



Photo Credit: G. Ortiz

# The Effect of Water Level on Burial in Beetle Family Haliplidae

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## Background

- Climate change is causing droughts to increase in frequency and severity
- Drought directly affects aquatic ecosystems by changing water quality and availability<sup>1</sup>
- Aquatic invertebrates have many diverse adaptations to respond to these changes, including dispersal and burial.
- In drying streams, aquatic invertebrates have been observed using sediment as a refuge from extreme environmental condition<sup>2</sup>. However the specific drivers of this behavior are unknown.
- This study will examine how decreasing water level affects burial behavior in a widely distributed family of aquatic beetles, Haliplidae<sup>3</sup>.



Photo credit: M. Platt

Figure 1: One of the species used in the study, *Haliplus punctatus*.

## Research Question

How does water level influence burial behavior in Haliplidae?

## Sampling & Husbandry

- Haliplid beetles were collected from Corte Madera Pond, San Diego County, CA
- Beetles were maintained at 16°C with aerators and fed brine shrimp every 2 days



## Experimental Design

- In each 2-ounce cup there was a toothpick for perching, 1.0cm of sediment and one of three water levels
- 90 beetles were randomly assigned to 2-ounce cups and placed in an incubator at 8°C (Figure 2)
- We observed burial every 24 hours for 10 days

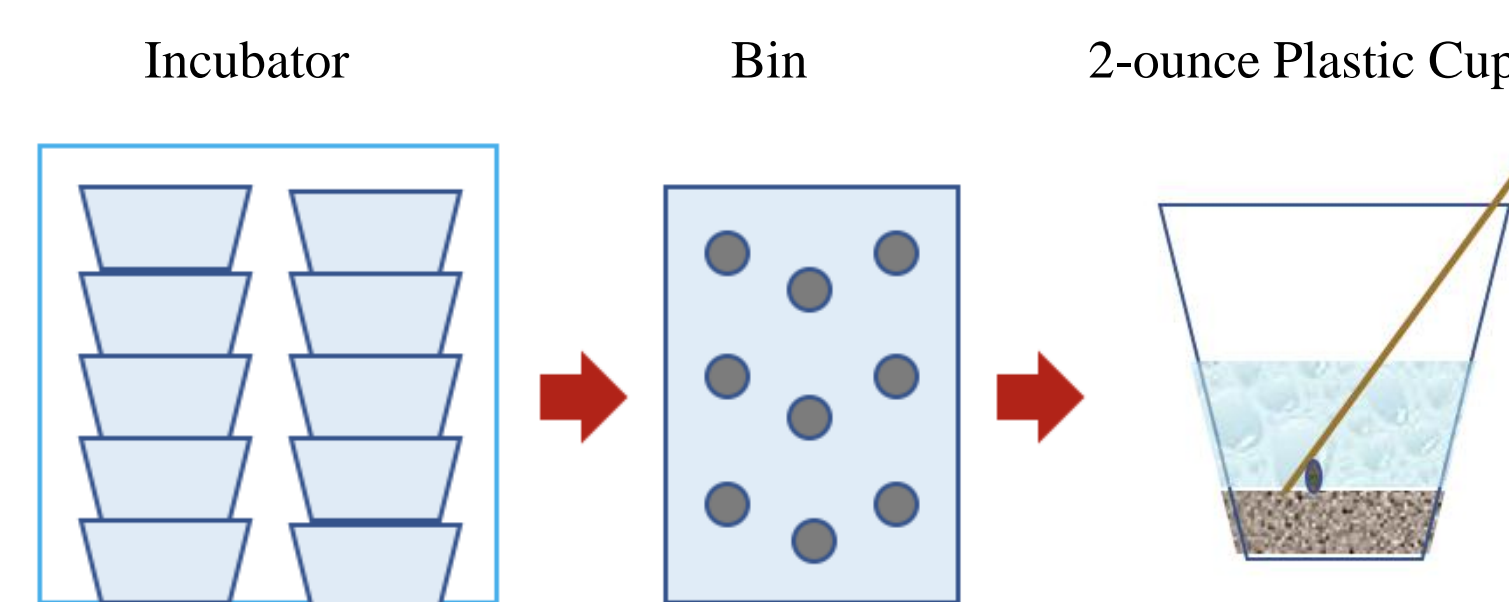


Figure 2: Experimental design including the incubator (side view), plastic bins (top view), and the 2-ounce plastic cup with toothpick as perch (side view).

