

Results of a Survey of *Corynorhinus rafinesquii* roosts, Including the First Documented Hibernacula in Southeastern Virginia

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Abstract

Little is known about the roosting ecology of *C. rafinesquii* in Virginia (the northern boundary of its range). As part of a study to quantify roosting and habitat associations of this species we conducted roost surveys throughout southeastern Virginia. These surveys included structures identified by the Virginia Department of Game and Inland Fisheries as *C. rafinesquii* roosts in 2001. Because all structures of interest were on private land, we contacted landowners to obtain permission to visit the sites. After obtaining written or oral permission, we visited a total of thirteen sites to evaluate current use. Of the thirty landowners contacted, nine gave us permission to visit their properties. We discovered that several structures documented as roosts in 2001 are now collapsed and no longer available to bats. Of the remainder, four continued to be used by the species while we failed to detect recent use at six sites. While we found two previously undocumented roosts, three of the five structures housing maternity roosts during the 2001 surveys have been destroyed. In addition to surveying sites for use and quantifying occupancy, we installed dataloggers throughout structures to evaluate climatic associations of roosting bats. We found three solitary hibernating *C. rafinesquii* that were in a variety of structures. We believe these represent the first documented hibernacula for this species in Virginia. In this presentation, I will discuss specific roosting associations, seasonality of roost use, and implications of this study for the effective management of *C. rafinesquii* in Virginia

Introduction

In Virginia, the northernmost known occurrence of Rafinesque's big-eared bat *C. rafinesquii*, little is known or has been studied regarding their roosting ecology. *C. rafinesquii* is listed as a state – endangered species (VDGIF, unpublished data) and will roost in hollow gum (*Nyssa* spp.) trees, abandoned buildings, bridges, culverts and cisterns. They roost in relatively small numbers, rarely exceeding 100 (Jones 1977). Few concrete girder bridges exist in southeastern Virginia, as many have been replaced w/ steel girders (Zack Meredith, pers. comm.). No studies of natural roosts have been done in the state; however a solitary roost was documented by Hobson (1998).

Virginia Department of Game and Inland Fisheries (VDGIF) occasionally surveyed building roost sites of *C. rafinesquii* in seven counties in 1993, 1997, 1998, and 2001 [Figure 1]. Two *C. rafinesquii* were netted during a mistnetting survey in 1998 (Hobson 1998), and a small telemetry and survey study was done in Virginia Beach in 2000 (Clark 2003). The 2001 VDGIF survey revealed that between 1997 and 2001, 35% of solitary roosts and 50% of maternity roosts on their list had been destroyed (VDGIF 2001).

Except for one maternity roost, none of these sites had been surveyed or monitored since 2001. Within this 5-year gap, a hurricane hit the area, which meant many sites might no longer exist. The purpose of this study was to determine the present condition of most of the sites, and for those still present, determine if *C. rafinesquii* still use these sites. While surveying these sites, we also noted other abandoned buildings that could be potential *C. rafinesquii* roosts.

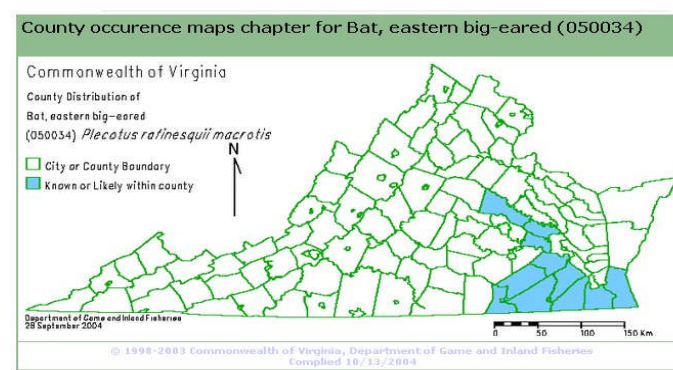


Figure 1: Occurrence of *C. rafinesquii* in Virginia.

Materials & Methods

VDGIF information given to us included survey forms from 1997-8 and computer files of the 2001 survey, which included most landowner names and contact information. Of the 62 sites (53 solitary, 9 maternity), 30 (21 solitary, 9 maternity) were selected to be re-surveyed. Phone calls and/or letters were sent to landowners in February 2006, to which 33% (10) responded. Of the 10 landowners, 7 gave permission, 1 denied, and 2 reported that the structures had been destroyed.

