

Use of Tree Hollows by Birds in Sclerophyll Forest in North-eastern Tasmania

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Abstract

Use of hollows for nesting by birds was examined in an area of sclerophyll forest in north-eastern Tasmania. Four hollow-nesting species, striated pardalote, laughing kookaburra, green rosella and yellow-tailed black cockatoo, breed on the site.

These species differed in the types of hollows utilised, which were distinguishable by entrance size and depth. Striated pardalotes used the smallest entrance sizes of around 5 cm. Their nest chambers were set back from the entrance and separated from it by a narrow tunnel. A complete or partly domed nest of bark was constructed by the birds. The entrance sizes of hollows used by kookaburras and green rosellas were similar, being around 10 cm, but the hollows differed in the depth and size of the nest chamber. Kookaburras had a relatively large nest chamber adjacent to the entrance. Green rosella nests were at least 30 cm below the entrance. The yellow-tailed black cockatoo used hollows with the largest entrance size. The single nest found for this species was located in a large vertical stem with open access in the top of the canopy.

Introduction

Few detailed studies of the requirements of hollow-nesting birds have been undertaken (e.g. Saunders 1979; Joseph *et al.* 1991). Even fewer studies have been published on a group of species nesting in the one area. A notable exception is the study of Saunders *et al.* (1982) on cockatoos in the south-west of Western Australia. In this paper, we report on nest use by an assemblage of hollow-nesting birds in an area of sclerophyll forest in north-eastern

Tasmania. This paper presents the results of the first part of a study which will continue after the area is logged. Use by hollow-nesting birds of retained trees in logged coupes, streamside reserves and wild-life habitat strips will then be re-examined.

Methods

Study area

The study was undertaken in a 324 ha area of compartment 7 (41° 06' S, 148° 03' E) in the Gladstone forest block in north-eastern Tasmania. The main study site was located on the south-eastern facing slopes above Old Chum Dam, but limited surveys were also conducted in forest to the south-west of the dam. Altitude varies from 100 to 250 m above sea level and geology is Ordovician granite. The dominant eucalypt is *Eucalyptus obliqua*, with *E. amygdalina* being subdominant over much of the area and dominant in some flatter drainage basins. *Eucalyptus viminalis* is widespread but uncommon. The understorey on most upper and middle slopes is very open, being dominated by bracken (*Pteridium esculentum*). The undergrowth is more shrubby on slopes above creek lines and gullies, with *Acacia verticillata*, *Olearia lirata* and *A. terminalis* being most common. Creek-line vegetation is of two major types. *Acacia melanoxydon* gully forest occurs along steep gullies and in some well-drained stream flats. *Dicksonia antarctica*, *Olearia argophylla*, *Pomaderris apetala*, *Coprosma quadrifida* and *Bursaria spinosa* form a dense, medium to tall shrub layer, with *Atherosperma moschatum*

occasionally being present. The second type has an undergrowth dominated by dense myrtaceous scrub consisting of *Melaleuca squarrosa* and *Leptospermum scoparium* and is associated with basins and soakages which have impeded drainage.

Sampling

Intensive field work was undertaken between mid September and early December 1989, with six visits, each of seven days duration. During these times, hollow-nesting birds were observed in order to locate their nest sites or an area was staked out to observe use of certain trees. On 11 occasions between 9 October and 13 December 1990, all nests previously located during 1989 were checked to see whether they were re-used. One nest was located by forestry workers during logging operations in January 1992.

Wherever possible, trees containing nests were climbed using single rope techniques and the nests examined. The following details were recorded: tree species, height and diameter at breast height (dbh) of the tree, location and height of the nest site, diameter of the bole or limb at the hollow entrance, height

and width of the entrance to the hollow, aspect of the entrance, distance from the entrance to the nest chamber, internal dimensions of the chamber and entrance tunnel (where applicable) and the slope of the tunnel.

Results

Four hollow-nesting species, the striated pardalote (*Pardalotus striatus*), the green rosella (*Platycercus caledonicus*), the laughing kookaburra (*Dacelo novaeguineae*) and the yellow-tailed black cockatoo (*Calyptorhynchus funereus*), were recorded breeding in the study area. Two other hollow-nesting species, boobook owls (*Ninox novaeseelandiae*) and swift parrots (*Lathamus discolor*), were occasionally recorded in the area but no nests of these species were located.

Striated pardalote

Twenty-three nests of this species were located (Table 1). The earliest record of nesting was obtained in August (P. Cale, pers. comm.), before the actual survey began, and the last record in December, three days before the end of the survey. However, 17 nests (74%) were found between 29 October and 5 November 1989.

