# Evaluation of *Acilius* larvae (Coleoptera: Dytiscidae) for **biocontrol** of **mosquito larvae**

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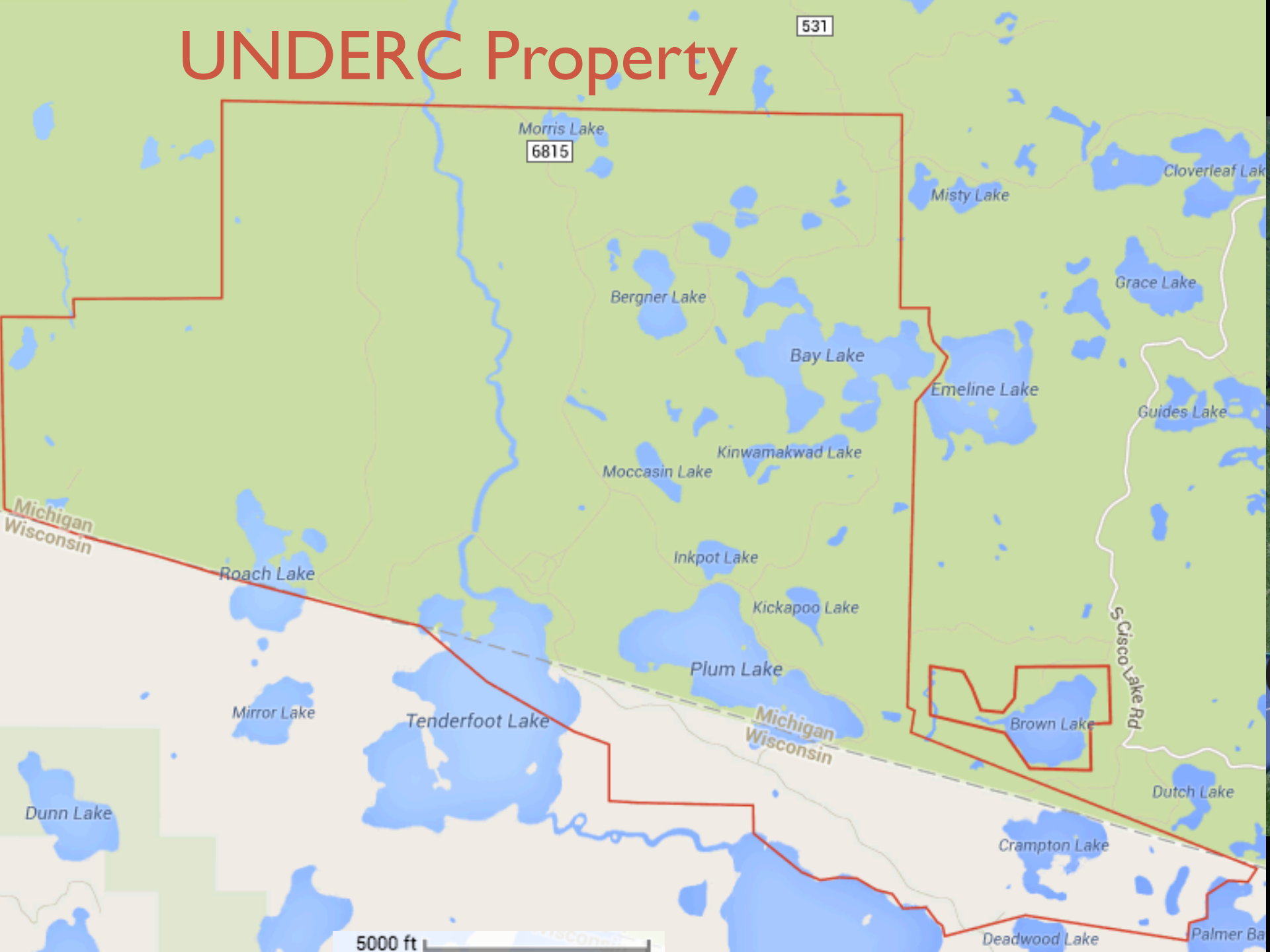
Photograph by Radek Sejkora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Misty Lake
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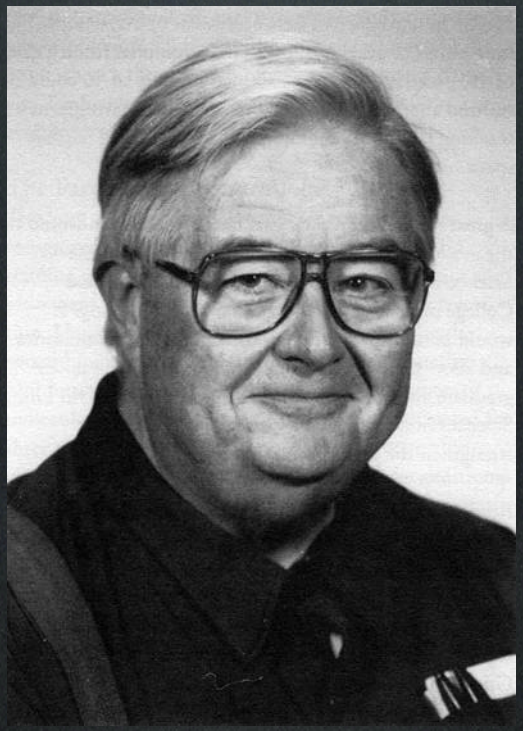
Photographs by Ivy Yen



