HABITAT UTILIZATION OF THE RED-COCKADED WOODPECKER DURING THE WINTER

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As only limited detailed information exists upon the Red-cockaded Woodpecker (*Dendrocopos borealis*) and Ligon (1970) and other workers (Steirly, 1957; Lay and Russell, 1970) have expressed concern for its survival, data relating to the ecology of this species take on a particular interest. These data have further ecological significance because they demonstrate differences in habitat utilization from those of a population Ligon (1968) studied in Florida. Ligon reported segregation in foraging between males and females; data presented here reveal no such differences. The previous studies cited above were conducted primarily or totally during the breeding season and no major seasonal changes were noted; this paper reports information gathered during the fall and winter.

DESCRIPTION OF STUDY AREAS

I observed Red-cockaded Woodpeckers from October to February during the winters of 1963–64 and 1964–65 while conducting a larger study upon mixed-species foraging flocks in which I often saw these woodpeckers (Morse, 1970). I gathered almost all the present data on a 4 × 2 km study area in a longleaf pine (*Pinus australis*) forest 5 km west of Fluker, Tangipahoa Parish, Louisiana. Trees averaged 15–18 m in height, and periodic burning every 1–2 years prevented the development of a heavy understory. Few other species of trees grew in this forest, the commonest being blackjack oaks (*Quercus marilandica*), which seldom reached a height of over 6–7 m. Though never comprising over 10 percent of the tree volume within a 1-ha plot, and under 1 percent over the entire area, these trees were used heavily by other species in the flocks with which Red-cockaded Woodpeckers sometimes foraged. The only other substantial areas of deciduous growth occurred along streams in this gently rolling country. I have described this forest further elsewhere (Morse, 1967, 1970).

I made additional studies in two mixed coniferous-deciduous forests (about 1 × 1 and 1 × 0.5 km) 4 km east of Satsuma, Livingston Parish, Louisiana. Both contained large numbers of mature loblolly and spruce pines (*P. taeda* and *P. glabra*), water-oak (*Quercus nigra*), and American hornbeam (*Carpinus caroliniana*), as well as several other deciduous species in smaller numbers. I have also described these forests elsewhere (Morse, 1970).

RESULTS

Population density.—Red-cockaded Woodpeckers occurred in small numbers throughout the longleaf pine forest at Fluker, and they apparently occupied large territories. I recorded a density of 1.3 individuals per 40 ha (100 acres) during the winter on the main study plot (Morse, 1970). I saw no Red-cockaded Woodpeckers during the regular censuses

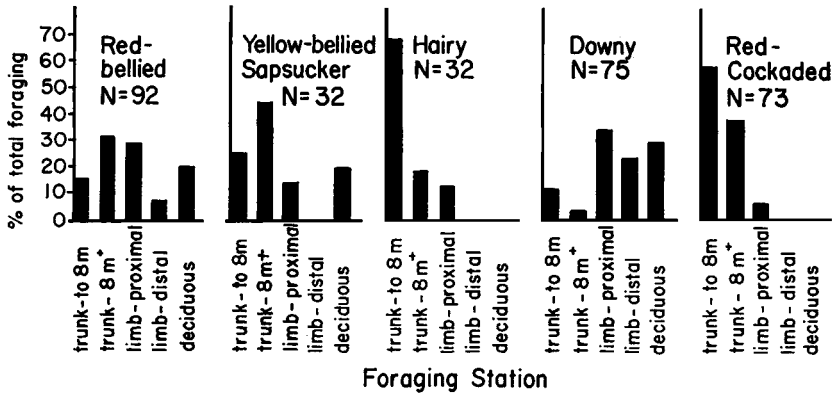

Figure 1. Foraging stations of small and medium-sized woodpeckers at Fluker. N = number of foraging observations.

in the mixed coniferous-deciduous forest (Morse, 1970). My only observations of this species during 2 years of regular field work there involved a single bird. The species' density there obviously was extremely low.

Intraspecific social relationships.—As indicated by Ligon (1968), one usually finds Red-cockaded Woodpeckers in pairs, even outside the breeding season. In this study a sizable percentage of sightings of this species (54 percent) involved two birds. In 18 of these cases one male and one female definitely made up these pairs. Only twice did I see three birds in close proximity to each other; these represented two birds in the process of driving a third bird from their frequented area. Such aggressive activity and the tendency for the birds to follow flocks for only short distances suggest that the pairs occupy territories during the winter at Fluker.

