Fledging of Galahs nesting in a suburban environment near Newcastle, NSW

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Wild Galahs *Eolophus roseicapilla* were observed breeding in nest boxes in a suburban garden between 2002 and 2017. The outcome of 12 nesting attempts made in four different nest boxes was similar to the outcome of nesting attempts made in natural tree hollows in the wild. Galah chicks often fledge in the afternoon, as well as in the morning. Most fledge less than two hours after sunrise or less than two hours before sunset.

INTRODUCTION

Galahs *Eolophus roseicapilla* nest in natural tree hollows, which are destroyed during land clearing. In rural areas, hollows are lost when large old trees, in which hollows form, are cleared. In urban areas, hollows are lost when living or dead hollow-bearing trees are cut down and when dead branches are cut off living trees for public safety.

Although Galahs are one of the most common backyard birds (BirdLife Australia 2017), they may lack sufficient resources in urban areas. Domestic gardens provide valuable bird habitat when they offer food, water, shelter and nesting sites. Nest boxes that are designed to copy the characteristics of natural tree hollows can be useful nesting sites (Parsons 2007). They can be installed in trees, or on poles or other structures in domestic gardens.

This short note provides insights into the breeding of Galahs in urban NSW at Thornton (32°24'S 150°38'E) near Newcastle based on observations made of nest boxes in a suburban garden between 2002 and 2017.

METHODS

Nest boxes were built to attract Galahs, Eastern Rosellas *Platycercus eximius* and Common Brushtail Possums *Trichosurus vulpecula* (Dengate 1997; **Table 1**). They were installed 7 m above the ground in two eucalypts (approximately 21 m tall, species unknown) and/or on two steel poles, 2, 5.5 or 6.5 m above the ground (**Table 2**) in the back right corner of our residential property, area 765 m². Each year, one to three nest boxes were installed. Different nest boxes were available in different years and some were mounted in different places in different years. Below them, the mid-storey and understorey vegetation consisted of native shrubs, including Acacia sp., Callistemon sp., Banksia sp. and Grevillea sp.

The nest boxes were made of plywood to provide insulation and painted with Dulux Weathershield to prevent moisture from penetrating and providing a suitable environment for mould to grow. Internal ladders were fitted to allow the chicks to climb up to the entrance holes (**Figure 1**).

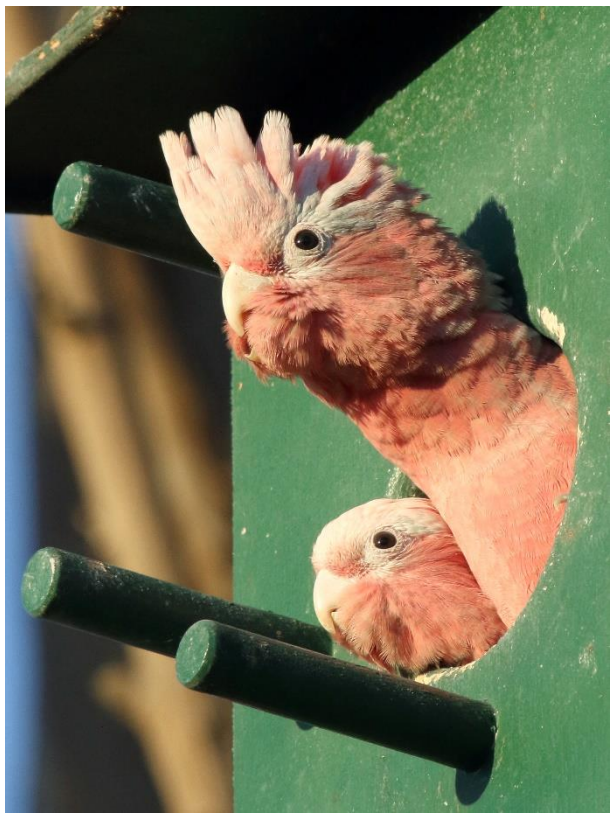

Figure 1. A wide internal ladder allowed siblings, such as Chick 2/2016 and Chick 3/2016 shown here, to look out of the nest box at the same time.

