

FOOD OF THE FOREST RED-TAILED BLACK COCKATOO CALYPTORHYNCHUS BANKSII NASO IN SOUTH-WEST WESTERN AUSTRALIA

By R.E. JOHNSTONE

Western Australian Museum, Francis Street, Perth W.A. 6000

and T. KIRKBY

49 Canning Mills Road, Kelmscott, W.A. 6111

ABSTRACT

The principal foods of the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* in south Western Australia are the seeds of Marri *Corymbia calophylla* and Jarrah *Eucalyptus marginata*. Of these, Marri is the most important especially during the breeding season in October-February. Other less important foods in northern forests include Snottygobble *Personia longifolia*, Common Sheoak *Allocasuarina fraseriana*, Blackbutt *Eucalyptus patens* and in southern forests, Albany Blackbutt *E. staeri* and Karri *E. diversicolor*. Although some Marri and Jarrah seed is available all year, the flowering and subsequent fruiting of both species varies between years on about a 4-6 year cycle. Preliminary results from this study suggest that variations in the extent of flowering and nutting may determine the numbers of birds which attempt to breed.

INTRODUCTION

The Red-tailed Black Cockatoo *Calyptorhynchus banksii* is widely distributed within Australia. Five subspecies are currently recognised three of which occur in Western Australia (Figure 1) namely: *C. b. macrorhynchus* occurring throughout the Kimberley; *C. b. samueli* found in the arid and semi-arid northern and north-eastern interior (i.e. Pilbara, Gascoyne, northern Wheatbelt and Goldfields); and *C. b. naso* inhabiting the south-western humid and sub-humid zones (mainly the tall eucalypt forests). Ford (1980) and Johnstone and Storr (1998).

The Kimberley subspecies *macrorhynchus* is generally common occurring in pairs and family parties and small flocks in forests and woodlands. Its range and status have not altered greatly in the Kimberley since European settlement. The mid-western subspecies *samueli* has greatly expanded its range south into the northern wheatbelt in the past 60 years. Whereas it was originally confined to northern watercourses including the Murchison, Irwin and Lockyer Rivers, it is now most numerous in the northern and north-eastern wheatbelt especially the Eurardy, East Yuna, Three Springs / Perenjori,

Jibberding and Trayning / Mukinbudin districts, occurring in pairs, small flocks and occasionally large flocks up to 500. The introduced South African weed the Double-gee *Emex australis* has become a major food source for *samueli* in the wheatbelt. This together with the provision of watering points for livestock has enabled *samueli* to increase in numbers and spread south into what was previously unsuitable habitat.

Conversely the arboreal forest inhabiting subspecies *naso* has experienced a severe decline since European colonisation. Formerly it occurred north to Dandagan (where there were once large stands of Marri);

west to near Gingin (casually), Guildford (resident in colonial times but now rare or absent), Mundijong, Coolup, Lake McLarty and Goodale Sanctuary (16 km SW of Pinjarra) (presumably visitors from adjacent Darling Scarp), Wokalup, Big Brook (23 km west of Nannup) formerly to Vasse River, and Margaret River; and east to Mt Helena (formerly to Toodyay), Christmas Tree Well, North Bannister (formerly to Wandering), Mt Saddleback, formerly to the Kojoonup district (where now only casual), Rocky Gully and upper King River (Figure 2). This forest cockatoo was formerly common throughout this historic range but is now rare to uncommon and