Eight nests were in *Eucalyptus amygdalina*, eleven in *E. obliqua*, three in *E. viminalis* and one in a dead eucalypt of unknown identity. These trees occurred across the range of topographic situations (i.e. in gullies and on slopes and ridges). Sixteen nests were located in the main bole or in vertical major branches. The remaining nests were mainly in smaller hollow limbs closer to the outer foliage of the tree.

Ten of the 18 aspect records obtained for nest entrances were between 0° and 90° (Figure 1). Only four nests faced west to any degree. If suitable hollows are randomly distributed with respect to aspect of the entrance, then pardalotes are preferentially selecting for a north-easterly aspect ($\chi^2_2 = 11.5, P < 0.01$). The entrances to the nest hollows were small (Table 1), often just large enough for the bird

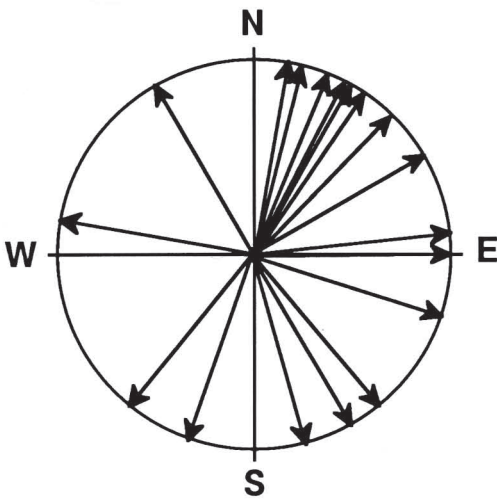


Figure 1. Aspect of the nest entrances of striated pardalotes.

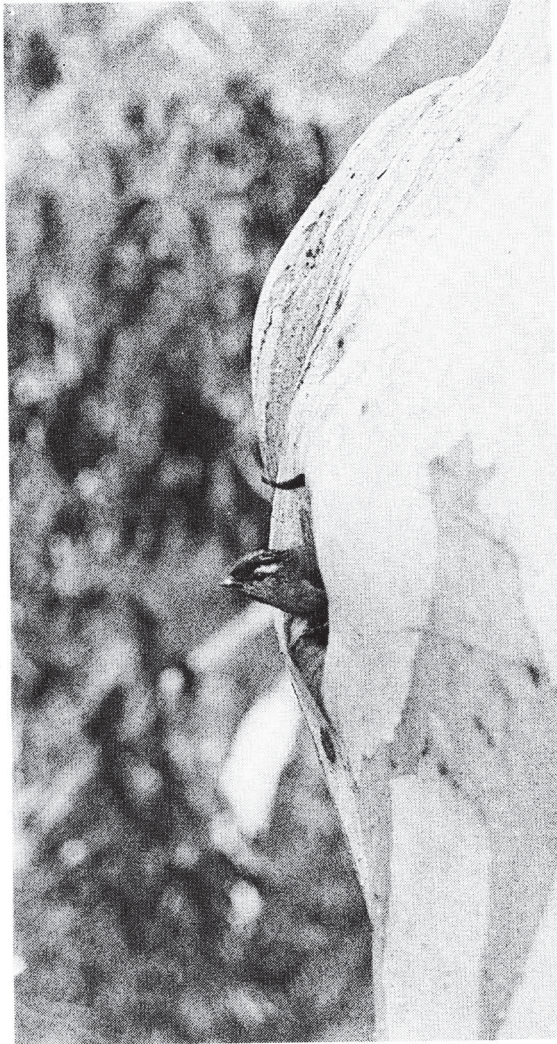


Photo 1. A striated pardalote nesting in a eucalypt hollow.

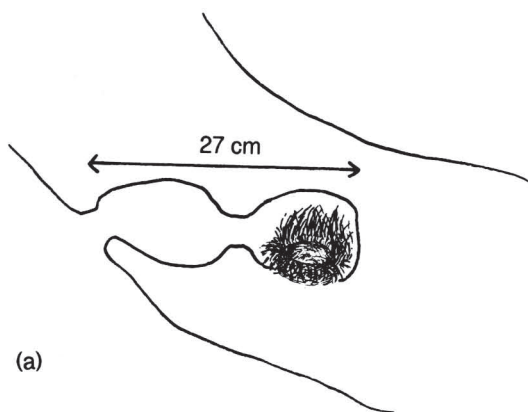
to fit through. All nest chambers were set back from the entrance to the hollow (Figure 2). For those where the nests were visible from the entrance, the mean distance to the nest was 22 cm (SD = 8.6, range 9–35 cm). In this gap, 11 of the nests had 'foyers'; that is, an enlargement of the hollow just inside the entrance before a further narrowing of the tunnel in front of the nest chamber. Two of these foyers seemed excavated (visible evidence of pecking or shaping). In two nests, these appeared to be prepared roosts, with neat pads of bark strips. A ring of bark strips often marked the

