

**Ecology and Behaviour of *Pachycephala rufogularis*
and *P. inornata* (Aves: Pachycephalidae)
in Woodlands of South Australia**



Immature *Pachycephala rufogularis* at Gluepot. (Photo D. Moise)

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ABSTRACT

Since European settlement, the woodlands and associated habitats, especially in the temperate zones of Australia, have been extensively cleared and converted to arable land and pastures. Much of the remaining vegetation in the agricultural zone occurs as small isolated patches prone to disturbance and degradation. Apart from habitat loss and fragmentation, altered fire regimes, periods of intense drought, and the introduction of exotic plants and animals, have contributed to the deterioration of most of the natural habitats across Australia, with a negative impact on the native wildlife, including birds. Many woodland bird species have undergone widespread declines, culminating in some local or even regional extinctions.

In the mallee woodlands of south-east Australia two closely related species of whistlers (fam. Pachycephalidae) — Red-lored Whistler *Pachycephala rufogularis* and Gilbert's Whistler *P. inornata* — have overlapping ranges, and in some areas they co-exist. These two species are morphologically and ecologically similar. However, despite the similarities, *P. rufogularis* has undergone greater declines in distribution and abundance than *P. inornata*. The ecology of these two species is poorly known, which renders adequate management impracticable. The major objectives of this thesis were to determine the key habitat requirements for the two species, to determine their habitat use, and to document the ecology and behaviour of the two species, particularly their foraging, and intra- and interspecific interactions. A sound knowledge of the ecology of the two species is needed to underpin appropriate actions for their management and conservation.

Morphological features were measured from skins of *P. rufogularis* and *P. inornata* in the South Australian Museum collection, and from captured live birds, to detect if any aspect of the morphology could indicate possible niche partitioning between the two species. Also, the use of biometry as a tool for separating the sexes for *P. rufogularis*, for determining the species of the uncoloured immature birds and for sexing immatures, was evaluated. No morphological feature suggested niche partitioning. The biometry did not prove a very reliable tool for distinguishing sexes in adult *P. rufogularis*, but reliably identified the species of the uncoloured immatures. Sexing immatures based on biometrical data alone was not possible.

Research was conducted in two main South Australian parks: Gluepot Reserve and Ngarkat Conservation Park. Ecological and behavioural data for *P. rufogularis* and *P. inornata* were collected by observing marked (colour-banded and radio-tagged) and unmarked individual birds of both species and sexes, over a two-year period from June 2004 to May 2006.

The home ranges of *P. rufogularis* and *P. inornata* were determined by tracking the movements of birds in the landscape. *Pachycephala rufogularis* had much larger home ranges than *P. inornata*, especially when breeding. The striking differences in home range size between the two ecologically similar species might be related to differences in site fidelity. *Pachycephala rufogularis* at Gluepot was sedentary, being detected in the same locations throughout the year, and over several years. On the contrary, *P. inornata* generally showed poor site fidelity, being more mobile, and shifting home ranges between and within seasons.

In the field the two species were segregated by habitat. *Pachycephala rufogularis* and *P. inornata* showed different habitat preferences, even in areas where they did not co-occur. *Pachycephala rufogularis* favoured low mallee with *Triodia* on sand dunes, while *P. inornata* favoured tall mallee with sparse shrub understorey in interdunes, but also other habitats, such as prickly *Acacia* thickets and *Casuarina* woodlands. However, both species used the mallee-*Triodia* with *Callitris* vegetation type. The key to coexistence in this habitat was a behavioural one, *P. inornata* acting as a subordinate species. *Pachycephala rufogularis* had strict habitat requirements, with the presence of *Triodia* being critical for the presence of the species. In contrast, *P. inornata* was more flexible in its habitat requirements, and used a broader range of vegetation types, being more of a habitat generalist.

The investigation of habitat use from both a spatial and temporal perspective confirmed that both species actively selected habitat, and that the habitats they selected differed. The core areas of home ranges predominantly contained the preferred habitat for both species. In both species, core areas of home ranges of breeding individuals (where generally the nests were placed) contained preferred habitat in higher proportion than core areas of non-breeding birds. This suggests that during breeding, both species are more restricted to, and/or use more intensely the preferred habitat than when not breeding.

The foraging behaviour did not differ consistently between the two species, both capturing insects mostly by snatching in canopy foliage, and also by gleaning on the vegetation, at different heights. However, the two species were already segregated by habitat. Thus the resource partitioning occurred spatially, at the macrohabitat level. In the instances when individuals of both species foraged in the same area and used the same resources, resource partitioning occurred at a temporal scale. Both species were generalists in foraging; therefore, a presumed foraging specialisation as a possible factor related to the decline of *P. rufogularis* was ruled out.

Pachycephala rufogularis and *P. inornata* are unlikely to be competitors. Support for this argument came from the situation at Ngarkat, where *P. inornata* was absent. Despite this, *P. rufogularis* did not use a broader range of vegetation types in Ngarkat, as would be expected under ‘competitive release’. Instead the species maintained strict habitat requirements, specializing virtually on a single vegetation type. The rigid habitat requirements of *P. rufogularis*, together with its sedentary nature, render this species vulnerable to disturbances, such as wildfires. On the other hand, the apparent flexibility in habitat requirements and greater mobility may explain why *P. inornata* has been more successful than its sibling species.

The information on habitat requirements, preference and use, and also on home ranges of *P. rufogularis* and *P. inornata* provided in this study should be included in future habitat suitability models and predictive models for these species, which will assist in their management.

DECLARATION

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Dragos Moise, 1 December 2008

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