Progress Report

Pre-monsoonal and Post monsoonal Habitat Use of the Narrow-headed Gartersnake, *Thamnophis rufipunctatus*, along the Gila River

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Project Objective: The primary objective of this project is to document seasonal habitat use, pre- and post-monsoon, of the Narrow-headed Gartersnake in the Gila River of southwestern New Mexico.

Within the scope of this study we also proposed to document seasonal thermal preferences of *T. rufipunctatus* associated with microhabitat use. Opportunistically, we also proposed to investigate this species' food habits by palping snakes possessing obvious food items, and document reproductive phenology.

Explanation of Need: *Thamnophis rufipunctatus*, the Narrow-headed Gartersnake, is found from central eastern Arizona, southwestern New Mexico, and south to western Chihuahua, and western Durango, Mexico (Degenhardt et al. 1996, pers. obs.). It is unique among gartersnakes because of its elongate and narrow head shape (Fitzgerald 1986a). *T. rufipunctatus* is a highly aquatic species that preys primarily on fish (Fleharty 1967) which it hunts from slack-water microhabitats within rocky streams. In New Mexico and Arizona this species often is associated with the interstices of submerged cobble, boulders, and rock formations or downstream of in-stream boulders (Fitzgerald 1986a & 1986b, Schwalbe and Rosen 1988, Degenhardt et al. 1996) where it may sit-and-wait for fish prey. This snake may be less strongly tied to rocky microhabitats in southern portions of its range (pers. obs.).

During the past five years populations of *T. rufipunctatus* have exhibited marked declines in many habitats in Arizona and New Mexico (Population trends in Mexico are less well documented.). Several factors have been suggested as causes of these declines including increased siltation of cobble and riffle habitats along southwestern rivers and streams, disease, and the introduction of non-native American Bullfrog, *Rana catesbeiana*, crayfish, *Oronectes* spp., and several fish species (Holycross et al. 2006, Nowak 2006, Painter, pers. comm.). *T. rufipunctatus* is currently listed as threatened by the New Mexico Department of Game and Fish and a Species of Greatest Conservation Need (NMGF 2008).

Conservation of this unique gartersnake is dependent upon a better understanding of the causes of observed declines and as well as an understanding of its ecology. Determining key factors in its natural and life histories are critical to development of sound conservation strategies. While an association with rocky habitats has been documented, details of when and how these rocky habitats are important to *T. rufipunctatus* are largely lacking. Likewise, dietary studies have not been conducted in New Mexico and may provide additional information regarding limiting factors affecting the distribution and abundance of this species. Details of thermoregulatory behavior, reproductive phenology, and the seasonality of habitat use are largely anecdotal.

Methods

We initiated field studies on 18 May 2009 in two focal study sites along the Gila River of southwestern New Mexico. The first was the Gila Bird Area, Grant County, NM (about

1350 m elevation). The second was the Heart Bar Wildlife Management Area, Catron County, NM (about 1700 m elevation). At each site debris piles, rocks, and other suitable cover objects were investigated in order to find *T. rufipunctatus* large enough to carry a 1 g transmitter (Snakes greater than 20 g would satisfy 5% criterion.). In addition to cover searches, we also set Gee minnow traps along the banks of the Gila River in habitats where *T. rufipunctatus* previously occurred or that appeared to be suitable habitat in those areas.

Results

The Gila Bird Area was searched and trapped from 18-26 May 2009 (see Table 1). During that time only one Black-necked Gartersnake, *Thamnophis cyrtopsis*, and one Black-tailed Rattlesnake, *Crotalus molossus*, were found.

The Heart Bat WMA was searched beginning on 26 May 2009. By 27 May (after just 12.5 search hours and 81 trap nights) two *T. rufipunctatus* were located by cover searches. An additional 207.5 search hours and 300 trap nights from 28 May to 8 June 2009 yielded one additional *T. rufipunctatus*, located on 4 June 2009. Other snakes encountered at the Heart Bar WMA included *C. molossus* (4), *Lampropeltis pyromelana* (1), *Pituophis catenifer* (3), *Salvadora grahamiae* (1), *Thamnophis elegans* (12), and *Thamnophis cyrtopsis* (4).

Table 1. Total search effort expended in the Gila Bird Area and Heart Bar WMA during the late spring of 2009, and numbers of *T. rufipunctatus* found.

	Heart Bar WMA	Gila Bird Area
Search Hours	220	38
Trap Nights	381	180
T. rufipunctatus Found	3	0

The three *T. rufipunctatus* found on the Heart Bar WMA included two adult females and one adult male, all large enough to carry transmitters (see Table 2). M1 and F1 were

Table 2. Measurements of three *T. rufipunctatus* found on the Heart Bar WMA.

