

**REPTILES AND AMPHIBIANS OF BOY SCOUT CAMP
LINWOOD-HAYNE: RESULTS FROM AN UNDERGRADUATE-
INITIATED THREE YEAR OPPORTUNISTIC INVENTORY**

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ABSTRACT

An inventory of the reptiles and amphibians of Boy Scout Camp Linwood-Hayne, Richmond County, Georgia, was compiled over a period of three years (2003-2005). Interpretation of range maps indicated that a total of 102 species could possibly occur on the property. State records indicate that a total of 98 species are documented in Richmond County. Sixty-two species were recorded from a combination of passive sampling traps, hand-captures, sightings, egg masses and/or vocalizations. This study demonstrates that student-led opportunistic surveys can be successful and cost effective vehicles for creating baseline inventories of small areas.

Keywords: Inventory, survey, reptile, amphibian, Georgia, opportunistic survey, species list.

INTRODUCTION

Various environmental problems contribute to reptile and amphibian declines across the world (1, 2). Inventories that provide baseline data such as the number of species observed and the area of the site searched are useful tools for use in biodiversity analyses (3). Although several standardized sampling methods are used for long-term studies such as population monitoring, a potpourri approach that includes opportunistic sampling for documenting species presence can be effective at creating an accurate species list for small target areas (4).

A variety of techniques and opportunistic captures over a period of three years (2003-2005) were used to compile a species list for a 157-ha property owned by the Georgia-Carolina Council, Boy Scouts of America. Gibbons et al. (4) suggest that undergraduate research projects and other academically-linked efforts could result in cost-effective and meaningful inventories of biodiversity. This inventory began as an academically-linked project, being conducted as part of an undergraduate research project for a herpetology class at the University of Georgia in the spring of 2003. Additional species were added as a result of field trips by herpetology classes from the University of Georgia in 2003 and 2005, an undergraduate research project from

December 2003 through March 2004 (5), and trips by the author to the study-site from 2003-2005.

METHODS AND MATERIALS

The number of possible species occurring on the property (102) was estimated by preparing a list of species whose distribution maps appeared to overlap the estimated location of the property in a widely used field guide (6; Table I). After the study was finished, the number of species previously recorded from Richmond County (98) was obtained from the state herpetologist (J. Jensen, personal communication) of Georgia (Table I).

Table I. List of potential species estimated from range maps, species previously recorded from Richmond County, and species found during this survey.

Species	Potential Species	Previously Recorded Species	Survey Species
<i>Acris crepitans</i>	X	X	X
<i>Acris gryllus</i>	X	X	X
<i>Agkistrodon contortrix</i>	X	X	X
<i>Agkistrodon piscivorus</i>	X	X	X
<i>Alligator mississippiensis</i>	X	X	X
<i>Ambystoma maculatum</i>	X	X	X
<i>Ambystoma opacum</i>	X	X	X
<i>Ambystoma talpoideum</i>	X	X	
<i>Ambystoma tigrinum</i>	X	X	
<i>Amphiuma means</i>	X	X	X
<i>Anolis carolinensis</i>	X	X	X
<i>Apalone spinifera</i>	X	X	X
<i>Bufo americanus</i>	X		
<i>Bufo fowleri</i>	X	X	
<i>Bufo quercicus</i>	X	X	
<i>Bufo terrestris</i>	X	X	X
<i>Carpophis amoenus</i>	X	X	
<i>Cemophora coccinea</i>	X	X	X
<i>Chelydra serpentina</i>	X	X	X
<i>Chrysemys picta</i>	X	X	
<i>Clemmys guttata</i>	X	X	
<i>Cnemidophorus sexlineatus</i>	X	X	X

