

Foods of the Glossy Black-Cockatoo *Calyptorhynchus lathami*

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Summary

The foods of the Glossy Black-Cockatoo *Calyptorhynchus lathami* were determined by direct field observations and a review of the published literature. The Glossy Black-Cockatoo appears to be highly specialised, feeding on *Allocasuarina* throughout its range. It is known to consume the seeds of only nine plant species; most of these (89%) are from the genus *Allocasuarina* and one is from the genus *Casuarina*. In at least some of its metapopulations, the Glossy Black-Cockatoo appears to favour an *Allocasuarina* species that is the most profitable in terms of cone abundance, cone profitability and proximity to other resources such as nest-trees. Although Glossy Black-Cockatoos may be able to meet their immediate energy needs while feeding on an alternative *Allocasuarina*, they may be prevented from breeding and thereby sustaining their population. This study has highlighted the importance of identifying the favoured food-plants of the Glossy Black-Cockatoo in each of its metapopulations. It is also critical to identify the alternative plant species that are used for feeding, because these appear to allow the cockatoos to survive (though not necessarily breed) during periods when their preferred foods are in short supply. A switch to alternative foods may indicate shortage of preferred food and may result in population declines as a result of the inability of the cockatoos to breed. Protection of habitat containing both preferred and alternative food-plants should therefore be a priority for the conservation of the Glossy Black-Cockatoo.

Introduction

Australia's black-cockatoos *Calyptorhynchus* spp. are granivorous and use their massive bills to feed on the seeds of woody-fruited plants such as *Allocasuarina*, *Banksia*, *Corymbia*, *Dryandra*, *Hakea* and *Pinus* (Higgins 1999). Most black-cockatoo species have adapted their foraging habits to exploit rapidly changing food resources, by feeding on exotic plant species (Cooper 1999; Cooper *et al.* 2002; Chapman 2006). The Glossy Black-Cockatoo *Calyptorhynchus lathami*, however, is highly specialised, because it appears to feed only on the seeds of *Allocasuarina* or *Casuarina* species.

Reports of Glossy Black-Cockatoos feeding on the seeds of plants other than those in the Casuarinaceae family can be found in the literature (see Higgins 1999 for a summary). However, as Higgins (1999) pointed out, these records must be treated with caution because many result from observations of the cockatoos perching in a habitat type in which they may not actually be feeding, or from the misidentification of the bird species observed. In addition, Glossy Black-Cockatoos can pick a cone from one species of plant such as an *Allocasuarina*, then fly to perch in another species, such as a *Eucalyptus*, and then begin processing the cone (Peet 1996; TFC pers. obs.). Thus, while they appear to be feeding in the eucalypt, they have in fact brought the cone from one plant to another. These problems highlight the importance of positive bird species identification, and recording the foraging behaviour of the bird to determine which plant species is

being used for feeding.

If Glossy Black-Cockatoos do feed exclusively on plants in the Casuarinaceae, and their feeding habitat is lost or modified, these cockatoos would be more likely to seek alternative Casuarinaceae foods in other locations than switch to exotic plant foods. Increasing evidence is emerging to show that Glossy Black-Cockatoo metapopulations may favour certain food-plants and sample other foods when their food supply is high (Chapman 2005). However, they appear to feed on the alternative plant species more extensively when food production by their favoured plant species is poor (Holliday 2004; Cameron & Cunningham 2006).

It is important to document the favoured plant species used for feeding by Glossy Black-Cockatoos in each of the metapopulations, to set priorities for the conservation of feeding habitats for these cockatoos. It is also important to identify alternative plant species for each metapopulation because these plants may sustain the populations when their favoured foods are in short supply.

The purpose of this study was to document the food-plant species of the Glossy Black-Cockatoo throughout its range. The results are discussed in the context of conservation management of feeding habitat for Glossy Black-Cockatoos.

