

Abundance of Tiger Salamanders in Kleinstuck Preserve

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INTRODUCTION

The study and preservation of amphibians has long been a concern in the world of ecology. Known for their use as environmental bioindicators, able-bodied amphibians have served the biological community as more than just elementary school study specimens in the classroom. In the wild, the ability to thrive in both terrestrial and aquatic ecosystems has made amphibians the perfect measuring tool for biological thresholds (ECOS 2003). Permeable skin that can allow for the absorption of water and oxygen, as well as other morphologic features, proves useful in the lives of amphibians, making living a possibility in aquatic ecosystems, and all the while, remaining terrestrial in nature as well (Osborne 2009).

However, these convenient anatomical features can prove deadly in return. Close proximity and sensitivity to their surrounding environment threatens amphibians, as slight changes in the climate, water contamination, and exposure to certain fungi and water-carried diseases can prove fatal for many amphibians. As they are so closely connected to their habitats, the relative presence or lack of amphibians provides biologists with a dependable health-monitoring method of the ecosystem. If living conditions are not tolerable, any negative changes in the population of amphibians is a first sign of trouble. Such decline in the amphibian population at the Kleinstuck Preservation first sparked concern in the Kleinstuck Stewards.

Upon initial examination, the presence of *Ambystoma tigrinum*, the tiger salamander, a species of salamander native to the Preserve's location in Michigan, was debated. After visiting the Kleinstuck Preserve and doing some preliminary research, our group hypothesized that an abundance survey using tree cookie cover boards would determine the presence of tiger salamanders. The use of the cover board analysis for our study was determined by the tiger salamander's specificity as a type of mole salamander. As a species of mole salamander, the tiger salamanders would spend most of their adult life in a terrestrial environment, using aquatic environments only for reproductive means (Kingsbury).

Further investigation and research at Kleinstuck Preserve left our group with secondary questions and possible solutions after it was determined that there could be a complete absence of salamanders at the preserve. Upon this hypothesis, our group also speculated that the absence of salamanders was due to either climate conditions, competition with the local frog population, or chemical poisoning.

METHODS

We conducted the salamander cover-board survey between the dates of April 23rd and May 26th. Plots were set in the Kleinstuck Preserve and named per their relative location in the preserve: Marsh 1, Marsh 2 (across the marsh from the first plot), Stream, and Upland Forest. Each plot was a 10m by 10m square and contained 16 1in. thick, 12in. diameter cover-boards made from elm trees. Commonly called “cookies,” these cover-boards were for salamanders to hide under. The cookies were arranged geometrically in four rows, with each row containing four evenly spaced cookies. One week after we arranged the cookies in the plots, they went missing from our Marsh 1 and Upland Forest plots. To compensate for this lack, we started time-based surveys on May 5th in Marsh 1, Upland Forest, and we added one additional plot to time survey near Marsh 2. The time-based surveys and under-cookie surveys were continued every week from May 5th to May 26th. Moreover, we surveyed salamanders at four plots in the Lillian Anderson Arboretum on May 19th. The eastern and western banks of Batts Pond, along Wood Frog Trail and Batts Pond Trail respectively, were plotted out. One 10m by 10m plot located downhill, and another uphill, for each side of the pond.

As additional surveys, we carried out a night survey and a leaf litter survey in Kleinstuck. In order to study salamanders in terms of temporal preference, we visited Kleinstuck on May 20th at 10:00pm and searched under the cookies in the stream plot and Marsh 2 plot, as well as random searches along the trails. Our leaf litter survey was aimed at the study of the variation and abundance of salamander prey. On May 25th, we randomly put 0.5m by 0.5m quadrats in each of our established plots and investigated the presence of salamander prey four times per plot. Four members of our team then searched for salamanders in leaf litter and under logs for 5 minutes in each plot. The fifth group member kept time. The abundance of prey was achieved by collecting leaf litter in each quadrat in buckets, filtering out the leaf debris with a wire rack, and then dumping the leftover material into a sorting pan. The abundance and type of prey found, (simply identified as either insect, worm, or spider) was then listed (Table II).

