

## GROUP SIZE, SEX RATIO, REPRODUCTIVE SUCCESS AND TERRITORY SIZE IN ACORN WOODPECKERS

ELIZABETH M. SWEARINGEN, 44 Murray Avenue, Annapolis, Maryland 21401

Published information regarding group size and composition, territories and reproductive success of the Acorn Woodpecker (*Melanerpes formicivorus*), a group-living bird, is limited. Scattered data concerning these characteristics have been found in a few references (Ritter 1938, Bent 1939, Skutch 1969). To collect more specific information about these aspects of Acorn Woodpecker ecology, I observed nine groups of these birds on the Stanford University campus, Stanford, California from 1973 through 1975.

The habitat of these groups included campus buildings, tree-lined streets and sidewalks, and large areas of woodland and grassland. The most common source of acorns, a primary food during much of the year, was the Coast Live Oak (*Quercus agrifolia*), but Valley and Blue oaks (*Q. lobata*, *Q. douglasii*) were also present. Most of the group roosted, nested and stored acorns in palm trees (mainly *Phoenix canariensis*). However, one group used Monterey Pines (*Pinus radiata*) for all three activities, while telephone poles and Blue Gums (*Eucalyptus globulus*) were used by others for storing and at least roosting. Wood shingles and roof tiles were also used for storing.

Group surveys of the unmarked Stanford birds were based on the largest number of individuals observed simultaneously. Males, females, and juveniles (before the molt) were readily distinguishable. This technique was supplemented by the recognition of some individuals by peculiarities of plumage. Surveys were done by observing the central gathering points in each group's territory to minimize the possibility of counting stray birds from neighboring groups. The central gathering points were acorn granaries, nesting and roosting sites and trees serving as anvil sites for opening acorns. Because the birds were not marked, seasonal group counts were repeated for several sittings to minimize the number of individuals omitted from the totals.

Estimates of territory size were made from observations of the same central gathering points of each group as in the group surveys. Birds could easily be observed flying back and forth from these places to other areas. All frequently traveled flight paths and destinations from the central points were charted. From these, approximate territorial boundaries were then mapped out.

Because of the proximity of many of the Stanford groups, it was sometimes possible to observe as many as three groups simultaneously. Flight paths and destinations from the central territorial points were

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rarely seen to overlap between groups. On occasion birds originating in one charted territory were seen entering a neighboring territorial region. These were usually chased out by the residents.

Observations totaled approximately 175 hours. Table 1 summarizes the findings on group size, sex ratio, reproductive success and territory size.

In a recent study by MacRoberts and MacRoberts of Acorn Woodpeckers in Monterey County, California (1976), a mean group size of 5.6 for 20 groups of banded birds observed over three years was found. The male:female ratio was 1.2:1. The reproductive rate ranged between 0.20 and 0.28 young fledged per adult. Territory sizes ranged between 3.5-9.0 ha (mean 6.2).

Another recent California study done by Chad Roberts (pers. comm.) revealed a mean group size of 3.1 for 65 groups in the Central Valley and a mean size of 3.0 for 14 groups of birds in Yolo County. As in Monterey County, the number of males per female was 1.2. Territory sizes ranged between 1.5-8.0 ha (mean 4.6 ha).

Although group size was similar to that found in Monterey County, territory sizes at Stanford were much smaller. This disparity may be due at least in part to the suitability of the terrain for woodpecker habitation. The area surveyed at Stanford was for the most part an unbroken stretch of woodpecker habitat, with many suitable storage and nesting sites (mainly palms) and a large number of oaks throughout the area. In Monterey County, islands of suitable woodpecker habitat (containing nesting, storing and foraging sites) were surrounded by often much larger expanses of land suitable for foraging but not for full-time habitation by another group (Koenig pers. comm.). Homogeneity of terrain suitable for habitation may therefore be a reason for the smaller size and proximity of the Stanford territories. This factor may also cause more territorial boundaries at Stanford to be imposed on a group by neighboring groups than in Monterey County.

The differences in breeding success between the Stanford and Monterey groups may be compared with the available supply of acorns at each location. In the former, acorns were observed to be an important part of the woodpecker diet for adults throughout the year, and for nestlings and fledglings. During the study period, the supply of stored acorns appeared to be plentiful in almost all territories at all seasons.

In the three years of the MacRoberts and MacRoberts study, the stored acorn supplies did not last throughout the summer due to poor acorn crops. The breeding success was only half that of the Stanford birds (MacRoberts and MacRoberts 1976). The following year, after a good acorn crop, acorns were available throughout the summer to feed nestlings and fledglings and the breeding success was several times that of the three previous years (Koenig pers. comm.).

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Table 1. Group size, sex ratio, numbers of fledged young and territory size.

YEAR/MONTH SPAN	1	2	3	4	GROUP			8	9	MEAN GROUP SIZE	SEX RATIO M/F	FLEDGED YOUNG Mean/ Group	YOUNG Mean/ Adult
1973 July-September					5	6	7			6.7 (4.9)**	2.1***	1.9	0.38
Adult males	4	3	3	4	4	3	2	NS*	NS				
Adult females	1	2	3	1	2	1	1						
Young	4	1	3-4	2	1-2	1	0						
Total	9	6	9-10	7	7-8	5	3						
1974 April-September										7.4 (5.2)**	1.9***	2.3	0.44
Adult males	3	3	4	4	4-5	3	2	4	3				
Adult females	2	2	2	2	1	1	1	2	3				
Young	3	2-3	2	2	1	2	2	3	3				
Total	8	7-8	8	8	6-7	6	5	9	9				
1974-75 October-January										6.9	1.5****		
Males****	4	6	4	4	6	3	2	4	4				
Females****	2	2	3	3	2	3	5	2	3				
Total	6	8	7	7	8	6	7	6	7				
TERRITORY SIZE (ha)	2.9	2.5	0.9	2.6	4.3	2.2	1.7	3.1	1.8	MEAN: 2.4 ha			

\* Not surveyed

\*\* Figures in parentheses are mean group sizes excluding young

\*\*\* Only adults included

\*\*\*\* Numbers of males and females include immatures as this survey followed the post-juvenile molt

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Given the abundance of acorns and the suitability of the land for woodpecker habitation at Stanford, limiting factors must have been working to keep the group numbers from increasing and/or territory sizes from decreasing to make room for more groups. One new group (No. 7) was established in 1973, where no previous group existed. However, the rest of the territorial boundaries changed little in the two years and group sizes remained approximately the same.

In at least four of the territories, potential granary sites were limited, perhaps providing an upper limit to the number of birds the territory could support. In the other five territories, several unused or under-used granary sites were apparent. In these territories, the granary sites nearest the tree or trees used as anvil locations tended to be the sites used as granaries. Proximity to suitable anvil sites could possibly be a limiting factor in the use of granaries.

Buildings provided boundaries for several of the territories. These may have limited the number of possible territories in the study area.

The mean number of males per female in the Stanford groups varied from survey to survey between 1.48 and 2.09. Significantly high male:female ratios (1.2:1) were also found in MacRoberts and MacRoberts' and Roberts' studies. Sex ratios biased in favor of males have also been found in many other group-living birds (Brown 1974, Fry 1972).

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