Methods

The Glossy Black-Cockatoo occurs in eastern Australia (Lendon 1973; Schodde *et al.* 1993; Garnett & Crowley 2000) from the Great Dividing Range to northern Queensland (Qld) and on Kangaroo Island in South Australia (SA) (Figure 1). Isolated metapopulations occur in New South Wales (NSW) and eastern Victoria, with scattered populations in the Pilliga–Riverina regions (Llewellyn 1974; Forshaw 1981; Schodde *et al.* 1993). The three recognised subspecies of the Glossy Black-Cockatoo (after Schodde *et al.* 1993) are: *Calyptorhynchus lathami erebus* which occurs along the coast of south-eastern Qld; *C.l. lathami* which occurs in south-eastern Australia (southern Qld to inland NSW and eastern Victoria); and *C.l. halmaturinus* which occurs on Kangaroo Island. The latter once also occurred on the South Australian mainland, but has been confined to Kangaroo Island since the late 1970s as a result of loss of feeding habitat from the mainland (Barrett 1949; Cleland & Sims 1968; Joseph 1989).

Observations of Glossy Black-Cockatoos' foraging behaviour were made by the author on Kangaroo Island, during research into the foraging ecology of the species (Chapman 2005; Chapman & Paton 2005, 2006). The author also consulted other researchers who studied Glossy Black-Cockatoos, and collated their records of the foods used by this species throughout Australia. Accounts of plant species and dietary items consumed by Glossy Black-Cockatoo were also collected from the literature. Where possible, the original report was obtained and assessed to determine if it was a direct observation or if it might have been a misinterpretation of a second-hand account (as suggested by Higgins 1999).

Results

Calyptorhynchus lathami erebus

The Queensland Wildlife Preservation Society (Glossy Black-Cockatoo Branch) made observations of the foods of Glossy Black-Cockatoos in the Nerang region between 2000 and 2005 (e.g. Stock & Wild 2005). These observations were confirmed by Stock, who observed either direct feeding or fragmented cones beneath plants of Forest Oak (Rose Sheoak) *Allocasuarina torulosa* and Black Sheoak *A. littoralis* (Table 1). Anecdotal evidence of the cockatoos feeding on Mountain Sheoak *A. rigida*, River Sheoak *Casuarina cunninghamiana*, Swamp Oak *C. glauca*, Coast Sheoak *C. equisetifolia* and Hoop Pine *Araucaria*



Figure 1. Distribution of the Glossy Black-Cockatoo *Calyptorhynchus lathami* (data from Birds Australia 2005)

cunninghamii were also investigated by Stock but could not be confirmed (M. Stock pers. comm.), and the record of Hoop Pine may refer to the Red-tailed Black-Cockatoo *Calyptorhynchus banksii* (cf. Higgins 1999).

Calyptorhynchus lathami lathami

In NSW, five species of *Allocasuarina* and one *Casuarina* species were used for feeding by these cockatoos (Table 1). Clout (1989) published the results of a study of Glossy Black-Cockatoos feeding on Black Sheoak in Yambulla State Forest. Clare Holleley (pers. comm.) undertook studies of feeding on Scrub Sheoak *Allocasuarina distyla* by Glossy Black-Cockatoos in the Blue Mountains National Park in September and October 2001. Cameron (2004, 2006) studied the ecology of Glossy Black-Cockatoos feeding on *A. diminuta* and Mallee Sheoak *A. gymnanthera* in Goonoo State Forest. He also observed them extracting seeds from Belah *Casuarina cristata* in Campbell State Forest on 17 February 2003 (M. Cameron pers. comm.).

Walpole & Oliver (2000) observed a small flock of about a dozen Glossy Black-Cockatoos foraging on the cones of Buloke *Allocasuarina luehmannii* near a farm dam at Rawsonville, 12 km west of Dubbo, in January 2000 (Table 1): the first published account of Glossy Black-Cockatoos feeding on Buloke.

