

**An Unusual Breeding Event in an Urban Park in Danville,  
Virginia with specific notes on the Eastern  
Spadefoot (*Scaphiopus holbrookii*).**

Jason D. Gibson

Danville City Schools

Galileo Magnet High School

230 South Ridge Street

Danville, VA 24541

frogman31@gmail.com

Paul Sattler

Liberty University

Dept. of Biology/Chemistry

1971 University Blvd.

Lynchburg, VA 24502

pwsattle@liberty.edu

### Introduction

The various factors which stimulate breeding in anurans are poorly understood. Obviously, the season, temperature and rainfall are involved, but it can be hard to predict exactly when anurans will breed, or how many species in one geographic locality will breed during any one rainfall event. This report describes one heavy rain event on 4 June 2009 and the anurans found breeding in an urban park, with specific/additional notes on the Eastern Spadefoot (*Scaphiopus holbrookii*). The Eastern Spadefoot is known as an explosive breeder; reproduction is activated primarily by heavy rainfall (Dorcas and Gibbons, 2008). Shortly after breeding, the species returns to its fossorial habitat and is rarely seen outside of breeding events. Very few observations of breeding choruses have been documented in Virginia and little is known about egg laying and tadpole development (Sattler and Gibson, 2007). One goal of this paper is to contribute information about this species in Virginia.

### Methods

On the night of 4 June 2009 JG and PS traveled to Dan Daniel Memorial Park and Anglers Park in Danville, Virginia to observe which amphibians a 1.4 centimeter rain (accumulated by 1700 h) had induced to reproduce. Rain continued to fall during the duration of a search which lasted from 2100 h to 2320 h. The starting and ending temperatures were 18.8°C and 17°C, respectively. Our method of surveying consisted of road cruising with subsequent searching on foot in areas with

calling males. At each location we documented a description of the site and recorded all of the species heard calling or hand captured (see Appendix 1). Pictures were taken to document rare species, deformities, and unusual behaviors. All sites were visited periodically by JG from 5 June until 24 June when all the pools had dried. A small complement of tadpoles were collected on 5 June and raised for 20 days until metamorphosis.

## Results and Discussion

Thirteen species of anurans were either heard or hand captured in a 2.5 hr period on 4 June (Table 1). Ten of the thirteen species were heard vocalizing during the survey period. Additionally, we found two species of salamanders and one turtle. Seven or more anurans were documented at three sites. Site 5 had the highest diversity of anurans with 11 species being documented at this wetlands area.

On the night of 4 June we documented 11 species of anurans at Dan Daniel Park (sites 1-4). *Anaxyrus americanus* and *Pseudacris feriarum* were uncharacteristically calling at this late time of the year. We have been documenting calling times for more than a decade in this area and have never had calling times this late for these species. At four sites, *Hyla chrysocelis* and *Hyla versicolor* were both calling. We noted that each species was calling from distinctly different microhabitats at site 2. Two male *Hyla versicolor* were observed calling from surrounding trees and all *Hyla chrysocelis* were heard calling from the ground surrounding the breeding pool. The most interesting observations came from sites 4A, 4C and 4D. We found 5 calling males and 1 amplexed pair of spadefoots at site 4A. At site 4C we found a chorus of approximately 50 Eastern Spadefoot. At site 4D we estimated approximately 100 calling *Scaphiopus* males. Dozens of these spadefoots were found in amplexus. Site 5 was visited last on 4 June. It turned out to be the most diverse of all sites visited. Seven species of anurans were calling and a total of 11 species were observed at this site. Surprisingly, only one individual Eastern Spadefoot adult was found beside the breeding wetlands at this site. After 2.5 h of effort we documented 13 species of anurans, which accounts for all the anuran species known or likely for

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Table 1. Species observed at each of five sites.

Site	1	2	3	4 A	4 B	4 C	4 D	5
<b>Anurans</b>								
<i>Acris crepitans</i>								C
<i>Anaxyrus americanus</i>			C2		C4			M
<i>Anaxyrus fowleri</i>			C2		C2			C
<i>Gastrophryne carolinensis</i>	C	AC12	C12		C			C
<i>Lithobates catesbeianus</i>	C		R1					C1
<i>Lithobates clamitans</i>	MR		R3					C3M
<i>Lithobates sphenocephalus</i>	MR							M
<i>Lithobates palustris</i>								M
<i>Hyla chrysocelis</i>	C	AC	C		C			C
<i>Hyla versicolor</i>	C	C2	C		C			C
<i>Pseudacris crucifer</i>	R1							
<i>Pseudacris feriarum</i>				C2				
<i>Scaphiopus holbrookii</i>				AC5		C50	AC100	1
<b>Salamanders</b>								
<i>Ambystoma opacum</i>						R1		M4
<i>Desmognathus fuscus</i>						R2		
<b>Turtles</b>								
<i>Kinosternon subrubrum</i>			1					

A = amplexus observed, C = calling anurans, M = metamorph, R = individual caught on road. Numbers = number of individuals captured or estimated from calling males.

for this area.