Foraging behavior.—Data on the foraging of Red-cockaded and other small and medium-sized woodpeckers appear in Figure 1. Methods essentially follow those of Ligon (1968), though I used point observations rather than timing by stopwatch because I gathered these data originally for a different purpose. I recorded where I first saw an individual and made only one observation on a bird in a day. The population studied contained approximately 20 individuals. While Wiens (1969) warns of the dangers of bias in point observations, occasional longer periods of study did not suggest a strong bias in this technique. The extremely open character of the forest should minimize such difficulties here.

In his younger and shorter forest Ligon divided the trunk into high and low parts, under 4.6 m (15 feet) and 4.6 m and over. This demarcation point roughly marked the trunk into limbless and limb-containing

parts. As the present forest is somewhat older and taller, I have used 8 m as a dividing point between limbless and limb-containing components. Use of Ligon's criterion (4.6 m) would place almost all the Red-cockaded Woodpecker records in the high category.

With one exception I only saw Red-cockaded Woodpeckers foraging in pine trees. The longleaf pines produced an extremely heavy seed crop during the winter of 1964–65 (Morse, 1967, 1970), yet this species did not make regular use of it, though several other species fed extensively on pine seeds. The one gut of a Red-cockaded Woodpecker examined from this period contained only arthropods. These birds fed almost exclusively on trunks of pines (Figure 1). I analyzed the 18 records of apparent pairs to determine whether differences might exist in the heights at which individuals foraged. The similarities of the two sexes when together was striking. In 16 of the 18 cases less than a 2-m difference occurred in the height at which the two sexes foraged. These all involved pairs on trunks. In one exception, the male occupied a position approximately 3 m above the female, and in the remaining case the male used a large limb about 15 cm from the trunk while the female worked upon a trunk at the same height. Only in 2 of these 18 records did the two individuals forage on the same tree; at other times they used different trees from 5 to 50 m apart. The tendency for the two members of a pair to forage in similar positions was highly significant ($P < 0.001$ in a binomial test).

The data for Red-cockaded Woodpeckers (Figure 1) indicate a high spatial overlap with Hairy Woodpeckers (*Dendrocopos villosus*) and a clear segregation from Downy Woodpeckers (*D. pubescens*). Overlap with the larger Red-bellied Woodpecker (*Centurus carolinus*) is lower than with Hairy Woodpeckers. While spatial overlap with the Yellow-bellied Sapsucker (*Sphyrapicus varius*) is high, the radically different foraging techniques of these two genera probably resulted in their obtaining somewhat different resources there.

Presence and abundance of other woodpeckers.—Several other woodpeckers occurred in the study areas: the Yellow-shafted Flicker (*Colaptes auratus*), Yellow-bellied Sapsucker, Pileated (*Dryocopus pileatus*), Red-headed (*Melanerpes erythrocephalus*) (Satsuma only), Red-bellied, Hairy, and Downy Woodpeckers. Though no one of these species is abundant at Fluker, their combined density considerably exceeds that of the Red-cockaded Woodpecker (Morse, 1970). Most of the other species potentially compete with Red-cockaded Woodpeckers, though as usual it is difficult to establish the existence of limiting factors. In addition to possible food limitation (discussed below), the number of satisfactory sites for constructing nesting and roosting cavities could

also act as a limiting factor in hole-nesting species. In Florida and elsewhere Red-cockaded Woodpeckers depend upon trees infected by the red heart fungus (*Fomes pinii*), which attacks and softens the heartwood (Steirly, 1957; Ligon, 1970). Particularly in a managed area, forestry practices may result in few available suitable trees.

Encounters between Red-cockaded Woodpeckers and other species.—Few data exist that permit insight into the possible role of encounters between Red-cockaded Woodpeckers and other species in restricting the parts of the habitat they forage in. In this study I noted no hostile interactions between Red-cockaded and Downy Woodpeckers, but as indicated in Figure 1, a clear segregation existed between the foraging sites used by the two species. I seldom saw Hairy Woodpeckers in my study area, and only upon extremely rare occasions did I find the two species together. I observed no hostile interactions, but the two species appeared together so seldom (six times) that one can draw few conclusions from this apparent absence of contact. No encounters were noted between Red-cockaded Woodpeckers and the other woodpeckers.

