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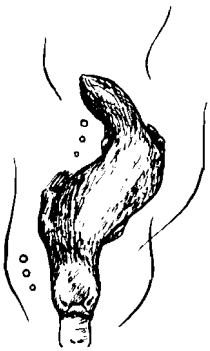

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RESULTS OF A SURVEY TO GATHER INFORMATION ON THE USE OF TREE HOLLOWS BY BIRDS IN TASMANIA

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INTRODUCTION

Australia has a high number of species that use tree hollows for nesting or roosting (Gibbons & Lindenmayer 2002), but there are no primary excavators such as woodpeckers present, as is the case in the northern hemisphere. This means that all hollows are produced by slow processes generally involving fire, fungi and termites, although some species are known to modify the size of cavities to an extent e.g. cockatoos, brushtail possums (Ambrose 1982; Saunders *et al.* 1982). Consequently, many years are required to form hollows, especially large hollows. There is a general decrease in hollow-bearing trees across Australia due to land clearing for urbanization and agriculture, forestry activities and the death of hollow-bearing trees retained in paddocks and urban areas (Gibbons & Lindenmayer 2002). This has resulted in concern for the conservation of hollow-using fauna across Australia (Lindenmayer *et al.* 1993; Gibbons & Lindenmayer 1997; Whitford & Williams 2002; Wormington *et al.* 2002).In Tasmania, hollow-dependent fauna are a management priority under the Tasmanian *Regional Forest Agreement* (CofA & SofT 1997). Forest management agencies in most states of Australia, including Tasmania, have developed management prescriptions for the conservation of habitat for hollow-using fauna (Wayne *et al.* 2006). Yet the tree hollow requirements and the degree to which fauna are dependent on hollows vary greatly among species. Consequently, an essential element of any retention strategy is knowledge of the fauna that use hollows in the region and their known or likely hollow requirements (Recher 1991). There are large differences in the amount of literature available for Tasmanian fauna species, birds in particular, with more information generally available for threatened species. This paper presents the results of a survey distributed to members of Birds Tasmania, intended to gather anecdotal information to assist in assessing the degree to which Tasmania's bird fauna are dependent on tree hollows. The information collected can also be used to help assess the conservation status and threatening process for these species.

METHODS

A survey was distributed to all recipients (approximately 320) of the Birds Tasmania newsletter. The survey asked four questions regarding 38 bird species found in Tasmania. The questions posed and the potential responses are outlined in Table 1. These questions included one which referred to the degree of knowledge the respondent had of the species in question. It should therefore be noted that people referred to as 'experts' in this text are

self-assessed as being such. The remaining questions in the survey aimed to gather the opinions of the participants on (a) the degree to which the species uses tree hollows, (b) the population status of the species and (c) the processes threatening populations of the species. The species considered in the questionnaire were those where mention was found in the literature that they use tree hollows (e.g. Sharland 1958; Munks *et al.*, in press). Additional comments on the status, population size and distribution, use of tree hollows and preferred habitat of the species included in the survey were also invited.

Table 1. Questions asked for each bird species included in the survey.

Question	Potential Responses
How do you rate your knowledge of this species and its current status?	Expert
	High
	Average
	Low
	None
How do you rate the hollow dependency of this species?	Reliant on hollows for roosting and breeding
	Reliant on hollows for breeding but not roosting
	Use hollows for roosting and/or breeding but can use other sites
	Do not use hollows
How do you rate the status of populations of this species?	Increasing
	Stable at high numbers
	Stable at low numbers
	Declining
Of the following issues, circle any you believe to be of concern to this species	Forestry activities
	Land clearing for agriculture
	Competition for nest sites with bees or introduced birds
	Over predation by endemic or introduced species
	Road-kill
	Hunting
	There are no concerns

RESULTS AND DISCUSSION

Hollow use

Although some variability in the survey responses was found for certain species, generally the respondents agreed on the hollow-using status of the bird species considered. The results of the survey largely confirmed the results of scientific studies where literature was available for the species in Tasmania.