<i>Coluber constrictor</i>	X	X	X
<i>Crotalus horridus</i>	x	x	x
<i>Deirochelys reticularia</i>	X	X	
<i>Desmognathus auriculatus</i>	X	X	X
<i>Desmognathus conanti</i>	X	X	X
<i>Diadophis punctatus</i>	X	X	X
<i>Elaphe guttata</i>	X	X	X
<i>Elaphe obsoleta</i>	X	X	X
<i>Eumeces egregius</i>	X	X	
<i>Eumeces fasciatus</i>	X	X	X
<i>Eumeces inexpectatus</i>	X	X	X
<i>Eumeces laticeps</i>	X	X	X
<i>Eurycea cirrigera</i>	X	X	X
<i>Eurycea guttolineata</i>	X	X	X
<i>Eurycea quadridigitata</i>	X	X	
<i>Farancia abacura</i>	X	X	
<i>Farancia erythrogramma</i>	X	X	X
<i>Gastrophryne carolinensis</i>	X	X	X
<i>Gopherus polyphemus</i>	X	X	
<i>Hemidactylium scutatum</i>	X	X	
<i>Heterodon platirhinos</i>	X	X	X
<i>Heterodon simus</i>	X	X	
<i>Hyla andersonii</i>	X	X	
<i>Hyla avivoca</i>	X	X	X
<i>Hyla chrysoscelis</i>	X	X	X
<i>Hyla cinerea</i>	X	X	X
<i>Hyla femoralis</i>	X	X	X
<i>Hyla gratiosa</i>	X	X	X
<i>Hyla squirella</i>	X	X	X
<i>Kinosternon subrubrum</i>	X	X	X
<i>Lampropeltis getula</i>	X	X	
<i>Lampropeltis triangulum</i>	X	X	
<i>Masticophis flagellum</i>	X	X	
<i>Micrurus fulvius</i>	X	X	
<i>Necturus punctatus</i>	X	X	
<i>Nerodia erythrogaster</i>	X	X	X

<i>Nerodia fasciata</i>	X	X	X
<i>Nerodia floridana</i>	X		
<i>Nerodia sipedon</i>	X	X	
<i>Nerodia taxispilota</i>	X	X	X
<i>Notophthalmus viridescens</i>	X	X	
<i>Opheodrys aestivus</i>	X	X	X
<i>Ophisaurus attenuatus</i>	X	X	
<i>Ophisaurus ventralis</i>	X	X	
<i>Pituophis melanoleucus</i>	X	X	
<i>Plethodon variolatus</i>	X	X	X
<i>Pseudacris crucifer</i>	X	X	X
<i>Pseudacris feriarum</i>	X	X	X
<i>Pseudacris nigrita</i>	X	X	
<i>Pseudacris ocularis</i>	X		X
<i>Pseudacris ornata</i>	X	X	
<i>Pseudemys concinna</i>	X	X	X
<i>Pseudemys floridana</i>	x	x	
<i>Pseudotriton montanus</i>	X	X	
<i>Pseudotriton ruber</i>	X	X	X
<i>Rana capito</i>	X	X	
<i>Rana catesbeiana</i>	X	X	X
<i>Rana clamitans</i>	X	X	X
<i>Rana grylio</i>	X	X	X
<i>Rana heckscheri</i>	X	X	
<i>Rana palustris</i>	X		
<i>Rana sphenoccephala</i>	X	X	X
<i>Rana virgatipes</i>	X	X	X
<i>Regina septemvittata</i>	X	X	X
<i>Scaphiopus holbrookii</i>	X	X	X
<i>Sceloporus undulatus</i>	X	X	X
<i>Scincella lateralis</i>	X	X	X
<i>Siren intermedia</i>	X	X	X
<i>Siren lacertina</i>	X	X	X
<i>Sistrurus miliarius</i>	X	X	
<i>Sternotherus odoratus</i>	X	X	X
<i>Storeria dekayi</i>	X	X	

<i>Storeria occipitomaculata</i>	X	X	X
<i>Tantilla coronata</i>	X	X	X
<i>Terrapene carolina</i>	X	X	X
<i>Thamnophis sauritus</i>	X	X	
<i>Thamnophis sirtalis</i>	X	X	
<i>Trachemys scripta</i>	X	X	X
<i>Virginia striatula</i>	X	X	
<i>Virginia valeriae</i>	X	X	

Camp Linwood-Hayne (33°18 N, 81°57 W) is located near the Fall Line in Richmond County, Georgia in the Central Savannah River Area (CSRA). The northern edge of the camp property is situated around Spirit Creek where an earthen dam forms a large pond (Spirit Lake). One of the small creeks that feeds into Spirit Lake from the south is also dammed and forms another smaller pond (Memory Lake). The small creek that feeds Memory Lake originates at the bottom of a severely eroded gorge from a series of seeps and was also the focus of a previous study on stream-inhabiting salamanders (5).

The two constructed ponds, their tributaries, and nearby seasonal wetlands were the focus of aquatic trapping. The rest of the property comprises mixed hardwood and pine forested uplands dotted with permanent campsites that are used on a seasonal basis (with heaviest activity occurring during the summer months). Inventory efforts consisted mostly of the author lifting cover objects, walking through potential habitat looking for reptiles and amphibians, and conducting nightly surveys for frogs during the spring and summer months of 2003 and 2005.

Coverboards (7) and minnow traps were employed occasionally in the spring and summer of 2003 and by herpetology students from the University of Georgia on a field trip in April of 2005. The 2004 captures are the result of research conducted on stream-inhabiting salamanders (5) and, for the purpose of this study, are included as coverboard or visual search captures. The only species recorded in 2004 that was not the result of salamander research was a scarlet snake, *Cemophora coccinea*, found by camp personnel and presented to the author.