DISCUSSION

The density of Red-cockaded Woodpeckers at Fluker is consistent with that recorded in the few winter and breeding bird population studies made in the geographical and habitat ranges of this species (Audubon Field Notes, 1946-1970). These studies reported a maximum density of one pair of birds per 40 ha, except for one case where two pairs nested. Ligon (1970) considered his population sedentary. If this condition holds elsewhere, and other authors (e.g. Murphey, *in* Bent, 1939) suggest that it does, data from breeding birds censuses may be roughly comparable to those from the winter season. Though nobody has compiled both breeding and winter censuses from a single census plot, those made in similar habitats show similar densities of Red-cockaded Woodpeckers for both seasons. Ligon implies that mature pine forests support denser populations than young forests, though none of the censuses in Audubon Field Notes provide insight into this common impression. Censuses published in that journal report the Red-cockaded Woodpecker only from longleaf pine forests. Thus its habitat distribution in eastern Louisiana appears typical of that found elsewhere.

The data indicate the absence of marked sexual differences in foraging in at least one local population of Red-cockaded Woodpeckers during the winter season. This condition contrasts with the situation reported by Ligon (1968), who found a pronounced difference between males and females—males foraged high in the trees and toward the extremities, females foraged low and toward the center of the trees. In addition to

Ligon's study, several other workers have reported sexual differences in woodpecker foraging (Kilham, 1965, 1970; Selander, 1966; Jackson, 1970; Koch et al., 1970; Short 1970a, 1970b, 1971; Willson, 1970). Though these workers' techniques suffice to separate species or sexes by gross spatial means, a finding of "no difference" need not indicate identical resource exploitation by the species or sexes in concern. Good evidence exists that males and females of some woodpeckers use a variety of strategies (Kilham, 1965, 1970; Ligon, 1968; Jackson, 1970; MacRoberts, 1970; Willson, 1970), but I noted no differences of this sort between male and female Red-cockaded Woodpeckers.

Too few specimens of Red-cockaded Woodpeckers exist from the Fluker area to determine whether the sexes of this population are structurally dimorphic. Ligon (1968) found no significant differences in bill lengths of Florida birds, but he does not mention whether the sample was confined to specimens from one locality or season. Short (1970a) has reported other structural sex differences in a sample of specimens of this species taken from a single locality in Florida.

The large number of woodpecker species present on the Fluker plot could account for the restriction of Red-cockaded Woodpeckers to trunks and the accompanying absence of foraging differences between the sexes. In the case of a high species diversity of potential competitors, one would predict the range of habitat utilization of any given species to be narrower than where a diversity of potential competitors occurs (see MacArthur and Wilson, 1967). However Ligon (pers. comm.) reports that all the woodpeckers encountered at Fluker occupied his study area as well. Particularly instructive at this point is the partitioning (Figure 1) of the trees at Fluker by Red-cockaded and Downy woodpeckers, probably the two most closely related species on the tract (Short, 1971). Ligon (1968) states that he never saw these species feeding "peacefully" in close proximity; neither could he detect any differences in foraging techniques or sites between Downy and male Red-cockaded woodpeckers. Such a partitioning might not occur immediately when two species come into contact, and if Ligon's (1970) suggestion that Downy Woodpeckers have only recently entered the pinelands of Florida in their present numbers is correct, then his observations of spatial overlap between these species may represent initial stages of contact, while mine may represent a more advanced condition. The differences in habitat utilization between the two species at Fluker and on Ligon's plot, combined with the differences in frequency of agonistic encounters in those areas, support such an interpretation.

Ligon reported two encounters between Hairy and Red-cockaded woodpeckers, though he found the Hairy uncommon in his study area.

These observations are consistent with mine and suggest the possibility of mutual exclusion between the two species. While substantial spatial overlap existed between Red-cockaded Woodpeckers and sapsuckers at Fluker (Figure 1), little overlap in resource utilization probably occurs between these species (see Lawrence, 1967). The Red-bellied Woodpecker, though considerably larger than the Red-cockaded Woodpecker, appears a more likely potential competitor, but like Ligon (1968), I noted no apparent encounters or signs of avoidance of one of these species by the other.