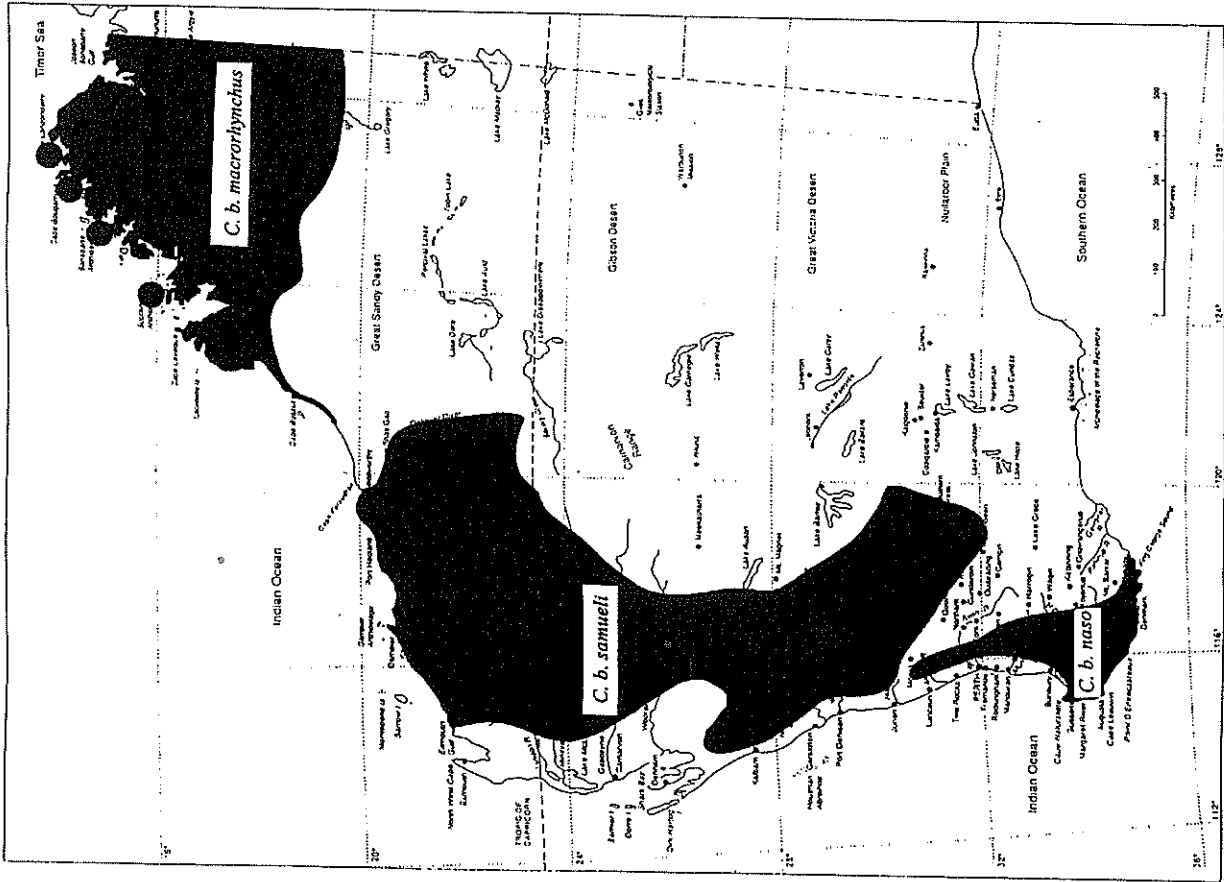


Figure 1. Distribution of Red-tailed Black Cockatoo in Western Australia.