The roofs were hinged and sloped downwards to the front. The nest boxes originally had one to three external perches, but these were removed in some years to prevent Laughing Kookaburras *Dacelo novae-guineae* using them to predate eggs and chicks.

Several handfuls of green eucalypt leaves treated with bird lice and mite spray or powder were put inside the nest boxes at the beginning of each breeding season. The nest boxes were installed using brackets and straps and faced to the east or north-east. They were left alone during the breeding season unless the chicks were at risk from lice or mites or the eucalypts were at risk of being ringbarked because the adults were removing patches of bark (scarring).

We occasionally provided wild bird seed in a bird feeder in our backyard. We also provided clean water in a pedestal bird bath.

Most of the clutch sizes (with five exceptions) were confirmed in the Galah Box mounted at 2 m, because of ease of access. Access to boxes mounted at 5.5 m and higher required a ladder and climbing equipment.

As soon as the first chick began to lean out of the nest box and make a distinct 'quack-quack' call to its parents, we spent each day monitoring the nest box. We sat outside for several hours each morning from before sunrise and for several hours each afternoon until after sunset. We went outside every time we heard the parents visit the nest box during the day. We defined fledging as the first time a chick left the nest box.

Table 1. Dimensions of nest boxes used by nesting Galahs in our backyard from 2002 to 2017

Nest box	Entrance hole diameter (mm)	Base (mm)	Front wall height (mm)	Back wall height (mm)	Ladder (attached to inside of front wall)	Orientation of nest box
Galah	120	260 x 260	700	770	parallel wooden strips	Vertical
Rosella	80	230 x 230	470	500	parallel wooden strips	Vertical
Possum	110	300 x 300	570	600	diagonal eucalypt branch	Vertical
Galah 2	100	250 x 250	700	750	wooden panel with cut outs	Vertical

Table 2. Clutch size, hatching success and fledging success for Galahs in four different nest boxes

Year	Nest box	Location	Height (m)	Eggs laid	Chicks hatched	Chicks fledged
2002	Galah	Right eucalypt	7			ND (3?)[1]
2003	Galah	Pole	2			ND (3?)
2004	Galah	Pole	2	NK[2]	NK	3
2005	Galah	Pole	2	NK	NK	2
2006	Galah	Pole	2	3	NK	1
2007	Galah	Pole	2	3, 3[3]	3	2
2008	Galah	Pole	2	3	2	1
2009	Galah	Pole	2	NK	1	0
2010	Galah	Pole	2	0	0	0
2011	Galah	Pole	2	0	0	0
2012	Rosella	Right eucalypt	7	NK	3	3
2013	Rosella	Right eucalypt then pole	7 then 5	4	3	3
2014	Possum	Pole	6.5	NK	3	3
2015	Galah 2	Pole	5.5	NK	NK	2
2016	Galah 2	Pole	5.5	NK	3	3
2017	Galah 2	Pole	5.5	NK	NK	1

[1] Not documented (successful nesting attempt; we believe 3 chicks fledged)

[2] Not known

[3] Replacement clutch of 3 eggs

RESULTS

Breeding statistics

The breeding season was July to December. However, Galahs visited the nest box intermittently during the non-breeding season. They placed sprays of green eucalypt leaves in the nest box to line it in the breeding and non-breeding seasons. Galahs used the sides of their faces to rub preen oil on the nest boxes and poles in the breeding and non-breeding seasons (**Figure 2**). Preen oil is produced by a gland near the base of a bird's tail and keeps feathers in good condition. It makes surfaces near the nest entrance smooth and slippery and gives them a musky odour. It may be difficult for nest predators such as monitor lizards to climb to the nest and the odour may be a repellent (Young 2014).

