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Brent Burt

*Stephen F Austin State University, dbburt@sfasu.edu*

James R. McCormick

*Department of Biology, Stephen F. Austin State University, Nacogdoches, TX 75961*

Richard N. Conner

Daniel Saenz

*Wildlife Habitat and Silviculture Laboratory, Southern Research Station, U.S.D.A. Forest Service, Nacogdoches, TX 75962*

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**DELAYED REPRODUCTION OF TRANSLOCATED  
RED-COCKADED WOODPECKERS**

JAMES R. MCCORMICK,<sup>1</sup> RICHARD N. CONNER,<sup>?</sup> DANIEL SAENZ,<sup>2</sup> AND BRENT BURT<sup>1</sup>  
*Department of Biology, Stephen F. Austin State University, Nacogdoches, TX 75961.*

<sup>2</sup> *Wildlife Habitat and Silviculture Laboratory, Southern Research Station, U.S.D.A. Forest Service,  
Nacogdoches, TX 75962.*

**ABSTRACT.**-Twelve pairs of Red-cockaded Woodpeckers were translocated to the Angelina National Forest from 21 October 1998 to 17 December 1998. Five breeding pairs (consisting of at least one translocated bird) produced eggs/nestlings within the first breeding season after translocation. Clutch initiation dates for all five pairs were later than those of resident breeders. The observed delay in reproductive timing by translocated woodpeckers may have resulted from a variety of factors including unfamiliarity with the habitat, a lack of breeding experience, delayed pair bonding or age specific causes.

The Red-cockaded Woodpecker (*Picoides borealis*) is an endangered species endemic to the southeastern United States. It is a cooperative breeder living in groups that include a breeding pair and up to 5 helpers (usually males) from previous years' breeding efforts (Ligon 1970, Walters et al. 1992). Habitat loss and degradation has produced a pattern of demographic isolation with woodpecker dispersal and gene flow among isolated populations being rare or absent (Conner and Rudolph 1989, 1991). Translocation of first-year birds have been shown to offset population declines (Carrie et al. 1999) and involves pairs of subadult birds being moved to unoccupied release sites containing artificial cavities (Copeyon 1990, Allen 1991). Translocation of first year males and females to sites with artificial cavities in areas where they can interact with helper males and dispersing females in the vicinity may provide an opportunity for inexperienced woodpeckers to breed, which normally would not have been possible due to existing distance-dispersal constraints and lack of cavities. Use of translocation in the management of the Red-cockaded Woodpecker is rapidly increasing, but to date minimal assessment of the effect of translocations on any aspect of the birds reproductive biology has occurred. In this paper we provide possible evidence for delayed clutch initiation in newly formed pairs of translocated birds as compared to resident birds.

**METHODS**

Twelve pairs of sub adult Red-cockaded Woodpeckers ( $N = 12$  males,  $N = 12$  females) were translocated from donor populations on the Kisatchie National Forest in Louisiana and the Sam Houston National Forest in Texas to the Angelina National Forest (31°15'N, 94°15'W) in eastern Texas between 21 October 1998 and 17 December 1998. Prior to these translocations, this 62,423ha forest contained 20 groups of resident Red-cockaded Woodpeckers.

We examined 22 nest trees of resident and newly established groups (17 pairs of resident birds and 5 pairs of translocated birds) for presence of eggs and/or nestlings from April through June of 1999. Each nest tree in the resident clusters was examined for occupancy every three days until nestlings were 22 days old using a

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<sup>1</sup>E-mail: Jim\_R\_McCormick@fws.gov

