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Effects of starvation and time of day on crayfish foraging behaviors

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Abstract

Crayfish foraging behaviors can alter aquatic ecosystems. Starvation and time of day are two potential factors that can influence those foraging behaviors, but the interaction between the two variables has not been studied. In this study, we observed the movement of fed and starved crayfish during the day and at night in the presence of both water and food odor. We calculated both total movement and change in movement and predicted more activity when starved and at night. Crayfish did not show a preference for day or night, nor did they display significantly more movement when fed or starved. These results do not match previous literature, meaning that further research on these factors is necessary, especially in *Cambarus acuminatus*.

Background

Crayfish are important members of freshwater ecosystems because of their foraging behaviors. Depending on their ecological role, they can change the way an ecosystem operates (Momot 2008). Therefore, it is important to understand what factors can change crayfish foraging behavior.

The length of time since feeding can influence foraging behavior. Previous studies have indicated that crayfish will be more active foragers after being starved for at least 3 days (Hazlett 2003).

Time of day can also influence foraging behavior. Stream crayfish can be preferentially nocturnal or diurnal depending on their sensory adaptations (Bouwma and Hazlett 2001).

The interaction of these two variables has not been tested. In addition, the crayfish used in this study, *Cambarus acuminatus*, is not well studied.

Objective: to further understand the simultaneous influence of starvation and time of day on crayfish foraging behaviors.

Hypothesis: Crayfish will be more active at night and when starved and show an interaction where starved crayfish are more active at night.

Methods

Crayfish maintenance

- 40 *C. acuminatus* collected from Horsepen Run
- Marked and measured carapace
- Kept in 20L tanks and fed cod every other day
 - Fed cod for at least 1 week before starving



Experimental conditions

- Two feeding levels: fed, starved for 5 days
- Two times: day, night
 - Day: tested at 14:00 in a room with natural lighting
 - Night: tested at 20:00 in a dark room with only red light
- Tested each combination of feeding and time of day

Procedure

- Put crayfish in individual tanks to be tested; 15 min acclimation
- Injected 10mL water, observed for two minutes
- Injected 10mL food odor, observed for two minutes
 - Food odor: cod crushed in water and filtered
- Calculated change in movement between water and food odor
- Calculated total movement times

Results

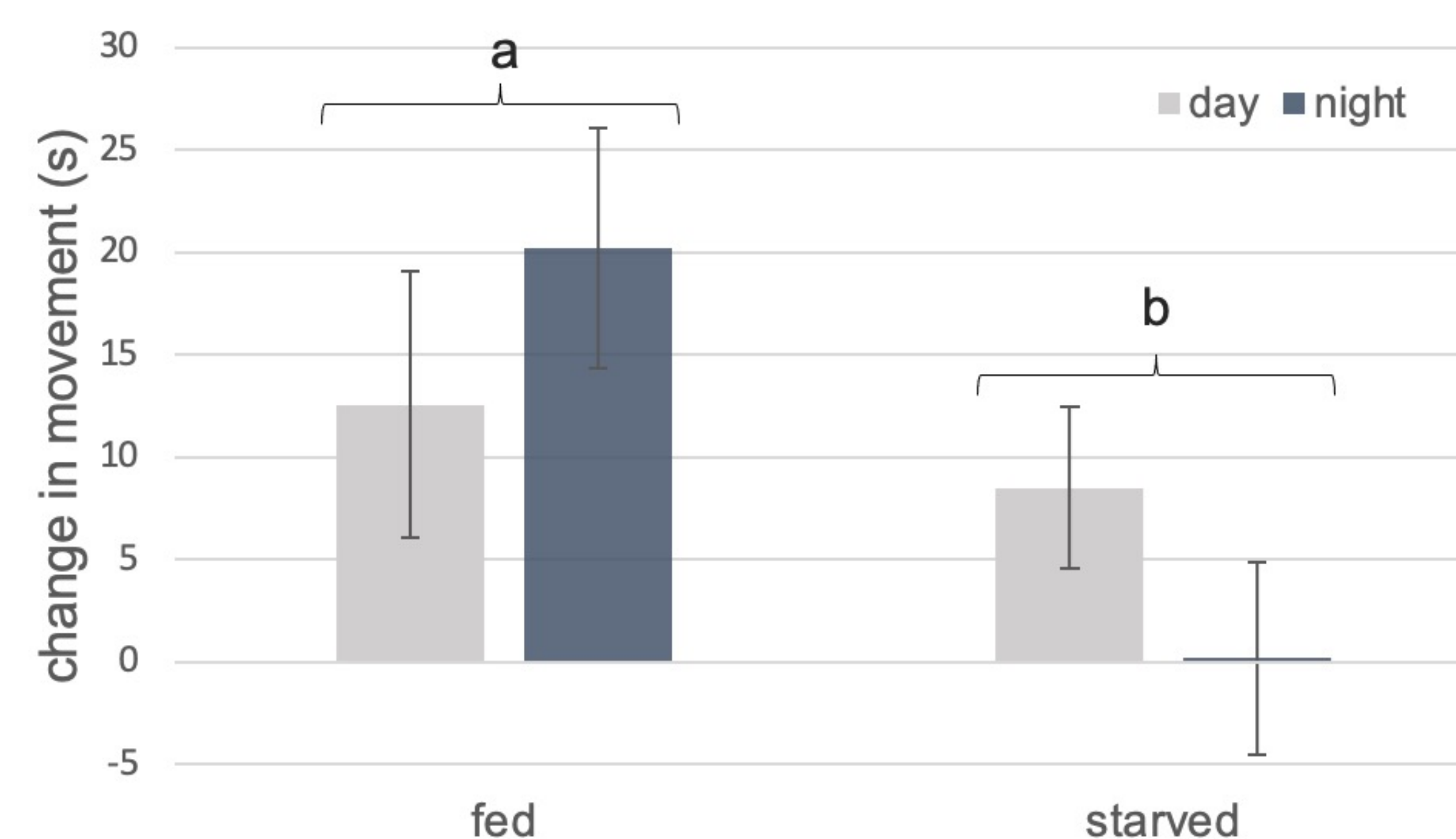


Figure 1. Change in movement of crayfish between water and food odor treatments for each experimental group (n = 10). Bars represent mean change in movement in seconds (\pm SE). Bars marked a are significantly different from those marked b (two-way ANOVA, feeding treatment, $p = 0.030$).