Snake	**Sex**	**SVL**	**Tail**	**Mass**
F1	Female	787 mm	202 mm	320.0 g
F2	Female	592 mm	160 mm	141.0 g
M1	Male	460 mm	131 mm	48.75 g

tracked using temperature sensing transmitters for two weeks. F2 was tracked for just one week. F1 used a variety of stream-side refuges including debris piles (accumulations of dead wood and vegetation collected on roots of up-turned trees and the bases of willows and other stream-side vegetation), rock crevices and overhangs, and overhung banks. F1 was found over a larger area than was M1, but even so only moved about 120 m during the two-week period (Fig. 1). M1 moved from a rock pile about 40 m from the

river (during a period of pre-molt) to debris piles immediately along the river about 100 m away.

Figure 1. Tracking locations for F1 (large adult female) from 27 May to 11 June 2009 on the Heart Bar WMA, Catron County, NM.

M1 and F1 during the period from 1 to 5 June 2009 maintained different average body temperatures ($t=2.04$, $df=54$, $P=0.046$). F1 averaged 28.49˚ C, while M1 averaged 25.35˚ C. F1 and M1 achieved maximum body temperatures that were, however, similar (33.5˚ C and 34.0˚ C, respectively). M1 maintained relatively stable body temperatures during the day, probably reflecting lack of movement and the insulative properties of the debris pile that housed him. F1s body temperature was more variable (Fig. 2), dipping toward water temperature more frequently. These drops in body temperature appeared to be associated with bouts of foraging in the river for fish (Fig. 3).

Discussion

Our inability to find *T. rufipunctatus* in the Gila Bird Area, Grant County, NM has stimulated us to look elsewhere for low elevation populations that could be used as a comparison with the relatively high elevation population found on the Heart Bar WMA. We will look for snakes along Whitewater Creek to serve this role.

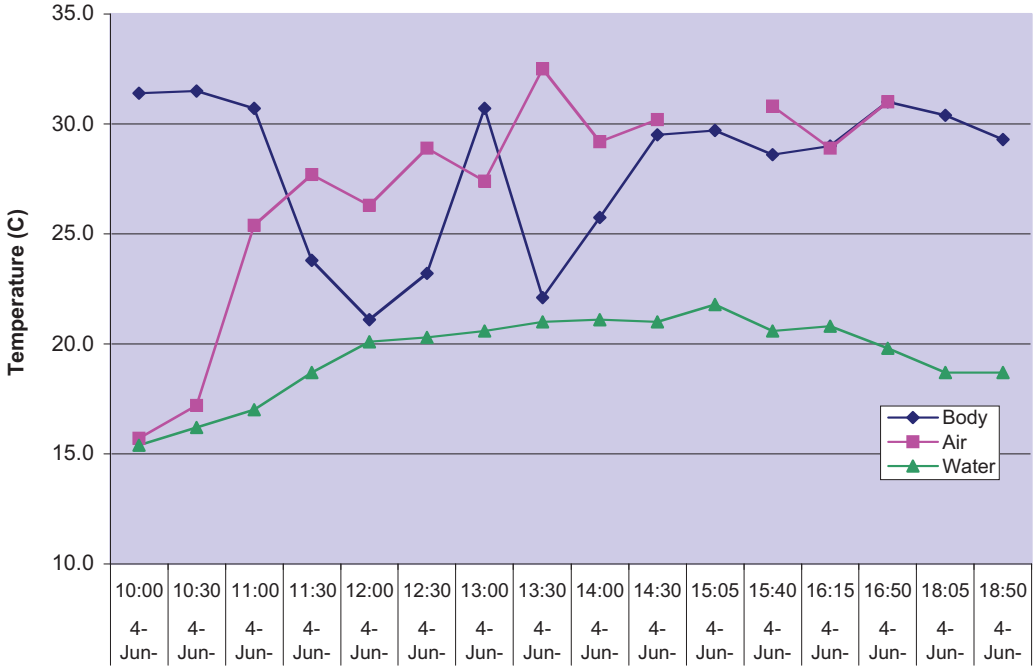

Figure 2. Daily temperature profile for female *T. rufipunctatus* (F1) showing two bouts of foraging with body temperatures dropping to near that of water.

Figure 3. Female *T. rufipunctatus*, F1, crawling along the bottom of the Gila River in 22 cm of water on 5 June 2009. She traveled over 4 m over a period of 1.5 h.

Extensive search and trapping effort at the Heart Bar WMA has yielded only three adult snakes. Two of these are relatively large females that have between 12 and 18 embryos each. In June 2007 the larger of these two snakes was captured and possessed near term embryos. One must question why no small *T. rufipunctatus* have been found. Certainly large numbers of *Rana catesbeiana*, American Bullfrogs, found adjacent to the river may an impact of *T. rufipunctatus* populations in the area.

That F1 possessed a higher average body temperature than M1 is interesting and may be explained by different activities of the two snakes or different reproductive conditions. F1 was conspicuously in the water, presumably foraging, more than M1. Attaining higher body temperatures after foraging could facilitate more efficient digestion. Similarly, F1 is gravid and higher body temperatures may allow more efficient conversion of food resources to embryo growth. Large numbers of temperature profiles will help understand such differences.

Subsequent telemetry activity will focus on temperature profiles obtained from lower elevation sites, and identification of microhabitats that are important to snakes.

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