In conclusion I have hypothesized that the apparent absence of strongly marked sexual foraging differences in a population of Red-cockaded Woodpeckers represents a response to the established presence of several species of woodpeckers, particularly the Downy Woodpecker. Further data are needed from a variety of seasons, differently aged habitats, species compositions, and geographic areas to assess quantitatively the extensiveness of sexual foraging differences in the Red-cockaded Woodpecker and the conditions under which it appears. Judging from the absence of marked morphological differences in Ligon's (1968) Florida population, this characteristic (sexual differences in foraging) may be of a transitory nature at any point in place or time.

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SUMMARY

Winter observations of a population of Red-cockaded Woodpeckers (*Dendrocopos borealis*) in eastern Louisiana indicated that males and females foraged similarly, concentrating their activities upon trunks of longleaf pines (*Pinus palustris*). These Red-cockaded Woodpeckers are segregated spatially from Downy Woodpeckers (*D. pubescens*), which concentrate their activities on the peripheral parts of pines. Hairy Woodpeckers (*D. villosus*) forage primarily on pine trunks, but seldom occur with Red-cockaded Woodpeckers. These results differ from those of Ligon (1968, 1970) in Florida, who founded marked differences in the foraging of males and females.

LITERATURE CITED

AUDUBON FIELD NOTES. 1946–1970. (Various breeding-bird censuses and winter bird-population studies.) Section II, Audubon Mag., vol. 48, and Audubon Field Notes, vols. 1–24.

BENT, A. C. 1939. Life histories of North American woodpeckers. U. S. Natl. Mus., Bull. 174.

JACKSON, J. A. 1970. A quantitative study of the foraging ecology of Downy Woodpeckers. Ecology, 51: 318–323.

KILHAM, L. 1965. Differences in feeding behavior of male and female Hairy Woodpeckers. Wilson Bull., 77: 134–145.

KILHAM, L. 1970. Feeding behavior of Downy Woodpeckers. I. Preference for paper birches and sexual differences. Auk, 87: 544–556.

KOCH, R. F., A. E. COURCHESNE, AND C. T. COLLINS. 1970 Sexual differences in foraging behavior of White-haired Woodpeckers. Bull. Southern California Acad. Sci. 69: 60–64.

LAWRENCE, L. DEK. 1967. A comparative life-history study of four species of woodpeckers. Ornithol. Monogr., 5: 1–156.

LAY, D. W., AND D. N. RUSSELL. 1970. Notes on the Red-cockaded Woodpecker in Texas. Auk, 87: 781–786.

LIGON, J. D. 1968. Sexual differences in foraging behavior in two species of *Dendrocopos* woodpeckers. Auk, 85: 203–215.

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

MACARTHUR, R. H., AND E. O. WILSON. 1967. The theory of island biogeography. Monogr. Population Biol., 2: 1–203.

MACROBERTS, M. H. 1970. Notes on the food habits and food defense of the Acorn Woodpecker. Condor, 72: 196–204.

MORSE, D. H. 1967. Foraging relationships of Brown-headed Nuthatches and Pine Warblers. Ecology, 48: 94–103.

MORSE, D. H. 1970. Ecological aspects of some mixed-species foraging flocks of birds. Ecol. Monogr., 40: 119–168.

SELANDER, R. K. 1966. Sexual dimorphism and differential niche utilization in birds. Condor, 68: 113–151.

SHORT, L. L. 1970a. Reversed sexual dimorphism in tail length and foraging differences in woodpeckers. Bird-Banding, 41: 85–92.

SHORT, L. L. 1970b. The habits and relationships of the Magellanic Woodpecker. Wilson Bull., 82: 115–129.

SHORT, L. L. 1971. Systematics and behavior of some North American woodpeckers, genus *Picoides* (Aves). Bull. Amer. Mus. Nat. Hist., 145: 1–118.

STEIRLY, C. C. 1957. Nesting ecology of the Red-cockaded Woodpecker in Virginia. Atlantic Naturalist, 12: 280–292.

WEINS, J. A. 1969. An approach to the study of ecological relationships among grassland birds. Ornithol. Monogr., 8: 1–93.

WILLSON, M. F. 1970. Foraging behavior of some winter birds of deciduous woods. Condor, 72: 169–174.

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