entrance to the chamber. In seven nests in trunks and wide steep branches, the tunnel curved away from the centre of the trunk. Eight of the tunnels showed evidence of excavation, eight were clearly natural and the remainder uncertain.

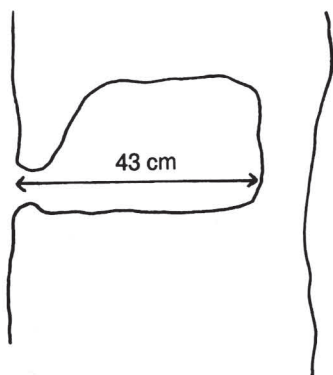
A complete domed nest was visible in one of the hollows examined. The dome was about 28 cm wide and a similar height. It filled the entire width of the hollow of an *E. viminalis* trunk. The entrance to the nest faced perpendicular to the hollow entrance and was about 12 cm below it. The nest entrance was about 5 cm wide. The nest was made almost entirely of neatly woven strips of bark which seemed the predominant material for most striated pardalote nests. The size of the branches that contained many of the other nests suggests a complete dome is unusual and that the size of the complete domed nest is much larger than the size of the nest chamber required. In most cases where the nest was visible, only the base of the cup was seen. The chamber of two nests seemed to be excavated to the dimensions required, such that the cup tapered to the edge of the spherical chamber. The hollow itself provided the dome. The chambers of these two nest sites were about 7 cm x 8 cm and 10 cm x 10 cm. The branch diameter at both nests was 29 cm, not including the swelling at the branch stubs. The smallest branch diameter at a nest was 28 cm. The thickness of the hard, living tissue on branches this size was at least 4 cm, which indicates a minimum useful branch diameter of 20 cm.

Laughing kookaburra

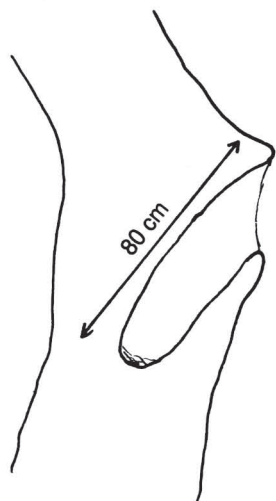
Three kookaburra nests were found, all in November 1989. Two were in *E. obliqua* and one in *E. viminalis*, and all nest trees were located on slopes. One of the *E. obliqua* nest trees also contained a striated pardalote nest. Two nests were in hollows in the main bole and one was in a hollow in a major branch. The entrances to the hollows were approximately circular (Table 1). All entrances faced horizontally and were orientated approximately north-east. All chambers were



(a)



(b)



(c)

Figure 2. Typical hollows utilised by (a) striated pardalotes, (b) kookaburras and (c) green rosellas.

immediately below the hollow entrance. The two nests found in tree trunks seemed to be largely excavated into oval arched chambers with flat floors. One chamber was 30 cm deep x 26 cm wide x 23 cm high and the other 43 cm deep x 35 cm wide x 20 cm high. The third nest had been excavated along a 62 cm diameter branch to form an elongated chamber 62 cm long x 30 cm wide x 30 cm high. These dimensions suggest a trunk or branch would need to be at least 40 cm thick to accommodate a nest (allowing 5 cm of sapwood).

Green rosella

Five green rosella nests were located. No data were collected for one of these because the nest was in a dead stag in the middle of Old Chum Dam. Three nests were in *E. obliqua* and one in *E. viminalis*, and all nest trees were located on slopes. Two were in the trunk of the tree and two were in major, near-vertical branches. Three nest entrances faced in a north or north-easterly direction and one in a south-westerly direction. Three entrances were ovoid to round, and the fourth was a long vertical split. The two hollows in branches were long, even-sided hollows, 12–15 cm wide, which extended down the branch for 75 and 80 cm. One of the trunk hollows extended down and back from the entrance for 45 cm, being 35 cm wide and 30 cm below the entrance. The other was in a pipe hollow, 42 cm in diameter, which extended 2.6 m below the entrance. All hollows appeared to be natural and not excavated. The three nests which could be examined were lined with a saucer of fine pieces of bark and woody debris.