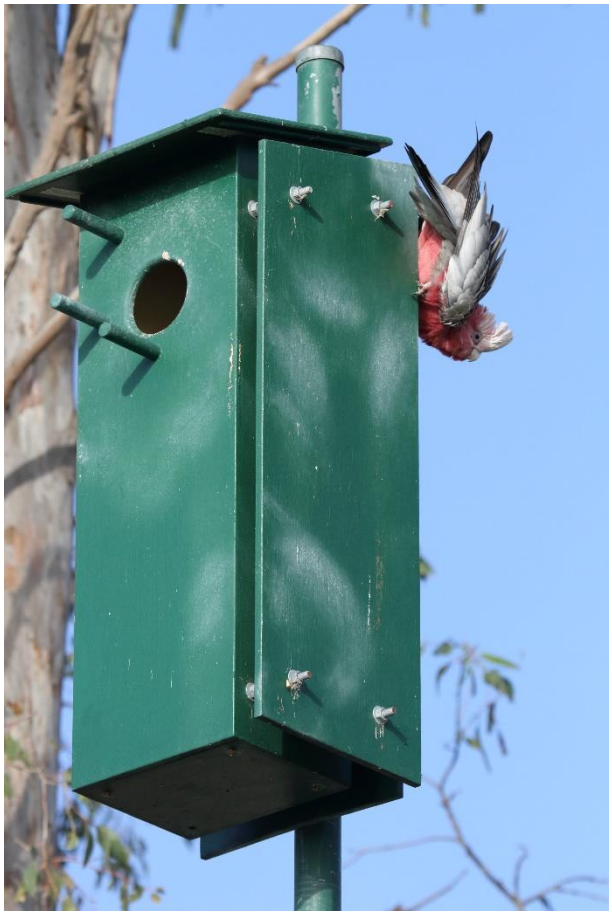

Figure 2. When Galahs rubbed preen oil on the nest box, they left white patches of 'feather dust', a very fine powder shed by their powder-down feathers.

Galahs have made 13 successful nesting attempts (when at least one chick fledged) in four nest boxes. They have made 10 successful nesting attempts in the longer Galah Box and Galah 2 Box and three successful nesting attempts in the shorter Rosella Box and Possum Box (**Table 2**). The Rosella Box was available in all years. In 2003, they tried to enlarge the hole of the Rosella Box before nesting successfully in the Galah Box. In 2013, they nested in the Rosella Box when the larger Possum Box was available.

For three nesting attempts in which the numbers of eggs and chicks were known, 13 eggs were laid, 8 chicks hatched (61.5%) and 6 chicks fledged (46.2%).

For four nesting attempts in which the clutch size was known, a total of 16 eggs were laid. This included a double clutch in 2007, involving initial and replacement clutches. The average clutch size was 3.2 (n=5).

For seven nesting attempts involving eight clutches (i.e. one replacement clutch) in which the numbers of chicks hatched were known, 18 chicks hatched, involving a maximum of three and an average of 2.6 chicks hatched per pair/annum, equivalent to 2.3 chicks per clutch.

For 12 nesting attempts in which the numbers of chicks fledged were known, 24 chicks fledged. A maximum of 3 and an average of 2 chicks fledged per pair/annum.

For four nesting attempts in which three young fledged, the fledging period measured as the time from the first chick(s) being heard to the third chick fledging was 47 to 69 days/7 to10 weeks (an average of 56 days/8 weeks).

Chick behaviour

Six to eight and a half weeks after hatching, a chick began to lean out of the nest box entrance hole and make a distinct 'quack-quack' call to the parents. The parents responded with a similar call from branches near the nest box. The chick and parents called intermittently for up to three hours (a calling session) in the early morning and late afternoon for up to three days before the chick fledged (the calling period). The male parent often preened the chick for several minutes the day before it fledged.

