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Demographics of Mole Salamanders (*Ambystoma talpoideum*) in a Northeastern Arkansas Pond

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The Mole Salamander, *Ambystoma talpoideum*, is a fossorial salamander that migrates to small ponds in late fall to mid-winter for breeding (Hardy and Raymond 1980, Semlitsch 1985, Trauth et al. 2004). Although widespread in the southeastern United States, Mole Salamanders have become locally threatened due to breeding site depletion and terrestrial habitat loss (Raymond and Hardy 1991, Trauth et al. 1993). Primary terrestrial habitats of non-breeding adult *A. talpoideum* are floodplain forests near gum and cypress ponds (Petranka 1998). *Ambystoma talpoideum* rarely stray more than a few hundred m from the pond during the non-breeding season and exhibit high breeding site fidelity (Raymond and Hardy 1990, Semlitsch 1981); therefore, if a breeding pond were destroyed, the entire population using it could become imperiled (Petranka 1998). Man-made ponds may serve as useful conservation tools for this species. This study investigated a small population of Mole Salamanders inhabiting a man-made pond.

We studied a large, water-filled borrow pit located on private land on Crowley's Ridge 7.4 km southwest of Paragould (Greene County), Arkansas. Terrestrial vegetation surrounding the area was dominated by loblolly pine (*Pinus taeda*), with an understory of blackberries (*Rubus spp.*), oak (*Quercus spp.*) and hickory saplings (*Carya spp.*). Aquatic vegetation was limited to sedges (*Carex spp.*). The pond was approximately 12 m by 8 m and gradually deepened from a heavily vegetated northern side to a maximum depth of 1.25 m at a vertical bank on the southern side. Substrate of the pond consisted primarily of gravel and coarse woody debris. Due to summer drying, paedomorphic salamanders were absent.

Ambystoma talpoideum populations were sampled every 2 weeks from 26 January 2007 to 16 March 2007. This corresponds to immediately post-breeding yet before most salamanders exit the pond. We used seines (15 mm mesh) and dip-nets (1.5 mm mesh) to sample *A. talpoideum*. Dip-nets were initially used in shallow, heavily vegetated areas to agitate and disturb the habitat, while attempting to capture any visible salamanders. Seines were then used to sample the deeper, less vegetated portions of the pond and prevent salamanders from avoiding escape. Each seining attempt involved a minimum of 4 passes or until no animals were collected on at least 2 consecutive passes.

We measured snout-vent length (SVL) to the nearest 0.05 mm (snout to anterior portion of vent) and mass to the nearest 0.05 gram. Sex and reproductive status were determined by presence of swollen cloaca, indicating male, and lack of swollen cloaca and/or presence of ova, indicating female. Each animal received an individual mark with fluorescent visible implant elastomer (VIE) dye, Northwest Marine Technologies, Inc. (Vasconcelos and Calhoun 2004). A different color VIE was used each week with the exception of one week when very few animals were caught. The animals were marked ventrally in at least 2 places: immediately posterior to front limbs (left or right) and immediately anterior to rear limbs (left or right). The recapture status of each individual was determined from the location and color of the VIE mark using amber glasses and a UV light. After the pond had been thoroughly sampled and data of the animals were collected, adults were released back into the pond.

A t-test using Minitab 14 (Minitab, Inc., State College, Pennsylvania, USA) with $\alpha = 0.05$ was used to compare morphological data between sexes. The breeding population was estimated using the Jolly-Seber Method (Jolly 1965, Seber 1965).

A total of 6 adult male and 11 adult female *Ambystoma talpoideum* was captured and measured during this study. Average morphological measurements showed no statistically significant differences between sexes (Table 1).

The mark-recapture data yielded single recaptures of 7 individuals (4 males and 3 females) and 2 recaptures of a single male. The estimated maximum population (± SE) of *A. talpoideum* in the pond was 37.3 (± 5.4) adults; consequently, the density of breeding adults in the pond was estimated at 0.39 individuals per m^2.

Table 1. Morphological differences between male and female *Ambystoma talpoideum* captured at the study site. Data are expressed as mean ± 1 SD. Comparisons were made between sexes using a *t*-test with $\alpha = 0.05$.

	Male n = 6	Female n = 11	*P*
Mass (g)	8.83 ± 2.61	8.54 ± 3.35	0.843
SVL (mm)	56.52 ± 7.58	60.1 ± 8.01	0.383

This study provides a starting point for further investigations that are necessary to fully understand the natural history of *A. talpoideum* in northeastern Arkansas as well as in man-made structures. Raymond and Hardy (1990) reported SVL values for 314 male and 310 female mole salamanders as 41-68 mm and 39-72 mm, respectively. Furthermore, those authors report mass for 316 males (2.7-12.2 g) and 310 females (2.3-14.3 g). Williams and MacGowan (2004), reporting from the northern limit of the mole salamander distribution in Indiana, presented data on 22 adults ranging from 45-60 mm SVL with a male mean of 51.7 mm and a female mean of 51.4 mm. Additionally, they report the mass of those 22 adults ranging from 3.5-10.5 g with a male mean of 7.1 g and a female mean of 7.5 g. The SVL and mass reported for both males and females in this study are similar to those reported by both Raymond and Hardy (1990) as well as Williams and MacGowan (2004).

Raymond and Hardy (1990) estimated a mole salamander population as high as 446.5 adults. This is considerably higher than our population estimate. However, they studied a pond that was much larger (1300 m^2). Thus, there were approximately 0.34 adult salamanders per m^2 in that population. The population density of adults reported here is similar at 0.39 adult salamanders per m^2. Given that this population has a density similar to others and contains individuals with similar length and mass as those of more natural locations, we believe that constructed wetlands may serve as useful tools in the conservation of this species.

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