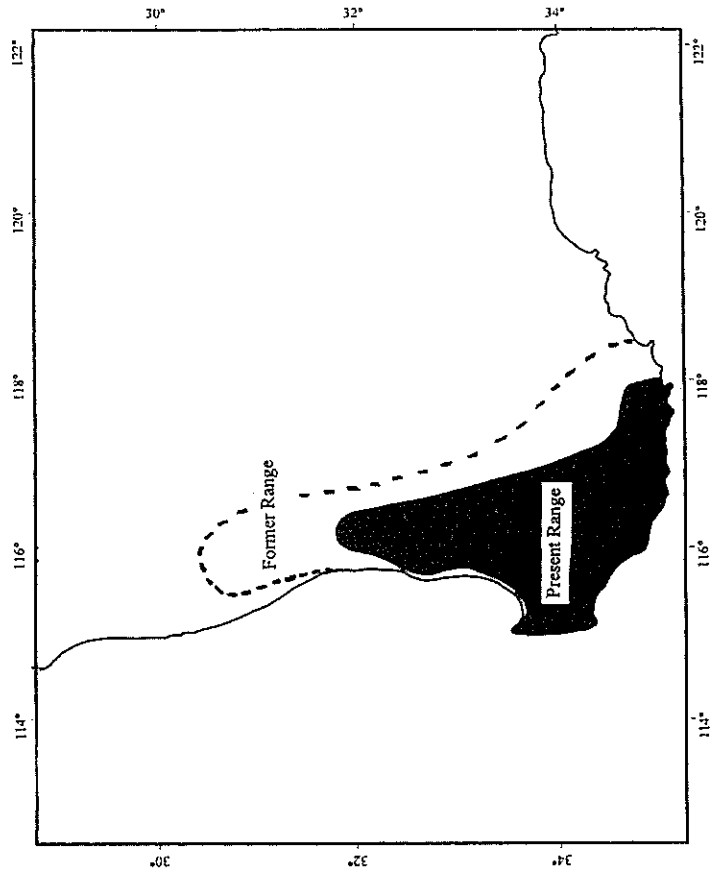


Figure 2. Distribution of *C. b. naso* in south-western Australia (showing present and former ranges).

observation ranging from several birds to the majority of the flock (see Table 1). Food trees were noted, food samples including discarded nuts were collected and in some cases photographed.

RESULTS

FOOD AND FOOD AVAILABILITY

The principal food in both study sites was Marri and Jarrah (see Table 1) comprising almost 90% of the diet. We made 96 observations with a total of 960 birds feeding on Marri and 87 observations with a total of 712 birds feeding on Jarrah. Other less important foods include *Eucalyptus patens*, *Allocasuarina* and *Persoonia*. There were two observations of two birds feeding on dead *Banksia grandis*, two observations with a total of 36 birds feeding on the seeds of the introduced Spotted Gum *Eucalyptus maculata* and one observation of 9 birds feeding on the seeds of the introduced Cape Lilac *Melia azedarach*. All food was taken from the tree canopy with the *Persoonia* and *Banksia* being small understory trees.

Birds were recorded feeding on Marri throughout the year (see Tables 1 and 2), however there was a strong seasonal shift between March and June from Marri to Jarrah and other foods. Flower and subsequent fruit production of both Marri and Jarrah varies between years on about a four to five year cycle (see tree ecology below and Table 2). Preliminary results indicate that the extent of flowering and nut production may determine the numbers of nesting birds in the subsequent breeding season. Although some seed of Marri and Jarrah is available all year, the cockatoos are extremely selective with respect to which trees they feed in and there may be large differences in seed quality, nutrient value, seed size and seed fill.

partly by the sound of hard nuts being cracked open and the continual stream of debris falling to the ground. When feeding in the outer foliage birds often pulled thin branches together for more secure footing and one female was seen to wedge herself into a fork with a spray of nuts in windy conditions.

Marri

Usually a bird bites off a tough woody nut and transfers it to the foot, almost invariably the left foot (but some birds are right footed). Marri nuts are large, thick and woody with measurements ranging from 25–45mm long and 20 x 40mm in width and birds will feed on green to hardened ripe nuts. The Marri nuts are opened in a number of ways (Figures 3 and 4) with individuals using one of the following techniques:

1. Holding the nut by the pedicel and chopping their way into the bowl (or hypanthium) from the rim.
2. Holding the rim of the nut and chopping in at the base of the hypanthium.
3. Holding the nut at the rim or base and chopping in at the centre and rotating the nut in the foot anticlockwise.