Most respondents agreed on the species that use hollows only very occasionally or perhaps not at all in Tasmania. These species are house sparrows (Figure 1-al), Australian kestrels (Figure 1-j) and peregrine falcons (Figure 1-k). Although there was a range of responses for azure kingfishers (Figure 1-a), most respondents, including an expert on the species, stated that they do not use hollows in Tasmania and are only found in very low numbers here. Similarly, although a range of responses was received for grey shrike thrush (Figure 1-p), the majority of recipients suggested they very rarely use hollows. A number of additional species were mentioned by the respondents as being known to use tree hollows very occasionally. These were black currawongs (*Strepera fuliginosa*), brown falcons (*Falco berigora*), scarlet robins (*Petroica multicolour*), spotted pardalotes (*Pardalotus punctatus*), bassian thrushes (*Zoothera lunulate*) and scrubtits (*Acanthornis magnus*). It was also clear that several of the species were vagrants and rarely recorded in Tasmania, including gang gang cockatoos (Figure 1-y) and sacred kingfishers (Figure 1b). Although the rainbow lorikeet (Figure 1-ae) was considered a vagrant by many respondents, recent reports indicate that it is now established in Tasmania (M. Holdsworth pers. comm.; Birds Tasmania, unpubl. data). The conclusion reached from this survey is that 29 of the species selected for this survey use tree hollows more than very occasionally.

Great discrepancy was exhibited on the hollow-using status of the dusky woodswallow (Figure 1-aj), with an expert on the species being the only respondent to state that this species is continuously dependent on hollows, while the majority of respondents stated they were non-dependent or did not use hollows. The literature states that dusky woodswallows can use hollows for breeding but that they also use stumps and roost behind bark (Sharland 1958; Coulson & Coulsen 1981). Reports were also received in this study of nests in the forks of trees (Table 2). Similarly, for the Australian wood duck (Figure 1-h-i) the more 'experienced' respondents stated they were dependent on hollows, largely for breeding, although other responses of non-use were also received. The only Tasmanian report found in the literature for this duck indicated that they can nest in hollows or on the ground (Sharland 1958).

For southern boobooks (Figure 1-l), responses ranged from continuous dependent to non-dependent on hollows. A study by Bell *et al.* (1997) indicated that they use hollows for nesting but are occasionally recorded using nesting boxes and other man-made structures. For roosting, southern boobooks do use tree hollows but will often use dense foliage, rocky clefts, caves or man-made structures (Bell *et al.* 1997). For Australian shelducks (Figure 1i), the majority of respondents indicated the species was either breeding dependent or non-dependent. The literature states that they use tree hollows for breeding but can also use holes in the ground (Sharland 1958). Reports were also received of their using rock crevices and disused rabbit burrows on islands and in treeless areas (C. Spencer pers. comm.). The degree of dependency was also unclear for masked owls (Figure 1-m), with the majority of respondents indicating they were non-dependent, but others stating they were dependent to some degree. From the literature it appears that this

species nests only in tree hollows but can roost in other locations such as cliffs, caves, vegetation and, occasionally, man-made structures (Bell *et al.* 1997). However, one respondent stated that they can also use caves for breeding.

The majority of survey respondents suggested that chestnut teals (Figure 1-f-i) are non-dependent on hollows. The only Tasmanian report found in the literature for this species indicated that they usually nest in tree hollows, although they can also nest elsewhere (Sharland 1958). This report by Sharland (1958) could be interpreted as non-dependency or as being dependent on tree hollows for nesting. For welcome swallows (Figure 1-q), the responses were either that they do not use hollows or they are non-dependent. In the literature it is stated that they do use hollows but no indication of frequency is given (Sharland 1958). For tree martins (Figure 1-r), the majority of responses were that they were non-dependent, but some stated they use them for breeding and roosting or were breeding dependent. In the literature it was stated that they mostly use tree hollows for nesting but can use other sites (Sharland 1958). The majority of respondents for galahs (Figure 1-b) indicated they are dependent on hollows for breeding. In Western Australia, galahs use hollows mainly for breeding (Rowley 1990). For long-billed corellas (Figure 1-x), respondents indicated either a continuous dependency on hollows or that the birds were dependent for breeding. In the literature it was stated that breeding has not been confirmed in Tasmania although it is believed to occur (Brown & Holdsworth 1992). For forty-spotted pardalotes (Figure 1-ag), respondents largely indicated either dependency or non-dependency on hollows for breeding. In the literature it appears that the degree of dependency can vary, as Brown (1986) found most individuals used hollows while Woinarski & Bulman (1985) found alternative sites were more frequently used.

