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ARTICLES

Canberra Bird Notes 47(2) (2022): 81-87

THE BREEDING SUCCESS AND DIET OF LITTLE EAGLES IN THE ACT AND NEARBY NSW IN A WET YEAR, 2021

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Abstract. *Monitoring of Little Eagles* (Hieraaetus morphnoides) *breeding in the Australian Capital Territory in 2021 was impaired by COVID-19 restrictions. It was a wet year. September and November, when most eagles lay eggs and hatch young, were notably wet. Six Little Eagle territories were recorded in the ACT in 2021. There were at least five pairs with nests, and a lone male was recorded at a sixth nest. All pairs laid eggs and one failed during incubation. The chicks in three nests died during periods of prolonged heavy rainfall and one pair raised a chick to fledging. In NSW, three pairs raised a single chick each. A known nest was built up in another territory in NSW but no birds were observed at it. The overall number of chicks reared per pair was 0.50. The proportion of rabbits in the birds' diet was low compared with the three previous years. How weather and diet might affect the breeding success of Little Eagles are discussed.*

1. Introduction

This is the fifth consecutive annual report by the Little Eagle Research Group, describing the population ecology of the Little Eagle, a species listed as vulnerable in the Australian Capital Territory (ACT) and New South Wales (NSW).

Monitoring of Little Eagles breeding in the Australian Capital Territory in 2021 was impaired by COVID-19 restrictions on movement, imposed by the ACT government (ACT Government 2021). Under these restrictions, all previously known breeding sites could not be checked for presence or absence of birds early in the breeding season. Some pairs could have begun to nest, then failed prior to observations. Therefore, a complete assessment of the birds' breeding success was not possible and the following results are presented as a minimum.

2021 was also significant for its weather. It was a wet cool year in the ACT, the wettest since 2010, there were significant rain events, and rivers flooded numerous times (BOM 2022a). The annual rainfall at Canberra Airport in 2021 was 912 mm, 146% of the average. Little Eagles in the ACT area in previous years of this study began nesting in late July to early August, the main incubation period has been in September and most chicks fledge in late November or December. Rainfall in September 2021 was twice the average and November

was the wettest on record across the ACT. There were severe thunderstorms and periods of strong winds from September to January 2022, the most destructive being that of the intense hailstorm on 3 Jan when there was severe structural damage to northern suburbs of the ACT and hundreds of trees uprooted and branches broken.

This was the second consecutive wet year in the study area after three dry years (Rae 2021, BOM 2021, 2022b). As in 2020, the grasses and herbs grew tall and there were many dried stalks of tall weeds such as thistle still standing since 2020, and European Rabbits (*Oryctolagus cuniculus*) were abundant (Rae *et al*. 2021a, pers. obs.).

A brief summary is here given of the Little Eagle's breeding success for the year and diet, as identified from food remains. The results are compared with those of the previous four years of study (Rae *et al*. 2018, 2019, 2020, 2021a), and possible effects of the high rainfall on breeding success and diet are discussed.

2. Methods

Fieldwork on the Little Eagle research was curtailed by the COVID-19 lockdown period from 12 August to 15 October, and travel between the ACT and NSW was restricted until mid-December. This prevented monitoring of most known breeding territories during the nest-building, incubation and hatching periods. Then, when movement was possible, most effort was spent checking known nest sites and little time was spent looking for nesting pairs in new areas.

When access was allowed, the methods followed were those established in previous years' reports (Rae *et al*. 2018, 2019, 2020, 2021a) and are standard (*e.g.*, Hardey *et al*. 2013). The main procedures were: checking for occupancy of all nests and territories known from previous surveys; watching for eagles from vantage points; following up any sightings of eagles for possible nests; monitoring the progression of the breeding stages at each nest to fledging; and collecting food remains and cast pellets from below nests and perches. Prey remains were identified from diagnostic body parts and the pellets were stored for later analysis (Rae *et al* 2021b).

3. Results

3.1. Number of Little Eagle pairs and breeding success

There was a minimum of five pairs of Little Eagle in the ACT in the 2021/2022 breeding season. A single male was observed at a new nest late in October. There was no evidence of a female, eggs or young in that nest. A single female was resident in another territory, and no birds were recorded at two other territories when monitored late in the season. In nearby NSW, there were pairs in three territories that were monitored from early in the season. A nest was seen to have been built up in another territory, but no birds of any species were observed at the nest. Occupancy by Little Eagles could not be confirmed. Two territories could not be monitored until late in the season and no birds were observed at either.

For the first time during this study, all known pairs in the ACT and nearby NSW laid eggs. In previous years 2017-2020, the proportions of pairs laying were 73, 79, 77 and 83%. One pair failed during the incubation stage in 2021, for unknown reasons. Hatching success was 88%, compared with 50, 73, 70 and 100% in 2017-2020. Three chicks died - most likely due to hypothermia and/or lack of food, as there were severe and prolonged periods of rain, hail and violent winds during the nestling period - and the remains of two nestlings were found

below their nests (Figs. 1 and 2). The fledging success per pair that hatched chicks was 57% compared with 100, 100, 86 and 70% in 2017-2020. The overall number of chicks fledged per pair was 0.50, similar to the mean (0.49) of the previous years (0.36, 0.57, 0.46, 0.58).

Figure 1. Scattered pin-feathers of a Little Eagle chick lie below a nest in early December. The body had been scavenged. The nest could not be visited earlier due to lockdown restrictions, although the adults had been watched flying to and from the nest. The chick likely died during prolonged heavy rain in the interim period.

Figure 2. The remains of a Little Eagle fledgling that died when a severe storm passed over the nest area, breaking branches and blowing over trees. The partly scavenged body was found directly below the nest.

3.2. Diet

The remains of 42 food items and 49 pellets were collected. Birds were the most common prey (21 items, 50.0%), followed by mammals (18 items, 42.9%) and reptiles (2 items, 7.1%) (Fig. 3). Rabbits were the only mammal taken and the proportion of rabbits eaten in 2021 was the second lowest proportion of the diet recorded since 2017 and 71% of that taken in 2020. The reptiles eaten were an Eastern Blue-tongue Skink (*Tiliqua scincoides*) and a Bearded Dragon (*Pogona barbata*).

