

ROOSTING BEHAVIOR OF RED-COCKADED WOODPECKER CLANS WITH INSUFFICIENT CAVITIES

BY ROBERT G. HOOPER AND MICHAEL R. LENNARTZ

There are often more birds in a territorial clan of Red-cockaded Woodpeckers (*Picoides borealis*) than there are roost cavities. Members of clans do not share cavities, and each bird has an exclusive cavity, when available, for roosting throughout the year. The species typically roosts and nests in cavities in live pines. The shortest reported time for completion of a cavity is 10-11 mo (Baker 1971), but typically several years of effort are involved (Jackson et al. 1979). Intragroup competition for available cavities is keen (Lennartz and Hooper pers. obs.). Within a territory, enlargement by other woodpeckers (Jackson 1978), encroachment of vegetation (Beckett 1971), and flooding by rain render some cavities useless to Red-cockaded. Interspecific competition for cavities is intense and an otherwise suitable cavity may be usurped by another animal (Jackson 1978).

Birds without cavities have several alternatives. They could try to join a clan with an adequate supply of cavities. Such behavior has not been reported, nor have we observed it. Some birds without cavities roost for brief periods within their territories on the trunks or limbs of live pines (Ligon 1970, Baker 1971, Nesbitt pers. comm.). Another option is that a bird could be a member of one clan, but roost in a cavity of another clan. This arrangement has been reported three times (Nesbitt et al. 1978, Roy S. DeLotelle and Jerome A. Jackson pers. comm.). In this paper we report that both open and extraterritorial roosting are common among Red-cockaded and appear to be adaptive behaviors when cavities within territories are in insufficient supply.

METHODS

From April 1976 to June 1980, 18 Red-cockaded clans were studied on the Francis Marion National Forest in Berkeley County, South Carolina. The area has at least 400 colonies on about 64,000 ha of habitat. In addition to time spent banding, watching nesting activity, and searching for extraterritorial roost sites, 2300 h were spent observing the clans in their territories. Clans ranged from 2 to 9 birds, but never had more than 1 breeding pair. Additional clan members were juveniles of both sexes and adult males. Adult males helped with feeding and care of nestlings (Lennartz and Harlow 1979), cavity excavation, and defense of territory. Territorial defense was exhibited year round (Hooper et al. 1982). A clan used from 1 to 6 cavities within a territory. These were typically aggregated into a small portion of the territory called the colony (Jackson and Thompson 1971). Unless stated otherwise, all birds discussed were color-banded.

RESULTS

Open roosting.—Three breeding females and 2 breeding males in 4 different territories roosted in the open. The longest period of open roosting was at least 317 d (16 June 1976–28 April 1977) by a breeding female. Her clan fledged 3 young in 1977 following an unusually severe winter. She acquired a cavity after the young fledged, and remained as breeding female through 1979. In another clan, the breeding male roosted in the open at least 86 d while his mate occupied the only available cavity. He gained access to the cavity for roosting no sooner than 3 days prior to egg laying. Another adult male, whose cavity was occupied by flying squirrels (*Glaucomys volans*), roosted in the open through the nesting season and made no known attempt to acquire the female's cavity. The pair did not nest that year: Red-cockadeds typically nest in the roost cavity of the breeding male. The male did nest in the same territory for both the 2 seasons before and 2 seasons after the incident.

We saw 8 different non-cavity roost sites used by adult Red-cockadeds. Five were scars on the trunks of live pines 1–21 m above ground. One of these was a fire scar at the base of a live pine. It was 1.3 m long, 15 cm wide, and 11 cm at its maximum depth. The other scars were shallow depressions where the bark had been removed down to the sapwood when the tree was struck by a falling tree or were scars where limbs had broken off from the trunk. These last 2 types of scars offered little concealment or protection to roosting birds. The 3 other sites were in forks of live pines 11–15 m above ground. One fork and 1 scar had numerous resin wells (small holes chipped into the sapwood to induce resin flow) in a pattern similar to that typically found around cavities. The fork was used at least 64 d by a breeding female; 23 mo after the female last used the fork, an unbanded bird roosted there one evening. In colonies of clans not being studied, we saw resin wells around 2 forks and around numerous scars, but did not observe roosting. Dennis (1971) described resin wells on trees without cavities that were adjacent to cavity trees. We have seen many such trees, and suspect that the resin wells were associated with the adjacent cavity tree. The trees we report were in colonies but were not adjacent to cavity trees. We believe the resin wells on the open-roost trees were related to the open-roost site and not a cavity in another tree. The presence of resin wells implies long-term use of some open-roost sites.

Although 1 male roosted in a cavity within 12 d after fledging, most juveniles do not have cavities available to them upon fledging. We saw 8 juveniles roosting on the trunks and limbs of live pines in their natal territories 4–17 wk after fledging. One of the juveniles was nearly concealed when he roosted on the trunk beneath a dead limb draped with Spanish moss (*Tillandsia usneoides*). Two of the juveniles, 3–4 d after fledging, roosted in the open 430 m from their nest tree. At other times these 2 birds and the 6 other juveniles roosted in the open within their respective colonies.

