Prey Selection in the Praying Mantis (*Tenodera sinensis*)

Rebecca A. Schmidt (Advisor Dr. Lee Boyd)
Department of Biology Washburn University™

Abstract

To explore prey selection in adult praying mantises (*Tenodera sinensis*), mantises were shown computer displays of moving circles of various sizes and colors. The number of strikes the mantis made at each target was recorded. *T. sinensis* appears to discriminate prey based on both size and color. Mantises appear to prefer the medium sized targets and to avoid yellow targets.

Introduction

A key component of examining prey preferences in any predatory animal is to present the subject with different types of prey items and observe the predator's behavior to determine if a preference is present. However, due to the unpredictable nature of live prey items, alternative methods provide a greater degree of control. Prete (1993) found that mantises will strike at computer images of moving rectangles as if they were live prey. Bowdish and Bultman (1993) discovered that mantises do discriminate between different colored prey items and prefer dark prey to lighter colored prey. This experiment is an attempt to use Prete's discovery to further investigate prey color and size preferences in praying mantises.

Materials and Methods

Four wild-caught female Chinese mantises were housed individually in small plastic containers for the duration of the experiment. The mantises were tested in a random order. A container was placed on a laptop keyboard so that the mantis was facing the screen, with one side of the container flush with the screen. A Microsoft PowerPoint presentation of different colored circles 1.5 cm in diameter was played. One trial consisted of a colored circle following a predetermined trail ten times. After a trial was completed, a different colored circle was shown. After all colors of circles had been shown, the process was repeated again two additional times. The number of strikes per trial was recorded. During the experiments, if the mantis looked away from the screen, the trial containing the black circle was shown until the mantis looked at the screen again. The trial would then start from the last loop where the mantis was still looking at the screen. If the mantis would not look at the screen, the session was terminated and only data from when the mantis was looking at the screen was recorded.

In a subsequent experiment, a Microsoft PowerPoint presentation of black circles 0.7 cm, 1.5 cm, or 3.9 cm in diameter (referred to as small, medium, and large) was played. One trial consisted of all three circles following the set trail ten times each. In each session, all possible orders of the circles were used, for a total of six trials per session. The number of strikes per trial was recorded. During the experiments, if the mantis looked away from the screen, the trial containing the 1.5 cm diameter circle was shown until the mantis looked at the screen again. Then the trial would start from the last loop when the mantis was still looking at the screen. If the mantis would not look at the screen, the session was terminated and no data was recorded for that session.

Fisher's Exact Test was used to determine if mantises had prey preferences based on color or size. Pairwise comparisons of all solid colored targets (excluding yellow) as well as pairwise comparisons of the different target sizes were performed using two-sample t-tests.

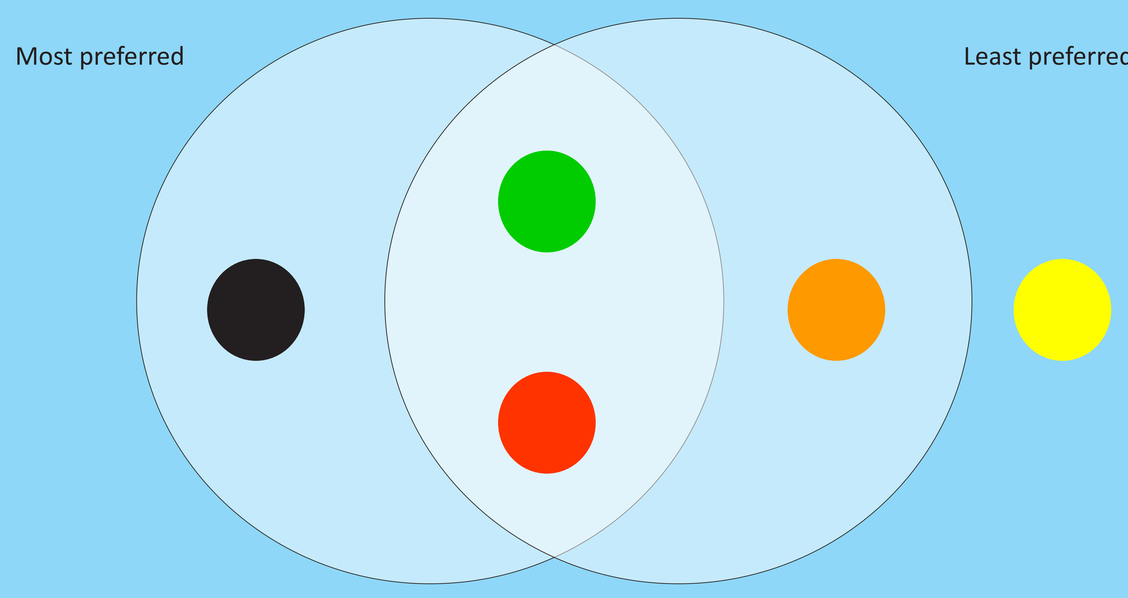
A mantis watches a computer display of moving circles– will it strike?

Results

Fisher's Exact Test

Comparison (bold indicates preferred)	P-value from Fisher's Exact Test
Black, Green, Orange, Red, and Yellow	<0.0001
Black with a yellow outline and yellow with a black outline	<0.0001
Yellow with a black background and yellow with a white background	0.0861
White with a black outline and **yellow with a black outline**	0.0231
Small, **medium**, and large	<0.0001

Pairwise Comparisions of Color



Pairwise Comparisons of Size

Mantises struck more frequently at small and medium sized targets and there was no significant difference in the number of strikes between these two groups (p=0.1650). The mantises could distinguish large targets from both small (p=0.0096) and medium sized targets (p=0.0309).

Conclusion

Mantises exhibit preferences for prey based both on size and color. Black targets were most preferred, followed by red and green, then orange. Yellow was not favored. These results corroborate the results of Bowdish and Bultman (1993). The medium sized target was most preferred, followed by small, and then large. Medium is a suitable compromise between a small prey item with low payoff and a large, more risky prey item. After observing that mantises seemed to strongly discriminate against yellow, further comparisons were performed to determine the cause of this preference. There is a significant difference in the number of strikes at the black circle with a yellow outline and the yellow circle with a black outline, indicating that yellow is not acting as an aposematic (warning) color (i.e., bees). There is no significant difference in the number of strikes at yellow circles on black versus white backgrounds, indicating that the mantises are not discriminating against yellow because it is difficult to see on a light-colored background. The mantises do exhibit a preference for yellow targets over white targets. It is possible that yellow, although not a preferred prey color, is slightly more biologically relevant as a normal prey color than white.

Works Cited

Prete, F.R. 1993. Stimulus configuration and location in the visual field affect appetitive responses to computer generated stimuli by the praying mantis Sphodromantis Lineola (Burr.). *Visual Neuroscience*. 10: 1997-1005.

Bowdish, T.I., and T. L. Bultman. 1993. Visual cues used by mantids in learning aversion to aposematically colored prey. *Am. Midl. Nat*. 129: 215-22.