Depending on the individual skill of the bird it takes about one-two minutes (0.38 – 2.45 minutes) to extract and husk the seed from a Marri nut. One adult male extracted seeds from five green nuts in 3.12 minutes. On one occasion an adult female was also observed taking (grabbing) opened nuts from her mate feeding alongside, taking them from his foot just as the seeds were exposed.

Jarrah

Jarrah nuts are held firmly in the foot or

manoeuvred in the bill (Figure 5) and the seed capsule is split open by the bill and the seeds extracted and husked at a rate of 2–5 nuts per minute (see Figure 6). One adult extracted seeds from 30 nuts in 8.20 minutes. In some cases however only half the seeds from each nut are extracted.

Allocasuarina

Allocasuarina cones are held in the foot, split down the centre with the bill, then rotated with the foot in order to extract and husk the seeds. Times recorded to extract and husk the seeds from *Allocasuarina* cones range from 30–36 seconds. The seeds of *Allocasuarina* are retained in the mature cones for only 1–2 months (January-February) and after this time very little seed remains for the cockatoos to harvest.

The fruits of the Snottygobble (*Persoonia*) are split down the centre and the tiny seed extracted. Birds feed very slowly on Snottygobble at the rate of about 2 fruits per minute and not all fruits are eaten. Often adults spending time pruning the outer branches as well as feeding. Spotted gum nuts are handled the same way as Jarrah nuts.

Cape Lilac fruits are sometimes held in the foot but mostly sliced in half and seeds extracted with just the bill and tongue.

DAILY ACTIVITY PATTERNS

In both study areas the flocks spend the night roosting in tall straight trunked isolated stands of Jarrah-Marri-Blackbutt growing in a road side verge, edge of a paddock or at the edge of a forest block. The birds usually leave their night roosts at sunrise (ca. 05:00 Western Standard time) split into smaller family groups and move into adjacent forest. Our study flocks (with



Figure 3. Discarded green Marri nuts from one tree showing range of opening methods.



Figure 4. Discarded Marri nuts eaten by naso showing both base (top row) and rim (bottom rows) opening methods.



Figure 5. Female *C. b. naso* with Jarraah nut in bill.



Figure 6. Discarded Jarraah nuts eaten by naso.

some banded birds) were usually located within 1–4 km of the roost. After a short period of preening and sometimes basking in morning sunlight they began feeding, usually in Marri or Jarrah trees. Feeding continued for up to 10–12 hours sometimes with short breaks to move to another tree, preen or clean the bill. Bill cleaning involves wiping the bill on dead branches or chewing into dead wood especially Jarrah and Banksia. At around 16:00 to 17:00 hrs birds would stop feeding, begin bill cleaning and preening, become more vocal and move off in small groups to drink at water in tree hollows, creeks, puddles, dams and troughs. Overall they have a preference for drinking at tree hollows and appear quite uncomfortable on the ground. On dark, the birds would return to the roost area.

This behaviour was repeated each day unless there was a marked change in the weather especially with heavy rain and strong winds. Under these conditions birds foraged less and remained more subdued in their behaviour. When breeding the female leaves the nest hollow once or twice a day to be fed by the male (by pump regurgitation). It takes immatures over a year to develop the skills necessary to extract seeds from Marri nuts and during this period they are constantly attended by both parent birds. Young birds must also learn which trees produce nuts with seed in order not to waste effort on seedless nuts.

ECOLOGY OF MARRI AND JARRAH

The flowering and subsequent nutting of Marri and Jarrah varies significantly from one year to the next. Marri flowers heavily on a five year cycle (P. Mawson pers. comm.). Buds are initiated in August or September, mature by January when flowering commences, develop

into nuts in March–December and the seeds dehisce from mature nuts in January–February of the third year. Overall taking about 17 months between initiation of buds and the shedding of seeds. At the end of this cycle trees which produce a heavy flowering and crop of nuts, are in poor condition with reduced leaves in the canopy and few new leaves. The resources used in producing such large flowers and nuts are so great that the tree requires another three years to recover enough to repeat the process. In any one year only about 20–50 percent of the trees produce a large nut crop. It is also noteworthy that a small proportion of Marri trees produce only male flowers and seedless fruits (Carr et al. 1981).

