2004. Proceedings of the Indiana Academy of Science 113(2):147–150

# NATURAL HISTORY DATA ON THE MOLE SALAMANDER (*AMBYSTOMA TALPOIDEUM*) IN INDIANA

**Rod N. Williams** and **Brian J. MacGowan**: Department of Forestry and Natural Resources, Purdue University, 195 Marstellar Street, West Lafayette, Indiana 47907 USA

**ABSTRACT.** Mole salamanders, *Ambystoma talpoideum*, are found primarily in the Coastal Plain of the southeastern United States and are not known to occur in Indiana. From 20–24 March 2004, we captured 24 mole salamanders in a bald cypress (*Taxodium distichum*) swamp in Posey County, Indiana (USA) using minnow traps. We provide baseline data regarding size, sex ratios, migration dates, and breeding status. Our data are similar to those found in other studies on populations within the core of the mole salamander's distribution. This likely represents a disjunct population on the northern limits of the species range. Future surveys need to be conducted to determine if additional populations exist that can bridge the distributional gaps between Indiana, Illinois and Kentucky.

**Keywords:** *Ambystoma talpoideum*, Indiana, mole salamander, morphology

The mole salamander, *Ambystoma talpoideum*, is found throughout much of the U.S. southeastern Coastal Plain with several small disjunct populations to the north. It also can be found along a northward extension of the Mississippi River drainage from Louisiana to southern Illinois. There are no known records of the mole salamander in Indiana (Minton 2001; Simon et al. 2002). Herein, we describe a small disjunct population of *A. talpoideum* in the extreme southwestern portion of Indiana, which may represent the northernmost population yet recorded.

In general, the mole salamander is a small, stout-bodied salamander with a broad rounded head, short tail and large limbs (Conant & Collins 1998; Petranka 1998; Powell et al. 1998). The body color is variable and is often brownish, grayish or blackish with scattered clusters of bluish-white flecks that tend to be smaller and more concentrated on the back and tail, but may form large blotches on the sides giving a lichen-like effect (Bishop 1943). Adults generally grow to a size of 8–12 cm and can live up to 6–8 years (Raymond & Hardy 1990; Semlitsch et al. 1993).

Most of our knowledge regarding the natural history of the mole salamander comes from research on populations found within the core of its range, while little information is known from the smaller disjunct populations. Moreover, detailed studies of geographic variation in morphology and life history for this species are lacking altogether (Petranka 1998).

The objectives of this report are: 1) to provide preliminary natural history information on this newly discovered and rare species in Indiana, and 2) to compare the body size and habitat data of the Indiana population to those within the core of its distribution.

## METHODS

The study site was a permanent shallow wetland complex dominated by bald cypress (*Taxodium distichum*), swamp cottonwood (*Populus heterophylla*) and overcup oak (*Quercus lyrata*) in Posey County, Indiana (Figs. 1, 2). The wetlands were in close proximity to one another and separated by an area of southern flatwoods which consisted mainly of swamp white oak (*Q. bicolor*), shagbark hickory (*Carya ovata*), cherrybark oak (*Q. pagoda*), and pin oak (*Q. palustris*).

In the Spring of 2004, we placed plastic minnow traps at the bases of trees and along fallen logs throughout the swamps. We placed traps at differing water depths ranging from completely submerged (i.e., under approximately 25–30 cm of water) to less than 10 cm of water.

From 20–22 March 2004, we set 28 minnow traps and checked the traps twice daily. On 23–24 March 2004, we set 41 minnow

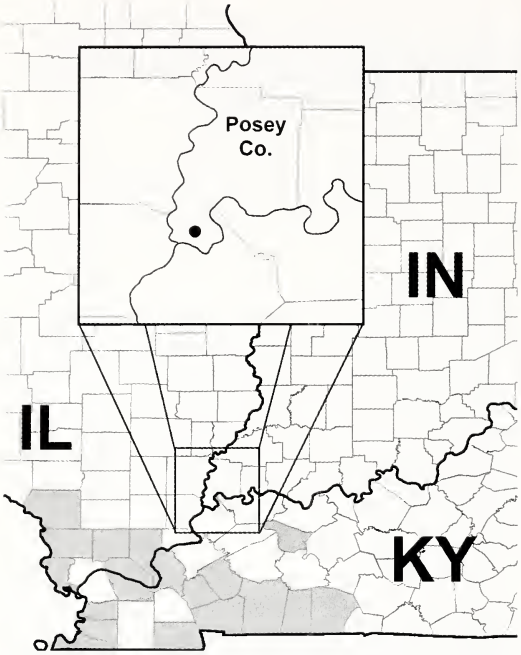


Figure 1.—Location of the mole salamander (*Ambystoma talpoideum*) in Indiana. The black dot represents the approximate location of the mole salamander (*Ambystoma talpoideum*) population in Posey County, Indiana. The shaded regions represent known populations in neighboring areas of Illinois and Kentucky.