Sites were located as described in old survey forms, either by the road name, route number, or nearest intersection where it was located. Once at the site, we investigated the building for bat presence. If no bats were present, the building was checked for other signs of bat use (i.e. guano, moth wings). Guano and moth wings were collected.

When bats were present, the number of bats were counted and temperature conditions were measured. An anemometer was used to measure wind speed, air temperature and humidity, while a temperature laser gun (Raytek® Raynger ST™) was used to measure the surface temperature of the bats and the substrate immediately surrounding them. The building's condition, structural components, and surrounding habitat were noted to compare roosts to each other and photos of bats and/or buildings were taken. At the one maternity colony still present, Hobo dataloggers were set in the main hall, a closet, the attic, and outside to compare temperature and humidity. In two areas, new sites were discovered and GPS locations were taken.

	checked	used	gone	damaged	new	total
maternity	4	1	2	1	2*	3
solitary	13	4*	1	3	2	6
bridge	1	1	-	-	-	1

Table 3: Summary Results of *C. rafinesquii* roost re-survey. * = overlap

Roost site	Survey Year					
	1997	1998	2001	2002	2005	2006
Su 6	30	n.d.	34	-	X	
Su 8	1	n.d.	0			
Su SH	-	-	20+	37	40	45
Gr 5	0	nd	0	-	-	1
Sf 7	0	1	0	-	-	0
Sf 8	1	nd	0	-	-	0
Sf 9	110	34*	50	-	-	Abandoned
Sf 12	0	0	0	-	-	- 10
Sf 13	0	0	0	-	-	1
Sf 9b	-	-	-	-	-	1
Sf A						20-25
So 12	1	nd	1	-	-	0
So 14	nd	nd	1	-	-	?
So 33	1	nd	0	-	-	
So 36	1	nd	0	-	-	1, Y
So 39	nd	nd	0	-	-	X
So 42	60	45*	60	-	-	X
So 43/44	1,1	1,1	0,0	-	-	X
So 43/44 b	-	-	-	-	-	1
Ha 1	1	nd	nd	-	-	0, Y
Nk 1	7	nd	0	-	-	X
IW 1	-	-	-	-	-	Table 1: Roost surveys by year
SO/IW bridge	-	3	nd	-	-	1, 1

Counties:	Key
Su= Sussex	maternity roost destroyed
Gr= Greenville	solitary roost destroyed
Sf= Suffolk	maternity colony
So = Southampton	hibernating bat
Ha = Hanover	nd= no data
Nk = New Kent	- = not surveyed
Iw = Isle of Wight	hibernacula
	X= destroyed
	* recorded early in season, before birth of juveniles

Site	Seasonal Use											
	J	F	M	A	M	J	J	A	S	O	N	D
SUSSEX												
Su 6 (M)				X			P					
Su 8				X								X
Su SH (M)			X			P						
GREENSVILLE												
Gr 5					X							
SUFFOLK												
Sf 7				X, X								
Sf 8					X							X
Sf 9 (M)				X			X, J		X			
Sf 12 (M)												
Sf 13				X, X								
Sf 9b									X			
Sf A (M)											X	
SOUTHAMPTON												
So 12				X	X							
So 14				X	X							
So 33			X	X								
So 36				X	X					X		
So 39				X								
So 42 (M)												X
So 43/44					X	X	J					X
So 43/44 b												
HANOVER												
Ha 1					X, X							X
NEW KENT												
Nk 1 (M)					X			X			X	
ISLE OF WIGHT												
IW 1												
SO/IW bridge					X	J, X						

Table 2: Seasonality patterns of *C. rafinesquii* in Southeastern Virginia

Future Plans

- We plan to continue locating additional sites in Sussex, Southampton, and Suffolk Counties.
- We are awaiting permission to visit a maternity site in nearby Virginia Beach (Ft. Story) and may also search for sites in this town.
- As part of my thesis, I plan to compare microclimate conditions of these building maternity roosts to natural maternity roosts (*Nyssa* trees) to determine if both sites have similar conditions and qualities that make them suitable for raising young.

