Color and Orientation Preference of *Procambarus clarkii*

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Introduction

Vision in organisms plays a very important role, because it helps the organism decipher its environment. This can confer survival benefits such as: locating nutrients, escaping predators and finding mates. It is, therefore, valuable to study vision in organisms to better understand their behavior. Color is a key component of vision, and thus the focus of this experiment. Based on the results of the experiment conducted by George Wald[4] the hypothesis was that *Procambarus clarkii* would show preference to the colors red and blue while showing no preference for the color yellow.

Materials and Methods

- *Procambarus clarkii* were obtained from various locations at the Lake Waco Wetlands.
- Three males were utilized in this experiment.
- 3 plastic containers (41.9cmL x 29.2cmW x 15.9cmH) were used (Figure 1) in the experiment.
- Each *Procambarus clarkii* was positioned in the neutral zone in each container and a clear plastic cup was placed over them. They were left to acclimate for **5 minutes**
- They were then released from the cup and observed for **15 minutes** for color preference (red, yellow, or blue)
- Orientation preference (left or right) was also observed to determine which side was preferred
- They were video monitored
- Three different timers were used to determine the amount of time they spent in each color/side.
- Each *Procambarus clarkii* underwent 4 trials in each container: 2 with one color on the left and another on the right, and 2 with the colors reversed. There was a total of 42 trials.
- The trials were conducted in a brown cabinet free of distractions. (Figure 1)

Figure 1. One of the containers used in the experiment. The neutral zone is the middle of the container is brown.

Results

Based on the results of t-tests, there was no statistical difference between the time *Procambarus clarkii* spent on the colors red and blue. There was a statistical difference between the time spent on the right (Figure 2). There was also a statistical difference between the time spent on the color blue and the time spent on the color yellow, regardless of the side (Figure 3). There was a 0.090 probability that the time spent on red was statistically the same as the time spent on yellow, however there was a 0.0016 probability that the time spent on the left and right side during all trials involving red and yellow were the same. This illustrated that there was no preference of red over yellow, but there was a preference of right over left (Figure 4). The overall orientation preference was highly skewed to the right (Figure 5).

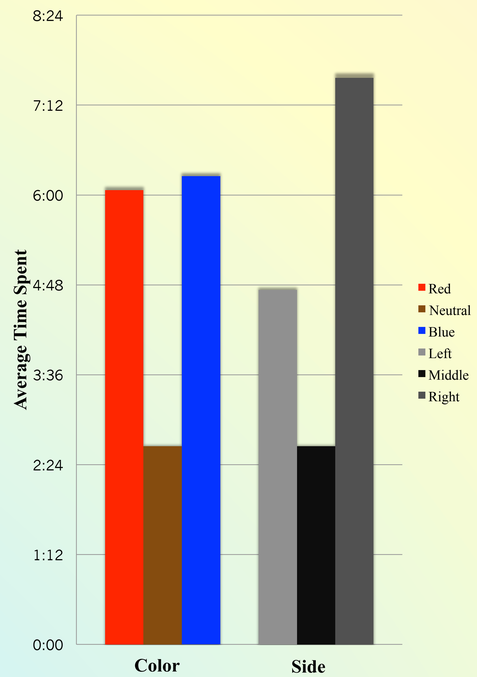

Figure 2. Average time spent in red and blue. Two trials with red on the left and blue on the right, and two trials with the colors reversed.

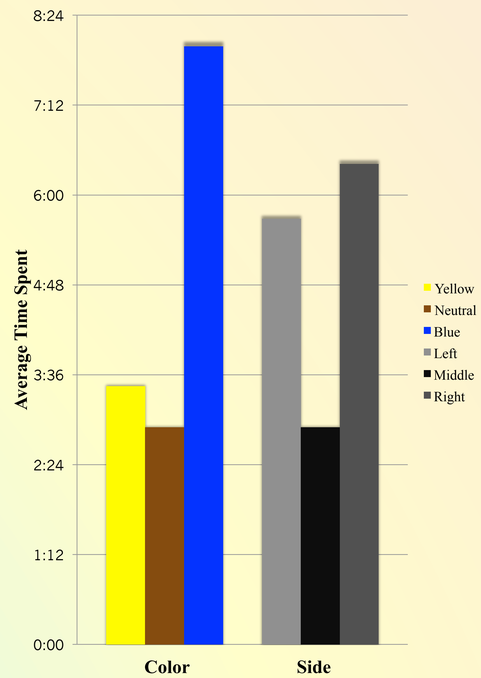

Figure 3. Average time spent in yellow and blue. Two trials with yellow on the left and blue on the right, and two trials with the colors reversed.