Population status

The information collected in this survey indicated that two of the species considered were rare vagrants. These were the gang gang cockatoo and the sacred kingfisher.

The results of the current survey were generally supported by the literature for those few species where literature was available on the population status of the species in Tasmania. This is the case for the ducks (GMSU 2005), sulphur-crested cockatoos and little corellas (Brown & Holdsworth 1992; Coupland 2000). A mixture of responses was received for galahs (Figure 1-t), ranging from increasing to stable at low numbers. In the literature it was indicated they are likely to be at low numbers but gradually increasing (Brown & Holdsworth 1992; Barrett *et al.* 2003; Birds Tasmania unpubl. data). For blue-winged parrots, respondents indicated they were either stable at low numbers or decreasing (Figure 1-aa). Reports in the literature were conflicting, with some studies indicating they were increasing (Brown 1979; Brown & Wilson 1982) while others suggested they have decreased since European settlement (Green 1983). For eastern rosellas (Figure 1-ac), respondents indicated they were either stable at low numbers or decreasing; Green (1983) suggested they were decreasing. For forty-spotted pardalotes, the majority of respondents indicated they are either stable at low numbers or decreasing in abundance (Figure 1-ag).

It was previously thought that this species was decreasing, but recent work suggests they may always have been found at low numbers (Bryant 1997).

There was, however, one species for which the literature did not support the survey responses. Survey respondents suggested that the masked owl (Figure 1-m) was either stable at low numbers or decreasing in Tasmania. Although this species is listed as endangered at the State level (Schedule 3 of the Tasmanian *Threatened Species Protection Act 1995*), there is no evidence of a decrease in their numbers (Bell *et al.* 1997) although anecdotal reports have been received saying masked owls were more commonly seen in the 1940s and 1950s than at present (Mooney 1997).

Most of the respondents provided similar responses for particular species. For example, there was some variation in responses for long-billed corellas, but the majority of respondents indicated their numbers were increasing. For grey shrike thrushes, the majority of respondents indicated they were stable, with only a couple suggesting they were decreasing. Similarly, the majority of the more experienced respondents indicated that populations of the southern boobook were stable, while a few respondents suggested they were decreasing. Given this response and the fact that southern boobooks are found in a number of reserves across the State (Bell *et al.* 1997), it is suggested that populations of this species are presently stable.

However, there were some species for which the respondents gave very mixed results for population status. The differences in responses obtained in this survey may be due to several reasons. Firstly, it is expected that most respondents will have greater knowledge of their immediate vicinity and less on a broader geographical scale. It is possible that the degree of hollow use, population trends and threatening processes will vary among geographical areas in Tasmania. Secondly, although attempts were made to make the questions and categories of responses clear to the survey participants, there is still likely to be an effect of interpretation of the questions. For example, what constitutes a population at 'high' numbers and one at 'low' numbers may differ among respondents. One sighting of a bird breeding or roosting in an alternate location may be interpreted by some respondents as 'non-dependency' while others will still rate the species as being 'dependent' because the majority of sightings are from tree hollows. The species for which mixed responses were given are briefly discussed below.

For dusky woodswallows (Figure 1-aj) and tree martins (Figure 1-r), some respondents indicated that the population status was stable at high numbers while others indicated that they were decreasing. For sulphur-crested cockatoos (Figure 1-u), responses ranged from increasing to decreasing, although the more experienced respondents tended to indicate either increasing or stable at high numbers. A great discrepancy in responses was received for green rosellas (Figure 1-ab), from increasing to decreasing but with the majority of respondents indicating they are stable at high numbers. For Australian shelducks (Figure 1-i), a great range of responses was received, but again the majority indicating populations of this species are stable. A survey conducted by the Department of Primary Industries,

Water & Environment (now DPIW) confirmed that populations of Australian shelducks are stable (Game Management Services Unit 2005), but no information on population status was found in the literature for the other species.

