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Southern Flying Squirrel Displaces a Red-cockaded Woodpecker from its Cavity

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The Red-cockaded Woodpecker (*Picoides borealis*), an endangered species, depends upon the cavities it excavates in living pines for nesting and roosting (Ligon 1970). Cavities, however, are often a limited resource (Ligon 1970). Factors limiting cavities include availability of suitable cavity trees, rate of cavity excavation, cavity enlargement, cavity tree loss, and use of cavities by other species (Conner *et al.* 1991, 1994; Hooper 1988, Loeb 1993).

Many vertebrates use Red-cockaded Woodpecker cavities, including Southern Flying Squirrels (*Glaucomys volans*), Red-bellied Woodpeckers (*Melanerpes carolinus*), Tufted Titmice (*Parus bicolor*), Great Crested Flycatchers (*Myiarchus crinitus*), Eastern Bluebirds (*Sialia sialis*), and black rat snakes (*Elaphe obsoleta*) (Dennis 1971, Harlow and Lennartz 1983, Jackson 1978, Kappes 1993, Loeb 1993, Rudolph *et al.* 1990). Southern Flying Squirrels and Red-bellied Woodpeckers are two of the most important cavity users. They are usually the most prevalent users of cavities (Kappes 1993, Loeb 1993, Rudolph *et al.* 1990), and removal of Southern Flying Squirrels from Red-cockaded Woodpecker clusters significantly increases Red-cockaded Woodpecker reproductive success (Laves 1996).

Although use of Red-cockaded Woodpecker cavities by Southern Flying Squirrels is well documented, to our knowledge direct interactions between Red-cockaded Woodpeckers and Southern Flying Squirrels have not been observed. Thus, it is not known whether Southern Flying Squirrels occupy cavities that Red-cockaded Woodpeckers have vacated or whether they can actually usurp cavities used by woodpeckers. We describe an incident in which a Southern Flying Squirrel displaced a Red-cockaded Woodpecker from its roosting cavity.

On 16 March 1994 we attempted to trap a Red-cockaded Woodpecker on the Savannah River Site, located in Aiken and Barnwell Counties, South Carolina. The bird was to be translocated to a new area and paired with a potential mate. Immediately after the bird entered its roost cavity at dusk, a funnel type trap made of a fine silk-mesh material attached to an adjustable pole was placed over the entrance. Techniques used to flush the Red-cockaded Woodpecker included slapping the base of the tree with our hands and sticks, shaking and scratching the net at the cavity entrance, yelling loudly, and kicking the base of the tree. Our experience had taught us that if the Red-cockaded Woodpecker does not exit after several flushing attempts, it will remain in the cavity. When initial attempts to flush the Red-cockaded Woodpecker into the trap failed, we decided to climb the tree and remove the bird.

To facilitate access to the cavity, we first removed a nest box, which had been placed on the roost tree approximately 1.5m above the ground. Upon doing so, two adult Southern Flying Squirrels ran from the box and up the tree in which the Red-cockaded Woodpecker was roosting. Further inspection indicated that a total of 5 Southern Flying Squirrels had been using the nest box. One of the escaped squirrels ran up the tree trunk opposite the cavity and was lost from sight in the canopy. The other squirrel ran directly up the tree,

passing between the funnel trap and the tree, and entered the cavity. Immediately thereafter, the Red-cockaded Woodpecker fled the cavity and was captured in the trap, although it subsequently escaped. The Southern Flying Squirrel remained in the cavity at least 40 minutes, at which time we ceased observation. No squirrels were present the following day when the cavity was inspected. That evening (17 March 1994) the Red-cockaded Woodpecker returned and roosted in the cavity (J. Edwards pers. comm.).

This is the first published observation of a Southern Flying Squirrel displacing a Red-cockaded Woodpecker from its cavity. Although the circumstances surrounding this observation were unusual and the result of human disturbance, this observation demonstrates that Southern Flying Squirrels can displace Red-cockaded Woodpeckers from their cavities. While the Red-cockaded Woodpecker was only forced to roost outside its cavity for a maximum of one night, disturbances such as these over a period of time may lead to decreased Red-cockaded Woodpecker survival by increasing energy costs and risk of predation.

Nest boxes may be an effective method of reducing use of Red-cockaded Woodpecker cavities by Southern Flying Squirrels and other species (Jackson 1978, Loeb and Hooper in press). However, the observation reported here suggests that nest boxes should not be placed directly on the Red-cockaded cavity trees and might be better if placed on other trees nearby. Further, it may be necessary to remove any Flying Squirrels occupying other cavities in the tree before management activities such as banding, checking nest cavities, or translocations are undertaken.

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