RESULTS

A total of 62 species were accounted for at the conclusion of sampling in April 2005 (Table I). The initial property inventory conducted in 2003 documented the presence of 56 species of reptiles and amphibians. Over the next two years, only six new species were noted to occur on the property. Two new species (banded watersnake [*Nerodia fasciata*], and scarlet snake [*Cemophora coccinea*]) were recorded in 2004 and four new species (American alligator [*Alligator mississippiensis*], marbled salamander [*Ambystoma*

opacum], spiny softshell turtle [*Apalone spinifera*], and greater siren [*Siren lacertina*]) were recorded in 2005.

Plastic-coated metal minnow traps, homemade turtle traps made from 1/4" chicken wire, visual searches, egg masses, and aural surveys all accounted for at least one new property record that was not detected by other techniques (Table II). The most successful method, visual searches, accounted for 54 species but did not include 8 species that were only accounted for by other methods.

Table II. Summary of total species recorded and number of species captured exclusively by each technique (percent of the sixty-two species recorded on-site in parentheses).

Technique	Species Recorded	Exclusive Records
Aural Surveys	16 (0.26)	4 (0.06)
Coverboards/PC Traps	9 (0.15)	0 (0.00)
Egg Mass	1 (0.02)	1 (0.02)
Metal Minnow Traps	3 (0.05)	2 (0.03)
Turtle Trap	1 (0.02)	1 (0.02)
Visual Searches	54 (0.87)	32 (0.52)
	Total	40 (0.65)

CONCLUSIONS

At the completion of the study in 2005, the inventory had accounted for 61 (62.2%) of the 98 species previously known to occur in the county and 62 (60.8%) of the 102 species that were considered "possible" from range maps. The little grass frog, *Pseudacris ocularis*, had not been previously recorded from Richmond County (J. Jensen, personal communication) and this record extends the known distribution to its northerly-most location in the state of Georgia.

The strength of different inventory techniques suggests that the potpourri approach for creating a species inventory produced a more inclusive species list than could have been compiled by a single method alone. Additionally, the inventory was conducted as part of a university-related undergraduate project and, as a result, access to the study site was the only "cost" that the property owners incurred. Using qualified academic resources (such as undergraduate classes with instructor supervision) to create baseline inventories of our native reptiles and amphibians would provide sorely needed current distribution information at little-to-no cost to landowners and state agencies.

When compared to recent reptile and amphibian inventories of nearby preserves, it is apparent that there is an incredible amount of reptile and amphibian biodiversity located at the relatively small Boy Scout camp. Metts and Nestor (8), using coverboards, area-constrained searches, and

opportunistic captures, accounted for 53 species at Sumter National Forest in South Carolina after a four-year (1999-2003) herpetological inventory of the 146,000-ha preserve. Tuberville et al. (9), using extensive field surveys, literature accounts, museum records, surveys, and personal collections and reports, accounted for 61 species at South Carolina's 8,621-ha Congaree Swamp National Monument and 55 species at Georgia's 284-ha Ocmulgee National Monument. Linwood-Hayne's 157-ha property represents less than 1% (0.39%) of Richmond County's 83,942-ha total area (<http://richmond-county.georgia.gov>, accessed 22 June 2007), however, this relatively small area contains 63.3% (62 out of 99) of the species now known to occur in Richmond County. Camp Linwood-Hayne's exceptionally high herpetological diversity demonstrates that even small parcels of land set aside for conservation or low-impact activities can provide suitable habitat for a wide range of reptiles and amphibians and are important components in any large-scale conservation plan.

ACKNOWLEDGMENTS

I thank the Georgia-Carolina Council of the Boy Scouts of America for access to the Linwood-Hayne property, scouts and scouters, the Patton family, the Powell family, the herp classes of 2003 and 2005, K. Andrews, K. Buhlmann, C. Cooper, R. Gaïtan, X. Glaudas, C. Jennison, M. Junkins, M. Lopez, J. Norman, F. Toole, and L. Wilkinson. J. W. Gibbons provided many helpful suggestions that contributed greatly to the manuscript. I thank the two anonymous reviewers for their helpful suggestions. I also thank my herpetology professor and teaching assistant who are also my first two herpetological mentors, R. Reed and C. Young. Special thanks to M. Adams and B. Gravanis who were co-investigators on the original survey in 2003 and to J. Jensen for Georgia herpetological records. Manuscript preparation was supported by the Department of Energy under Award Number DE-FC09-07SR22506 to the University of Georgia Research Foundation.

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