For yellow-tailed black cockatoos (Figure 1-s), the majority of respondents indicated they were decreasing, while a number of others, including the one expert on the species, indicated they were stable. Only one respondent indicated they were increasing, stating that "*It is against all my expectations to have ticked 'increasing'. In this area (Swan Point) until recent years, a flock of 10-15 would be as many as we would see. For the last three years we have seen up to 80 in a flock. They have learnt to feed on* Pinus radiata *cones as have their white tailed cousins in southwest Western Australia*". Concern for this species has been expressed because their habitat is degraded by forest harvesting as they are dependent on large hollows for breeding (Wilson 1981; Bekessy *et al.* 2004).

Similarly, for musk lorikeets (Figure 1-ad), six of 14 responses to the survey indicated the species is decreasing, while only a single response (from the 'expert') said that the species is increasing. Reports in the literature as to their status are conflicting (Bryant 2002; Barrett *et al.* 2003). The majority of respondents also indicated that flame robins (Figure 1-a-i) are decreasing, while two respondents, including the 'expert', indicated they are stable at high numbers. Comparisons between two major national bird surveys (Barrett *et al.* 2002) suggested a nation-wide decrease in flame robins and anecdotal reports also suggest a decrease in numbers around Hobart (see Newman 2002). It was suggested that changes in rainfall patterns as a result of climate change may be cause for concern for this species (Newman 2002). The suggestion of a decrease in populations of yellow-tailed black cockatoos, musk lorikeets and flame robins, although not from the experts, is of concern and warrants further investigation.

Threatening processes

In terms of threatening processes, the one process considered to be of major concern for most species by the majority of respondents was forestry activities (although for six respondents this included the orange-bellied parrot which nests in southwest Tasmania where forestry practices do not occur, Figure 1-z). Agriculture was also considered to be a major concern. The degree of threat perceived to be due to competition for nesting sites varied among species, being quite high for some such as the orange-bellied parrot and very low for others (although these were largely those species considered to be non-dependent on hollows).

The effect of predation was perceived as being relatively unimportant for most species, although was still considered to be important for species such as rainbow lorikeets (Figure 1-ae). The effect of cars was also variable in their perceived threat, being considered of relative importance to some species such as Australian owlet nightjars (Figure 1-n), but of little concern for the majority of species considered here. The effect of hunting was greatest for the duck species, of which several species can be legally hunted (Game

Management Services Unit 2005). However, hunting was also considered to be of some importance for the owl species and non-hollow-using peregrine falcons. One threatening process which was not provided as an option but was mentioned by several of the respondents was death to birds caused by windfarms.

The species that were universally ranked as having no perceived threat were the introduced the house sparrow (Figure 1-al) and the European starling (Figure 1-ak). However, a number of other species were also considered to have no threats. Occasionally a respondent indicated there were no threats for a species while simultaneously specifying threatening processes. This was interpreted to mean that although the indicated threatening process does kill some individuals, it is not of major concern. Those species with the greatest responses of 'no threat' were sulphur-crested cockatoos (Figure 1-u), pacific black ducks (Figure 1-g), galahs (Figure 1-t), Australian wood ducks (Figure 1-h), grey shrike thrushes (Figure 1-p), laughing kookaburras (Figure 1-c), welcome swallows (Figure 1-q) and rainbow lorikeets (Figure 1-ae).

CONCLUSION

The responses to questions posed in this survey provided support to the fact that 29 bird species commonly found in Tasmania are likely to regularly use tree hollows for either roosting or nesting. The results from this survey indicate, however, that only one species, the Australian owlet nightjar, is considered to be dependent on tree hollows for both nesting and roosting. Nineteen other species are believed to be largely reliant on tree hollows for nesting, while the remaining 10 species use tree hollows to varying degrees. Four hollow-using bird species are currently listed as threatened in Tasmania (swift parrot, orange-bellied parrot, forty-spotted pardalote and masked owl, all on Schedule 3 of the *Tasmanian Threatened Species Protection Act* 1995). Respondents to the survey expressed further concern over the status of yellow-tailed black cockatoos and musk lorikeets. The threatening processes considered to be of greatest concern were associated with land clearing (forestry activities and agriculture).

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