Results

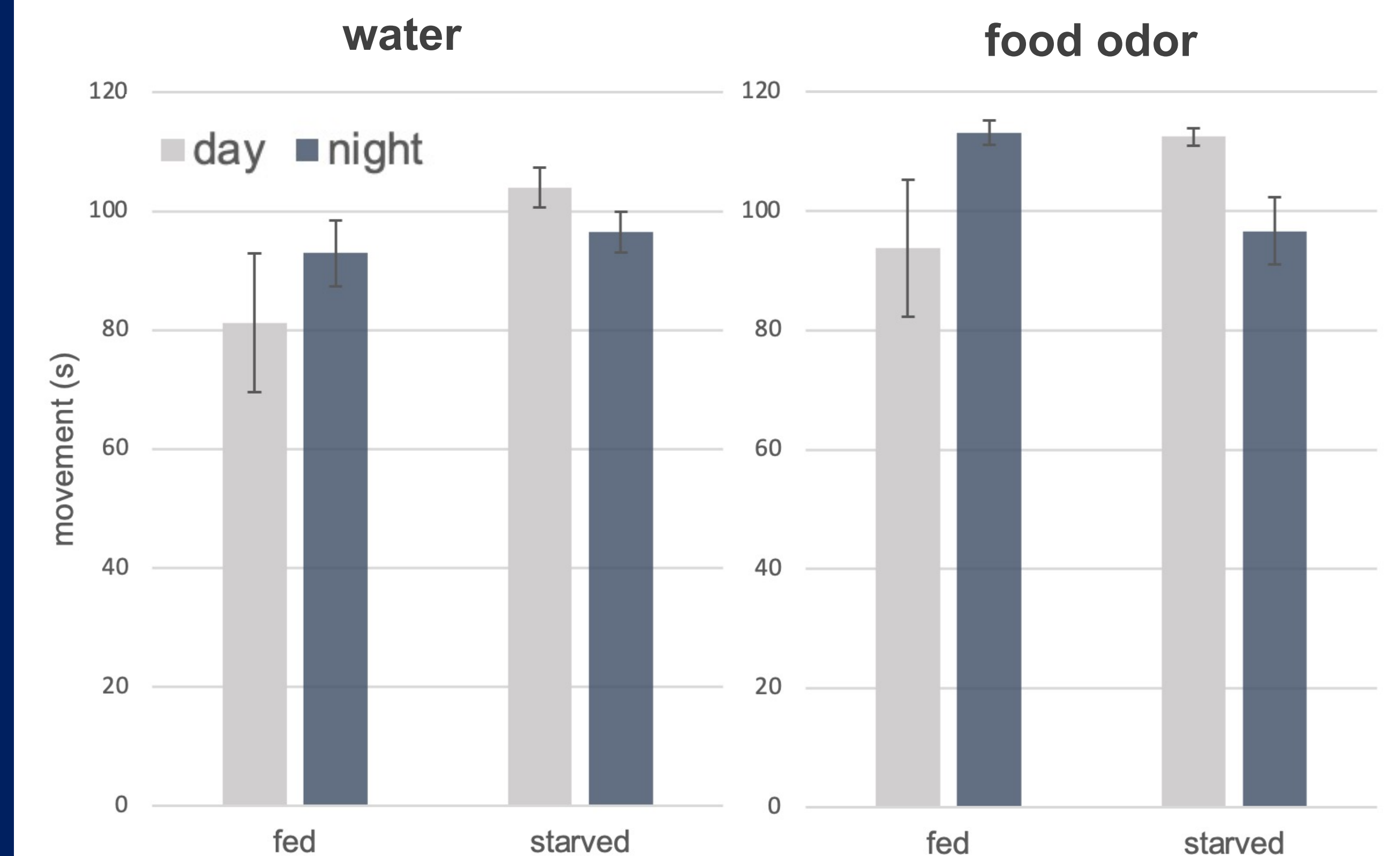


Figure 2. Movement of crayfish during water and food odor treatment for each experimental group (n = 10). a) movement of crayfish in the presence of water. b) movement of crayfish in the presence of food odor. Bars represent mean movement in seconds (\pm SE). Significant interaction between feeding and time of day only present for food odor (two-way ANOVA, interaction feeding * time, $p = 0.011$).

Conclusions

This data does not support the proposed hypothesis of more activity during the night and when starved, nor does it show the hypothesized interaction of more activity at night when starved.

Fed crayfish showed a significantly greater change between water and food odor than starved crayfish. Previous studies show a much more significant change from water to odor for starved crayfish (Hazlett 2003). This less than significant change could be due to smaller acclimation times.

C. acuminatus in this study did not show a preference for day or night. The significant interaction of time of day and feeding level in the presence of food odor could suggest a preference for day.

Further research:

Further research might include conducting the same study with a larger sample size and/or with alarm odor. Another study could investigate day/night preference of *C. acuminatus*.

References

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