

APPALACHIAN COTTONTAILS, *SYLVILAGUS OBSCURUS*  
(LAGOMORPHA: LEPORIDAE), FROM THE SOUTH  
CAROLINA MOUNTAINS WITH OBSERVATIONS  
ON HABITAT USE

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**Abstract:** The Appalachian cottontail (*Sylvilagus obscurus*) is poorly known in South Carolina. We conducted a survey to document the presence and habitat associations of this species in three habitat types in Sumter National Forest, Oconee County: a mature pine stand, a pine-hardwood stand, and a regenerating clearcut. A total of 14 *S. obscurus* was captured in 4,008 trapnights. Although 11 of 14 *S. obscurus* were trapped from the mature pine stand, the number of captures in each habitat type was not significantly different. Twenty-nine eastern cottontails (*S. floridanus*) also were captured during the survey. More individual *S. floridanus* were taken from the clearcut than expected ( $n = 20$ ,  $p < 0.05$ ); fewer individuals were taken from the mature pine stand than expected ( $n = 2$ ,  $p < 0.05$ ). Previously unpublished, specimen-supported records of *S. obscurus* from the mountain counties of South Carolina also are presented. Additional studies are needed to determine the distribution and habitat associations of *S. obscurus* in South Carolina and other southeastern states and to determine possible impacts from expanding populations of *S. floridanus*.

**Key Words:** Appalachian cottontail; distribution; habitat; South Carolina; *Sylvilagus obscurus*.

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## INTRODUCTION

Appalachian cottontails (*Sylvilagus obscurus*) range from the Hudson River in New York southward through montane portions of Pennsylvania, Maryland, West Virginia, Virginia, Tennessee, North Carolina, South Carolina, Georgia, and Alabama (Burt and Grossenheider, 1976; Webster et al., 1985; Chapman et al., 1992). *Sylvilagus obscurus* was regarded as the New England cottontail (*S. transitionalis* Bangs 1895) until 1992, but karyotype (Ruedas et al., 1989) and morphometric (Chapman et al., 1992) analyses provided clear evidence of two distinct species. Consequently, the range of *S. transitionalis* was restricted to boreal habitats from Maine to New York as far west as the Hudson River (Chapman et al., 1992; Litvaitis and Litvaitis, 1996).

*Sylvilagus obscurus* is primarily restricted in the southeastern United States to

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high elevation (>762 m) woodlands and mountain balds of the Appalachian highlands (Webster et al., 1985; Chapman et al., 1992), although historical occurrences in Alabama and Tennessee are from well below this threshold (e.g.,  $\leq 610$  m; Hall and Kelson, 1959). Important habitat features include a thick cover of mountain laurel (*Kalmia* spp.), rhododendron (*Rhododendron* spp.), blueberries (*Vaccinium* spp.), and coniferous forests (Webster et al., 1985). However, highest densities of both *S. obscurus* and *S. transitionalis* are reportedly associated with regenerating clearcuts and other disturbance patches five to 25 yr old (Chapman et al., 1977; Webster et al., 1985; Litvaitis, 1993). Although once continuously distributed in boreomontane portions of the eastern United States, *S. obscurus* and *S. transitionalis* apparently now are restricted to isolated areas of suitable habitat where competition with the more common eastern cottontail (*S. floridanus*) is minimal (Chapman et al., 1977; Webster et al., 1985; Litvaitis and Litvaitis, 1996).

Appalachian cottontails in South Carolina are considered to be of undetermined status and listed as a species of Special Concern (South Carolina Wildlife and Marine Resources Department, 1996). As late as 1985, Webster et al. reported that there were no South Carolina records of *S. obscurus*, but a record from northeastern Georgia indicated that the species also could occur in the Blue Ridge Province of extreme northwestern South Carolina (from east to west, portions of Greenville, Pickens, and Oconee counties). The first specimen of *S. obscurus* from South Carolina was collected from Oconee County in 1988, with additional specimens taken from Greenville and Pickens counties in 1989 and 1992, respectively (Campbell Museum, Clemson University records). We present survey results to document the presence and habitat associations of *S. obscurus* at sites near the Chauga River in Oconee County. We also provide information on previously unpublished specimen-supported records of *S. obscurus* from the mountain counties of South Carolina.