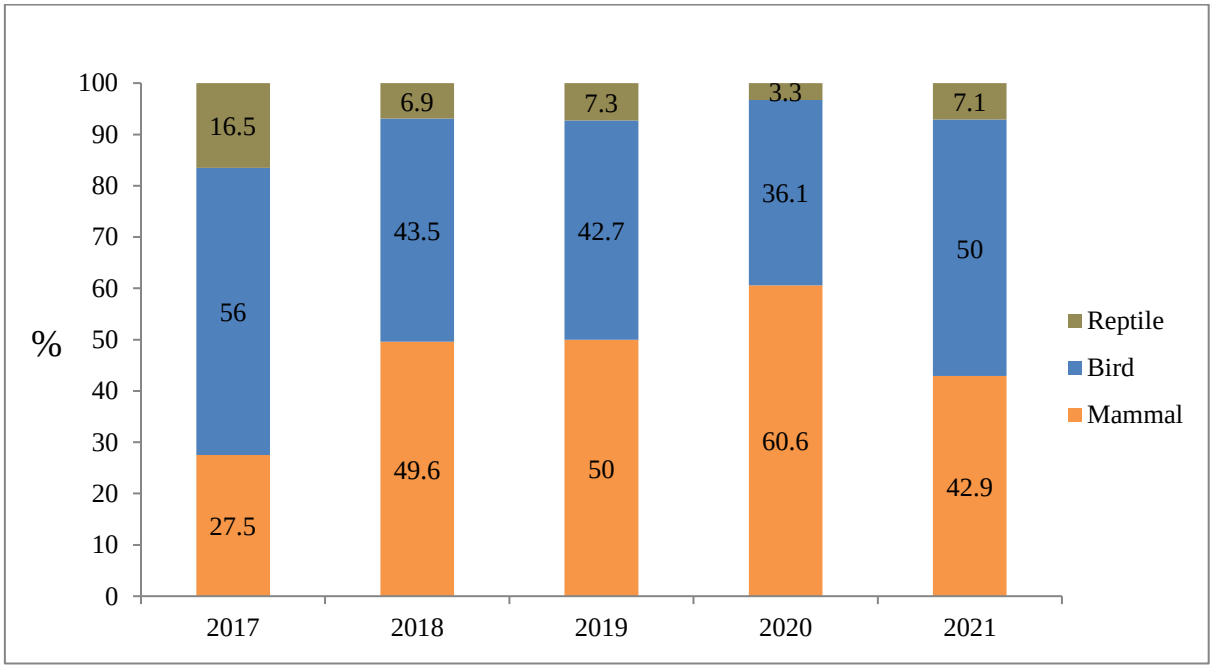

Figure 3. Proportions of food types in the diet of Little Eagles during the breeding seasons in the ACT and nearby NSW in 2017 - 2021.

The bird species recorded were Crimson Rosella (*Platycercus elegans*) (n = 7), Red-rumped Parrot (***Psephotus haematonotus***) (4), Eastern Rosella (*P. eximius*) (3), Common Starling (*Sturnus vulgaris*) (3), Galah (*Eolophus roseicapilla*) (2), and singles of Noisy Friarbird (*Philemon corniculatus*), Common Bronzewing (*Phaps chalcoptera*) and Crested Pigeon (*Ocyphaps lophotes*). The lining of an unidentified passerine nest was found below one eagle nest, evidence that the nestlings had been snatched by an eagle. A minimum of ten of the birds were juveniles of the year (47%), similar to that in 2020 (41%).

4. Discussion

The wet weather of 2021 had mixed effects on nesting Little Eagles. All pairs laid eggs, yet the breeding success was similar to the mean of all previous years, because a higher proportion of chicks died in 2021 than in other years. In 2017 and 2018, when there was less than average rainfall and few heavy falls (BOM 2018, 2019), fewer birds laid eggs, yet all chicks fledged.

A high laying rate is indicative of good food supply for raptors prior to laying (Newton 1979). 2020 was also a wet year in the study area (BOM 2021), and the main cause for breeding failure then was also loss of chicks (Rae *et al*. 2021a). It is likely that prolonged or heavy rainfall and strong winds have a major effect on Little Eagle breeding success due to

death of chicks from hypothermia or starvation when rain or storms inhibit the hunting success of parents (as observed in other raptors, *e.g.*, Newton 1986).

Fewer rabbits were eaten by Little Eagles in 2021 than in any of the previous three years (Rae *et al*. 2019, 2020, 2021a). Rabbits were commonly seen during fieldwork and they appeared to be as abundant as in the previous year. The eagles were possibly constrained in hunting over grasslands because the grasses and herbs had grown tall. Thistles were abundant in 2020 and their dried stems were still standing in 2021 when new thistles grew through them (Fig. 4). This would have created a formidable barrier to hunting eagles and could have led to few grassland animals such as rabbits and reptiles being caught. Although recorded in the diet in previous years, grassland birds such as Eurasian Skylark (*Alauda arvensis*), Australian Pipit (*Anthus australis*) and Stubble Quail (*Coturnix pectoralis*) (Rae *et al*. 2021b) were absent in 2021. Eastern and Crimson Rosellas, Common Starling and Red-rumped Parrot continued to be the most common birds in the diet.

Figure 4. The dried stems of thistles that grew in the ACT in 2020, still standing in 2021, with fresh growth emerging. A Little Eagle would not be able to dive through to reach prey.

In summary, the laying success of Little Eagles seems to be improved by greater food supply following rain, as in 2020 and 2021, compared with the dry years of 2017-2019. However, too much or too heavy rainfall or hail and violent windstorms seem to counteract the benefits, by causing the death of chicks. How weather and diet might affect the breeding success of Little Eagles are main elements in this ongoing long-term study. This could be particularly relevant in this period of changing climate and volatile weather patterns.

Acknowledgements

We thank the other members of the Little Eagle Research Group and the growing number of enthusiastic helpers who have joined the study. Our work could not be done without the equal enthusiasm of the landowners and managers who allow access to nest sites and hunting areas. Alex Drew and Sandra Lauer were particularly helpful in monitoring birds on land they had unrestricted access to during the lockdown period. Diana Tracy gave helpful comments on the draft.

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A juvenile Little Eagle watches a parent high in the sky. This bird fledged on 29 Dec 2021 and had left the nest area by 16 Feb 2022, four days after this photograph was taken (*Stuart Rae*).

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THE STATUS OF THE BANDED LAPWING (*VANELLUS TRICOLOR*) IN THE CANBERRA REGION

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Abstract: *The Banded Lapwing* (Vanellus tricolor) *has the status of a 'rare breeding visitor' in the Canberra Region (COG 2018).* i.e. *the Canberra Ornithologists Group's Area of Interest. For this region, 348 records were reviewed, covering a 40-year period (1981 – 2021). Lake Bathurst and The Morass held 64% of all records, with the remainder widely scattered across the region. The species has been found in all months, with the highest reporting rate in October. It is most common between September and December. The highest numbers were 156 Lapwings in October 2020 and 158 in January 2012 at Lake Bathurst. There is significant movement of Banded Lapwings through our region: in some years the species was recorded for 6 months of the year or more, in others for only a couple of months and in one year not at all. Larger numbers of Lapwings tend to spend only a limited time here. From 2009 onwards the number of records in areas other than Lake Bathurst increased greatly. Large-scale rainfall patterns seem to be the main drivers for such movements. The Millennium Drought (1996 - mid 2010) followed by two years of La Niña affected the presence of the species in the region. Breeding was observed 40 times, with only 6 records between1981 and 2006, and 34 between 2007 and 2019, coinciding with an overall increase in records. The status of the Banded Lapwing in the Canberra Region, based on this review, can be described as 'irregular to locally common breeding visitor'.*

1.Introduction

The Banded Lapwing (*Vanellus tricolor*) has a wide distribution in Australia (Fig. 1), largely South of the Tropic of Capricorn (Marchant and Higgins 1993; Cooper *et al.* 2014; Wiersma and Kirwan 2020). In New South Wales (NSW) it is more often found west of the Tablelands. Large flocks of up to 440 birds have been recorded in NSW between 1970 and 1990. But in more recent years numbers have been much lower and at times only a few records were available (Cooper *et al.* 2014; Wiersma and Kirwan 2020).

Figure 1. Distribution of the Banded Lapwing (Wiersma and Kirwan 2020).

For the Canberra Region, *i.e.* the Canberra Ornithologists Group's Area of Interest (COG's AoI), the species has the status of a *rare breeding visitor* (COG 2020). It seems that records for the Region

have never been looked at in any detail, except for the observations from the Hoskinstown Plain (Butterfield 2015, 2016).

This article will therefore:
(1) review available data, and
(2) see whether the trends reported for NSW as a whole also apply to the Canberra Region.

2. Materials and Methods

Records were sourced from the COG database, covering the period from 1981 to 2018, with additional records from the COG waterbird survey at Lake Bathurst to 2021, from the eBird distribution map for the Banded Lapwing (eBird 2022), the literature and personal communications from observers. Overall, a high proportion of records originated from the COG waterbird surveys at Lake Bathurst and Lake George. These have been conducted for more than four decades (Lenz 2014, 2021). Lake Bathurst and The Morass have been visited monthly for many years. When the lake system was dry, visits did not always involve walking across the different parts of the wetland landscape, as was the procedure when water was present in the system.