RESULTS

As shown in Table 1, our original cover-board method at Kleinstuck did not result in the discovery of tiger salamanders, *Ambystoma tigrinum*, (or salamanders of any other species). Our supplementary timed searches at Kleinstuck also yielded no results.

In our study at the Lillian Anderson Arboretum, we discovered no salamanders under the existing cover boards or in timed searches. One Blue Spotted Salamander, *Ambystoma laterale*, was found when randomly searching under debris. The night survey at Kleinstuck, used to test for temporal partitioning, also had an outcome of zero salamanders.

The leaf litter survey at Kleinstuck, used to test for prey abundance, yielded a large variety of insects, worms, and spiders as shown in Table II. We found the most prey abundance of our plots in the stream site.

Table I. This table shows results from our cover board survey at Kleinstuck. (X) indicates site with stolen cookies. (-) indicates sites where cookies were not yet set up.

Date	Marsh 1	Marsh 2	Upland	Stream
4/23/09	-	0	-	0
5/5/09	0	X	X	0
5/12/09	0	X	X	0
5/19/09	0	X	X	0
5/26/09	0	X	X	0

Table II. The relative condition and abundance of leaf litter at Kleinstuck and abundance of insects and worms at salamander cover-board sites.

LL Abundance (Relative)	Marsh 1	Marsh 2	Upland	Stream
	Thin litter	Limited litter, "cleaned up" site	Dry, abundant	Thick, moist
Insects/Spiders	24	14	14	38
Worms	0	3	0	6
Total	24	17	14	44

DISCUSSION

Many reasons can be speculated for why we did not find any salamanders at Kleinstuck Preserve. One idea was that this was not the right year to look for salamanders. For example, this season could have been dryer than previous years, and all the salamanders could have dispersed to other areas. In the past, there have been salamanders at Kleinstuck. One resident who lives near the preserve told our group that one year in the 1990's there were so many tiger

salamanders, that the steps leading to her basement were covered in them. If the salamanders have indeed dispersed, then what were their motives?

One motive could be the salamanders' preference for certain habitats. Salamanders can often be found buried under leaf or bark litter on the forest floor. At Kleinstuck Preserve, there was not much leaf litter in either of our marsh sites. There was litter at the upland forest site, but we think it was too dry for salamander preferences. It can be speculated that this plot was too far away from the water for the tiger salamanders liking. At the stream site there was a thick moist layer of litter. If there are any salamanders at Kleinstuck, we would have expected them to be at the stream site. There is also a higher abundance of prey at that site than others, which also supports our theory that there would be salamanders there (Table II).

The plots around Batts Pond at Lillian Anderson Arboretum contained more leaf and woody litter than Kleinstuck. The surrounding vegetation was similar to that of the upland forest plots at Kleinstuck, but the site at the Arboretum was closer to the water. We also noted that compared to Kleinstuck, the Arboretum seemed to have a smaller population of frogs. It is found that the frogs and salamanders are in competition with one another since they both eat similar resources and they also each eat the other's larvae. Since we found a salamander at the Lillian Anderson Arboretum, we theorized that salamanders might prefer habitats closer to the water with more woody debris and with smaller populations of frogs.

There are several ways the residents of Kleinstuck could encourage the tiger salamander population to come back, if the salamanders have indeed left the preserve. One way would be to increase the amount of woody and leafy debris in areas closer to the marsh. A reason why there might not be as much debris at Kleinstuck is erosion. When erosion occurs, the water carries off all the topsoil and ground debris is striped away. To prevent the erosion problem after invasive trees and invasive plants have been uprooted more native trees and plants could be planted so their roots can stabilize the soil. Also, the residents can make sure that they do not use any harmful pesticides or chemicals in their lawns because run-off water carries any harmful chemicals to the marsh because it is lower geographically than the surrounding areas.

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