traps which we checked once daily. We recorded all amphibian species captured during the trapping period. Each mole salamander captured was weighed (to nearest 0.1 g), measured (to nearest 1.0 mm) to obtain both total and snout-vent lengths (SVL) and classified to sex. We used cloacal swellings and the presence of granular regions on the dorsolateral regions of the tail to classify individuals as breeding adult males (Petranka 1998). Any individual with a SVL > 43 mm and lacking both the swollen vent and granular regions on the tail was classified as a breeding adult female (Semlitsch 1985). *T*-tests were used to determine if males or females differed significantly in size (i.e., SVL, total length, and mass). A chi-squared test was used to determine if the observed sex ratio significantly departed from parity.

Three voucher specimens were collected from the study site. An adult male and an adult female were deposited in the Field Museum of Natural History, Chicago, Illinois.

Figure 2.—Habitat of the mole salamander (*Ambystoma talpoideum*) in Posey County, Indiana.

The remaining voucher specimen, an adult male, was deposited in the Purdue University zoological collection within the Department of Forestry and Natural Resources (Williams & MacGowan 2004).

## RESULTS

Males outnumbered females 1.4:1 and did not significantly differ from parity ($\chi^2 = 0.73$, $df = 1$, $P = 0.39$). We captured 22 terrestrial adults (13 males and 9 females), one (presumably recent) metamorph of unknown sex, and one potentially branchiate adult of unknown sex. The SVL and total lengths for the 22 terrestrial adults captured ranged from 45–60 mm and 86–109 mm, respectively (Table 1). The weight of the 22 terrestrial adults captured ranged from 3.5–10.5 g (Table 1). No significant difference was found for the SVL ($t = 0.13$, $df = 20$, $P = 0.89$), TL ($t = 1.10$, $df = 20$, $P = 0.28$) or mass ($t = 0.59$, $df = 20$, $P = 0.55$) between males and females. No body size data was collected on the suspected branchiate adult. Neither the metamorph nor the suspected branchiate adult was included in any of the analyses.

We captured a total of seven amphibian species within the wetland complex: mole salamander, eastern newt (*Notophthalmus viridescens*), smallmouth salamander (*Ambystoma texanum*), marbled salamander (*Ambystoma opacum*), western lesser siren (*Siren intermedia*), chorus frog (*Pseudacris triseriata*), and southern leopard frog (*Rana utricularia*).

## DISCUSSION

The mole salamander in Indiana may serve as the northernmost population and is likely

Table 1.—Data taken on the mole salamander (*Ambystoma talpoideum*) from 20–24 March 2004 in Posey County, Indiana (SVL = snout-vent length and TL = total length). *Not included in calculation of means, chi-squared tests or *t*-test. **No data collected.

| Individual | SVL (mm) | TL (mm) | Mass (g) |
|---|---|---|---|
| Males | | | |
| 1 | 56 | 106 | 8.5 |
| 2 | 55 | 103 | 9.0 |
| 3 | 55 | 103 | 8.0 |
| 4 | 55 | 102 | 9.0 |
| 5 | 54 | 97 | 7.0 |
| 6 | 53 | 105 | 7.5 |
| 7 | 51 | 100 | 6.5 |
| 8 | 50 | 102 | 7.5 |
| 9 | 50 | 102 | 6.5 |
| 10 | 50 | 100 | 6.5 |
| 11 | 50 | 92 | 6.0 |
| 12 | 47 | 91 | 5.5 |
| 13 | 46 | 92 | 4.5 |
| Females | | | |
| 1 | 60 | 109 | 10.5 |
| 2 | 57 | 98 | 9.5 |
| 3 | 55 | 101 | 8.0 |
| 4 | 50 | 102 | 8.0 |
| 5 | 50 | 101 | 7.0 |
| 6 | 49 | 92 | 7.0 |
| 7 | 49 | 90 | 7.0 |
| 8 | 48 | 88 | 4.5 |
| 9 | 45 | 86 | 6.0 |
| Metamorph* | 41 | 77 | 3.5 |
| Branchiate adult* | ** | ** | ** |
| Male mean | 51.7 | 99.6 | 7.1 |
| Female mean | 51.4 | 96.3 | 7.5 |

isolated from other populations. Its discovery allows us to collect baseline data for comparison with populations in other parts of its range. The habitat in which the Indiana breeding population was found is similar to those sites in core areas that consist of extensive floodplain forests located near gum and cypress swamps (Semlitsch 1981; Shoop 1960). The lengths of the Indiana mole salamanders and the lack of morphological difference between sexes ($P = 0.28$) also are consistent with measurements reported from populations within its core distribution (Raymond & Hardy 1990). According to Petranka (1998), adults generally emigrate from the breeding ponds in March. Some adults ($n = 6$) from the Indiana population were observed under cover objects in the surrounding floodplain forests on 7 April 2004 (Z. Walker & M. Ladato pers. commun.), suggesting a similar emigration pattern.