George B. Craig, Jr.

# Research Goal

To determine if *Acilius* are potential candidates for the biological control of mosquito larvae.

# Why mosquitoes?

# Why mosquitoes?

# Mosquito Control

## Insecticides

Currently the most effective method, but harmful to environment and mosquitoes may gain resistance

## Biological Control

Recent work: copepods in Vietnam, mosquitofish in Australia

# Biocontrol: Predaceous Diving Beetles

- Voracious predators
- May have selective feeding habits
- Native and plentiful in many areas

Original photograph by Jan Hamrsky

# Experimental Overview

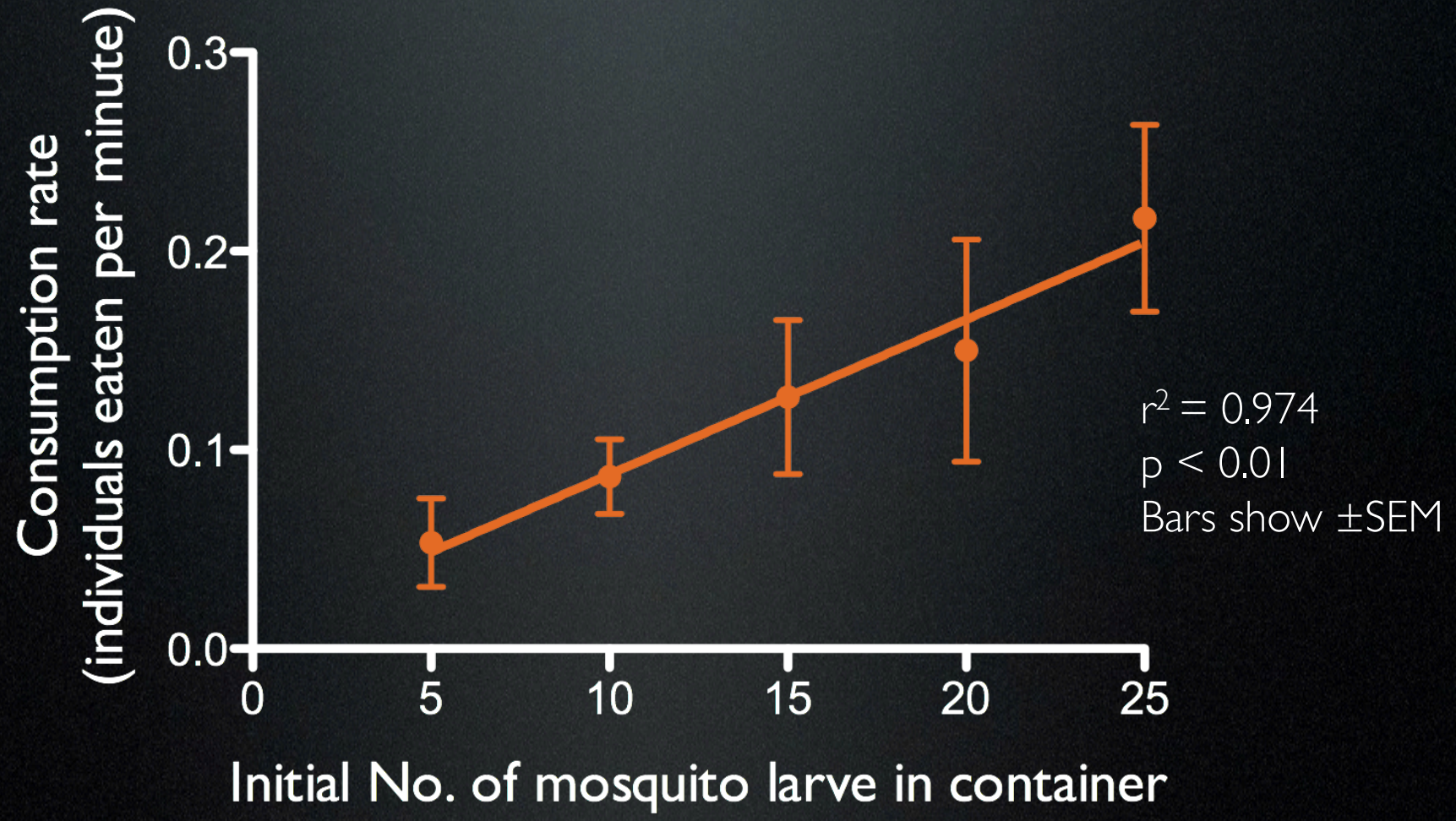
| Criterion for biocontrol | Experiment |
| --- | --- |
| Efficient predation | Predation rate assay |
| Long term effectiveness | Outdoor mesocosm trials |
| Selective Predation | Laboratory choice tests |