The parents did short demonstration flights from branch to branch in the eucalypts and in slow circles in front of the nest box during the calling session in which the chick fledged, and often during the previous calling session. They sometimes flew over several residential properties or flew to the roof of a nearby house, landed then flew back in less than a minute. Just before the

chick left the nest box, it stood on the entrance hole with its claws visible and leaned even further out. The chick and parents called more loudly and insistently. As soon as the chick left the nest box, the parents flew to it then flew one to two metres on either side of it (**Figure 3**). In 2015, Chick 1 returned to our yard with the parents the afternoon before and the morning Chick 2 fledged. Chick 1 did short demonstration flights in front of the nest box and flew closely beside Chick 2 and the parents when Chick 2 fledged.

Figure 3. As soon as Chick 1/2017 left the nest box, the male parent left the roof and the female parent left the tree to fly away with their young.

While the parents were calling a chick to leave the nest box, they either did not feed it or gave it a very short feed. They gave it a long feed if it had not left by later in the morning or by sunset. After this, they flew away (morning) or went to sleep near the nest box (evening). They began calling again the next morning or afternoon. The parents did not call a chick to leave the nest box during the middle of the day or during wet or windy weather, even if the calling period had begun.

Only one chick called at a time. The next chick did not begin calling until the previous chick had fledged, even if it looked out of the entrance hole during a calling session.

If a chick left the nest box prematurely and only flapped to the ground, the parents cared for it in our backyard while caring for older siblings that had fledged successfully and were capable of sustained flight. They visited the chick on the ground many times during the day to feed, shelter with and preen it. They also left it for intervals that ranged from ten minutes to more than four hours. They sometimes slept in our backyard at night and sometimes slept elsewhere (presumably near the older sibling(s) that had fledged successfully). They cared for Chick 2/2007 (second of two) for 10 days (**Figure 4**) and Chick 3/2014 (third of three) for 2.5 days (**Figure 5**). Both chicks flew out of our backyard with their parents.

Figure 4. The parents preened and cared for Chick 2/2007 on the grass and in the gardens in our backyard for 10 days.

Figure 5. The parents fed and cared for Chick 3/2014 on the grass and in a low banksia shrub for 2.5 days.

Timing of fledging

The timing of fledging relative to sunrise and sunset for seven nesting events involving one to three chicks is shown in **Table 3**. Fourteen out of 15 chicks (93%) left the nest box less than two hours after sunrise or before sunset. Nine out of 15 chicks (60%) left an average of 54 minutes after sunrise and six out of 15 chicks (40%) left an average of 80 minutes before sunset. When the exception was removed, five out of 15 chicks (33%) left an average of 43 minutes before sunset. In 2012, 2013 and 2016, siblings left in the morning and the afternoon (**Table 3**).

Table 3. Timing of fledging of Galah chicks relative to sunrise and sunset (Australian Eastern Standard Time)

Chick hatch number / year	Date chick left the box	Time chick left the box (h)	Sunrise [1] (h)	Time after sunrise (minutes)	Sunset [1] (h)	Time before sunset (minutes)
Chick 1/2008	10/12/08	0500	0444	16		
Chick 1/2012	2/11/12	0641	0458	103		
Chick 2/2012	4/11/12	1650			1826	96
Chick 3/2012	9/11/12	1410			1830	260
Chick 1/2013	19/10/13	1730			1812	42
Chick 2/2013	20/10/13	0618	0512	66		
Chick 3/2013	21/10/13	1758			1814	16
Chick 1/2014	23/10/14	0600	0509	51		
Chick 2/2014	3/11/14	0535	0458	37		
Chick 3/2014	7/11/14	0615	0454	81		
Chick 1/2015	no data					
Chick 2/2015	13/11/15	0530	0450	40		
Chick 1/2016	22/10/16	0545	0509	36		
Chick 2/2016	26/10/16	1735			1818	43
Chick 3/2016	27/10/16	1759			1819	20
Chick 1/2017	16/10/17	0610	0516	54		

[1] (Geoscience Australia 2010).

Chick 2/2007, which flapped to the ground on the morning of 22 November 2007, left the backyard on 2 December 2007 at 0630 h, 107 minutes after sunrise, which was at 0443 h. Chick 3/2014, which flapped to the ground at 0615 h on 7 November 2014, left the backyard at 1830 h on 9 November 2014, exactly at sunset, which was at 1830 h.