Results & Discussion

This survey revealed that within the past 5 years, three of the five investigated maternity colonies no longer exist, and one maternity colony has been abandoned due to structural damage. The only bridge documented as a roost in 2001 was still occasionally used as a solitary roost. Of the six solitary roosts, four were still used by bats, while the other two were inaccessible. Two additional solitary roosts were observed near other known roost sites. A possible third maternity site was called to our attention by a neighbor of a landowner we know. While no bats were present when surveyed, evidence of its use (fresh guano and distinct smell) by the bats, and the landowner's own knowledge of the bats seasonal patterns there let us know it was indeed a maternity colony. [Tables 1 &3]

Building Roost Conditions

The only characteristic shared by solitary, maternity, and hibernation roosts were that (almost) all were in close proximity (≤ 4 km) from cypress-gum swamps, where their natural roosts occur. The two exceptions were a maternity colony (Site Su-SH) and a solitary roost that were ~ 10 km and 8 km respectively from swamp habitat.

Both maternity roosts were wooden, 2 story buildings in which the bats roosted in the smallest room. There was little to no vegetation surrounding both buildings, and both were exposed to the sun. The three hibernacula were within 2 km of cypress-gum swamps, and the bats roosted in enclosed areas (attics and girders) that protected them from the rest of the open, airy roost. The most variety in structure was observed in solitary roosts, in which qualities varied from dark to well lit, open to enclosed rooms, and brick to wood houses.

Seasonality

Comparisons were done between the 1997-8, 2001 and 2005/6 surveys to evaluate the seasonal activity pattern of *C. rafinesquii*. The bats were first observed out of hibernation in April at solitary roosts and May for maternity roosts. Pups were born between mid-June and late July, and nursery populations ranged from 3 to 120. Bats were last seen at both maternity and solitary roosts in early-mid November. Similar patterns were seen in *C. rafinesquii* maternity roosts in Mississippi, with peak populations in June and a population decline in September (Trousdale and Beckett 2004). Roost seasonality patterns in Virginia appears to be a month later than their observed seasonality patterns in East Texas (February – October, Mirowsky 1996), possibly because of the colder temperatures in Virginia. Solitary roosts saw less fidelity than the maternity colonies; however this may also be due to the fact that roosts were only surveyed periodically. [Table 2]

An interesting observation was noted at two former maternity colonies and current maternity colony Su SH. In early-mid November, days before leaving the maternity roost to hibernate, bats were observed roosting in an area of the building that had not been used at all during the spring or summer. Surveys of those roosts 2-10 days after noticing this, the bats had gone to hibernacula roosts.

Microclimate

Unfortunately, one of the four dataloggers placed at maternity site Su-SH malfunctioned and a second one was removed from the site. However, a basic comparison was made between the closet (where the maternity colony roosted), and near a shut, but drafty, window. It appears to be slightly warmer in the closet than near the window and slightly less variation, but little difference nonetheless. [Figure 6]

The Sf 12 Paradox?

An interesting phenomena was observed in September 2006, where we observed a small maternity colony in a building historically known to be a solitary roost (Site Sf 12). This building was on the same property as the abandoned maternity roost. Additionally, the bats were found in a well lit room even though the attic was nearby, easily accessible, and darker. There was little guano accumulation at the site which led us to believe that the bats may be switching roosts; there are several other abandoned buildings on the property, several of which were inaccessible but could be potential roost sites. It was also noted that the bats at this site were not vocal when disturbed, quite contrary to the behavior seen at the other maternity colony.

Conclusion

The degree to which many of the roosts have either been destroyed, inaccessible, or degraded makes it clear that these buildings that *C. rafinesquii* currently inhabit need to be protected and regularly surveyed in order to better conserve the populations. Their natural habitats, cypress-gum swamplands, have been depleted, and few natural roosts have been documented here in Virginia; therefore these anthropogenic roosts need to be protected and maintained as much as possible until their status is better known in the state. Also, communication and cooperation with landowners needs to be better established. There needs to be an improvement in getting higher response rates from them and possibly the method itself of contacting landowners. Awareness of the bats needs to be publicized as well so that both landowners and the public can be on the lookout for them, and hopefully provide more cooperation between biologists and the public and an increase in public knowledge of the bats.

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