# Predation Rate Assay: Methods

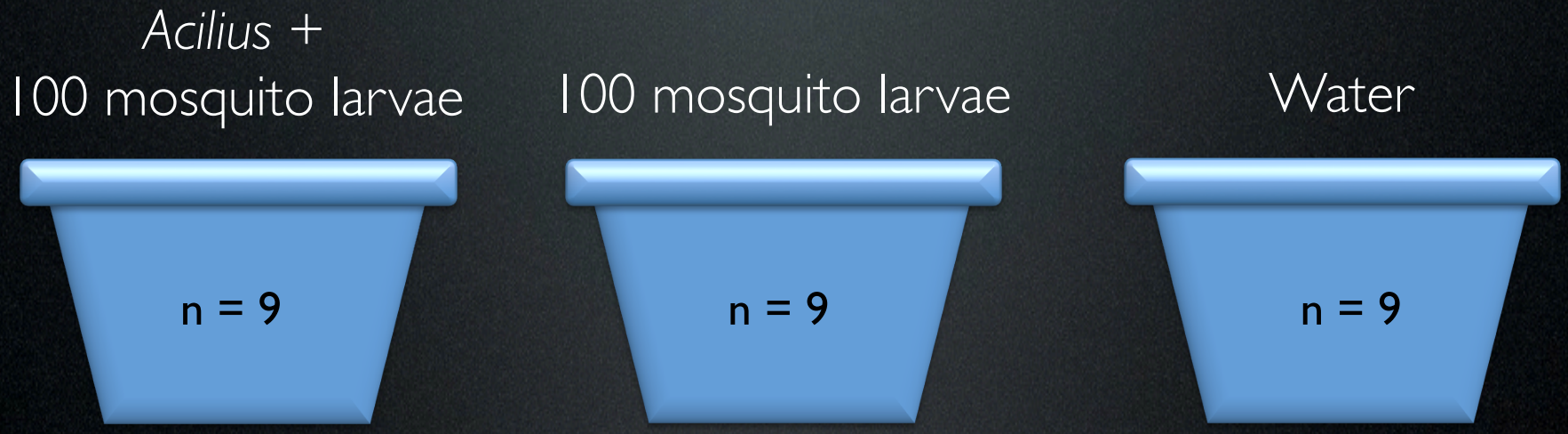
- Beetles (n = 10) starved for one day
- Placed singly into containers with different densities of mosquito larvae (5, 10, 15, 20, 25 individuals)
- Fed for 30 minutes. Repeated on 5 successive days

Hypothesis: *Acilius* beetles will consume mosquito larvae and increase predation rate at higher densities of prey

