

LOCATION OF EGGS OF THE SPOTTED SALAMANDER (*AMBYSTOMA MACULATUM*) IN RELATION TO AQUATIC VEGETATION IN A VERNAL POND

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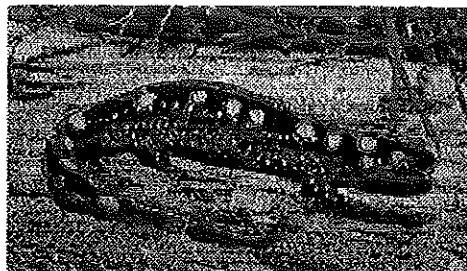
ABSTRACT

We observed physically and statistically that Spotted salamanders (*Ambystoma maculatum*) lay their eggs in close association with aquatic vegetation and submerged upright sticks. Therefore, the reproductive success and future survival of these salamanders may depend on there being sufficient aquatic vegetation and woody material in the vernal ponds where they lay their eggs.

INTRODUCTION

We examined where Spotted salamanders, *Ambystoma maculatum* (Fig. 1), lay their eggs in relation to aquatic vegetation in vernal ponds. Vernal ponds are shallow depressions that seasonally fill with water. These areas become the breeding grounds for many amphibians including the Spotted salamander. Vernal ponds may be found in forests, meadows, river flood plains and coastal dunes.

Figure 1. An adult Spotted salamander, *Ambystoma maculatum*.



Spotted salamanders are one of the most common salamanders in Pennsylvania. They prefer to live underground and are primarily nocturnal amphibians. Spotted salamanders reach an adult size of about six to eight inches and are easily recognizable by the two rows of yellowish orange spots that extend

down the length of their body. The salamander prefers a hilly woodland habitat with ponds for reproduction. Reproduction occurs in early spring after the first warm rains fall. The salamanders lay their eggs after an all-night courtship dance. We were able to observe a female salamander laying her eggs on the afternoon that we collected our data. Spotted salamanders lay two different types of eggs. The eggs may be clear or milky in appearance. It is not yet known why the salamander lays these two types of egg masses. The eggs are usually deposited near aquatic vegetation or branches. Spotted salamanders hunt at night, eating worms, slugs and insects.

The hypothesis that we tested was that Spotted salamanders should lay their eggs in close proximity to aquatic vegetation. If so, significant amounts of aquatic vegetation may be crucial for the reproductive success, and hence survival of the salamanders.

We chose the Spotted salamander because they are the most common salamander in vernal ponds in Huntingdon County. Their life cycle is dependent upon the vernal ponds for their life functions such as egg laying and maturation. In addition, their egg clusters are fairly large in size, up to four inches, making them easy to identify.

FIELD SITE

Our field site was a large vernal pond in the woodlands alongside Petersburg Pike, Huntingdon County, PA. The pond was located approximately 50 feet into the woods from the roadside. The vegetation found at the pond site was mainly trees, such as oaks and maples, shrubs, ferns, wildflowers, and aquatic vegetation, *Juncus sp.* (See Fig. 2 for details of the pond-circumference measurements). The vernal pond contained a large variety of invertebrates, insects, and amphibian eggs; but there were no fish in the pond. The lack of predators makes the vernal ponds an ideal situation for maturing young.

METHODS AND MATERIALS

The circumference of the vernal pond was estimated using measuring tape, and trees along the shoreline as markers. The location of egg clusters was determined with reference to these measurements (Fig. 2). Distance from the shoreline and water depth were recorded. Chi-square tests were used to test whether egg clusters were significantly associated with aquatic vegetation and submerged upright sticks.

RESULTS

The egg clusters of the Spotted salamander were located along the periphery of the pond, except for one area where there was very little or no vegetation (Table 1, Fig. 2). Both clear and milky egg clusters were always found among aquatic vegetation or attached to submerged upright sticks (clear clusters: $\chi^2 = 18.5$, $P < 0.001$, $N = 37$; milky clusters: $\chi^2 = 28$, $P < 0.001$, $N = 56$; Tables 2 & 3).

Figure 2. Vernal pond circumference map. This map shows the circumference measurements (in feet) of the vernal pond, using trees along the edge of the pond as markers (shown as circles). Also indicated are where the Spotted salamander egg clusters were located. (Note: this is an estimated outline of the pond).