Where multiple records were available of the same birds at a given location by different observers within a given month, only the record with the highest number of birds was selected. This situation was quite common for sightings within the ACT. Where continuous records existed over two or more months at a given site, only the record with the highest number of birds for each month was included.

Breeding records were assigned to the month of the first observation that indicated breeding (*e.g.* 'on nest, clutch, young of different ages'), although the full breeding cycle will have covered a more extended period.

Figure 2. Banded Lapwing, standing (left) and in flight (right) (*Julian Robinson*).

3. Results and Discussion

A total of 348 records for the period 1981 to 2021were considered for this overview.

3.1. Habitat preferences

Banded Lapwings are mainly found on sparsely vegetated plains, dry lakes, airports, recently ploughed fields and crops at the early stage of growth or after harvest, as well as on short well-grazed pastures. They may also be found near water, although they do not depend on it (Marchant and Higgins 1993; Cooper *et al.* 2014).

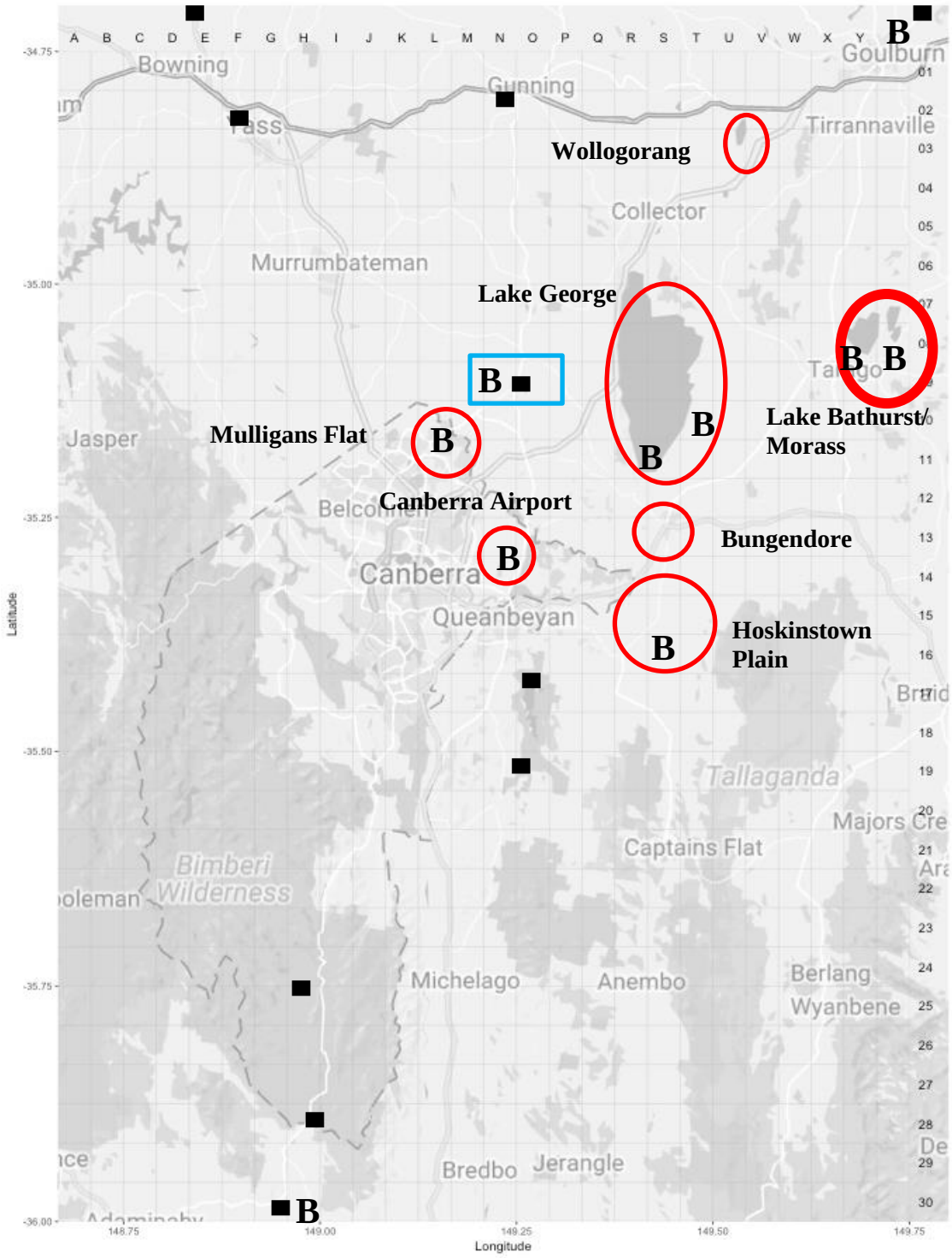

Figure 3. Distribution of Banded Lapwing records in COG's AoI (based on eBird (2022) map for Banded Lapwing and other records; see also Table 1)**.** Circles: sites with > 5 records; ■: sites with 1-5 records; **B:** breeding sites; Rectangle: site near Gundaroo (see text).

Many records in COG's AoI came from more sparsely vegetated land, such as grazed paddocks (livestock, kangaroos), grassland, Canberra Airport, stubble fields (Butterfield 2016), and recently tilled fields, or lucerne fields at an early stage of growth (Butterfield 2015; Lenz and Kamprad 2019), *i.e.* in many cases, specific features of the agricultural landscape provided suitable habitat for the species.

At Lake Bathurst and the Morass, birds usually spend most of their time on dry open land between the different parts of the lake system, and on the dry lake bed. Occasionally they may be found in shallow water. Several records from Lake George also include birds present on the dry lake bed and along wet and dry areas of the lake shore.

3.2 Distribution in COG's AoI

As Fig. 3 and Table 1 indicate, the key site for the Banded Lapwing in our region is Lake Bathurst/Morass, with 64% of all records. This is the site where the species has been most regularly recorded over the years and at highest numbers.

Lake George and the plains to the South of the lake via Bungendore to Hoskinstown also hold notable numbers of records. To the North of the lakes, paddocks near the Wollogorang Lagoon have a number of sightings, although this site has been visited more regularly only in recent years and may have more significance for the species than the current number of records would indicate.

At the grasslands on the NW edge of Canberra, at Mulligans Flat[1] and the Canberra Airport, the species has been recorded at various times (Fig. 2, Table 1). Early records exist also for Jerrabomberra Wetlands (Taylor and COG 1992).

Table 1. Number and (percentage) of Banded Lapwing records from a total of 348 records for main areas in COG's AoI.

Lake Bathurst	Lake George	Bungendore	Hoskinstown	Mulligans Flat	Other sites*
223	33	8	20	23	41
(64.0)	(9.5)	(2.3)	(5.7)	(6.6)	(11.7)

*Other sites: Adaminaby, Boorowa, Canberra Airport, Googong, Goulburn, Gundaroo, Gunning, Namadgi NP, Windellama, Wollogorang, Yass.

Other records are widely scattered (see Fig. 3, Table 1), and are often of single or only a few birds.

Although the Banded Lapwing is a bird with striking plumage (Fig. 2) and an unmistakable call, the species is easily overlooked, even in larger groups. They can blend in with their surroundings, squat lower among vegetation and move away quietly from any approaching observer (see also Butterfield 2016). They are more noticeable when breeding. They will defend their nest site and brood against any perceived danger by taking to the air and noisily trying to drive away any potential predator.