In Jarrah, flowering occurs every 4–6 years (Abbott and Loneragan 1986). Buds are initiated in December–January each year and if conditions are favourable they are retained and develop further, flowering between September and December. These flowers develop into nuts during the next year and mature in September. Seed is shed three months later in December–March taking overall 24–27 months from bud initiation to shedding seed.

CONCLUSIONS

Habitat destruction has clearly caused the Forest Red-tailed Black Cockatoos marked decline in south-western Australia. The extensive clearing of the Jarrah–Marri and Wandoo forest and woodland, largely for agriculture, has led to a loss of over one third of its original range. Land clearing has slowed greatly in recent years. Cockatoos are however long-lived and it is not clear whether this factor is masking a continuing decline in their overall populations.

The birds are currently only patchily distributed throughout the south-western forests. Judging from this study the cockatoos are relatively sedentary and could be extremely vulnerable to habitat loss and fragmentation. The two limiting factors in the birds' survival are food and suitable nest hollows. At present it would appear that the food supply in both study sites is adequate, however quality as well as quantity may be crucial (especially in breeding season). In this context further study is required as to why some trees are extensively cropped whilst others apparently at a similar stage are ignored. The cockatoos are highly dependent for food (and nest hollows) on Marri and to a lesser extent on Jarrah (R. Johnstone, unpublished data). Observations of flock movements, diet changes and breeding times appears to be coincident with the heavy nutting cycle of the Marri so food may be a limiting factor in breeding times. Breeding was only recorded in both study sites in October–December of 1995 and 1997 when both areas had a heavy Marri nut crop. It is also noteworthy that even in these two breeding years only some 10% of the flock in both study areas attempted (or appeared capable) of breeding. Further research into the breeding biology of this subspecies is in progress.

ACKNOWLEDGEMENTS

We thank John Darnell for help and comments on a draft of this paper. We would also like to thank Peter Mawson and Ian Abbott for information on the ecology of Marri and Jarrah. Considerable assistance to this study was provided by Phil Stone, Kim Sarti and the Bungendore Management Com-

mittee. We also thank the Water Corporation who allowed access to catchment areas. This study was partly funded by a grant from the Department of Conservation and Land Management and the Western Australian Museum.

REFERENCES

- ABBOTT, I. 1984. Emergence, early survival, and growth of seedlings of six tree species in Mediterranean forest of Western Australia. *Forest Ecology and Management* 9, 51–66.
- ABBOTT, I. 1998. Conservation of the forest red-tailed black cockatoo, a hollow-dependent species, in the eucalypt forest of Western Australia. *Forest Ecology and Management* 109, 175–185.
- ABBOTT, I. and LONERAGAN, O. 1986. Ecology of Jarrah (*Eucalyptus marginata*) in the northern Jarrah forest of Western Australia. Bulletin No. 1 Department of Conservation and Land Management Perth, Western Australia.
- CARR, S.G.M., CARR, D.J. and ROSS, F.L. 1981. Male flowers in eucalypts. *Australian Journal of Botany* 19: 73–83.
- FORD, J. 1980. Morphological and ecological divergence and convergence in insolated populations of the red-tailed black-cockatoo. *Emu* 80, 103–120.
- JOHNSTONE, R.E. and STORR, G.M. 1998. *Handbook of Western Australian Birds, Vol. 1. Non-passerines (Emu to Dollarbird)*. Western Australian Museum, Perth.
- STORR, G.M. 1991. Birds of the South-west Division of Western Australia. *Rec. West. Aust. Mus. Suppl.* 35: 84–85.