On 5 June sites 2, 3, and 4 were visited at 1120 h and 2100 h to listen for calling anurans and to look for egg deposition. The rainfall, as of 1700 h Friday, totaled 3.1 centimeters. *Gastrophryne carolinensis* was calling from all sites during the daytime. Two egg masses of this species were observed floating in a wet area at site 2. Several *Pseudacris feriarum* were vocalizing at 1120 h from a vernal pool adjacent to a forested area at site 4. One lone male Eastern Spadefoot was heard calling at 1120 h from the forested vernal pool located at site 4. The large vernal pool in the grassy field at site 4 yielded the most interesting observations. This site on 4 June had around 100 spadefoots with many amplexed pairs. On 5 June, clustered in the southwest corner of the vernal pool, were numerous spadefoot eggs deposited on vegetation and submerged sticks. A search of the pond at 1130 h produced three amplexed pairs of toads and seven individual males. Two of the amplexed pairs, one female from an amplexed pair, and seven individual males were hand captured. Each of the twelve spadefoots were measured, inspected for disease, inspected for the presence of ectoparasites, and sexed (Table 2).

Table 2. Information gathered on 12 spadefoots collected 5 June 2009.

No.	SVL (mm)	Sex	Notes
1	51	M	
2	55	F	Spent female (no eggs visible through skin)
3	53.5	M	
4	46	F	Found in amplexus (proximal portion of front limbs missing)
5	52	M	
6	54	M	
7	52	M	
8	57	F	Eggs visible through skin.
9	58.5	M	
10	58	M	
11	55	M	
12	53	M	

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One female found in amplexus was observed to have either a double front limb amputation or bilateral ectromelia (a genetic or developmental defect causing incomplete development of a limb) (Meteyer, 2000). We did not take x-rays to determine the true nature of the condition. Information on diseases, malformations, and parasites are generally lacking for this species (Palis, 2005). The North American Reporting Center for Amphibian Malformations only has 3 reported cases of malformations for this species in Virginia. To our knowledge bilateral ectromelia has not been documented. We speculate that our observation was probably caused by a predator attack or a tractor mowing the grass field rather than a developmental defect. In future encounters with this population, we will try to collect more adults to check for additional deformities and malformations. On the night of 5 June no spadefoots were heard calling from any of the sites. Calling *Anaxyrus fowleri* were very numerous at site 4.

On 6 June the sites were surveyed again. As of 1700 h the air temperature was 21°C and water temperature was 33°C at site 4. As of 1719 h the spadefoot eggs had hatched and larvae were observed on the egg jelly. Some eggs were swollen and white with fungi. A search of the vernal pool did not reveal any adult Eastern Spadefoots. The adults that were kept on 5 June were released into the vernal pool one at a time after being photographed. Each spadefoot immediately exited the pond to the east and headed directly for the forested area adjacent to the grass field. A small sample of tadpoles was collected to rear through metamorphosis. Of note, several Eastern Narrow-mouthed Toads were calling from the periphery of this vernal pool and several egg masses of this species were observed floating on the surface. No other anuran eggs were observed in this pool. The forested vernal pool at site 4 had continuous and overlapping calls of *Gastrophryne carolinensis* at 1700 h. One *Lithobates clamitans* was also heard calling from this area. Site 5 was visited at 1759 h. Calling anurans included *Acris crepitans* (four males), *Anaxyrus fowleri* (one male), *Gastrophryne carolinensis* (continuous chorus with many overlapping males), *Lithobates clamitans* (two males), and *Lithobates catesbeianus* (one male).

The vernal pools with Eastern Spadefoot tadpoles were visited on 18, 19, 21, and 24 June. By 24 June all the pools were completely dry. No metamorphs were found from any of the sites. Tadpoles were found on 18 and 19 June at two of three sites known to have eggs deposited. The grassfield vernal pool did not yield any tadpoles. Perhaps high levels of bird predation in this pool, with no concealing cover, caused this observation. Schooling behavior of spadefoot tadpoles was observed at one of the two remaining sites and scavenging of dead earthworms by the tadpoles was a common observation.