# **Results:** Predation rate increased as the initial density of mosquito larvae was increased



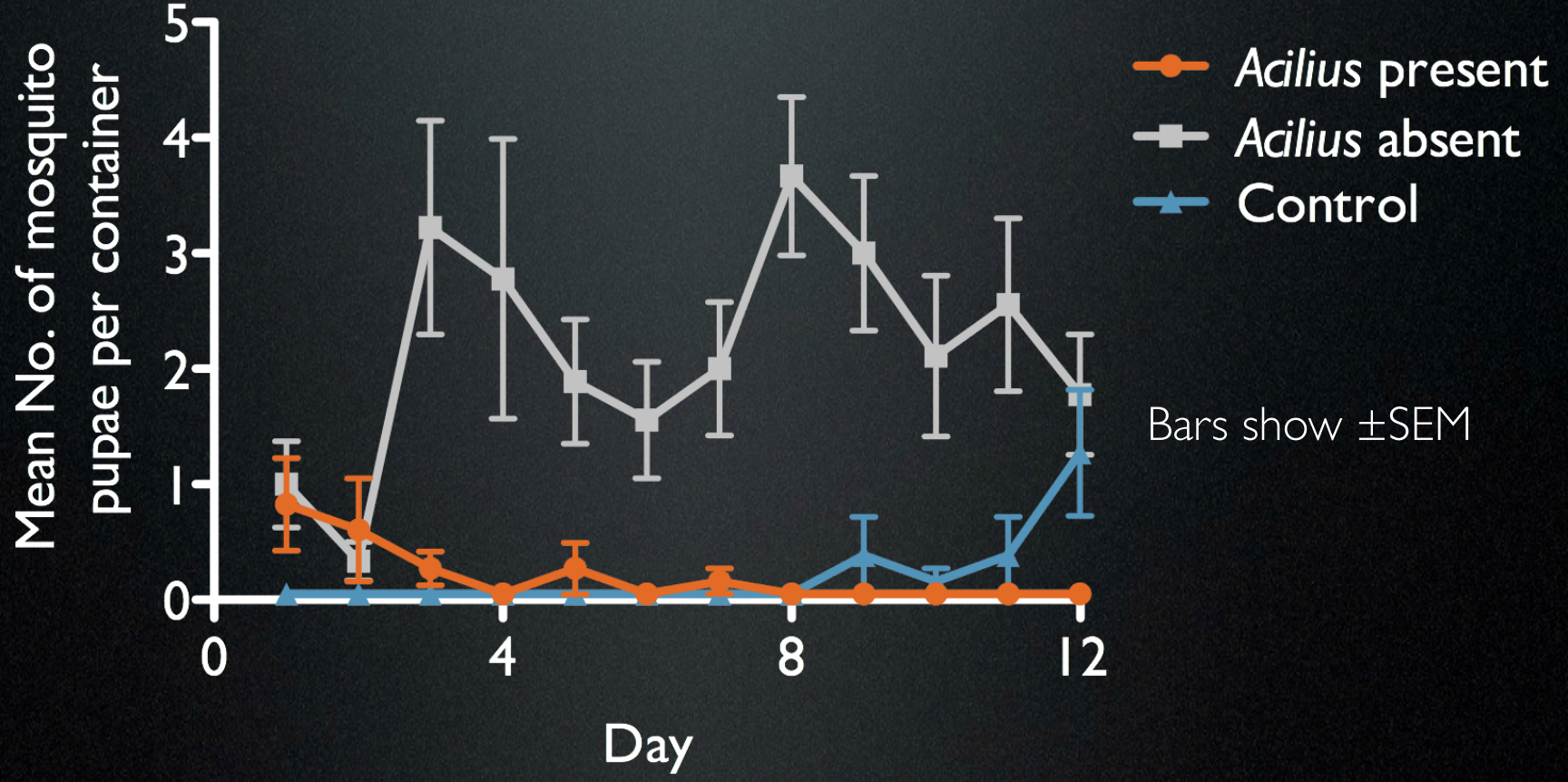
# Outdoor Aquatic Mesocosms: Methods




- Buckets placed outside and left open for new oviposition
- Checked every night for 12 days for appearance of mosquito pupae

Hypothesis: *Acilius* will consume mosquito larvae before pupal stage can be reached, including larvae that result from oviposition