## STUDY AREA

Study sites were located along the Chauga River in the Andrew Pickens District, Sumter National Forest, South Carolina. The Andrew Pickens District lies within the northern portion of Oconee County. Three stands representing three distinct habitat types were selected for habitat comparisons. Stand 1 was a 15 ha, 94-yr-old forest dominated by shortleaf pine (*Pinus echinata*) and white pine (*P. strobus*), with scattered hardwoods in the midstory. Its understory was dominated by *Kalmia latifolia*, *Rhododendron* spp., and *Vaccinium* spp. Stand 2 was an eight ha, 64-yr-old mixed pine-hardwood stand. Dominant overstory species were Virginia pine (*P. virginiana*) and various hardwoods with loblolly pine (*P. taeda*) saplings in the understory on steeper slopes. Stand 3 was a nine ha, seven-year-old clearcut. Regeneration was predominately shortleaf and white pine seedlings and saplings with mixed oaks (*Quercus* spp.) interspersed. Elevations at the three sites ranged from 472 to 518 m.

## METHODS

Trapping was conducted within the three stands to document the presence and habitat associations of *S. obscurus*. Traps consisted of standard rabbit boxes baited with apple slices. Trapping effort was roughly distributed relative to the area of each stand and in stands where *S. obscurus* was expected to occur (e.g., mature

pine and clearcut stands; Webster et al., 1985). Trapping was conducted during three 12-day periods: 7 to 18 February 1993, when a trial run with 50 traps was conducted only in the mature pine stand; 7 to 18 December 1993; and 24 January to 3 February 1994. Traps (142) were distributed among the various habitat types during the second and third sampling periods. Eighty-four traps were placed in the mature pine stand, 40 traps in the clearcut, and 18 traps in the pine-hardwood stand at approximately 25-m intervals.

Rabbits were identified on the basis of pelage characteristics (Godin, 1977; Litvaitis et al., 1991; Chapman et al., 1992). Although similar in appearance, eastern cottontails may be differentiated from Appalachian cottontails using a combination of characteristics. Adult *S. floridanus* often have a white blaze or "star" on the forehead which is lacking from adult *S. obscurus*. Additionally, a black "saddle" may be present on the back of *S. floridanus*, but is always absent from *S. obscurus* specimens. The ears of *S. obscurus* are shorter, more rounded, and heavily furred with long white hairs on the anterior border in comparison with those of *S. floridanus*. A distinct black spot between the ears and/or a black margin around the ears often can be observed on *S. obscurus*. The broad black stripe on the outer edge of the ear of *S. obscurus* does not gradually blend into the brown fur of the ear, as in *S. floridanus* (Godin, 1977). All rabbits were individually marked with PIT (passive integrated transponder) tags injected at the neck. Standard body measurements were taken, and voucher specimens were deposited in the mammal collections of the Campbell Museum of Natural History (CUSC), Clemson University, Clemson, South Carolina.

Chi-square tests with Bonferroni simultaneous confidence intervals (Neu et al., 1974) were used to test the hypothesis that rabbits were captured proportional to trapping effort in each habitat type. Expected values for the analyses were based on proportional trapping effort among habitat types (i.e., the percentage of total effort made in a habitat type  $\times$  total captures for all types), and observed values were the actual number of captures in each type.

