

## MONITORING INTERACTIONS BETWEEN RED-COCKADED WOODPECKERS AND SOUTHERN FLYING SQUIRRELS

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Although several studies have suggested that southern flying squirrels (*Glaucomys volans*) may have a significant negative impact on red-cockaded woodpeckers (*Picoides borealis*) (Loeb and Hooper 1997, Laves and Loeb 1999), the nature of the interactions between the species remains unclear. Particularly lacking are data that address if southern flying squirrels directly usurp red-cockaded woodpeckers from cavities, or simply occupy cavities previously abandoned by red-cockaded woodpeckers. Ridley et al. (1997) observed the displacement of a red-cockaded woodpecker by a southern flying squirrel that was released after being captured. Observations of nocturnal displacements of red-cockaded woodpeckers by flying squirrels, however, are lacking. Due to the difficulty of observing interspecific interactions, determining the mechanisms by which flying squirrels impact red-cockaded woodpeckers is problematic.

## METHODS

We tested the feasibility of using passive integrated transponders (PIT tags) to monitor interactions between flying squirrels and red-cockaded woodpeckers in an active cluster on the Savannah River Site, South Carolina. We captured 26 flying squirrels in nesting boxes placed within the cluster and injected each with a PIT tag subcutaneously. Three woodpeckers (the breeding pair and 1 male helper) were netted as they left their cavity, and PIT tags were injected into the breast muscle of each bird. A 15.2 cm (6.0 in) diameter antenna was placed around each cavity and connected to a power source and data logger at the base of the tree. This setup

allowed us to passively record use of cavities by marked squirrels and woodpeckers almost continuously. Cavities were monitored between September 1997 and June 1998.

## RESULTS

The PIT tags and data loggers allowed us to record several interactions between flying squirrels and red-cockaded woodpeckers. The helper male was last recorded at his cavity on 30 October 1997. No flying squirrels were detected at this cavity during the duration of the study. Likewise, no flying squirrels were detected at the breeding male's cavity. The breeding female, however, was directly displaced from her cavity on 5 April 1998 by an adult female flying squirrel. The woodpecker was not recorded at this or any other cavities after the displacement. The squirrel visited the cavity on several nights until 15 May 1998 when she took up residence in the cavity with her adult female offspring. These 2 squirrels were recorded in the cavity daily until the study terminated on 19 June 1998. Another flying squirrel was recorded at the cavity for 1 second. Thus, out of 26 flying squirrels marked, only 3 were recorded. From the date that the breeding female woodpecker was displaced until the end of the study, the breeding male red-cockaded was recorded 283 times at the cavity occupied by flying squirrels. These observations ranged in duration from several seconds to over 1 minute, and ranged in frequency from 1 to 31 visits per day.

## DISCUSSION

We encountered several problems with our technique. Initially, birds would not enter their cavities after the antennas were installed. To overcome this response we moved the antennas at least 5.0 m (16.0 ft) below the cavity and gradually moved them back to a position encircling the cavity. The metal within the artificial cavity insert interfered with the function of the antennas, requiring us to space the antenna 4.0 cm (1 in) from the cavity. Finally, periodic equipment failure resulted in discontinuous data collection. Despite problems with this technique, unique data were collected on the interactions between these 2 species. Our results document a rarely observed usurping of red-cockaded woodpecker by a flying squirrel (Ridley et al. 1997), and suggest that birds spend considerable

time and energy around cavities when squirrels occupy them.

Our results should be viewed as preliminary since we only equipped 3 cavity trees with antennas. However, the feasibility of using this technique to monitor interactions between flying squirrels and red-cockaded woodpeckers was demonstrated. Use of this technique on a larger scale to test the effectiveness of flying squirrel excluder devices (Loeb 1996) or the effectiveness of cavity predator control (e.g., Gaines et al. 1995) should yield valuable data to further direct conservation efforts of red-cockaded woodpeckers.

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