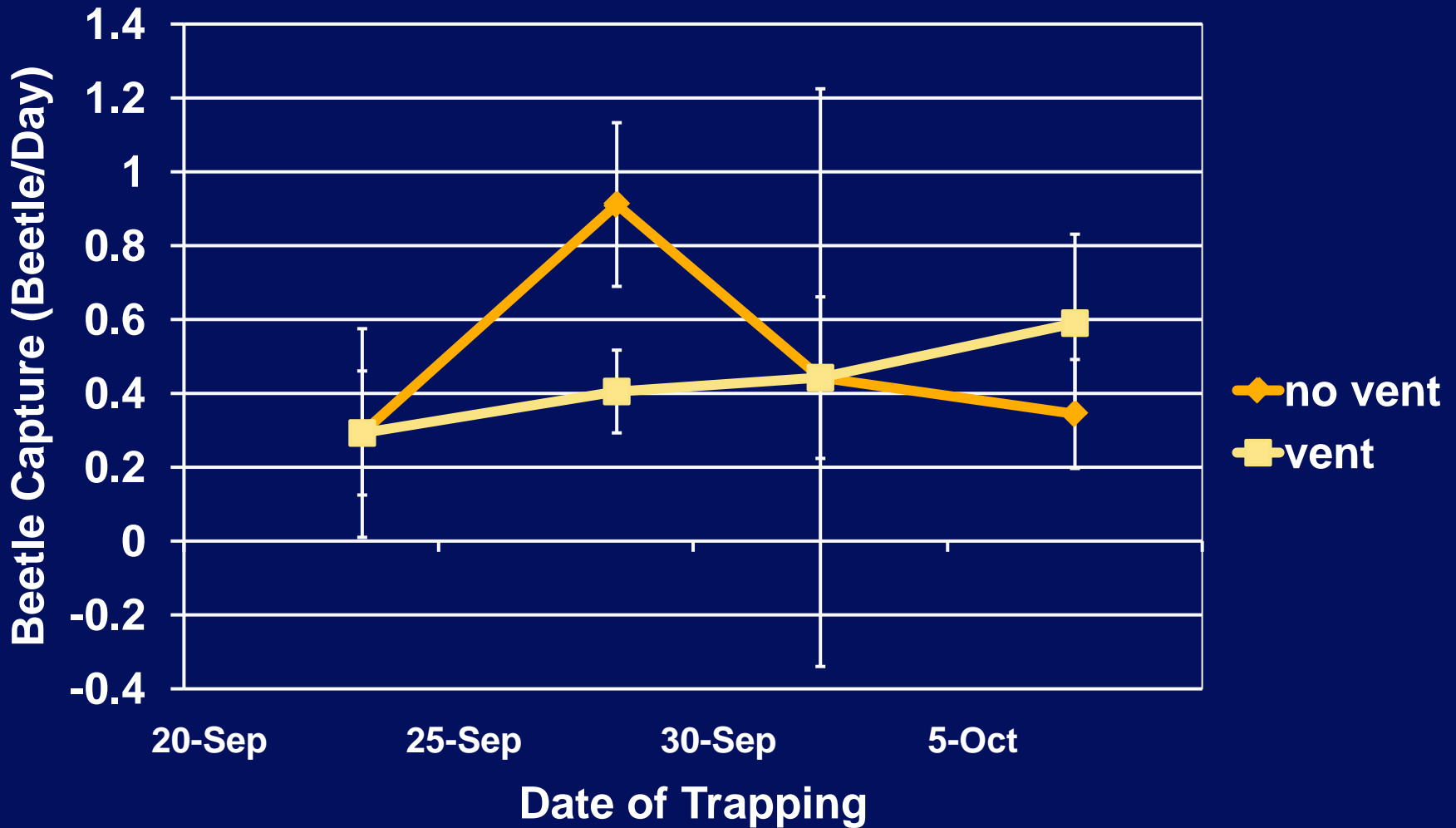
Vent



Vents: Spotted Beetles



Vents: Striped Beetles



Conclusions

- *1. Evaluate degradation of cucurbitacin in the beetle bar.
- * stable at temperatures at or below 21° C
- * Degradation is more rapid at 32° C

Conclusions

*2. Kairomone Degradation

- * Longevity of Kairomone is between 40-50 days in the field.

Conclusions

- * 3. Alternative traps and modifications.
 - * The yellow vane trap had higher observed capture rate
 - * The vent and mini-lure modifications did not increase beetle capture rate.
 - * The 10% BHM dilution increased beetle capture rate.

Acknowledgements

- * Special thanks to...
 - * John Luna, as my advisor.
 - * Jana Lee, secondary advisor, and the ARS for use of the controlled temperature chambers
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Questions