Twenty-two adults were captured and clearly were in breeding condition. Moreover, Z. Walker (pers. commun.) found mole salamander larvae within the wetland on 16 June 2004. The presence of larvae strengthens the premise that the adult salamanders we collected represent a breeding population. The gilled specimen captured on 22 March 2004 was probably a branchiate adult and not an overwintering larva, but no data were collected for confirmation prior to release. Branchiate adults are more common in permanent wetlands while terrestrial adults are frequently found in ephemeral wetlands (Scott 1993; Semlitsch & Gibbons 1985). The permanency of bald cypress wetlands makes a suitable habitat for branchiate adults (Semlitsch 1981).

The mole salamander is likely limited to the extreme southwestern portion of Indiana due to its habitat requirements, but further studies are required to confirm this. The cypress wetlands, the preferred habitat of this species, are extremely rare and fragmented in Indiana. Surveys need to be conducted to determine if additional populations exist that can bridge the gaps between the Indiana population and neighboring populations in Illinois and Kentucky.

## ACKNOWLEDGMENTS

We thank Zachary Walker, Mark Pochon, Roger Hedge, and Nate Engbrecht of the Indiana Department of Natural Resources for access to sampling sites and field assistance. We especially thank Z. Walker for assistance with species identification and comments on the manuscript, and M. Pochon for providing lodging while field work was being conducted. Ray Semlitsch of the University of Missouri-Columbia, Alan Resetar of the Chicago Field Museum of Natural History, Robert Brodman of Saint Joseph's College, and Mike Ladato provided assistance with species identification. Purdue University Department of Forestry and Natural Resources provided funds to conduct the field sampling. J.A. DeWoody and members of his lab group provided many helpful comments on earlier drafts of this manuscript. This manuscript is

ARP contribution #17380 from Purdue University.

## LITERATURE CITED

Bishop, S.C. 1943. A Handbook of Salamanders. Comstock Publishing. Ithaca, New York. 555 pp.

Conant, R. & J.T. Collins. 1998. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed., expanded. Houghton Mifflin Company. Boston, Massachusetts. 616 pp.

Minton, S.A., Jr. 2001. Amphibians and Reptiles of Indiana. Indiana Academy of Science. Indianapolis. 404 pp.

Petranka, J.A. 1998. Salamanders of the United States and Canada. Smithsonian Institution. Washington, D.C. 587 pp.

Powell, R., J.T. Collins & E.D. Hooper, Jr. 1998. A Key to Amphibians and Reptiles of the Continental United States and Canada. University Press of Kansas. 131 pp.

Raymond, L.R. & L.M. Hardy. 1990. Demography of a population of *Ambystoma talpoideum* (Caudata: Ambystomatidae) in northwestern Louisiana. Herpetologica 46:371–382.

Scott, D.E. 1993. Timing in reproduction of paedomorphic and metamorphic *Ambystoma talpoideum*. American Midland Naturalist 129:397–402.

Semlitsch, R.D. 1981. Terrestrial activity and summer home range of the mole salamander (*Ambystoma talpoideum*). Canadian Journal of Zoology 59:315–322.

Semlitsch, R.D. 1985. Reproductive strategy of a facultatively paedomorphic salamander *Ambystoma talpoideum*. Oecologia 65:305–313.

Semlitsch, R.D. & J.W. Gibbons. 1985. Phenotypic variation in metamorphosis and paedomorphosis in the salamander *Ambystoma talpoideum*. Ecology 66:1123–1130.

Semlitsch, R.D., D.E. Scott, J.H.K. Pechmann & J.W. Gibbons. 1993. Phenotypic variation in the arrival time of breeding salamanders: Individual repeatability and environmental influence. Journal of Animal Ecology 62:334–340.

Shoop, C.R. 1960. The breeding habits of the mole salamander, *Ambystoma talpoideum* (Holbrook), in southeastern Louisiana. Tulane Studies in Zoology 8:65–82.

Simon, T.P., J.O. Whitaker, Jr., J.S. Castrale & S.A. Minton. 2002. Revised checklist of the vertebrates of Indiana. Proceedings of the Indiana Academy of Science 11:182–214.

Williams, R.N & B.J. MacGowan. 2004. Geographic distribution. Mole salamander. Herpetelogical Review 35:279.

*Manuscript received 13 July 2004, revised 9 September 2004.*