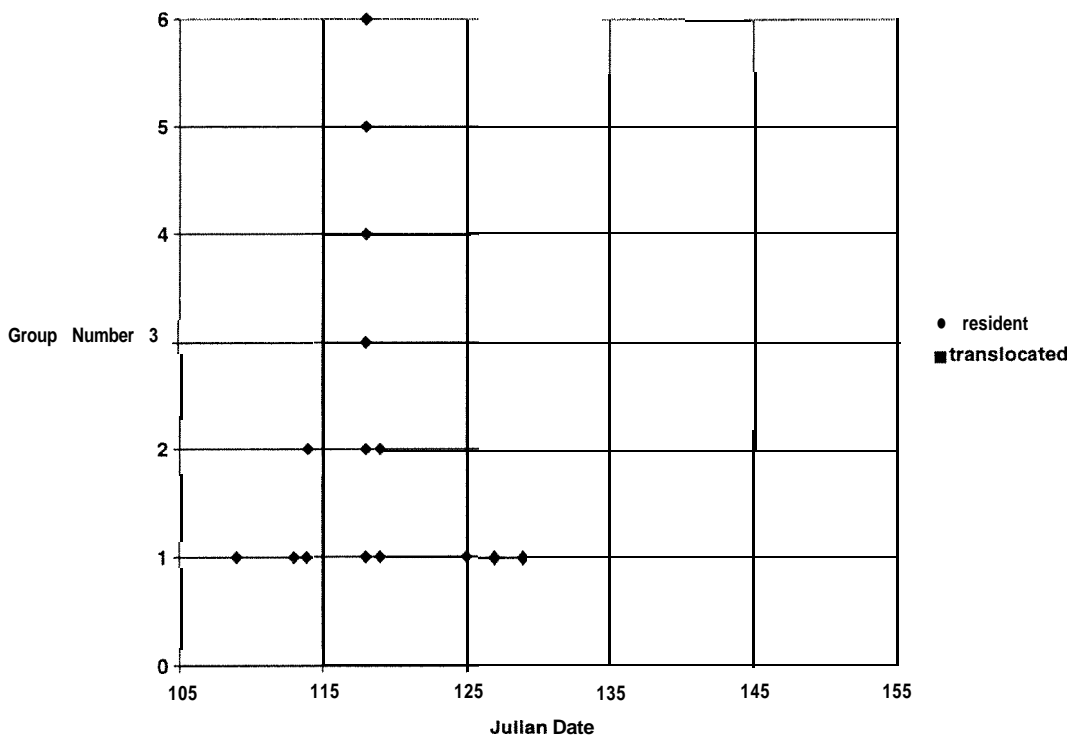


Figure 1. Clutch initiation dates for translocated ( $N = 5$ ) and resident ( $N = 17$ ) birds on the Angelina National Forest (One-tailed  $c$ -test:  $t = 6.28$ ,  $P < 0.0001$ ).

small camera attached to a telescoping pole (Richardson et al. 1999). We inspected translocation sites every two weeks until a nest was detected to minimize disturbance to the translocated birds. Habitat was uniform in all study areas (McCormick unpublished data).

When nestlings were found in either the translocated or resident nest cavity we aged them following criteria developed by Ligon (1971) and then estimated the clutch initiation date for each group. When eggs of resident birds were found we revisited the nest until eggs hatched and then estimated clutch initiation. When eggs of translocated birds were found, to minimize disturbance to the cluster site, we assumed that the discovery date was day 11 of incubation and that the young would hatch the next day (LaBranche and Walters 1994). This assumption was the most conservative approach and reduced the probability of detecting a difference in clutch initiation dates if a difference was actually present. Once we detected a nest and examined cavity contents, we identified breeders in the newly formed translocation clusters by their color bands and visitation was subsequently ceased. Due to logistical constraints we were not able to identify the previously established breeders for life/breeding histories for comparison. We used a one-tailed  $c$ -test to compare mean clutch initiation dates for established breeders and translocated birds.

## RESULTS

Pairs containing translocated Red-cockaded Woodpeckers on the Angelina National Forest initiated clutches at a later date than resident breeders ( $N = 5$  and  $17$  respectively;  $t = 6.28$ ,  $P < 0.001$ ). The clutch initiation date range for resident birds (19 April 1999 to 14 May 1999) did not even overlap with that of translocated birds (16 May 1999 to 26 May 1999, Fig. 1).

The groups in translocation sites were composed of either a pair of translocated individuals ( $N = 3$ ) or a mix of translocated and resident birds ( $N = 2$ ). Of the two pairs that contained a resident bird and translocated bird, one pair consisted of a female resident and a male translocated bird. The second pair consisted of a resident male, a resident bird of unknown sex and a translocated bird of unknown sex. This was the only translocation site with three adult birds. The resident bird of unknown sex did not have a leg band combination that would

have permitted identification. We made no attempt to capture the birds for positive identification in order to minimize disturbance to the newly formed pair. We assumed the breeding female was the translocated bird and the third bird was a helper. The other three pairs were composed of translocated birds that moved a short distance from their original release site but had still paired up with a translocated bird from that year. Our sample size was too small to test for a difference in the timing of breeding between groups that consisted of a combination of resident and translocated birds and groups with only translocated birds.

#### DISCUSSION

The observed delay in clutch initiation by translocated woodpeckers in this study may have resulted from multiple factors including unfamiliarity with the habitat, a lack of breeding experience, delayed pair bonding or age specific causes. Due to the amount of time these birds had to acclimate themselves to the surrounding habitat (minimum of 4 months) unfamiliarity with habitat seems less likely as a contributing factor.

First year male and females rarely breed and age specific causes of delayed reproduction are a distinct possibility. Walters et al. (1988) reported that first year male Red-cockaded Woodpeckers typically do not attempt nesting even if they have a territory and a mate. When first year birds did disperse and attempted to reproduce they had significantly lower reproductive success than older more experienced birds. Other studies conducted on the Red-cockaded Woodpecker have also shown that reproductive success improves dramatically with age in both male and female breeders with success of first year breeders being much lower than older birds (Lennartz et al 1987, Walters 1990, DeLotelle and Epting 1992). In other species of birds including gulls, Thick-billed Murres and Lesser Scaup reproductive success has been shown to increase with age and experience with first time breeders often nesting later, laying smaller clutches, and producing fewer fledglings (Pugesek and Diem 1983, Afton 1984, Forest and Gaston 1996). Previous studies conducted on the Red-cockaded Woodpecker have not reported any instances of younger inexperienced birds laying clutches at an earlier date than older experienced birds or that late nesting in general (independent of age) negatively affects reproductive success. However, when data were collected for the next years breeding effort (April-May 2000) in these same translocated clusters, the now "experienced" birds initiated clutches at an earlier date than the previous year (McCormick unpublished data). This general effect of age may be relevant because earlier nesting is often correlated to the higher reproductive success of older "more experienced" birds. Our observations support the hypothesis that translocated first year birds exhibit a later clutch initiation date due to the inexperience of the breeders. Future research with a larger data set is necessary to identify other potential contributing factors to delayed reproduction in translocated Red-cockaded Woodpeckers.

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