The influence of predation risk on habitat use of red eared sliders (*Trachemys scripa elegans*)

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INTRODUCTION

One of the primary objectives in ecology is to gain a better understanding of the factors that affect the density, distribution, and abundance of organisms across the landscape. Altering those variables can be easily achieved when an organism is forced to choose between different habitats and there are many factors that contribute to those choices. Some of those factors that could influence habitat choice could be resource availability and predation risk. One would expect the most desirable habitats to be those with abundant resources and a minimal risk of predation. To date, very few studies exist that have documented the effects of predation (but see Werner, et al. 1983; Gilliam and Fraser, 1987) on habitat choice.

This experiment examines the effects of predation on habitat choice in the red eared slider (*Trachemys scripa elegans*). This particular species is commonly used in laboratory experiments because it is a hearty species and is easy to raise in captivity.

Turtles, such as the red eared slider, are preyed upon, in the wild, by wading birds like the blue heron. In this experiment the effects of predation were simulated with the use of a model of the blue heron head (Figure 1).

In this study, we test the hypothesis that if predators are present, then the sliders will select the habitat that provides the most cover. A model of a blue heron head is used to simulate the presence of a predator since they prey upon turtles in the wild (Janzen et al. 2000). Five trials were conducted in each of four treatments: control (no cover, no predator); Cover (floating mats of macro algae) without a predator; no cover with predator; and cover with predator.

METHODS

In this experiment, eight turtles were maintained in a 50 gallon aquarium tank and fed five scoops of Zoo Med Natural Aquatic Turtle Food daily. The tank was exposed to UVA/UVB fluorescent lights for basking and placed on a timed12 hour light-dark cycle. In order to minimize human contact and disturbance, the tank was surrounded by a dark tarp (Figure 2). The tank environment was also equipped with floating haul-out sites for basking and an underwater cave for the turtles to hide.

Each experiment was conducted in the same 50 gallon tank where the turtles were kept. The two sides of the tank were divided by a floating haul-out site, which allowed the turtles to climb out of the water for basking. On one side of the haul-out, the turtles had access to underwater "caves" (Figure 3). This was also where the floating, artificial vegetation was placed for trials that included cover. The opposite side of the tank was empty, except for the gravel bottom (Figure 3).

All of the turtles participated, at the same time, in an individual trial. Five trials, in total, were conducted for each experimental treatment (no cover and no risk, cover and no risk, cover and risk, no cover and risk) (Figure 4). Trials, of a single treatment, were conducted on five consecutive days. Treatments were only changed after all of the trials for that treatment were complete.

During each trial the location of each turtle was recorded at five minute intervals for a three hour period. Trials that included predation risk used a model of a blue heron head (Figure 1) to strike the water at the midpoint of each the five-minute intervals.

Data analysis was completed using ANOVA.

Figure 1. Model heron head

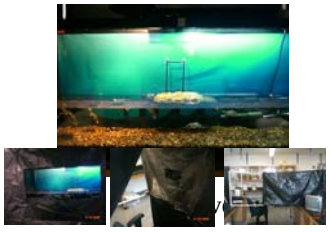

Figure 2. Experimental tank

Figure 3. Cover

Figure 4. ANOVA Results

	p-value	
Predation risk	0.0083	Highly significant
Habitat use (cover)	0.0118	Highly significant
Trial number	0.0361	Significant
Predation risk * Habitat use	0.1022	Moderately significant
Predation risk * Trial number	NS	
Habitat Use * Trial Number	NS	
Predation * Habitat use * Trial number	NS	

RESULTS/DISCUSSION

ANOVA reveals that both the presence of cover ($p=0.0118$) and risk of predation ($p=0.0083$) are significant factors in determining the location of the turtles in the tank. When habitat cover was present, the an average of 3.5 turtles used cover, whereas only 2.72 used the side without cover.

Predation risk was also a highly significant ($p=0.0083$) in determining habitat choice. When predation risk was present, the turtles clumped on one side of the tank.

Although the interaction between predation risk and habitat use are only moderately significant ($p=0.1022$), increasing the number of trials could improve the statistical power of these results, and give a better indication of whether this interaction truly influences habitat choice.

It is also appears that the trial number is a significant ($p=.0361$) factor influencing the turtle's choice in habitat. These results suggest that the turtle's may be learning that the heron head is, in fact, a model and does not present a true threat.

The results of this experiment are important to animals in their natural habitat. It demonstrates that both cover and predation risk are important to habitat use decisions. These finding could be important in decisions regarding buffers between urban areas that are adjacent to wildlife preserves. The Everglades, for example, are increasingly impacted by motor and airboat traffic. As traffic increases, aquatic animals could begin to perceive the disturbances as a predation risk. Further, urban development may also remove protective cover for these animals and could lead to changes throughout the food web.

Future research should examine specific habitats for a variety of Everglades species in order to determine the best approach for addressing the effects of human impacts.

It will also be important to address the apparent "learning" by turtles by either testing different groups, or a larger number of hatchlings. Another area for improvement would be increasing the number of trials to better approximate the interaction effect between predation and habitat use.

REFERENCES

--Gilliam, J.F. and D.F. Fraser. 1987. Habitat selection under predation hazard: Test of a model with foraging minnows. Ecology 68: 1856-1862.

--Heithaus, M.R. and L.M. Dill. 2002. Food availability and predation risk influence Bottlenose dolphin habitat use. Ecology 83: 480-491.

--Janzen, F.J., J.K. Tucker, and G.L. Paukstis. 2000. Experimental analysis of an earl life-history stage: avian predation selects for larger body size of hatchling turtles. Journal of Evolutionary Biology 13: 947-954.

--Schlosser, I.J. 1988. Predation Risk and Habitat Selection by Two Size Classes of a Stream Cyprinid: Experimental Test of a Hypothesis. Oikos 52: 36-40.

--Werner, E.E. J.F. Gilliam, D.J. Hall, and G.G Mittelbach. 1983. An Experimental Test of the Effects of Predation Risk on Habitat Use in Fish. Ecology 64: 1540-1548.

--Wirsing, A.J. M.R. Heithaus, and L.M. Dill. 2007. Fear factor: do dugongs (*Dugong dugon*) trade food for safety from tiger sharks (*Galeocerdo cuvier*)? Oecologia 153:1031-1040.