03-028W

Report to Illinois Wildlife Preservation Fund

Population Census of *Ambystoma platineum* Kickapoo State Park, Vermilion County, Illinois

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Introduction

Study Site

The study site consists of one natural ephemeral pond in Middle Fork Woods Nature Preserve (MFWNP) , Kickapoo State Recreation Area, Vermilion County, Illinois and one man-made ephemeral pond just outside MFWNP. The ponds are located on a ridge and separated by approximately 100m. The natural pond is usually filled by snowmelt or late winter-early spring rains. The man-made pond fills partially in late fall and fills completely with snowmelt and rain. At its fullest, the natural pond is approximately 45 meters in diameter, while the man-made pond is approximately 18 meters in diameter. The natural pond is dominated by swamp white oak, *Quercus bicolor* with an average of 99% canopy cover. The man-made pond is located on a woodland edge, in an open field, with an average of 45% canopy cover.

Study Species

Within the state of Illinois, *A. platineum* is found only at MFWNP and is protected by the Illinois Endangered Species Protection Act as endangered. *Ambystoma platineum* is a triploid unisexual member of the *A. jeffersonianum* complex that reproduces primarily via gynogenesis. At this site, A. platineum is a sexual parasite of *A. texanum*. Fertilization occurs at a relatively higher rate compared to other populations studied in nearby Indiana, resulting in a high rate of tetraploid individuals (Phillips et al. 1997). We will use the term polyploid *Ambystoma* to include all *A. platineum* as well as all individuals of higher ploidy resulting from the fertilization of *A. platineum* embryos by *A. texanum* sperm. These species are members of the mole salamander family Ambystomatidae, which spend much of the year in terrestrial burrows away from the breeding pond. Two other species of ambystomatid salamander breed at this site, the spotted salamander (*A. maculatum*) and the fall breeding marbled salamander (*A. opacum*).

Most salamander species in the family Ambystomatidae migrate to breeding ponds in late winter or early spring, often moving in large pulses during warm rains. Timing of this migration is important to the survival of the salamanders and their reproductive success. The breeding ponds for these species are ephemeral, and thus to maximize offspring development time, the adults should mate and oviposit as soon as conditions are favorable.

Males of ambystomatid species typically arrive at the breeding ponds before the females. Individuals of Jefferson's salamander (*Ambystoma jeffersonianum*) initiate their migration to the breeding ponds once a minimum threshold temperature and ground saturation level has been reached. Males will continue the migration until they reach the pond, whereas females will temporarily halt their movements if the climate drops below their threshold (Douglas, 1979). Individuals of the spotted salamander (*Ambystoma maculatum*) typically migrate to the breeding ponds shortly after congeners, such as the small-mouthed salamander (*A. texanum*) and the Jefferson's salamander.

We used a drift fence/drop can array, as well as visual encounter surveys and minnow traps to census the breeding migration of *Ambystoma* adults at the two ephemeral ponds in Kickapoo State Park, one natural pond in the Middle Fork Woods Nature Preserve (MFWNP) and a man-made pond just outside the preserve.

Materials and Methods

We constructed a drift fence using aluminum screening with drop cans placed every 4.5 meters on 8 February 2001. Traps were covered with plywood coverboards and held down with shelf brackets to prevent depredation. Beginning on 1 February 2003 traps were checked following precipitation events or every second day, whichever was more frequent. On 18, 19, 23, and 27 March, we performed timed visual encounter surveys of the man-made pond. Four minnow traps were set on 15 March and checked daily until they were removed on 29 March.

Adults were identified to species based on gross morphological characteristics. For bisexual species, sex was determined and recorded. The number of each species and sex captured in each can was recorded. The snout-vent lengths (SVL) of all salamanders were measured, and marked by clipping the toe on the outer front foot. For individuals from the natural pond, the left front foot was used, for individuals from the man-made pond the right front foot was used. Temperature and humidity were recorded once per hour using a data logger and precipitation data was taken from the Danville Sewage Treatment Center.

On 12 April 2003, the fences were removed from the site.

Results

At the natural pond in the nature preserve, we collected 35 polyploids (5 juveniles), 12 *A. texanum* (1 female, 6 males and 5 juveniles), and 24 *A. maculatum* (10 females, 14 males). In the man-made pond, we collected 46 polyploids, 10 *A. texanum* (5 females, 4 males, 1 juvenile), and 2 *A. maculatum* (1 male and 1 female). The first salamanders migrated to the ponds on 1 February, with the largest number moving on 18 March (Table 1). Salamanders were encountered following precipitation events (Fig. 1). Overnight low temperatures remained below freezing until 12 March (Figure 1).