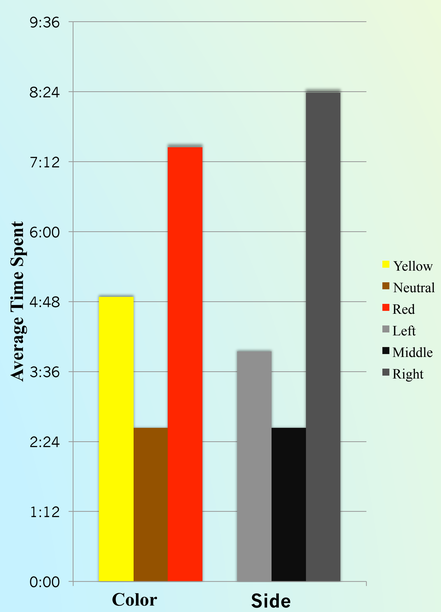

Figure 4. Average time spent in the yellow and red. Two trials with red on the left and yellow on the right, and two trials with the colors reversed.

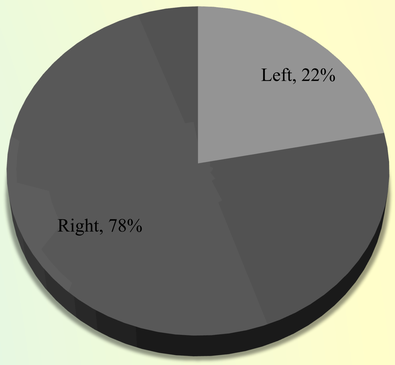

Figure 5. Overall Side Preference based on all forty-two trials

Abstract

Color is a key component of vision, and thus the focus of this experiment. In this study, three male *Procambarus clarkii* were collected and observed in the lab for behavioral responses in relation to the colors: red, blue, and yellow. Data was collected for *Procambarus clarkii* responses to the stimuli and there was a tendency for the *Procambarus clarkii* to migrate towards the blue and the right side. These were the expected results because of the color spectrum that they see and the position of the air stone on the right side of the holding tank.

Discussion and Conclusion

The preliminary findings suggest *Procambarus clarkii* prefer blue over yellow, with no significant difference in preference for the colors red and blue or the colors red and yellow. This rejects the hypothesis because *Procambarus clarkii* did not show a significant preference for red over yellow. Crandall and Cronin[1], indicated there was relatively little variation in λmax 522–530 nm, which is one explanation for why *Procambarus clarkii* did not respond to the yellow color. Findings by Wald[4] indicated a simple visual spectrum that sees red, only when the color blue is present. This confirms that *Procambarus clarkii* saw both red and blue in Figure 2, while seeing only blue in Figure 3, and neither red nor yellow in Figure 4. Therefore, the *Procambarus clarkii* preferred colors in their visual spectrum.

Although the experiment showed significant findings, there may have been an experimental error. With the possibility of experimental error, the orientation preference was tested along with color preference. The *Procambarus clarkii* preferred the right side unquestionably more than the left (Figure 5). This may be because, in order to keep the *Procambarus clarkii* for experimentation, a blue air stone was placed on the right side of the neutral holding tank. The air stone provided oxygen to the *Procambarus clarkii*. When not in an experimental trial, they frequently located themselves around the air stone. The *Procambarus clarkii* could have been conditioned to choose blue and right.

Acknowledgements

Marty L. Harvill, Ph.D.; Lake Waco Wetlands; Bryce Whinnen; Alex James; Baylor University Biology Department; Baylor University Dean of Arts and Science; URSA.

Literature Cited

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