## RESULTS AND DISCUSSION

Our survey of 4,008 trap nights yielded 14 *S. obscurus*: eight individuals and six recaptures. Eleven captures occurred in the mature pine stand, one in the pine-hardwood stand, and two in the clearcut. Both clearcut captures were in the ecotone bordering the mature pine stand. We also captured 29 *S. floridanus*: 12 individuals and 17 recaptures. Two *S. floridanus* were trapped in the mature pine stand, seven in the pine-hardwood stand, and 20 in the clearcut. Although 11 of 14 *S. obscurus* were trapped in the mature pine stand, Chi-square analysis did not reveal a significant difference in the number of captures with regard to the three habitat types. Chi-square analysis of habitat types, in contrast, was significant for *S. floridanus* ( $\chi^2 = 44.47$ ,  $df = 2$ ,  $p < 0.001$ ), with more individuals trapped in the clearcut than expected ( $p < 0.05$ ) and fewer individuals trapped in the mature pine stand than expected ( $p < 0.05$ ).

Few historical collection records of *S. obscurus* from South Carolina probably are not an indication of the species rarity in the area as much as the lack of sampling effort. Considerable portions of the Blue Ridge Province in South Carolina meet or exceed the minimum elevations at which *S. obscurus* is found elsewhere in the southern Appalachians (Webster et al., 1985), but results from

any systematic surveys in the region have not been published. Additionally, our results as well as historical records from Alabama and Tennessee (Hall and Kelson, 1959), indicate that *S. obscurus* inhabits sites well below the 762 m threshold reported by Webster et al. (1985). However, it is possible that Appalachian cottontails are declining over portions of their range in the southeastern United States (Webster et al., 1985). Distribution of the closely related New England cottontail has declined substantially in the northeastern United States during the last four decades (Litvaitis and Litvaitis, 1996). This decline has been attributed to forest maturation, urbanization, and competition with expanding populations of eastern cottontails (Chapman and Morgan, 1973; Litvaitis, 1993; Litvaitis and Litvaitis, 1996). *Sylvilagus transitionalis* is now restricted to isolated patches of suitable habitat where secondary succession has progressed for 10–25 yr (Litvaitis, 1993). Likewise, declines of *S. obscurus* populations in Maryland and West Virginia, and suspected declines in the southeastern United States, have been linked to habitat loss and competition with *S. floridanus* (Chapman et al., 1977; Webster et al., 1985).

Ninety-two percent (13/14) of *S. obscurus* captures occurred in or adjacent to the 94-yr-old pine stand. Although this association was not statistically significant, sample sizes were small. The characteristics of this stand (e.g., coniferous forest, understorey of *Kalmia latifolia*, *Rhododendron* spp., and *Vaccinium* spp.) are consistent with the key habitat features described by Webster et al. (1985) for populations of New England cottontails in the southern Appalachians. However, since highest densities of Appalachian cottontails reportedly are associated with early-successional habitats (Webster et al., 1985), the paucity of captures from the regenerating clearcut was somewhat surprising. Eastern cottontails, in contrast, were significantly associated with the clearcut and appeared to avoid the mature pine stand. Although it is possible that mature coniferous stands are favorable habitats for Appalachian cottontails in the southeastern United States, previous studies indicated that the scarcity or absence of *S. obscurus* in early-successional habitats may result from displacement or exclusion by the more abundant and aggressive eastern cottontail (Chapman and Morgan, 1973; Chapman et al., 1977). Researchers in South Carolina and other southeastern states should increase their efforts to document the status and habitat preferences of *S. obscurus* and to determine potential impacts of expanding populations of *S. floridanus*.

#### COLLECTION SITES

The following South Carolina localities are supported by voucher specimens in the Campbell Museum (CUSC), Clemson University.

*Greenville Co.:* Caesar's Head, off SC 276, July 1989 (CUSC 2235). *Oconee Co.:* Long Mountain, N of Walhalla, 16 November 1988 (CUSC 2132); Long Mountain, N of Walhalla, 15 December 1988 (CUSC 2133); End of Grapevine Road, near Chauga River, off USFS 764, 18 February 1993 (CUSC 2482); Duke Power Bad Creek Project, 3 March 1993 (CUSC 2511); Sumter National Forest, Andrew Pickens District, Compartment 30, 14 December 1993 (CUSC 2531). *Pickens Co.:* Near Rocky Bottom, off Horse Pasture Road, 13 October 1992 (CUSC 2458).

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