

Miscellaneous Notes on *Ambystoma texanum* in Vigo County, Indiana

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Introduction

Ambystoma texanum, the small-mouth salamander, was studied extensively between 1974 and 1980 in Vigo County, Indiana. These salamanders congregate in temporary breeding ponds in early spring (Cook, 1964; Bailey, 1943). It is believed that *Ambystoma* spp. migrate above ground at night into the ponds (Taylor, 1972; Shoop, 1965), and that moisture and temperature together act as stimuli to migration (Blanchard, 1930; Wright and Allen, 1909). The purpose of this study was to gain an understanding of the movements of the small-mouth salamander during the breeding period and to determine the effects of temperature and precipitation upon migration.

Methods

Salamanders were collected at four sites in Vigo County, here referred to as Dave's Pond, Ambystoma Pond, Scaphiopus Pond and the Milwaukee Railroad embankment, in the early springs of 1974, 1976, 1978 and 1980. The first three ponds are in the uplands about 5-10 miles NE of Terre Haute. The railroad embankment is in the Wabash floodplain. Included in this study area is a breeding pond, but also, large numbers of salamanders live along the embankment itself, and numbers can often be caught under the old ties strewn along the tracks. This gave us a rather unique opportunity to collect information on this species during the non-breeding season.

The animals were collected in minnow traps, along drift fences and, in 1980, in a specialized can trap set in the banks of two ponds (Ambystoma Pond, Railroad embankment), and under the ties (RR tracks). The drift fences consisted of $\frac{1}{4}$ " mesh hardware cloth 8" high and of various lengths. Sunken bottle traps were placed along their lengths. These fences were established at varying distances from the ponds. The specialized can traps consisted of a metal can (10.5 cm diameter, 17.5 cm height) with a wire screen at one end and a wire screen funnel (5.5-6.0 cm in length) at the other. The funnel, with a 2 cm diameter opening at one end, was placed in tunnel openings along the banks of the ponds, at or near the water's edge. Traps were checked daily, sometimes more frequently, from the time they were set out until after the salamanders had left the ponds.

Some of the animals taken in traps were toe-clipped for identification and released in order to assess movements and duration of stay in the ponds. Population estimates (Peterson Estimate, Lincoln Index) were also calculated based on mark and recapture data.

Temperature and precipitation data were taken from climatological observations made by the Pfizer Company of Terre Haute in 1974 and from NOAA monthly climatological publications for Indiana in 1976, 1978, and 1980. Maximum and minimum temperatures were averaged for mean daily temperatures.

Results and Discussion

Earliest breeding reported for *Ambystoma texanum* is in December in Tennessee (Ashton, 1961). Generally small-mouth salamanders breed from March to April (Cook, 1964; Bailey, 1943; Smith, 1934). Results in this study show animals beginning to arrive in the breeding ponds in high numbers as early as 17 February 1976 and as late as 23 March 1978. It appears that the animals will not enter the ponds in Vigo County in January even if conditions are right (high temperatures, melting of ice). For example, in late January 1969 five days of 50 to 70°F temperatures occurred, and the ice completely melted from the ponds, but no salamanders were found in the ponds.