[1] The grassland site of observations at Throsby in November 2014 is now under housing (Kim Farley, pers. communication)

The species could be present at far more sites than the map (Fig. 3) indicates. A good example is the record of 21 Sep 2014 of 4 Banded Lapwings on a tilled paddock just 1 km north of Gundaroo (see rectangle in Fig. 3), as the author stopped the car on a whim at the gate to this paddock to check for small birds. By 2 Nov only two Lapwings could be seen, but on 30 Nov the pair was accompanied by a young bird. In subsequent years the species has never been recorded again at the site.

At Lake Bathurst/Morass, at times single birds or pairs would fly over low, ignoring other Banded Lapwings on the ground, and vanish in the distance. The author had assumed that they might be visiting other paddocks in the area, either for foraging or breeding. The farming landscape around the lake, as at Lake George, may offer many potential sites for them, although many sites may be suitable in one season but not in others, depending on changing land use. On another occasion, while no Banded Lapwings were found at Lake Bathurst, a group was discovered on a tilled field less than 2 km from the lake.

In general, the agricultural landscape does not receive much attention from observers, largely owing to the difficulties of access (Lenz and Kamprad 2019). It is probably safe to assume that the Banded Lapwing occurs at more sites than current records indicate. However, few such sites will be occupied on a regular basis (see also Butterfield 2015, 2016; Kim Farley, pers. communication).

3.3. Seasonal distribution

The Banded Lapwing has been recorded in all months of the year. The monthly reporting rate (% of all records) is highest between August and January, with the maximum value in October and the lowest in April (Fig. 4). Over the period from September to January, it is most common, as indicated by the average, maximum and total number of birds (Table 2).

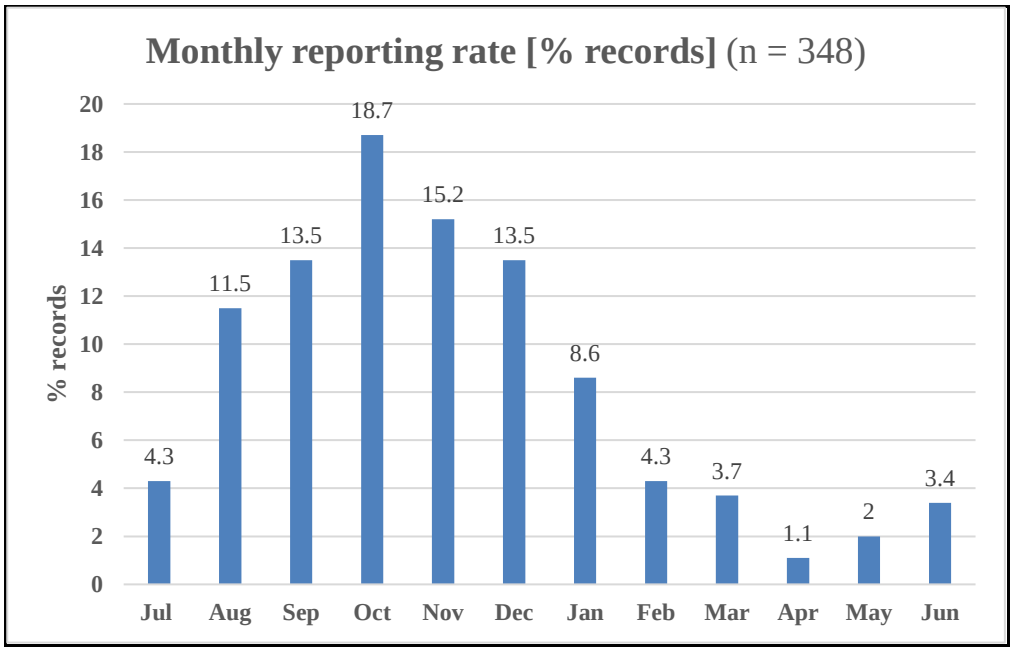

Figure 4. Monthly reporting rate for the Banded Lapwing in COG's AoI.

The monthly reporting rate for NSW as a whole is at a maximum in August (Cooper *et al.* 2014), *i.e.* two months earlier than in COG's AoI. For NSW the majority of records comes

from the warmer areas to the west of the Great Divide, so the increase in August may coincide with an earlier start of the breeding season than in Canberra (see Sect. 3.5.).

Table 2. Seasonal distribution of Average, Maximum and Total number of Banded Lapwings in COG's AoI.

Months	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Average. no. birds	3.6	4.6	7.1	14.4	12.6	12.6	16.7	10.1	7.3	16.2	8.0	6.5
Max. no. birds	11	38	82	156	105	96	158	32	25	20	18	17
Total no. birds	71	182	332	935	670	615	503	152	95	65	56	78

Movements of Banded Lapwings are poorly known, but rainfall and food are the main drivers (Marchant and Higgins 1993). Large-scale seasonal movement is not apparent, but seasonal patterns of occurrence have been described for some regions, possibly linked to rainfall patterns (Marchant and Higgins 1993). The records from COG's AoI clearly show movement into the area by August and an exodus by February (Table 2).

It is notable that larger groups at Lake Bathurst do not stay long and seem to either move on or disperse from the lake over the wider landscape. For example, the second highest number at the lake so far consisted of 139 birds on 1 Oct 2020; it had grown to 156 birds by 28 Oct, but on 25 Nov only 7 were encountered (Lenz 2021). The highest number was 158 birds on 1 Jan 2012 (Lenz). It seems that Lake Bathurst is an important stopover site for birds moving through the region, notably with one record of high numbers in spring, the other towards the end of the breeding season. These observations show that significant movements occur, but do not explain the underlying causes and patterns.

3.4. Long-term trend

The annual reporting rate (% of all records) indicates variable, relatively low values from 1981 to 2008 (from 0 to 4.0). From 2009 onwards the reporting rate increased and stayed overall higher than in the preceding 30 years, with a maximum of 7.8 in 2012 (Fig. 5).

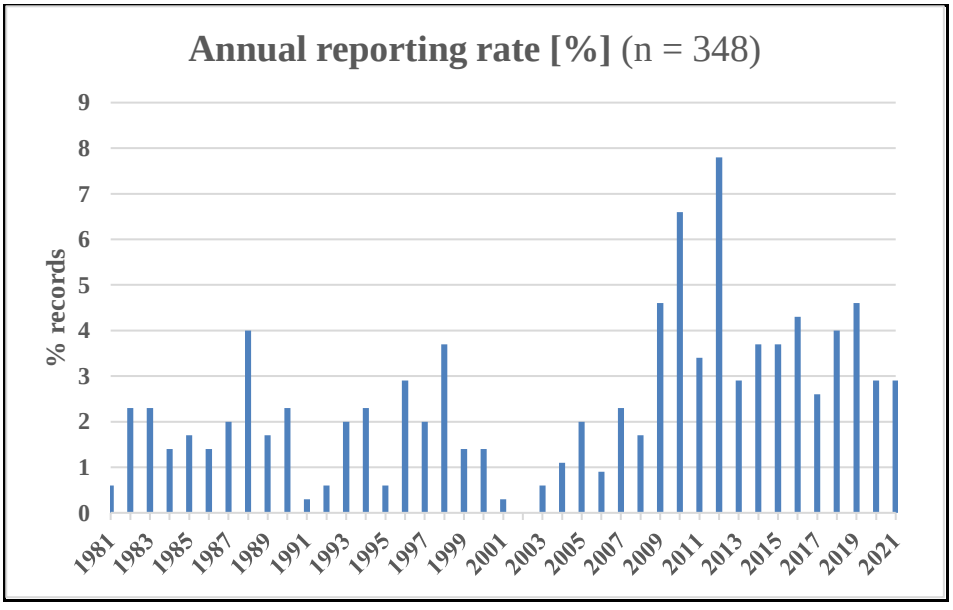

Figure 5. Annual reporting rate for the Banded Lapwing in COG's AoI.