Glossy Black-Cockatoos were first recorded in the Australian Capital Territory (ACT) during a survey published in 1946 (Daley 1946), when they were considered uncommon 'visitors' to the Territory (Wilson 1999). They were recorded frequently in the ACT during the 1990s and early 2000s. Fragmented cones, which appeared to be the remains from their feeding, were observed in Goorooyarroo Nature

Table 1

Summary of plant species used for feeding by the three subspecies of the Glossy Black-Cockatoo. *A*=*Allocasuarina*. NP= National Park, NR= Nature Reserve, SF= State Forest. Source: 1 Cameron (2004, 2006), 2 Clout (1989), 3 Walpole & Oliver (2000), 4 Holliday (2004), 5 Lenz *et al.* (2004), 6 Cleland & Sims (1968), 7 Joseph (1982), 8 Pepper (1993,1996), 9 Pedler (2000); unpublished data: CH= Clare Holleley, MC= Matthew Cameron, MS= Michelle Stock.

<i>Subspecies</i>	<i>State</i>	<i>Location</i>	<i>Food-plant</i>	<i>Source</i>
<i>C. lathamii erebus</i>	Qld	Nerang SF and private properties in Nerang & Mudgeeraba areas	Forest Oak (Rose Sheoak) Black Sheoak	MS
<i>C.l. lathamii</i>	NSW	Blue Mountains NP	Scrub Sheoak	CH
		Goonoo SF	<i>A. diminuta</i>	1
			Mallee Sheoak	1
		Campbell SF	Belah	MC
		Yambulla SF	Black Sheoak	2
		Rawsonville	Buloke	3
	ACT	Goorooyarroo NR, Mt Majura–Mt Ainslie Range	Drooping Sheoak	4–5
<i>C.l. halmaturinus</i>	SA	Kangaroo Island	Drooping Sheoak Slaty Sheoak	6–9

Reserve in April 2004 in stands of Drooping Sheoak *Allocasuarina verticillata* in a gully (Holliday 2004) and also in the Mt Majura–Mt Ainslie Range (Lenz *et al.* 2004).

Calyptorhynchus lathamii halmaturinus

The foods of the Glossy Black-Cockatoo population on Kangaroo Island have been well documented in detailed studies published since 1980: the birds feed mainly on the seeds of Drooping Sheoak (Joseph 1980, 1982; Pepper *et al.* 2000; Crowley & Garnett 2001; Chapman 2005). During three years of field observation between 1995 and 1997, Glossy Black-Cockatoos were observed feeding only on Drooping Sheoak (TFC pers. obs.). They have also been recorded feeding on Slaty Sheoak *A. muelleriana notocarpica* on the Island (Pepper 1993; Pedler 2000), but not to the extent that they feed on Drooping Sheoak. Slaty Sheoak is less abundant (Ball 2002), and its seeds are less profitable, than the latter (Pepper 1996), and this may account for why the latter is the more commonly used food species on Kangaroo Island.

Reports of Glossy Black-Cockatoos feeding on *Hakea* and *Acacia* in SA appear in the literature. Joseph (1989) cited reports of them feeding on *Acacia* on Kangaroo Island and on *Hakea* on the adjacent mainland. However, the observation of feeding on *Acacia* was a misinterpretation of a report, by Cleland (1942), of the introduced Gang-gang Cockatoo *Callocephalon fimbriatum*. The observation of the cockatoos feeding on *Hakea* remains ambiguous because the birds were reportedly 'found' in patches of *Hakea* by Gordon Lord (Joseph 1989). Since much of the Drooping Sheoak habitat on the southern part of the mainland adjacent to Kangaroo Island was destroyed by fire in 1934 (Joseph 1989), it seems possible that the cockatoos may have been sampling an alternative food source

after their primary food-plant had been destroyed.