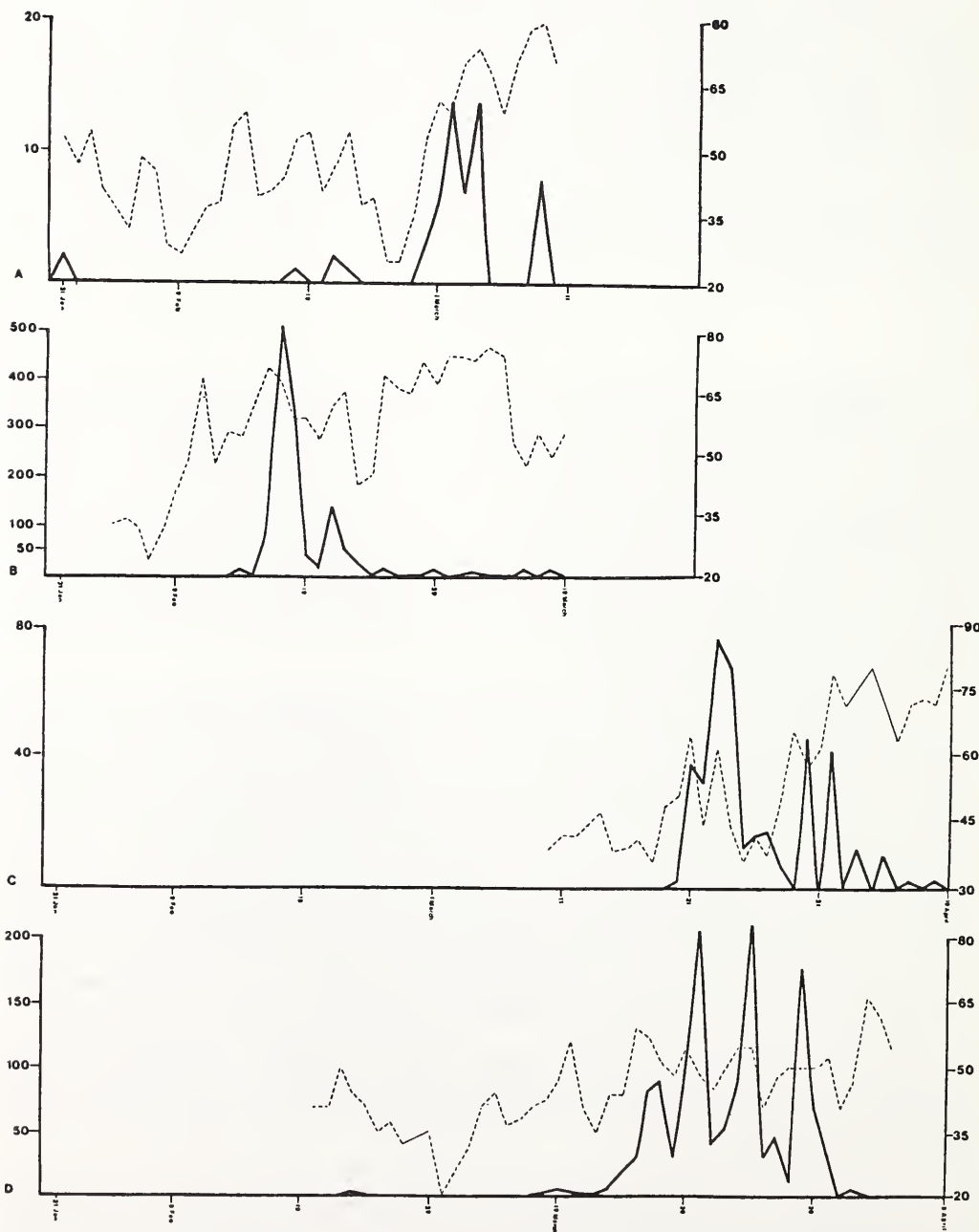


FIGURE 1: Numbers of *Ambystoma texanum* Captured per Day (solid line) and Maximum Daily Temperatures (°F) for (A) 1974, (B) 1976, (C) 1978 and (D) 1980

Temperature and precipitation are considered important as stimuli for migration into the breeding ponds. Smith (1934) reports animals breeding soon after the ponds were free of ice, and Bailey (1943) notes breeding associated with warm weather. Ramsey and Forseyth (1950) state that *A. texanum* in Texas breeds after heavy rains, while Bailey (1943) reports that although breeding may be associated with rains it is not considered a necessity. Minton (1972) states that two days or more of mild, rainy weather in winter stimulates migration to breeding ponds.

The influence of temperature on migration to the ponds seems obvious from our results (Figure 1). In 1974 and 1976 maximum daily temperatures were above 50°F on nearly all days when salamanders were captured. In 1978 and 1980 maximum temperatures were 40°F on all days but two in 1978 (25 and 27 March) when animals were taken. In all years the greatest number of animals per day was taken following at least four (1974) and up to 11 days (1980) of greater than 40°F maximum temperature. In 1974, 1976, and 1980 these peaks followed four (28 February, 1, 2 and 3 March; $N = 7$), five (13, 14, 15, 16, 17 February; $N = 488$) and three days (23, 24, 25 March; $N = 210$), respectively, of greater than 50°F maximum temperatures. In 1978 animals were beginning to peak on 20 March (65°F maximum) when temperatures dipped to 44°F and the numbers dropped. The next day temperatures rose to 62°F and the number of *Ambystoma texanum* increased accordingly (Figure 1C).

Precipitation did not produce a similar effect (Figure 2). There did not seem to be any relationship between precipitation and either peak numbers of animals taken in the ponds or the beginning of migration. In 1974 animals began to enter the breeding ponds on 18 February ($N = 1$). There was no precipitation on this day (Figure 2A). On 28 February animals again began to move into the ponds and again there was no precipitation, nor had there been any for two days prior to this. Numbers of animals peaked on 3 March ($N = 14$) and again on 5 March ($N = 14$). There was no precipitation on 3 March, but it rained 0.65 inches on 5 March.