# **Results:** Buckets with *Acilius* produced less mosquito pupae than buckets without *Acilius**



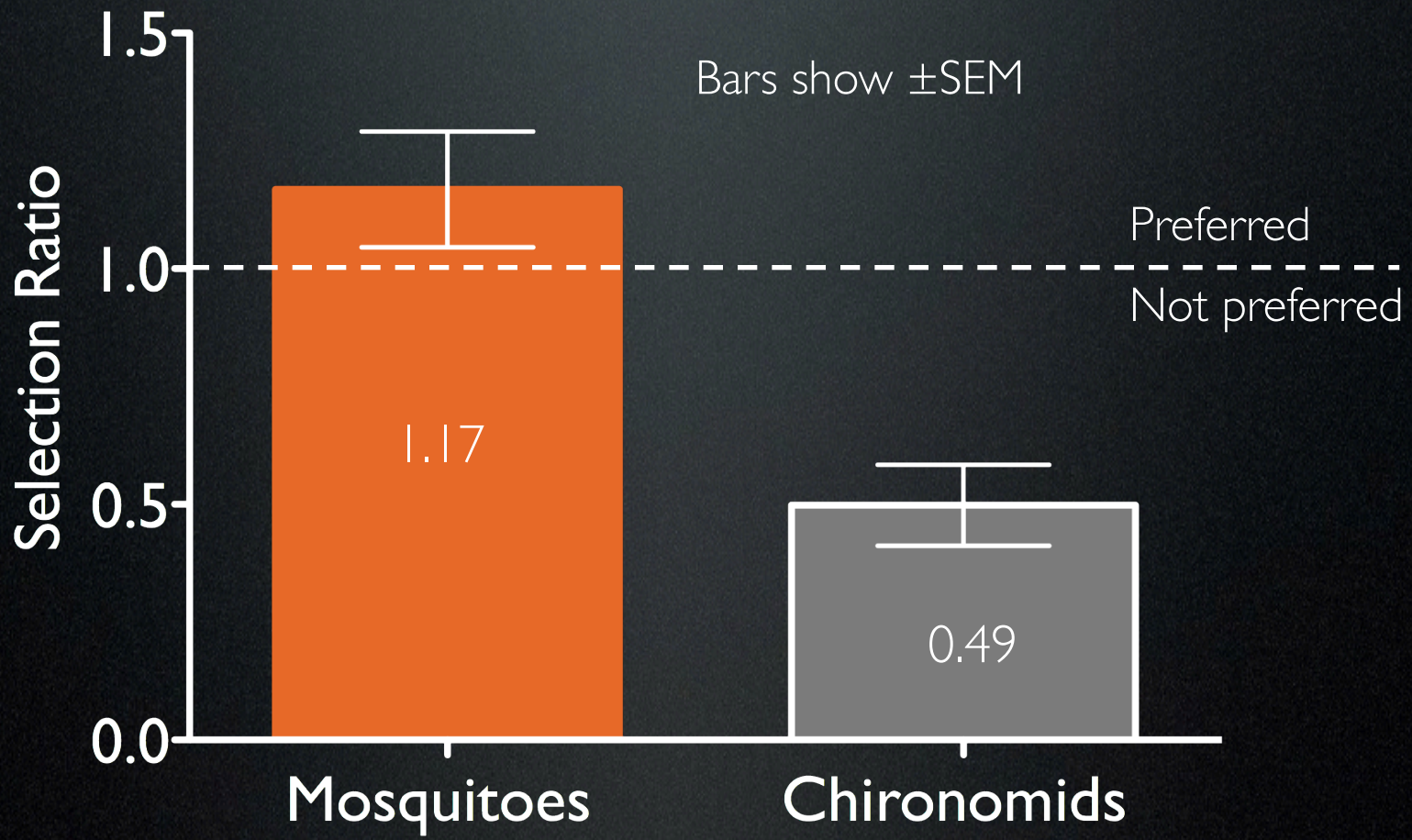

* $p < 0.05$ in Friedman ANOVA, followed by Dunn's Multiple Comparison

# Selective Predation Assay: Methods

- Beetles (n = 30) starved for one day
- Placed singly into containers with 5 mosquito larvae and 5 chironomid larvae
- Fed for one hour

Hypothesis: *Acilius* will preferentially feed on mosquito larvae

# **Results:** *Acilius* significantly preferred to feed on mosquitoes more than chironomids*




* $p < 0.01$ in paired t-test

# Conclusions

- *Acilius* show potential as agents of mosquito control
  1. efficient predators of several mosquito genera
  2. successful control in outdoor mesocosms
  3. some selectivity in predation

- May be useful man-made ecosystems with low diversity: artificial backyard ponds, roadside ditches, newly constructed wetlands

- Ecosystems already populated by *Acilius* dytiscids should be managed with a policy of conservation

# Future Research

- Predation preference of *Acilius* with other invertebrates and amphibians as prey
- Determine saturation and satiation points of predator
- Foraging behavior of *Acilius* at different prey densities
- Influence of dytiscids on mosquito oviposition preference

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Questions?