

Co-operative breeding in the Superb Fairy-wren  
Malurus cyaneus.

by

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PREFACE

I certify that the substance of this thesis has not already been submitted for any other degree and is not being submitted currently for any other degree.

I certify that all the work for this thesis was carried out solely by the candidate. All assistance received in the preparation of the thesis and all sources used have been acknowledged herein.



Raymond C. Nias

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## ABSTRACT

A population of Superb Fairy-wrens was studied from September 1982 to February 1986 at Eastwood State Forest, near Armidale, New South Wales. An attempt was made to investigate the adaptive significance of co-operative breeding in this population.

Co-operative breeding arose when immature birds failed to disperse from their natal group and remained, instead, as non-breeding helpers for one or more years. Helpers assisted in the reproductive efforts of the breeding pair by feeding nestlings and dependent fledglings.

The number, and composition of breeding groups in the Eastwood population varied between the four breeding seasons. Breeding groups were more numerous in the 1982/83 and 1983/84 breeding season than in the 1984/85 and 1985/86 breeding seasons. In the 1982/83 breeding season at least 75% of male fledglings produced in the previous year remained as helpers in their natal group. In the remaining breeding seasons, between 15% and 23% of males remained as helpers, at least in their first year. Female helpers were recorded in the 1982/83 breeding season ( at least 75% of fledglings ) and 1983/84 breeding season ( 11% of fledglings ) but not in the 1984/85 or 1985/86 breeding seasons.

Breeding groups occupied areas of the study-site that contained patches of dense understory vegetation or thicket. In particular, there was a close correspondence between breeding territories and the presence of blackberry brambles. Brambles were important refuges for fairy-wrens

and were favoured nesting sites. The area of brambles present within a territory was correlated with the number of helpers present and the reproductive output of the breeding pair. The survival of adult birds showed a general, though non-significant, correlation with the area of brambles present. Nests in brambles were more often successful, and produced more fledglings per egg laid, than nests in other sites. The greater success of nests in brambles was attributed to better concealment and protection from predators and brood parasites, two major causes of reproductive losses.

Brambles were identified as a major influence on the lifetime reproductive success of breeding birds. However, in the 1982/83 and 1983/84 breeding seasons, virtually all brambles were included in breeding territories. No suitable habitat existed for the formation of new breeding territories by potential breeders. Breeding vacancies occurred only after the death, or disappearance of a resident breeding bird. A number of birds were therefore unable to gain access to breeding positions within the population. In contrast, some suitable areas of habitat were not occupied in the 1984/85 and 1985/86 breeding seasons and the habitat was not considered to be 'saturated'. Although no female helpers were recorded in the latter breeding seasons, male helpers were relatively common. Some males were unable to breed in unoccupied habitat because of an apparent scarcity of sexual partners. The relative scarcity of females in the latter breeding seasons was a result of greater dispersal by females out of the study area not being balanced by females arriving in the study area.

For those birds unable to obtain a breeding position, there was a number of potential advantages in remaining with their natal group including; (i) greater survival relative to 'floaters', (ii) better chances to monitor nearby breeding vacancies, and (iii) the possibility ( at least for males ) of inheriting the breeding position within the natal group.

Breeding birds also gained some advantages from the presence of helpers. Breeding males made fewer nest-visits, and breeding females began re-nesting sooner, when helpers were present. However, despite the assistance given by helpers, breeding pairs with helpers did not achieve greater seasonal reproductive success than unaided pairs.

As helpers were almost always the offspring of one, or both, of the breeding pair, any benefits gained from co-operative breeding by helpers would also benefit the fitness of the genetic parent. In this sense, co-operative breeding was seen as a form of 'extended parental care' by breeding birds toward their offspring.

The results of this study suggest that more than one type of ecological constraint may prevent fairy-wrens from breeding independently. In particular, males and females may be subjected to different types of constraint on independent reproduction, and may therefore delay dispersal for different reasons. Similarly, different constraints may operate in different years..

Co-operative breeding in fairy-wrens was therefore seen to be an adaptation which maximised the fitness of breeders, and their offspring, when the reproductive opportunities for potential breeders were constrained.