In 1976 animals were first captured in the ponds on 13 February ($N = 3$) and increased over the next 4 days, to peak on 17 February ($N = 488$). There was no precipitation on 13 February; however, 1.05 inches of rain did fall on the seventeenth (Figure 2B).

Similar results were seen in 1978 and 1980. In 1978 migration began on 20 March with no precipitation ($N = 2$), and animal numbers peaked on 23 March with no precipitation ($N = 78$), and again on 30 March ($N = 46$), 0.05 inches of precipitation (Figure 2C). In 1980 animals began to enter the ponds on 9 March ($N = 2$), no precipitation, and peaked on 21 March ($N = 205$), .10 inches precipitation, and 25 March, no precipitation ($N = 210$) (Figure 2D). There did not seem to be any relationship between precipitation and movements of *A. texanum*.

Ambystoma spp. have been reported to migrate into breeding ponds at night (Hurlbert, 1969; Shoop, 1965). Similar, though limited, results were seen in this study. In 1974 at Dave's Pond between 3 March and 5 March, though traps were checked both in the morning and in the evening, all animals ($N = 33$) except 3 were captured during the night. In 1976, 1978 and 1980 traps were checked only once each day so no further data are available.

It was assumed that *Ambystoma texanum* travels above ground into the breeding ponds. However, results here seem to contradict this. In 1974 at Dave's Pond drift fences and minnow traps were set out by 24 January. The first salamander was taken in a seine on 31 January and 14 *A. texanum* eggs were seined on 14 February. It was not until 18 February that animals were captured at the fences. In 1980 minnow traps were set at Dave's Pond under ice. Two