Until 2009, most records originated from Lake Bathurst, with only a limited number of records from other sites. As the graph depicting the annual number of records (Fig. 6) indicates, the total number of records is almost identical to the number of records from Lake Bathurst. The situation changes from 2009 onwards, with a notable increase in records from other parts of COG's AoI. This change is a real one since the new areas where Banded Lapwing were sighted are ones that were visited by birdwatchers on a regular basis before Banded Lapwings were recorded there (*e.g.* locations such as Mulligans Flat; surveys in and around the ACT during the national and ACT Atlas projects (Blakers *et al.* 1984; Taylor and Canberra Ornithologists Group 1992; Barret *et al.* 2003).

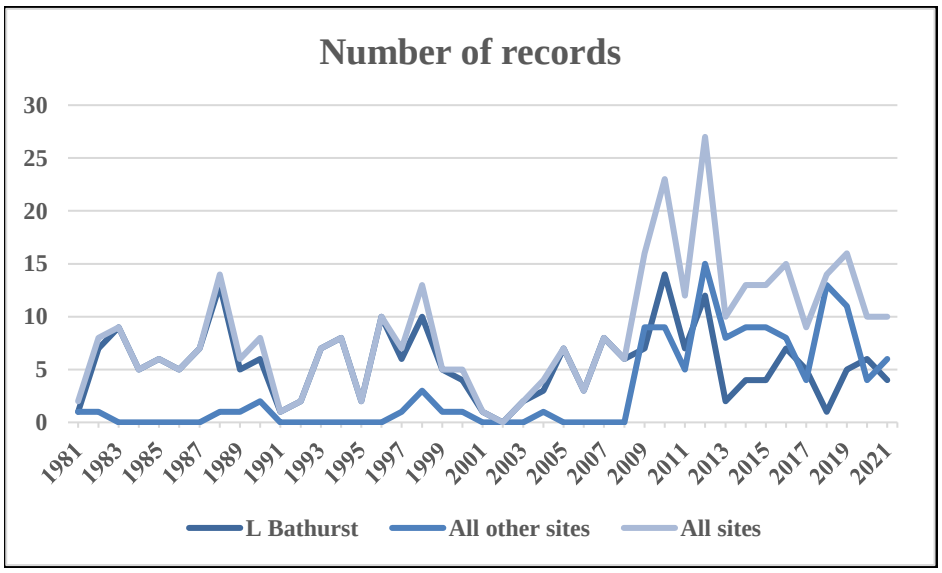

Figure 6. The number of Banded Lapwing records for Lake Bathurst, all other sites in COG's AoI and for all sites combined.

The pattern of the annual reporting rate in COG's AoI, a very small part of NSW, is very different from that of NSW as a whole. In NSW the reporting rate shows a steady linear decline from 1988 to 2006, the available period of data (Cooper *et al.* 2014). It is probably problematic to compare events in a small section of NSW with those in the state as a whole. In the same period, values are quite low in COG's AoI, but increase in the following years. However, that increase seems to be largely due to movements of birds triggered by large-scale weather events, notably drought (see below).

Another way of looking at the local Banded Lapwing records is to identify the number of months per year in which the species has been recorded in COG's AoI (Fig. 7). This also indicates a very dynamic situation. Years with a more persistent presence, *i.e.* with records for six months or more, are for Lake Bathurst 1983, 1985, 1987-1988, 1990, 1994 and 1996, 2007 and 2009-2012, and for all other sites 2015 and 2018-2019. In other years the species is a much rarer sight; in 2002 it was not recorded at all from Lake Bathurst/The Morass.

These results indicate significant, highly variable movement of Banded Lapwings through our area, certainly to a greater extent than is generally assumed (Marchant and Higgins 1993). Perhaps only a longer data series such as the one for our region can reveal this dynamic.

Movement by Banded Lapwing is assumed to be linked to rainfall patterns. For example, during inland droughts birds tend to move towards the coast (Marchant and Higgins 1993).

Looking at the rainfall records from Lake Bathurst (Bureau of Meteorology 2022a; Mark Quinlan, pers. communication) for years with a high presence of Banded Lapwings, it is evident that long presence and high rainfall match for some years (1984, 1987/88, 1990, 1996, 2010, 2012), but for just as many (1983, 1994,1997, 2009, 2015, 2019, 2020) a longer presence of Lapwings occurred when rainfall was low or average (Fig. 8).

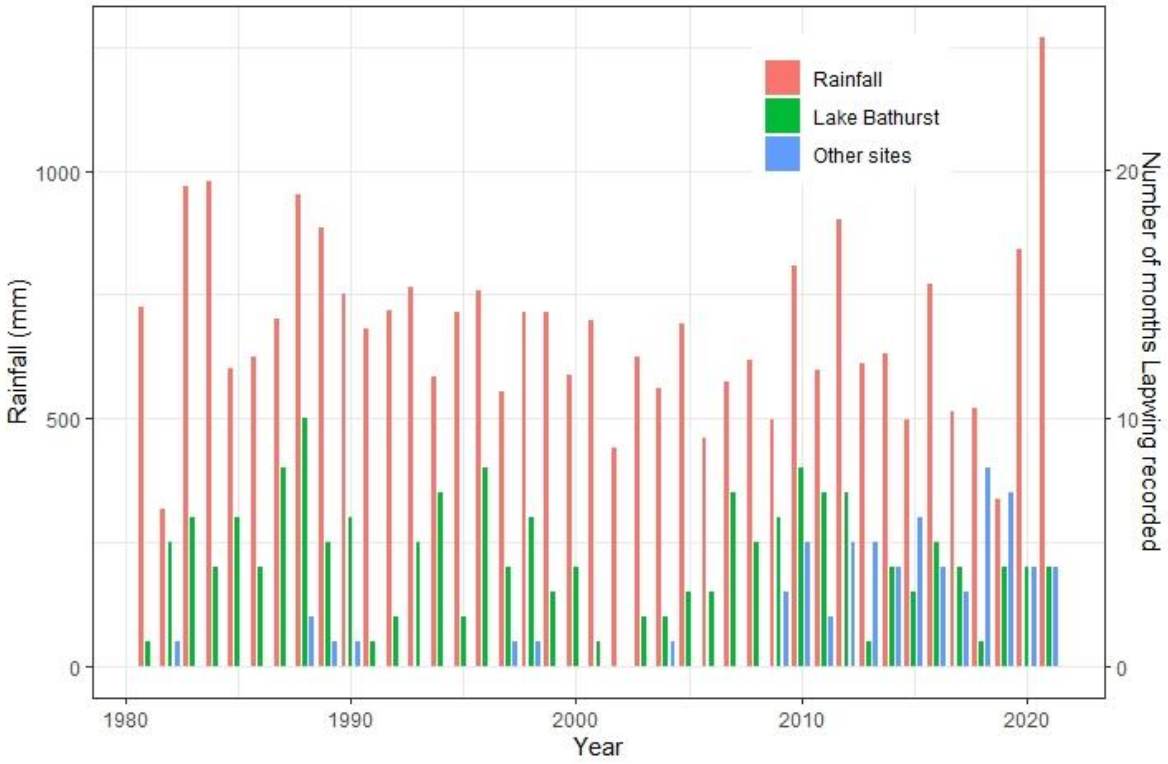

Figure 7. Rainfall for Lake Bathurst and the number of months per year with Banded Lapwing records for Lake Bathurst and all other sites.

