Post-breeding Terrestrial Movements of *Ambystoma tigrinum* (Eastern Tiger Salamanders)

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Abstract - To assess use of terrestrial habitat by ambystomatid salamanders, *Ambystoma tigrinum* (Tiger Salamanders) were monitored with radiotelemetry. Four individuals were tracked as they exited a wetland and made wide use of the surrounding landscape. Salamanders moved up to 255 m from the wetland of origin and found refugia both within forested land and wildlife food plots. Based on the extent of terrestrial movements by Tiger Salamanders, our findings support previous work demonstrating that upland habitat surrounding wetlands are critical areas in amphibian life cycles. Salamander movements did not appear to be influenced by agricultural development, as two individuals traveled through this habitat type.

Introduction

Ambystomatid salamanders make extensive use of terrestrial habitat surrounding breeding ponds (e.g., Douglas and Monroe 1981, Kleeberger and Werner 1983, Semlitsch 1981, Wacasey 1961, Williams 1973). For example, Semlitsch (1998) suggested a 164.3-m buffer surrounding wetlands would be necessary to protect 95% of individual ambystomatid salamanders in a breeding population, but data regarding movement patterns of several species were limited. *Ambystoma tigrinum* Green (Tiger Salamanders) are known to undertake considerable terrestrial movements (up to 286 m from wetlands, mean = 60.5; Madison and Farrand 1998) but scant information exists regarding movement of this species, particularly within the southern portion of its range (Semlitsch 1983).

Study Area

This study was conducted at the Joseph W. Jones Ecological Research Center at Ichauway (31º13'N, 84º29'W), an approximately 11,500-ha reserve. Ichauway is primarily a *Pinus palustris* Miller (longleaf pine) forest with undisturbed, native ground-cover species. The property is managed intensively with prescribed fire to maintain a pine/grassland community. Scattered individual hardwoods and hardwood patches exist within the longleaf pine matrix as a result of natural and manmade fire shadows. The site formerly was a private quail-hunting plantation, and portions of the site are still managed for traditional hunting, which has resulted in a diverse habitat mosaic of active and abandoned food plots within the forest matrix.

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Methods

Herein we present data collected on four radio-tagged, post-breeding *A. tigrinum* exiting a 0.56 ha seasonally inundated wetland surrounded by predominantly mixed pine/hardwood forest. Approximately 40 m southwest of the wetland are 2 food plots (3.1 ha and 0.8 ha) bisected by a strip of mixed evergreen/deciduous hardwood forest (20 m x 400 m, 0.7 ha). Eight *A. tigrinum* (4 females and 4 males) were captured in pitfall traps at a drift fence as they exited the wetland between January–February 2005. Salamanders were anaesthetized by immersion in a 1:1000 solution of buffered MS-222 and surgically implanted with 0.8-g radio-transmitter units (BD-2H, Holohil Systems Ltd., Carp, ON, Canada) with an estimated battery life of 21 days. Surgical methods followed Madison (1997).

After surgery, salamanders were held until a rain event (3–7 days) and released at dusk within 2 m of the trap where they were captured. The first 6 individuals were released on the same night in mid-January. Attempts to locate these individuals were undertaken after several hours, but their apparently extensive movements made locating them difficult. Two of these individuals were eventually located after a week of searching (female 3 and male 5; Table 1). Two additional animals were released, one in January and another in February, and were monitored every 30–60 minutes until movement ceased. Once an animal had found underground refugia and remained relatively stationary, it was monitored daily until battery failure or presumed predation.

Results

Prior to being located within a burrow, salamanders were observed crawling or stationary under leaf litter. Only one individual was found to use more than one burrow. When we discontinued monitoring, salamanders had not moved beyond their respective burrow for at least 2 days. There was considerable variability among individuals in total distance traveled and in total distance from the wetland (Table 1). Salamanders traveled overland relatively quickly; one individual (male 2) was found to have moved 28 m in 30 minutes and 17.9 m in 45 minutes

Table 1. Movement data for four radio-tagged adult tiger salamanders (*Ambystoma tigrinum*).

Sex	ID	Mass (g)	Total fixes[A]	Total locations[B]	Total movement (m)[C]	Straight line distance from wetland (m)[D]
Male	2	20.78	14	7	57.75	67.5
Female	3	13.22	3	1	235.80	255.5
Male	5	22.28	3	1	112.90	103.8
Male	6	20.65	14	4	27.40	15.9

[A]Number of times an individual salamander was tracked and located.
[B]Number of unique locations where an individual was located.
[C]Total straight line distance between locations, commencing at release point.
[D]Straight line distance from final location to closest wetland boundary.

between fixes. The transmitter from one salamander (male 6) was found 11 days after release at the mouth of a burrow in which the salamander had been residing for 3 days. The transmitter was etched and pitted, indicating that this was possibly a predation event.

Two individuals were located only within the mixed pine/hardwood forest surrounding the wetland. However, one individual (male 2) was found within a wildlife food plot (3.1 ha), and another individual (female 3) was found within the strip of mixed evergreen/deciduous hardwood forest that was bordered on both sides by the food plots. Amphibian movements are known to be constrained by features of the landscape that disrupt forest connectivity (Gibbs 1998, Rothermel 2004). Interestingly, two of four *A. tigrinum* in our study traveled through or found refugia within wildlife food plots. In addition, the majority of salamanders captured at this wetland were caught in traps nearly adjacent to this land cover type (L.L. Smith, unpubl. data), suggesting that *A. tigrinum* may use this habitat extensively.

Discussion

Our results indicate adult *A. tigrinum* moved considerable distances—up to 255 m—from their breeding wetland, emphasizing the importance of upland habitat for pond-breeding salamanders. Although only four salamanders were successfully monitored with radio-transmitters, the study wetland contains a breeding population of several hundred individuals (L.L. Smith, unpubl. data). If movement data from this study are representative of the larger population, *A. tigrinum* appear to make wide use of the surrounding landscape, provided underground refugia are available. No evidence was gathered to suggest that *A. tigrinum* movements were constrained by agricultural development. Because of the relatively large number of burrowing rodents, e.g., *Peromyscus polionotus* Wagner (oldfield mice), that live in these areas, these habitats may actually provide increased opportunities for shelter. Small-mammal burrow density has been suggested as a potential factor limiting *A. maculatum* Shaw (Spotted Salamander) populations (Regosin et al. 2003). Additionally, food plots are tilled annually and the loose sandy soil may be particularly suitable for fossorial species such as *A. tigrinum*. Further research may reveal how agricultural development and altered small mammal populations may influence this species.

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