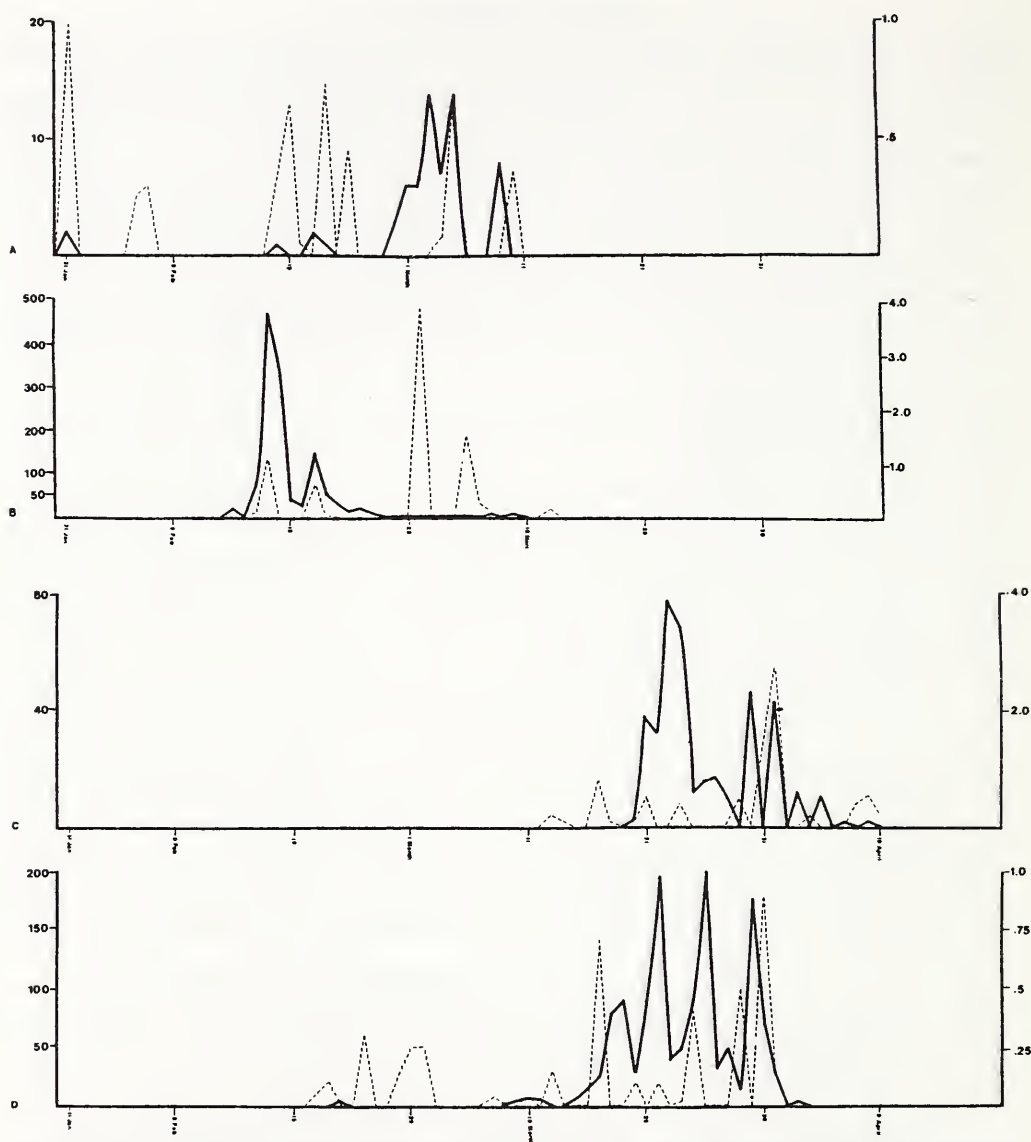


FIGURE 2: *Numbers of Ambystoma texanum per Day (solid line) and Daily Precipitation in inches.*

salamanders were captured on 23 February while the pond was still covered with ice. In that year specialized can traps were set in burrows in the banks of Ambystoma Pond and the Milwaukee railroad embankment pond. Ten *Ambystoma* were captured in these traps while none were taken at the fences. These results indicate that numerous small-mouth salamanders move underground through burrows into the ponds rather than above ground.

Animals were toe clipped and 1976 data were recorded on movements of the salamanders both in the breeding ponds and in a permanent colony found under railroad ties at the Milwaukee railroad embankment. At Ambystoma Pond ($N = 22$) animals moved an average of 12.7 meters and a maximum of 40 meters. At the Milwaukee railroad embankment (the permanent population) movements ($N = 8$) ranged from 0 to 170 meters $\bar{x} = 44.6$ meters).

Mark and recapture data were also used in 1976, 1978, and 1980 to gather information concerning duration of stay in the breeding ponds. Data indicate that there is a rapid turnover of individuals, so the population estimates were not

TABLE 1: Mark and Recapture Data Showing Duration of Stay in Breeding Ponds

		Days since Marking																Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1978 (*N = 233)																		
Ambystoma	♂	26	23	18	12	3	5	4	19	11	3	12	1	1	0	0	0	1
Pond	♀	5	1	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0
Total		31	24	19	12	4	5	4	19	13	3	12	1	1	0	0	0	1
1980 (N = 487)																		
Milwaukee	♂	3	2	2	2	4	0	3	1	0	3	0	2	0	0	0	0	0
Railroad																		
Pond	♀	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
Total		3	2	2	2	4	0	4	1	0	3	0	3	0	0	0	0	0
1980 (N = 120)																		
Ambystoma	♂	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pond	♀	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		6	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*(N = Number of salamanders marked)

reliable. In 1976 on 16 February 17 individuals were marked and released. On 17 February of 109 animals captured 5 were recaptured. On 18 February there were 16 recaptures in 75 captures, 21 February 6 recaptures of 81 individuals, and on 22 February 6 recaptures of 27 individuals. Between 17 and 22 February 292 animals were captured with a total of 33 recaptures.

In 1978, two hundred thirty-three animals were marked and 147 were recaptured. In 1980 at Ambystoma Pond 120 individuals of *Ambystoma texanum* were marked in a total of 183 captures. Only 11 of these marked individuals were recaptured. That year at the temporary pond at the Milwaukee railroad embankment 1122 animals were captured, 487 were marked but only 24 recaptured. These low numbers of recaptures seem to indicate a rapid departure of the salamanders from the breeding ponds.

Males occurred in higher numbers in the breeding ponds and remained for longer periods of time than females. In 1978 of 233 captures 195 were males and 38 were females. One hundred thirty-nine of the 147 recaptures that year were males. One male was recaptured 17 days after marking while the longest stay for a marked female was only 5 days (Table 1). In 1980 at Ambystoma Pond 7 of 11 recaptures were male and 4 female. Only two females were recaptured and they had been in the pond 7 and 12 days, respectively. A total of 1122 individuals was captured at this breeding area including 200 females, 2 undetermined and 920 males.

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