Other evidence of Glossy Black-Cockatoos sampling foods other than *Allocasuarina* appears in newsletters and magazines. For example, they have been recorded feeding on Black Cypress-pine *Callitris endlicheri* in Goonoo Forest, NSW (Peet 1996), and Coastal Banksia *Banksia integrifolia* at Port Stephens, NSW (Ambrose 2004). The latter observation of feeding on *Banksia* was made during a time of poor cone production by *Allocasuarina* during drought (Ambrose 2004), which suggests that in times of desperate shortages of *Allocasuarina* cones, Glossy Black-Cockatoos may have no alternative but to attempt to feed on species such as *Hakea*, *Callitris* and *Banksia*.

Discussion

This paper demonstrates the highly specialised feeding requirements of the Glossy Black-Cockatoo. Throughout its range, the Glossy Black-Cockatoo is known to feed on nine plant species, all in the Casuarinaceae family: most (89%) are from the genus *Allocasuarina*, with one from the genus *Casuarina*. The limited number of food-plant species used by the Glossy Black-Cockatoo throughout its range has important implications for the conservation of this species: it appears to be highly adapted to specialised feeding on *Allocasuarina* and, although it appears to sample the seeds of other species such as *Hakea*, *Callitris* and *Banksia*, at present it does not use these species as a major food source.

Studies of the foraging ecology of the Glossy Black-Cockatoo show that it selects the most profitable foods within its range (Pepper *et al.* 2000; Crowley & Garnett 2001; Cameron & Cunningham 2006; Chapman & Paton 2006), notwithstanding the influence of other factors, such as proximity to nesting hollows (Crowley *et al.* 1998) and predation pressure (Chapman & Paton 2005; Cameron & Cunningham 2006). One reason for this specialisation may be that the profitability of *Allocasuarina* is superior to alternative plants, i.e., by feeding on *Allocasuarina*, the Glossy Black-Cockatoo is best able to obtain the energy needed to survive, while continuing to meet other needs such as raising young and predator avoidance. Conversely, it may be that if it has to feed on other plants, it may be unable to meet its energy needs, as well as other needs such as raising a nestling and predator avoidance.

In at least some of its metapopulations, the Glossy Black-Cockatoo appears to favour an *Allocasuarina* species that is the most profitable in terms of cone abundance, cone profitability and proximity to other resources such as nest-trees (Pepper *et al.* 2000; Crowley & Garnett 2001; Cameron & Cunningham 2006; Chapman & Paton 2006). If the profitability of this favoured species is diminished, e.g. by habitat loss, drought or fire, the cockatoos appear to feed on an alternative species. For example, in NSW, they fed on *A. diminuta* and Mallee Sheoak, but foraged more intensively in sites where the more profitable *A. diminuta* was present (Cameron & Cunningham 2006). During times of drought, when cone supply was poor, they fed on both species but failed to breed, presumably because the profitability of the alternative species was inadequate to raise young (Cameron 2004, 2005). This example suggests that although Glossy Black-Cockatoos may be able to meet their immediate energy needs when feeding on an alternative *Allocasuarina*, they may be unable to breed and thereby sustain the population. This limitation may account for why they are so specialised on *Allocasuarina* and have not switched to rely on any plants outside the Casuarinaceae.

This study has highlighted the importance of identifying the preferred food-plants of the Glossy Black-Cockatoo in each of its metapopulations. It is also critical to identify the alternative species that are used for feeding, because these appear to allow the cockatoos to survive (though not necessarily breed) when preferred foods are in short supply. Protection of habitat containing both preferred and alternative food-plants should thus be a priority for the conservation of the Glossy Black-Cockatoo.

If alternative foods do limit the ability of the Glossy Black-Cockatoo to breed, loss of preferred *Allocasuarina* feeding habitat is likely to represent a significant threatening process for a species that is already threatened throughout its range. The Glossy Black-Cockatoo is currently under threat on Queensland's Gold Coast, Kangaroo Island, and on the NSW South Coast and Southern Tablelands, from loss of foraging habitat for residential, commercial and rural development (D. Oliver pers. comm.; TFC pers. obs.). Further research is needed to identify and monitor the foods used in each of these metapopulations, because any switch to alternative foods may indicate shortage of preferred food and may result in population declines as a result of the inability to breed.

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