There was no difference in SVL of salamanders at the natural pond and the man-made pond. Polyploid adults averaged 82.55 mm SVL at the natural pond and 85.3 mm SVL at the man-made pond. Adults of *A. texanum* averaged 80.67 mm SVL for males at the natural pond, 81.1 mm SVL for males at the man-made pond and 82.2 mm SVL for females at the man-made pond. The one female (A. tex) captured at the natural pond was 75 mm SVL. One female and one male *A. maculatum* were captured at the man-made pond, measuring 89 mm SVL and 95 mm SVL, respectively. At the natural pond, males averaged 85.15 mm SVL and females averaged 87.91 mm SVL.

Discussion

During the breeding season of 2003, rainfall and temperatures were below average. The natural pond in MFWNP never filled. The largest precipitation event of 1.75 cm occurred on 12 March, which was also the first day with low temperature above freezing. Salamanders typically migrate during precipitation events when the daily low temperatures are above freezing. At this site, large breeding migrations typically occur between the last week of February and the first two weeks of March, with the majority of adults having reached the ponds by the middle of March (Mui, 2002; Mui and Phillips 2001; Phillips et al. 2001). If the threshold conditions are not met, most salamanders will not migrate to the ponds.

The recapture rate at the natural pond drift fence was too low to accurately estimate the size of the breeding population this year. Individuals which entered the ponds either escaped capture when emigrating or remained in the dry basin after 12 April when the fence was removed. Our census size was 37 polyploids, 12 *A. texanum* and 24 *A. maculatum.* Because of the lack of rain, no mass migration occurred and presumably the actual population is much larger than our results indicate.

The drift fence at the man-made pond was easily trespassed by adult salamanders and thus can not be used to accurately estimate population size. Our hand capture and minnow trapping efforts give us a minimum breeding population size of 46 polyploids, 10 A. texanum and 2 A. maculatum. We can not, however estimate the actual population size due to low recapture rates. This is the first year that adult *A. maculatum* have been captured at the man-made pond, and the second year that egg masses of *A. maculatum* have been found in the pond.

The natural pond failed to fill during the spring of 2003 and the man-made pond dried in the middle of April. This was not sufficient time for the completion of the aquatic stages of the salamander life cycle. There was no recruitment from either pond.

Summary

Our results show that the man-made pond is being utilized by a large number of adult salamanders and that three of the four species of ambystomatid salamanders from MFWNP are now breeding in the man-made pond. The fourth species, *A. opacum* is a fall terrestrial breeder and thus less likely to colonize the man-made pond. There was no recruitment of salamanders from either pond in 2003 due to low precipitation levels.

No accurate estimate of breeding population could be made, nor of actual population size due to low precipitation levels and low recapture rates

Expenditures

All expenditures were travel expenses to and from the study site. Most travel was done in an Illinois Natural History Survey vehicle at the rate of $0.17 per mile, approximately 58 miles roundtrip. During one week in March, an undergraduate student drove his personal vehicle to and from the site at the rate of $0.35 per mile. One of the principal investigators was also reimbursed for 2 roundtrips from her home in Chicago, Illinois to Kickapoo State Park in her personal vehicle at the rate of $0.35 per mile, approximately 280 miles round trip. Additionally, for the removal of the drift fence at the end of the study, a larger vehicle was borrowed from the Illinois Natural History Survey and billed at $0.31 per mile.