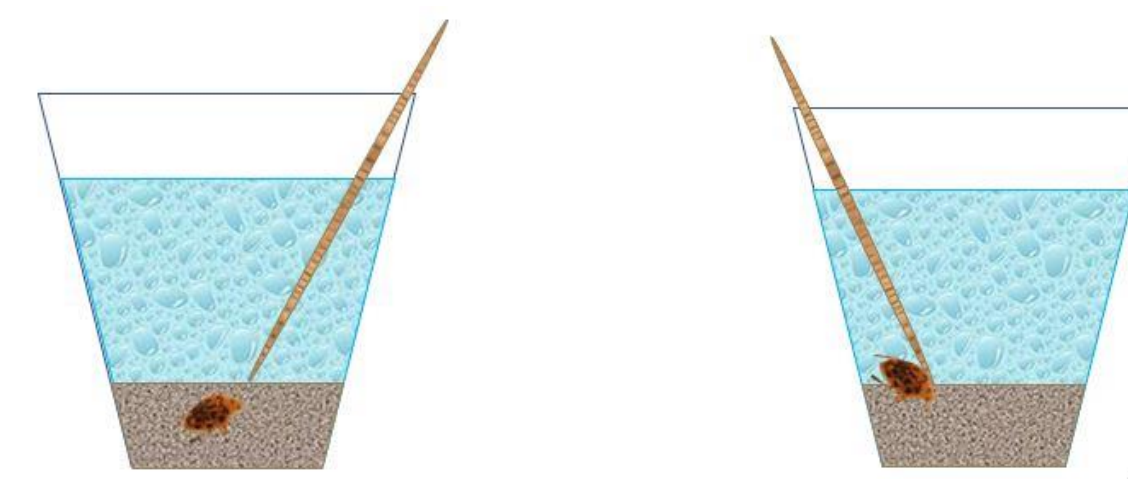


Figure 3: Burial was defined as fully covered by the sediment (left) or wedged between the sediment and toothpick (right)

## Data Analysis

- All data analysis was preformed in SPSS
- ANOVA: proportion buried ~ water level x temperature
- ANOVA: proportion buried ~ water level
- Bonferroni post hoc comparison: proportion buried ~ water level
- Linear regression: proportion buried ~ day + water level