The tadpoles JG took home to rear were raised using spring water, natural algae, and thawed frozen lettuce. The tadpoles were divided into 3 plastic containers of the same size and same volume of water. Of the dozen tadpoles that were reared, three were hypopigmented. These tadpoles exhibited no pigmentation except for pigmented irises. This is defined as a degree of albinism called leucistic (Dyrkacz, 1981). These tadpoles were smaller in size than the rest of the normally pigmented tadpoles. On 25 June the tadpoles were observed with front legs (It took 20 days for all four legs to form and thus for the final stages of metamorphosis to begin). Water was held constant at 26.6°C. Metamorphs with all 4 legs were separated and put into a tank with some rocks and water. On 3 July one representative normal phenotype and one leucistic phenotype metamorph were viewed under a stereomicroscope to note differences in chromatophore composition. The normal phenotype exhibited the following phenotypic characteristics: the iris had a brilliant golden rim surrounding the vertical pupil, the warts on the body were dark red with large amounts of pigment, the body had concentrated amounts of dark melanin pigment, the legs were dark with melanin but not as dark as the body, and the head and bifurcated pigment band extending the length of the body had much golden pigmentation. The leucistic phenotype exhibited the following characteristics: the iris had a brilliant golden rim surrounding the pupil, the warts were red but with less pigment than the normal phenotype, the body was tan (light tan in some places and darker tan in others) with a reduced amount of melanin compared to the normal, the legs had very little

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melanin thus making it light tan, many of the blood vessels were easily visible through the skin, the head had many fewer golden specs and the bifurcated (lyre) dorsal body pattern had so few golden specs that it was almost not visible. The leucistic metamorph was distinctly smaller in size than the normal phenotype. The cause of the decrease in pigmentation (and size) could have a genetic, metabolic, or endocrine etiology. The underlining cause was not pursued.

It amazes us that one large rain could bring out all thirteen species of anurans on one night. This survey suggests that documentation of all the anurans species in a given area can be obtained on one night. We encourage all readers to explore wetlands during heavy rainstorms and to publish their results. Many interesting observations on rare and common species may be obtained. These records will also help better delineate the distribution of the anurans in our state.

### Acknowledgments

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**Appendix 1.** Description of survey sites sampled at Dan Daniel Park and Angler's Park in Danville, Virginia.

#### Dan Daniel Park Sites

Site 1 (36°34'38.10"N, 79°22'8.57"W)

Site 1 consisted of a softball field parking lot sitting adjacent to a man-made pond. The pond is used to catch runoff from the softball fields and parking lot before it enters a small ephemeral stream. The pond is surrounded by a mature hardwood forest on one side and a young successional forest of pines on the other.

Site 2 (36°34'29.93"N, 79°22'21.01"W)

Site 2 sits adjacent to the War Memorial and a picnic shelter. The area consisted of a poorly draining area which pools with water during rain events. The site is next to a mature hardwood forest.

Site 3 (36°34'32.18"N, 79°22'27.36"W)

Site 3 was a series of road ruts between two hard paved roads. The area receives runoff from the roads and from drain pipes coming from a baseball field. The grass surrounding this site is mowed short. Nearby this site is a small patch of forest.

#### Site 4

Site 4 consisted of a series of microhabitats which are adjacent to one another each having unique characteristics.



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A. (36°34'36.22"N, 79°22'32.07"W)

This site consisted of a small pool between a paved walking trail and a small patch of mature hardwood forest. The pool depth was about 12 cm.

B. (36°34'36.56"N, 79°22'32.87"W)

This site consisted of a small flooded area between a paved walking trail and a grassy field. Adjacent to this site is a small stream and a small patch of mature hardwood forest.

C. (36°34'38.90"N, 79°22'32.84"W)

This site was a long patch of mature hardwood forest with a slough running down the middle. During dry periods this slough completely evaporates. On one side of this site was a paved road used by city and state maintenance vehicles. The other side is a series of grass fields.

D. (36°34'41.29"N, 79°22'35.60"W)

This site consisted of a flooded grassy field. The grass surrounding this site is mowed short.

### Anglers Park Sites

Site 5 (36°33'42.31"N, 79°21'33.20"W)

Site 5 was a restored vernal wetlands area consisting of a main ephemeral water impoundment with low vegetation surrounding the periphery. It is bordered by soccer fields on one side and a road on the other. A mature hardwood forest is nearby. This site sits on a flood plain of the Dan River.