No doubt, local conditions will influence whether Banded Lapwings stay in our region or move on, especially at Lake Bathurst. However, ultimately large-scale weather patterns will determine whether or not they migrate in the first place, towards the East from inland during drought, and back towards the inland after good rainfall.

The Millennium Drought followed by two years of La Niña would have been just such major weather patterns with an influence on Banded Lapwing movement.

> 'From late 1996 to mid-2010, much of southern Australia … experienced a prolonged period of dry conditions, known as the Millennium Drought [Fig. 8]… The drought conditions were particularly severe in the more densely populated southeast and southwest, and severely affected the Murray-Darling Basin and virtually all of the southern cropping zones.' (Bureau of Meteorology 2015).

Much of the breeding distribution range of the Banded Lapwing would also have been impacted by the drought (compare Figs. 1 and 8). It is likely that the appearance of Banded Lapwings at several areas in COG's AoI before 2009 was linked to eastward movement from drought areas into and through our area.

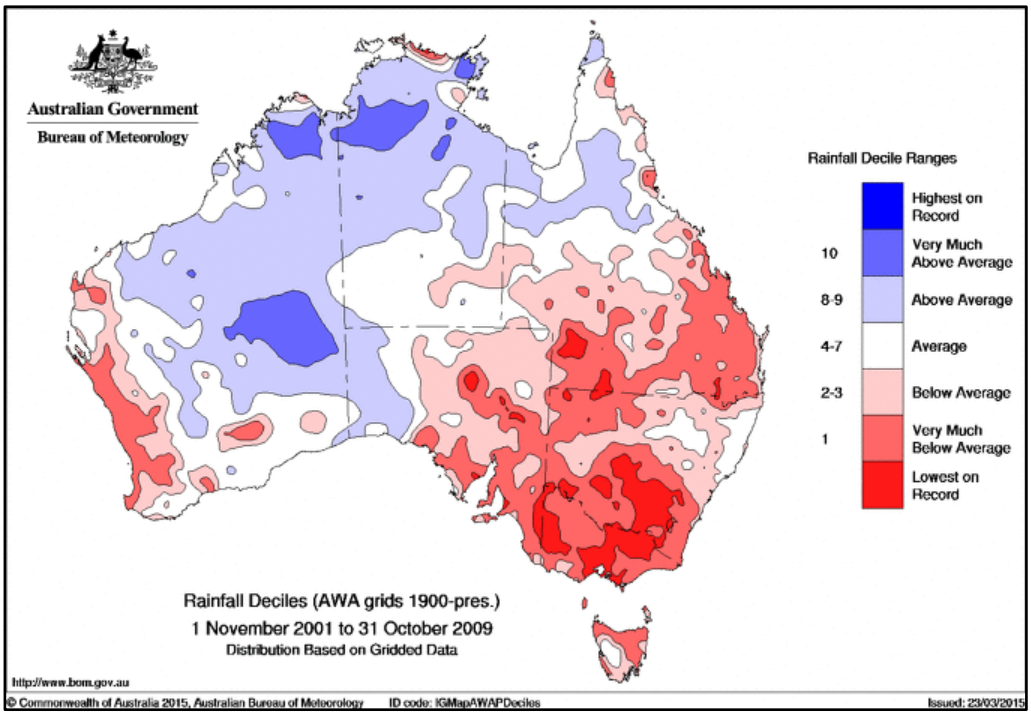

Figure 8. Rainfall deciles at the peak of the Millennium Drought (2001-2009), showing below average to record-low rainfall across much of southwest and southeast Australia, extending to cover much of eastern Australia at the peak (Bureau of Meteorology 2015).

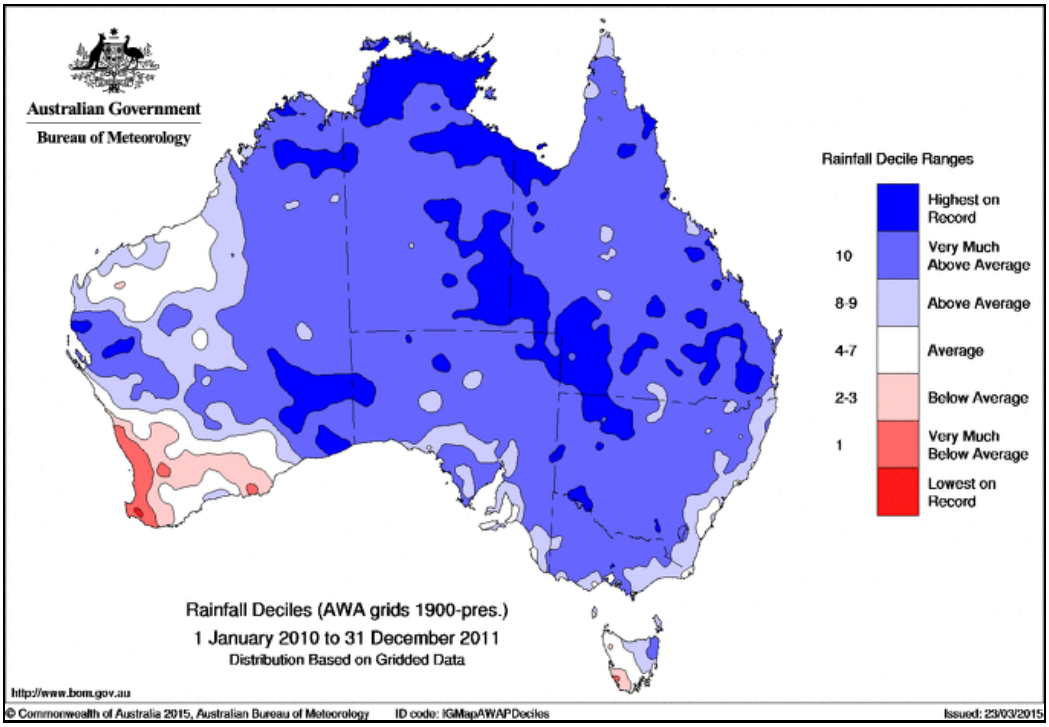

Figure 9. Australian rainfall deciles during the two whole years affected by the two consecutive La Niña events of 2010/11 and 2011/12 (Bureau of Meteorology 2015).

‘2010 and 2011 were dominated by La Niña conditions and heavy rainfall for most areas except the far southwest [Fig. 9]. The rainfall was particularly heavy during summer,

> with large areas experiencing record or near record rainfall. This rainfall was sufficient to give Australia its wettest two year period on record … (2010 to 2011) … and effectively ended the extremely dry hydrological conditions that were a signature of the Millennium Drought' [Fig. 9] (Bureau of Meteorology 2015).

The La Niña rain would have triggered return movement by Banded Lapwings to inland areas.

3.5. Breeding

Between 1981 to 2021 breeding was recorded 40 times in COG's AoI. Breeding was restricted to the period August to March with a maximum in September (10 records). The species rarely breeds after January (Fig. 11).