## Results

As water level increases, burial also increases

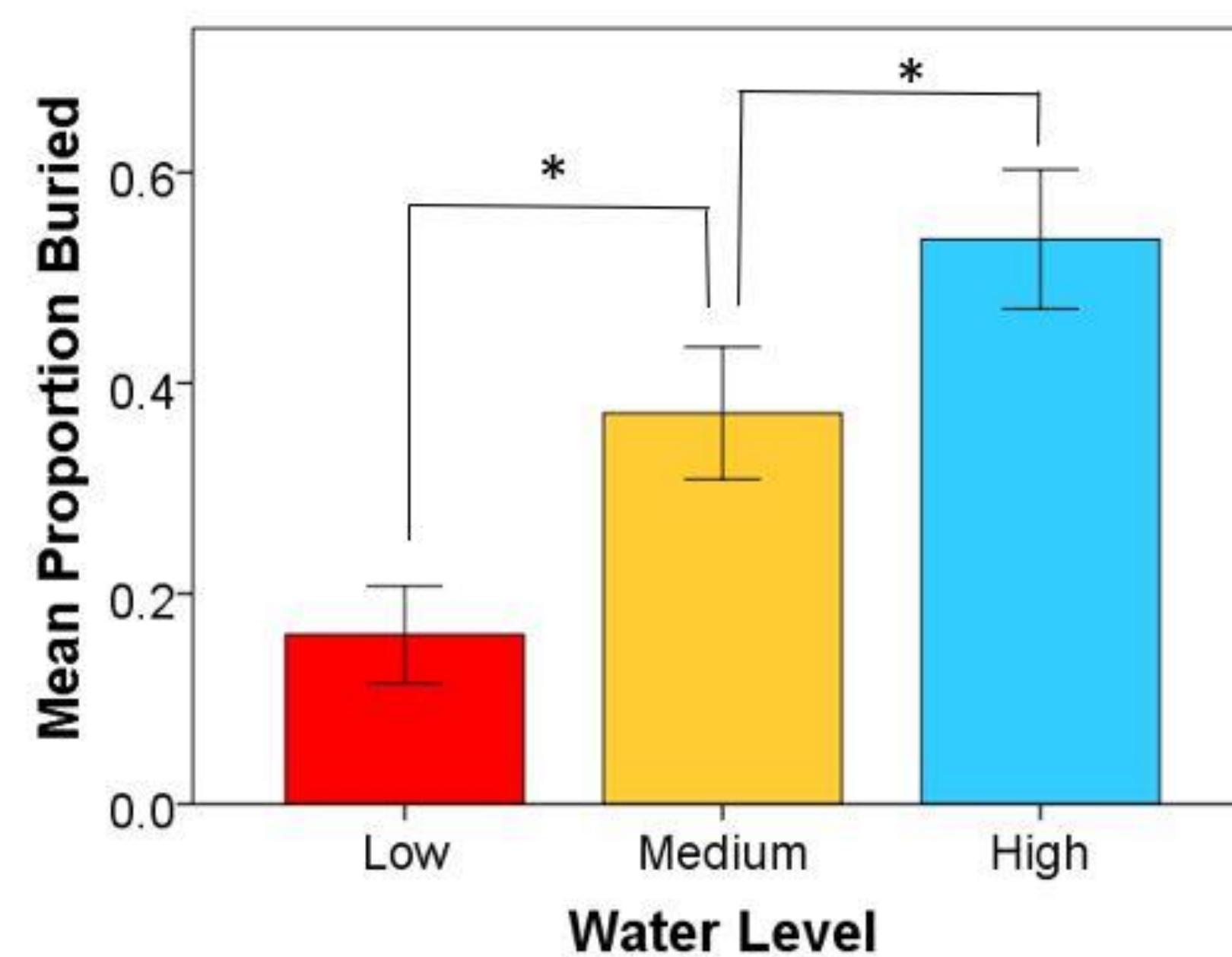


Figure 4: The Effect of Water Level on Mean Proportion of Beetles Buried. ANOVA:  $f = 40.738$ ,  $d.f. = 2$ ,  $p < 0.001$ . Bonferroni post hoc: low < medium;  $p < 0.001$ , medium < high;  $p < 0.001$ , low < high;  $p < 0.001$