Yellow-tailed black cockatoo

One pair of black cockatoos was found breeding in the area in December. The nest was entered via the broken top of a large, major, near-vertical branch, 35 m up a 40 m tall *E. obliqua* with a diameter (dbh) of 137 cm. The nest was not able to be accessed to examine it. The nest entrance was estimated to be more than 20 cm in diameter.

Table 1. Characteristics of trees and hollow entrances utilised by hollow-nesting birds. Values are $\bar{x} \pm SD$ (n) with ranges given below.

Nest site characteristics	Bird species		
	Striated pardalote	Kookaburra	Green rosella
Height of tree (m)	31.5 \pm 5.5(23) 20–41	32.3 \pm 5.0(3) 27–37	34.3 \pm 10.3(4) 23–43
Dbh of tree (cm)	107 \pm 40(23) 39–197	129 \pm 30(3) 97–156	132 \pm 19(4) 105–146
Height of entrance above ground (m)	21.6 \pm 5.7(23) 10–30	20.7 \pm 4.9(3) 15–24	23.5 \pm 6.5(4) 15–31
Horizontal diameter of entrance (cm)	4.3 \pm 1.6(21) 2.4–6	9.7 \pm 1.3(3) 8.5–11	12.5 \pm 7.5(4) 4–22
Vertical diameter of entrance (cm)	5.0 \pm 2.1(21) 2.4–11	8.5 \pm 1.8(3) 6.5–10	29.8 \pm 36.3(4) 8–84
Diameter of bole or branch at hollow entrance (cm)	45.1 \pm 16.7(19) 28–96	92 \pm 35(3) 62–130	88 \pm 30 62–125

Re-use of nests in subsequent years

Evidence of re-use of 17 of the 23 pardalote nests was found in the 1990 breeding season. Two of the three nest hollows were re-used by kookaburras. The tree containing the hollow that was unused was within 50 m of logging operations and it is thus possible that disturbance contributed to the nest not being re-used. One of the three green rosella nest sites checked was re-used. However, pairs were seen near both the other sites and their re-use cannot be ruled out altogether. There was no evidence of re-use of the nest site by the black cockatoos. However, a pair was seen in the study area on several occasions.

Discussion

The four species nesting in tree hollows in the study area were found to differ in the types of hollow utilised. These could be differentiated on entrance size and depth. The entrances to most of the hollows used by pardalotes were 3–6 cm wide. The widest hollow entrance was 10 cm but the nest was located down a tunnel 5 cm in diameter. Entrance widths used by both kookaburras and

rosellas were mostly 10 cm or greater, but the position of the nests differed for these two species. Kookaburra nests were adjacent to the entrance whereas nests of green rosellas were from 30 cm to over 2 m below the entrance. Kookaburras are thought to have their entrance adjacent to the nest so that the young may excrete through the entrance (Readers Digest 1977). The nests examined in this study, however, were found to be full of faecal waste. The kookaburra and green rosella also differed in the size of the hollow used, with rosellas having nests with a smaller floor area. The hollow used by the yellow-tailed black cockatoos seemed, from the ground, to have a much larger entrance size than those of other species. Forshaw (1981) describes the cockatoo's nest requirements as a spacious hollow of about 20 cm in diameter at the entrance, widening to twice that on the floor of the hollow. Normally, they are also high in large vertical stems in large trees, with open access to the entrance (Beruldsen 1980), as was the nest found in this study.

Our results showing distinct differences in the requirements of species nesting in the same area are in accord with those of

Saunders *et al.* (1982) for cockatoos in woodland in south-western Australia. Saunders *et al.* (1982) showed that entrance and hollow size were related to the size of the bird species. They concluded that the depth of the hollow was less important, contrasting with the results of the present study. Saunders *et al.* (1982) concluded that aspect was unimportant. In this study, there seemed to be a preference for north-east facing hollow entrances. However, it is not possible to positively conclude that such hollows were selected for without a knowledge of the aspects of all suitable hollows.

A high level of re-use of nest sites in successive years was found. This could be interpreted as indicating that good nest sites were limiting. However, it is equally possible that the birds were simply re-using nest sites because they had successfully raised a brood there the previous year.

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The distribution of tree hollows amongst eucalypt species and in different topographic locations, and the possible effects of logging on their availability is examined in Taylor and Haseler (1993).

Acknowledgements

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