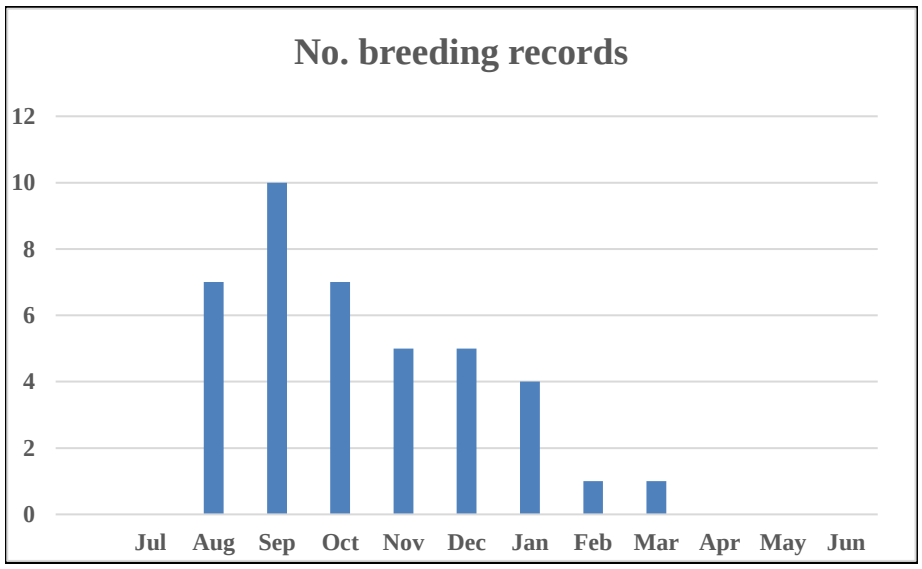

Figure 11. Seasonal distribution of the 40 breeding records for the Banded Lapwing in COG's AoI.

Table 3. Number and (percentage) of breeding records from a total of 40 records for main sites in COG's AoI.

Lake Bathurst	Lake George	Hoskinstown	Mulligans Flat	Other sites*
18	2	10	6	4
(45)	(5)	(25)	(17.5)	(7.5)

*Adaminaby, Canberra Airport, Goulburn, Gundaroo.

Most records (Table 3) are from Lake Bathurst and the Hoskinstown area (Butterfield 2015, 2016).

The distribution of breeding records across the years shows an interesting pattern (Fig. 12). Breeding was a rare event for the period from 1981 to 2006, with just 6 records (mainly at Lake Bathurst). The other 34 records were concentrated between 2007 and 2019, both at Lake Bathurst (14x) and a number of other sites (20x).

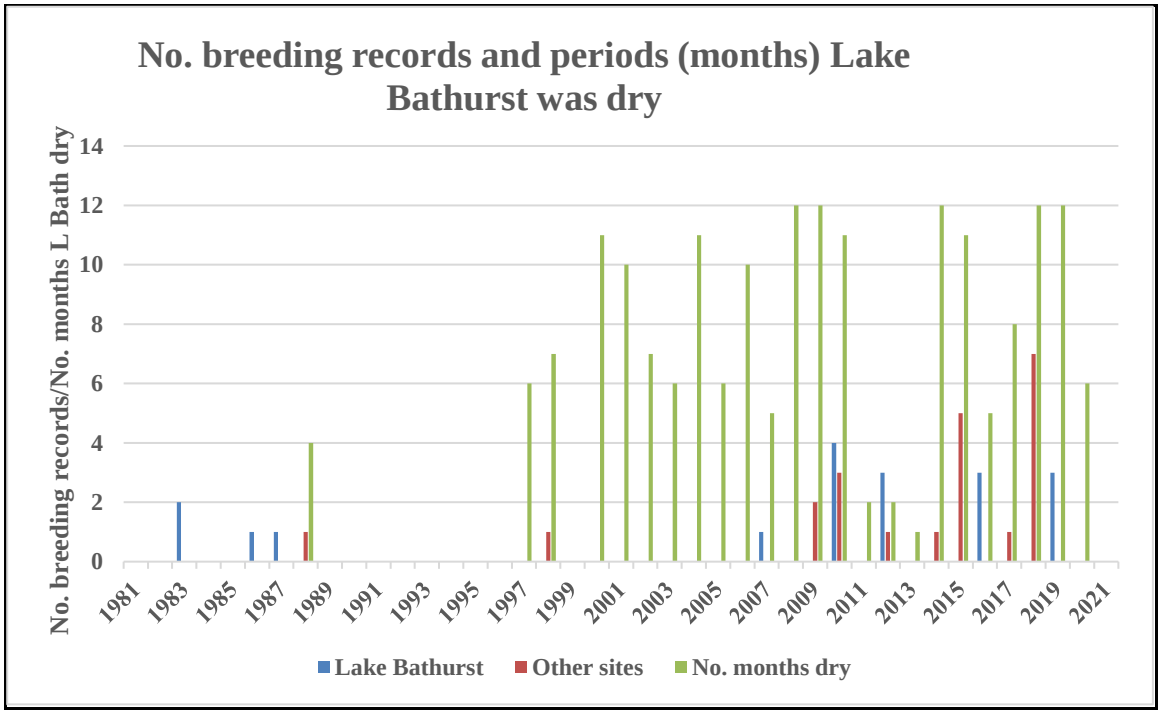

Figure 10. The number of breeding records for Lake Bathurst and other sites and the periods (no. months) when Lake Bathurst was dry.

3.5.1. Pattern of breeding at Lake Bathurst/Morass

In the early years of the surveys (1983 to 1987) breeding was reported four times at Lake Bathurst/Morass without information on the breeding habitat. Then over a period of 25 years (1988 to 2006) no breeding was observed, and in the following 13 years (2007-2019) 14 times (Fig. 10).

It is possible that over the 25-year period when no breeding was recorded on survey days, some breeding events may have gone unnoticed, especially if they failed at an early stage. However, it is more likely that grazing by sheep, and in several parts of the area also by cattle, may have deterred the lapwings from breeding, although grazed paddocks may provide suitable conditions for foraging. Further, the gradual but steady spread of dense stands of the exotic weed Serrated Tussock (*Nasella trichotoma*) across the landscape not under water (see Lenz 2014) has rendered large tracts of land unsuitable for breeding (and for livestock). Only in some areas of the wetland system is Serrated Tussock actively managed, so that livestock (mainly cattle) grazing is not impeded.

It is notable that Lapwing breeding from 2007 onwards was on more or less bare dry lake bed (main lake and The Morass). During the earlier period of quite dry conditions at Lake Bathurst, from 1997 to 2006 (see Fig. 12), livestock still had access to the lake bed, and initially, grass growth was better on the lake bed than on surrounding land. But in the following years without livestock on the dry lakes Banded Lapwings could breed unimpeded.

4. Conclusions

The review of 40 years (1981 to 1921) of Banded Lapwing records for COG's AoI revealed that the species is a regular visitor to Lake Bathurst/The Morass, and a more irregular visitor to other areas (see also *e.g.* Butterfield 2016). The species may use elements of the

agricultural landscape more opportunistically, both for foraging and breeding, than is generally thought, although changing land use from one season to the next may affect the suitability of many sites. The periods Lapwings stay in our area vary greatly between years. Overall, data indicate significant movement of birds through our area, both by highly variable numbers and the time they may stay. Large-scale weather patterns, such as drought *versus* periods of rainfall, are the most likely triggers for such movements.

Patterns of decline reported for NSW as a whole (Cooper *et al.* 2014) are not necessarily reflected in COG's AoI. It is possible that having Lake Bathurst within COG's AoI, an area with a very regular presence of the species, may give a more positive picture of the status of the species. It is probably also problematic to compare events in a small section of NSW with those in the state as a whole (but see above Section 3.5 Long-term trend). Our data series, being longer than that for the NSW Atlas, provides added perspectives, notably on movement of birds through our area in relation to large-scale weather patterns.

The breeding observations indicate long periods without any records. At Lake Bathurst at least, grazing by livestock and the spread of the invasive Serrated Tussock may have prevented breeding in many years. During the prolonged Millennium drought, dry lake bed became available, enabling the species to breed, further aided by no grazing pressure from livestock. During the drought period there was a notable influx of Banded Lapwings, and the species also bred at several other sites in COG's AoI.

The status of the Banded Lapwing for COG's AoI based on the records from 1981 to 2021 can be described as 'irregular to locally common breeding visitor'.