Extraterritorial roosting.—Three breeding females, 1 unbanded bird believed to be a breeding female, and 1 nonbreeding male roosted outside their 5 respective territories. One female that was the breeder in 1977 and 1978, fledging 2 and 3 young respectively, roosted outside her territory at least 262 d (17 May 1977–3 February 1978). Her mate used the only available cavity until one became available to her within the territory. A breeding female in another clan roosted in a cavity 2.1 km from her nest tree, but only .2 km from the nest tree of another clan. She roosted outside her territory at least 213 d. Prior to her capture and banding, an unbanded bird, believed to be the same female, left the territory to roost during a 153-d period. The breeding pair fledged 2 young each year from the male's cavity the breeding season prior to and the one included in the combined 366-d period (29 June 1976–30 June 1977). In another clan, the breeding female with nestlings left her territory at roost time. The clan fledged 3 young. She was the breeding female of the previous year and had stopped roosting in her cavity tree some time after it had died. A male helper roosted in the dead tree and the breeding male roosted in the only live cavity tree. The female subsequently acquired a cavity within the territory and remained through a third breeding season. In another clan, an unbanded bird believed to be a breeding female, left its territory to roost through a 2-mo period including nesting. Two young were fledged. A male in another clan roosted outside his natal territory, first as a juvenile and then as a helper, for at least 490 d. On 2 checks 14 d apart, he roosted in a cavity of a foreign clan 1.0 km from his natal colony. In subsequent years this bird became the breeding male in a third territory.

Additional evidence of extraterritorial roosting is provided by 8 birds that roosted in cavities in 4 colonies but were never seen to associate with the resident clans. A female roosted at least 71 d in a colony 1.0 km from the colony of the clan she was associated with. Prior to banding this bird, an unbanded bird roosted in the same cavity for at least 62 d and exhibited the same flight line upon leaving the colony as did the banded female. In the other territories, we did not know where the alien birds went upon leaving their roost cavities, but they repeated their flight lines into and out of the colonies: 1 banded female over a period of 58 d, and 3 unbanded birds for 108, 85, and 17 d. A juvenile male definitely not a member of the resident clan, was banded in a colony and was not seen again. Generally, alien birds roosted after and left their cavities before the resident clans. On 5 occasions when alien birds and residents did come into contact, the aliens were chased and harassed.

DISCUSSION

Although access to a cavity for roosting is important to Red-cockaded, and males must have a cavity in order to breed, some birds do not have roost cavities for extended periods. Some birds without cavities could abandon their clan and attempt to join a clan with surplus cavities,

but such behavior has not been observed. We observed birds to move from one clan to another to fill a vacancy created by the loss of a breeder or to assume breeding status by displacing a resident breeder. Our observations do not indicate that these movements and shifts from non-breeding to breeding status were associated with a lack of cavities in the birds' original territory. Clan members without cavities frequently roost in the open within their territories or use cavities in adjacent territories, rather than give up the opportunity to breed or the association with an established territory. Some birds temporarily without a roost cavity in their territory successfully nested and survived until a cavity became available within their territory.

In 5 clans a member roosted outside its respective territory, and aliens roosted in 4 additional colonies. Thus, banding data and knowledge of the number of occupied cavities alone are inadequate for determining clan size in Red-cockaded. It is also clear that some clans can temporarily survive and nest with only a single cavity within their territories.

SUMMARY

Rather than give up their current status in an established clan, some Red-cockaded Woodpeckers without roost cavities within their territories roosted in the open or flew to adjacent territories that had a surplus of cavities. Some of these birds reproduced successfully and survived until a cavity became available for their use within their territory.

ACKNOWLEDGMENTS

We thank W. W. Baker, J. H. Carter, P. D. Doerr, V. G. Henry, and L. Kilham for their helpful comments on various drafts of the manuscript.

LITERATURE CITED

- BAKER, W. W. 1971. Progress report on life history studies of the Red-cockaded Woodpecker at Tall Timbers Research Station. Pp. 44-59, in R. L. Thompson (ed.), *The ecology and management of the Red-cockaded Woodpecker*. Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station, Tallahassee, Florida.
- BECKETT, T. A., III. 1971. A summary of Red-cockaded Woodpecker observations in South Carolina. Pp. 87-95, in R. L. Thompson (ed.), *The ecology and management of the Red-cockaded Woodpecker*. Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station, Tallahassee, Florida.
- DENNIS, J. V. 1971. Utilization of pine resin by the Red-cockaded Woodpecker and its effectiveness in protecting roosting and nest sites. Pp. 78-86, in R. L. Thompson (ed.), *The ecology and management of the Red-cockaded Woodpecker*. Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station, Tallahassee, Florida.
- HOOPER, R. G., L. J. NILES, R. F. HARLOW, AND G. W. WOOD. 1982. Home ranges of Red-cockaded Woodpeckers in coastal South Carolina. *Auk* 99:675-682.
- JACKSON, J. A. 1978. Competition for cavities and Red-cockaded Woodpecker management. Pp. 103-112, in S. A. Temple (ed.), *Endangered birds, management techniques for preserving threatened species*. Univ. of Wisconsin Press, Madison.
- , M. R. LENNARTZ, AND R. G. HOOPER. 1979. Tree age and cavity initiation by Red-cockaded Woodpeckers. *J. For.* 77:102-103.
- , AND R. L. THOMPSON. 1971. A glossary of terms used in association with the

Red-cockaded Woodpecker. Pp. 187-188, in R. L. Thompson (ed.), *The ecology and management of the Red-cockaded Woodpecker*. Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station, Tallahassee, Florida.

LENNARTZ, M. R., AND R. F. HARLOW. 1979. The role of parent and helper Red-cockaded Woodpeckers at the nest. *Wilson Bull.* 91:331-335.

LIGON, J. D. 1970. Behavior and breeding biology of the Red-cockaded Woodpecker. *Auk* 87:255-278.

NESBITT, S. A., D. T. GILBERT, AND D. B. BARBOUR. 1978. Red-cockaded Woodpecker fall movements in a Florida flatwoods community. *Auk* 95:145-151.

U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Department of Forestry, Clemson University, Clemson, South Carolina 29631. Received 18 Jan. 1982; accepted 12 Sept. 1982.