## Results

Time does not affect burial

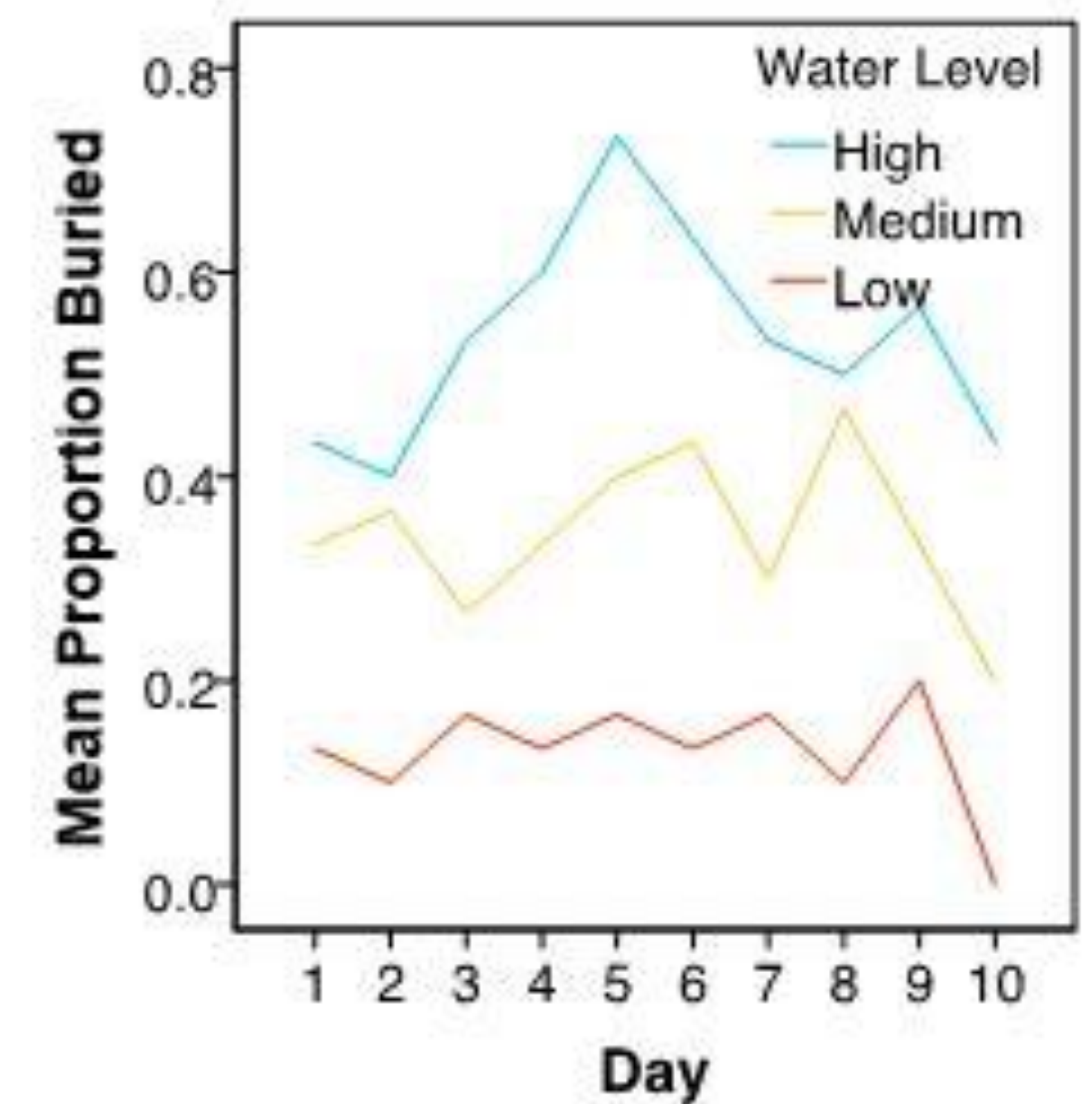


Figure 5: The Effect of Time in Days on the Proportion of Beetles Buried. Linear Regression:  $f = 0.299$ ,  $d.f. = 1$ ,  $p = 0.586$

## Conclusion

- Contrary to literature regarding burial in other aquatic invertebrates<sup>4</sup>, Haliplidae was observed burying more with increasing water level (Figure 4), regardless of time (Figure 5)
- Burial is often an important resistance behavior for many aquatic invertebrates<sup>4</sup>, but might not be a drought response of Haliplidae
- Haliplidae may instead employ other drought resistance behaviors

## Implications

- It is important to understand how aquatic invertebrates respond to drought conditions in order to predict how these changes may affect aquatic ecosystems
- Further research is needed to investigate the resistance behaviors of Haliplidae, and what environmental factors influence different behaviors

## References

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