For seven nesting attempts for which the fledging date was known, the first chick left the nest box between 16 October and 10 December. Four of the seven first chicks left between 16 and 23 October.

For four nesting attempts for which the fledging date was known, the third and last chick left the nest box between 21 October and 9 November.

For four nesting attempts in which three chicks fledged, the interval from the first chick fledging to the third chick fledging ranged from 2 to 15 days (an average of 7.3 days). On average, Chick 2 left the box 4.5 days after Chick 1 and Chick 3 left the box 2.8 days after Chick 2.

DISCUSSION

In a comprehensive study between 1970 and 1977 in the wheatbelt of Western Australia, the typical number of siblings which finally left nest hollows was three to four (Rowley 1990), slightly higher than the mean value of 2.3 in this study.

It has been suggested that chicks fledge in the morning to decrease their chance of being preyed upon in the nest (Chiavacci *et al*. 2015). We observed that 40% of Galah chicks left the nest box in the afternoon. This may mean that nest predation risk was low in our backyard. During the nestling period, the parents did not react to our dog. However, they performed the heraldic display (stood upright with crest raised, wings spread and tail fanned and gave the screech call (Pidgeon 1970)) when they saw a cat or an Eastern Blue-tongue Lizard *Tiliqua scincoides*. Neither cats nor lizards attempted to climb to the nest boxes.

It has also been suggested that chicks in riskier nests fledge over a shorter period of time than chicks in safer nests (Chiavacci *et al*. 2015). We observed siblings leaving the nest box over a period of 2 to 15 days. We were not aware of any additional risks in 2013, when they left over 2 days, compared with 2014, when they left over 15 days.

In our study, siblings that fledged in the morning did not necessarily also fledge over a shorter period. In 2013, three chicks fledged in the afternoon, morning and afternoon but over a shorter time (two days) while in 2014, all three chicks

fledged in the morning but over 15 days. This suggests that other factors may influence fledging, for example parental care, chick development, nest height, nest concealment and proximity to other birds and animals.

Previous studies have found that Galah chicks usually fledge in the morning and fly strongly to a preferred fledgling habitat, or crèche (Higgins 1999). We observed the parents calling to each chick every morning and every afternoon for up to three days until it fledged. Furthermore, the calling in the afternoon appeared to be as prolonged and urgent as the calling in the morning. This suggests that the parents are able to quickly escort the chick to the safety of the crèche.

Fourteen out of 15 Galah chicks in our nest boxes (93%) fledged shortly after sunrise or shortly before sunset. In addition, the two chicks that had flapped to the ground finally left our backyard less than two hours after sunrise or at sunset. This may be because their parents are most active at these times. Galahs spend most of the day sheltering from the heat in trees (BirdLife Australia 2012a). Chicks may also fledge at these times to avoid natural predators, such as Peregrine Falcons *Falco peregrinus*, which hunt mainly during the day (BirdLife Australia 2012b).

In the Western Australian study (Rowley 1990), large differences were noted in the number of days between the first and last Galah chicks leaving the nest (range of 1 to 12 days), which is consistent with our observations. Rowley suggests that delayed fledging may be a consequence of a number of factors including difference in the timing of eggs hatching, the availability of food, particularly when provisioning clutches containing a runt. Within the confines of natural nest hollows the larger siblings may be preferentially fed and have increased opportunity to exercise and develop their wings. Galahs are surprisingly powerful fliers on fledging, allowing them to be moved to juvenile crèches some distance from the nest site where there is readily available food. Hence, sibling Galahs may be contemporaneously provisioned at nest hollows and at the juvenile crèche.

CONCLUSIONS

Our study conducted in a suburban environment using artificial nest sites gave generally similar results to those found in more comprehensive studies of birds using natural nest hollows. In this study involving Galahs habituated to the observer's passive presence, it was possible to get more intensive data on the timing of fledging than has been possible in other studies (Rowley 1990).

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