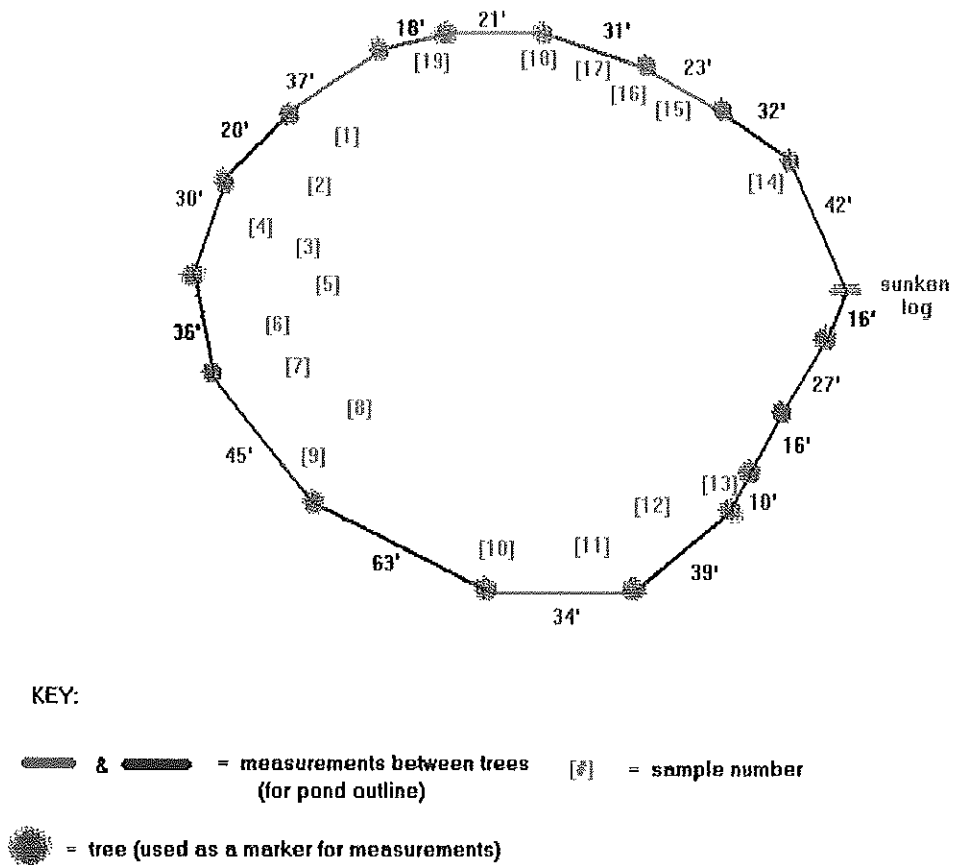


Table 1. Observed number of Spotted salamander egg clusters at sample sites.

Sample Number	Number of clear egg clusters observed	Number of milky egg clusters observed	Total number of egg clusters observed
1	1	2	3
2	1	1	2
3	1	3	4
4	4	3	7
5	2	4	6
6	4	5	9
7	1	3	4
8	3	4	7
9	1	2	3
10	1	0	1
11	3	5	8
12	4	7	11
13	1	3	4
14	1	0	1
15	1	0	1
16	2	4	6
17	2	5	7
18	1	0	1
19	3	5	8
TOTALS	37	56	93

Table 2. Frequency of clear egg clutches of the Spotted salamander (*Ambystoma maculatum*) in vegetated vs non-vegetated areas in a vernal pond

	# of Clutches Near Vegetation	# of Clutches Near Non-vegetation
Observed	37	0
Expected	18.5	18.5

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}} = 342.25/18.5 = 18.5 \text{ (Critical value}_{0.001} = 10.828)$$

Table 3. Frequency of milky egg clutches of the Spotted salamander (*Ambystoma maculatum*) in vegetated vs non-vegetated areas in a vernal pond

	# of Clutches Near Vegetation	# of Clutches Near Non-Vegetation
Observed	56	0
Expected	28	28

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}} = 784/28 = 28 \quad (\text{Critical value}_{0.001} = 10.828)$$

DISCUSSION

At the study site, Spotted salamanders only laid their eggs close to or on vegetation or woody material. These results agree with those of Shaffer (1991).

ACKNOWLEDGEMENTS

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LITERATURE CITED

Shaffer, Larry L. 1991. Pennsylvania Amphibians & Reptiles. Pennsylvania Fish and Boat Commission, Harrisburg, Pennsylvania, USA.