Predator - Prey Interactions with *Physa acuta*

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Abstract: Freshwater communities can be complex with the predatory strategies that take place within them. Gastropods are an example of a typical prey that is found within these freshwater communities. Their predators give off a chemical cue that the gastropods can sense in the water. In doing so, these animals can enact their antipredator behaviors to avoid becoming prey. When gastropods are continuously exposed to these chemical cues, enacting these behaviors is regularly seen. Molluscs within communities without predators or with less predators use their antipredator behaviors less. Many studies have experimented to see whether these behaviors are instinctive or whether they are learned throughout their lifetime. This study asks the question if early exposure to these predator cues changes the reaction of the snail when later exposed to the same cue. The average of each group that was found below the line in behavioral trials was compared to find that the early exposure to the predator cue did not make a significant difference in exhibiting antipredator behavior when the experimental group reaction to the later cue was compared to the control group reaction. The delta akaike information criterion (delta AIC) was calculated for the following variables; test, (test*condition), (test*time), and (test*time) + (test*condition) + (test*condition). These values were calculated to show which variable or combination of variables best explained the data. It was shown that the test variable was the best variable to explain the data. The study showed that one early exposure to a predator cue does not significantly change the behavior of a gastropod.

Keywords: Behaviors, Communities, Predator, Prey, Cue

Introduction

Within freshwater communities, predator and prey interactions with gastropods depend mostly on escape tactics or the structure of their shell (Alexander and Covich 1991). Gastropods have many predators including crayfish (Correia et al. 2005) and different species of fish (Dalesman et al. 2007). When predators are near, snails can detect their presence because these predators usually release a chemical cue that can be sensed through the water. The mollusks can escape these predators by either floating to the top of the water (Turner et al. 2006), moving out of the water, or by retracting into their shell (Hoverman and Relyea, 2007) so that the predator can not reach them (Alexander and Covich 1991). Moving out of the water or floating to the top of the water line protects these snails from their predators, since they are normally restrained to the water. This is useful so that they can successfully escape being preyed upon. Although most predators of mollusks are omnivorous (Correia et al. 2005), snails are still the main source of food for these animals. This study examines how or if exposure to a crayfish predator cue early in a *Physa acuta*'s life changes their behavior to the predator cue later on in their life.

Methods

Snail collection

The F0 generation was collected from Sanborn lake in Stillwater, Oklahoma. Egg masses were collected from the F0s. These were separated into two groups, and were labeled F1s. The eggs were checked daily by placing the glass bowls under a light and microscope to check if they were hatched. A week and a half after hatching, the eggs had hatched and forty individuals were separated into individual deli cups by using a pipette to move each snail.

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Husbandry

Twenty of the eggs were randomly labeled for the predator cue and twenty were randomly labeled for the control. Each snail received a small portion (about an eighth) of an algae disk. One week after hatching, the control group lost an individual and was tested with nineteen individuals for the rest of the time. Individuals were fed and water changed once a week. three weeks after the snails had hatched, the experimental group was given a predator cue after their water change. After water change was done, 1mL of predator cue was added to each individual cup. Water changes were continued for another two weeks as normal, with no predator cue given.

Behavioral Tests

Six weeks after the snails had hatched, they were set up for behavioral trials. All of the snails were randomized to remove biases from the behavioral trials. Each trial lasted an hour. During the first trial, no cue was given. Each deli cup had a midline drawn on the side. In increments of five minutes, each snails behavior was recorded by indicating whether the snail was above, below, or on the midline of each deli cup. After both trials, the snails were returned to their original cups and given a portion of an algae disc

Analysis

The delta AIC level was calculated for the test, test*condition, test* time, (test*time) + (test*condition) + (test*condition), and the null variables. The delta AIC is calculated by finding the log of maximum likelihood of the hypothesis given the data. The null delta AIC value was 19.3. This proved that the variables that we had tested explained the data sufficiently. The test variable had a delta AIC value of zero, meaning it explained the data the most adequately.

Results

The test variable in the study was the predator cue given to the snails. The variables delta AIC level (Table 1) was calculated from the results from the behavioral trials (Figure 1). The results of the behavioral trials showed that for the control group during the predator trial (trial where predator cue was given) thirty percent of the mollusks were observed to be below the line of the deli cup when each of the 5 minute intervals were averaged. For the control trial, forty-five percent of the snails were observed to be below the line on average. The experimental group had thirty percent of snails below the line for the predator trial and forty five percent of the snails observed to be below the line during the control trial.

Table 1: This table shows that the test variable best explained my data because the other variables had higher delta AIC levels.

Models	**ΔAIC**
Test	0.0
Test*Time	0.9
Condition*Test	1.9
(Test*Time) + (Test*Condition) + (Test*Condition)	6.0
Null	19.3

Discussion

The results of the behavioral trials showed that there was an insignificant difference between the reaction of the control and experimental groups. The delta AIC value being low proved that the snails were responsive to the chemical cue, but since the results for

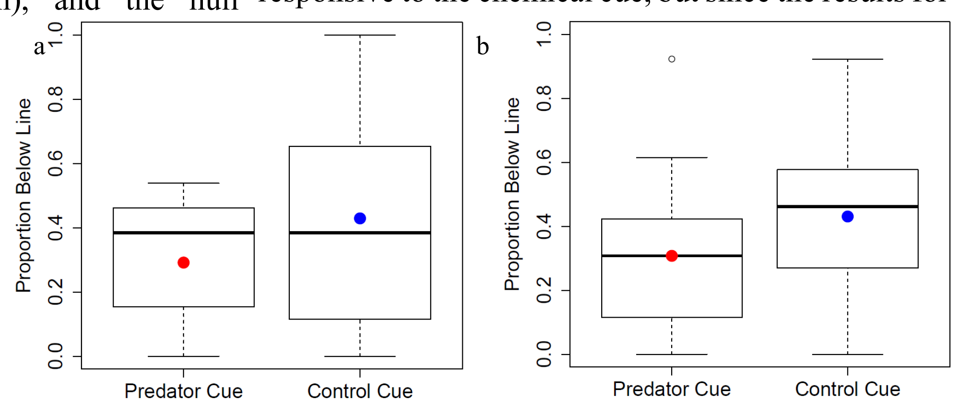

Figure 1: This figure shows the average of each snail group that was observed to be below the midline during each behavior trial in control conditioning (a) and predator conditioning (b).

both groups were almost equivalent for the behavioral trials it is concluded that early exposure to the chemical cue did not change the reaction of the experimental group compared to the control group. For future research, exposing the snails more than once in their early lifetime may result in a more significant difference between the control and experimental groups.

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