Literature Cited

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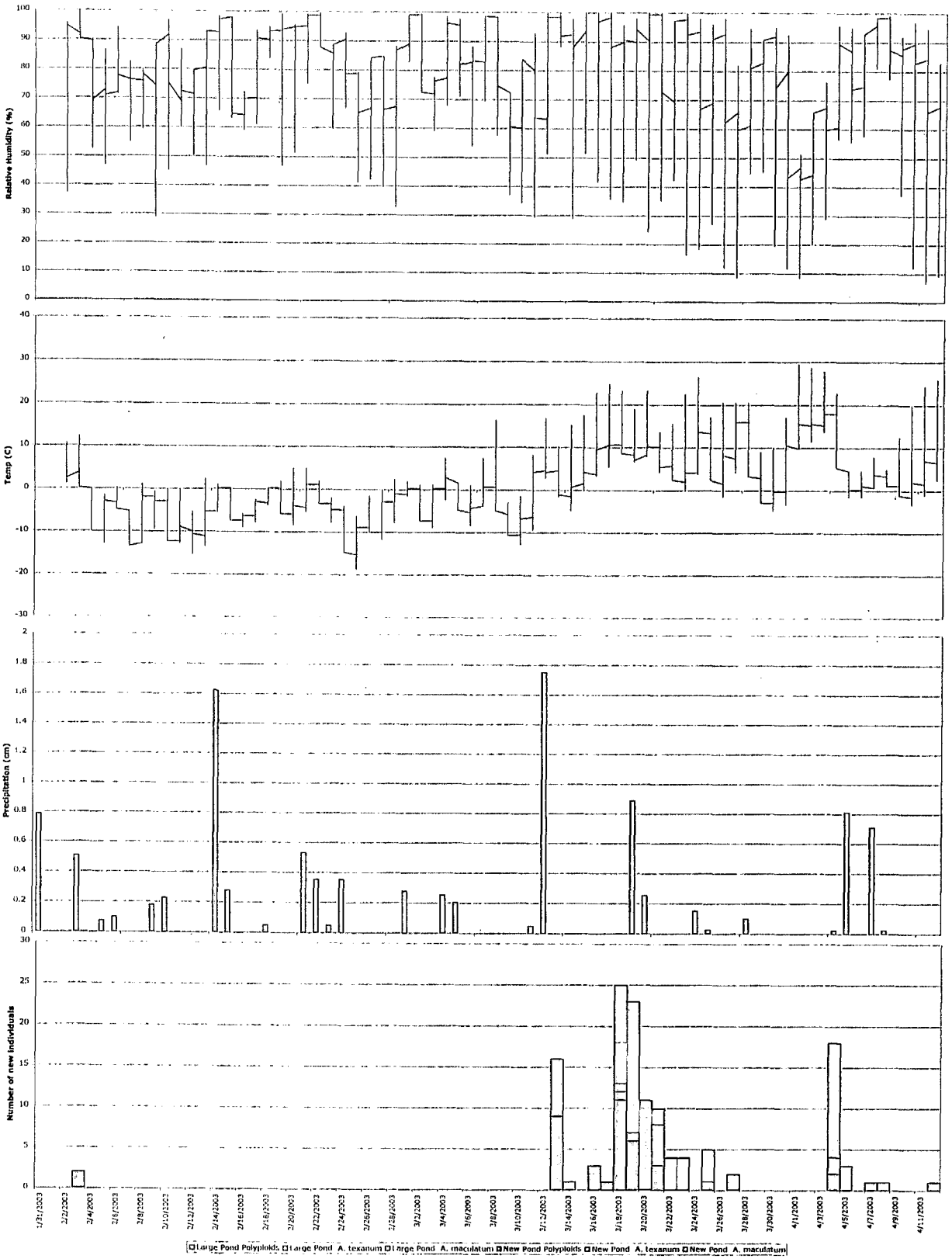
Date	Natural Pond Polyploids	Natural Pond *A. texanum*	Natural Pond *A. maculatum*	Man-made Pond Polyploids	Man-made Pond *A. texanum*	Man-made Pond *A. maculatum*
3-Feb	2*	0	0	0	0	0
13-Mar	9	7	0	0	0	0
14-Mar	1	0	0	0	0	0
16-Mar	0	0	0	2	1	0
17-Mar	1*	0	0	0	0	0
18-Mar	11*	1*	1	5	7	0
19-Mar	6	1*	0	15	1	0
20-Mar	0	0	0	10	1*	0
21-Mar	3	0	5	1	0	1
22-Mar	0	0	0	4	0	0
23-Mar	0	0	0	4	0	0
25-Mar	0	0	1	4	0	0
27-Mar	0	0	0	1	0	1
4-Apr	2	2	14	0	0	0
5-Apr	0	0	3	0	0	0
7-Apr	1*	0	0	0	0	0
8-Apr	1	0	0	0	0	0
12-Apr	0	1	0	0	0	0
Total	37	12	24	46	10	2

Table 1. Number of unmarked individuals captured on each day at the natural pond in Middle Fork Woods Nature Preserve and the man-made pond outside the preserve. There were no unmarked individuals captured on omitted days. (* indicates presence of juveniles)


Relative Humidity (%)
Temp (C)
Precipitation (cm)
Number of new individuals
Large Pond Polyploids
Large Pond A. texanum
Large Pond A. maculatum
New Pond Polyploids
New Pond A. texanum
New Pond A. maculatum