Acknowledgements

The Canberra Ornithologists Group granted access to the Banded Lapwings records held in its database, making this review possible. This manuscript has benefitted from comments by Kevin Windle, Kim Farley and A.O. Nicholls. I am grateful for their input. I also thank A.O. Nicholls for preparing the graph in Figure 7. Alison Rowell provided additional Banded Lapwing data and Mark Quinlan (Bundong, Lake Bathurst) gave rainfall records for the lake.

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PILOTBIRDS (*PYCNOPTILUS FLOCCOSUS*) IN THE ACT AND COG'S AOI. RARE? YES. HARD TO FIND? NOT SO MUCH.

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Abstract. Pycnoptilus floccosus, *Pilotbird, is found in the Australian Capital Territory (ACT) and surrounding areas of NSW at altitudes above 600 metres. Nearly 40 years of data compiled by the Canberra Ornithologists Group (COG) indicate that the species is rare. However, Pilotbird is being reported more often, due to greater observer effort, likely influenced by the use of eBird. Despite its rarity across the ACT and surrounding areas of NSW in COG's Area of Interest (AoI), the species can be fairly readily seen or heard in its wet forest habitat, most easily in spring and summer. In its preferred habitat the Pilotbird can be considered Uncommon to Common. Severe bushfires in 2020 have negatively affected the wet-forest habitat of Pilotbird across south-east Australia. As an aid to identification observers are urged to become familiar with the species' distinctive song since this will be heard more often than the birds are seen.*

1. Introduction

Pilotbird is special wherever it is found, but Canberrans should take pride in the species as, sometime prior to 1851, the type specimen was collected in what was called the Brindabella-Mt Clear Range. This specimen established the taxon and was described by ornithologist John Gould in the Proceedings of the Zoological Society. London in 1851, and then noted in HANZAB Vol. 6 (Higgins and Peter 2002).

The species is found in the ACT in suitable habitat above 600 metres altitude, mainly in the Tidbinbilla and Brindabella Ranges. It also occurs in the COG AoI in the Tallaganda Range in NSW.

In 2022, and a result of the 2019/20 bushfires, Pilotbird was listed as Vulnerable category under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The listing applies across the species' entire range, but does not necessarily reflect all locations in the range. In the ACT, areas of prime habitat escaped burning in 2020, with Pilotbird continuing to be reported from those areas.

In the ACT, COG designates Pilotbird as a rare breeding resident, based on the Reporting Rate (RR) of the species in the ACT and COG AoI. This paper suggests that the species is probably easier to find in its preferred habitat than indicated by records of local sightings, or the Reporting Rate across the ACT and COG AoI.

Data sourced from both COG and eBird were used to provide an overview of the species in the ACT and COG AoI in NSW. In all, 555 records (known by COG as 'sightings') for the period 1986-2021 were consulted. The Appendix describes how the dataset was derived.

2. Distribution

Pilotbird is confined to the south-east corner of Australia, with the species' distribution shown in Fig. 1. There are two races:

- The nominate subspecies *floccosus* is found above 600 metres altitude - from the Brindabella Ranges in the ACT, through the Snowy Mountains in NSW and into parts of the Alpine NP in Victoria. In the ACT it occurs in the upper and lower Cotter River catchments of the Brindabella and Tidbinbilla Ranges. In the COG AoI in NSW it is found in Brindabella NP and Bimberi NR, both of which adjoin Namadgi NP. It is presumed that the Pilotbirds found in the higher altitude parts of the Tallaganda Range east of the ACT are also *floccosus*.
- The other subspecies, *sandlandi,* is found below 600 metres altitude in the Blue Mountains in NSW, down coastal south-eastern NSW into Victoria and across central Victoria as far as the Strathbogie and Dandenong Ranges.

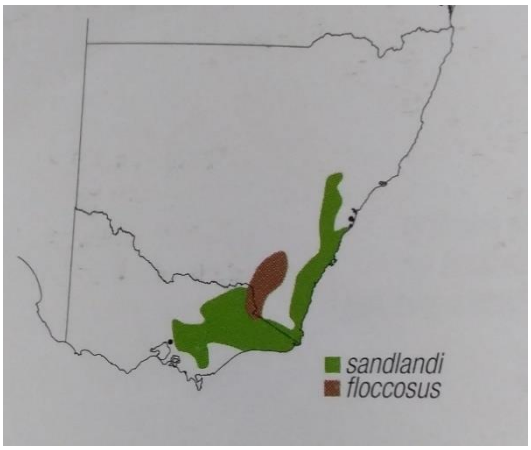


Figure 1. Distribution of Pilotbird in NSW and Victoria (Menkhorst *et al. 2017*).

Figure 2. Prime Pilotbird habitat, New Chums Rd, Namadgi NP, 27 Nov 2022 (*Sue Beatty*).

3. Habitat

In the ACT, Pilotbirds will usually be seen and heard in tall wet forest dominated by Ribbon Gum (*Eucalyptus viminalis*), Brown Barrel (*E. fastigata*), Mountain Gum (*E. dalrympleana* ssp. *dalrympleana*) and/or Alpine Ash (*E. delegatensis* ssp. *delegatensis*) with a dense shrub understorey. This will often be near creeks and drainage lines, or on sheltered eastern or southern slopes. In the ACT, the shrub layer will often include Blanket Leaf (*Bedfordia arborescens*), Silverleaf (*Olearia argophylla*), Blackwood (*Acacia melanoxylon*) and Prickly Currant Bush (*Coprosma quadrifida*), plus tree ferns. The ground layer will include terrestrial ferns (*e.g.* Mother Shield Fern (*Polystichum proliferum*) and *Blechnum* species) (Fig. 2.).

Pilotbirds will sometimes also be seen in areas, adjacent to wet forest, where the vegetation is drier and more open. This can include dense regrowth eucalypt forest (*HANZAB* Vol. 6 p.126).

4. Description

For the everyday birder, the most easily seen features of Pilotbird are that it is a smallish plump bird with warm brown plumage above, and lighter tan-brown or even rufous plumage on the forehead and most of the underparts. A scaly pattern may be noticed on the breast. Observers will also see that the tail is carried half-cocked. The bird will be larger than a White-browed Scrubwren, and with a longer tail. It will be smaller than a Grey Shrike-thrush (*Colluricincla harmonica*).

For those who like more detail, *HANZAB* Vol. 6 describes the taxon as being 17-19 centimetres in length with a wingspan of 22-25 centimetres and an average body weight of 27 grams Males have slightly longer wings and tail than females.

Adult plumage is the same all year round and the same for both sexes. The lores, forehead, face, throat and breast are light tan-brown to rufous with the breast feathers edged darker giving a scalloped appearance. Generally, the upperparts (crown, nape, back, wings and tail) are a warm brown, with the primary and secondary feather margins and the margins of the largest tail feathers (rectrices) a little paler. The rump is rufous or tan. The centre of the belly is off-white, though in the author's experience this pale belly patch is not readily seen in the field. The tail is quite broad, square-tipped, and with the undertail coverts the same light tan-brown to rufous as the forehead, chin and throat. The bill is pointed and greyish black, grading to paler brown at the base of the lower mandible. Again, this gradation of colour in the bill is not readily seen in the field. The gape is pink and the eye red. The legs and feet are dark brown or dark grey. Figs. 3 and 4 show the plumage, typical stance and size of the species.

Juvenile plumage is of a softer looser-looking texture, with the plumage colours generally similar to those of the adult. There will be less or no scalloping on the breast. The tail will be shorter than that of an adult. The bill is grey-black merging to a dull yellow or fleshy colour at the base of the lower mandible. The gape is yellow or whitish, and the eye grey-brown rather than the red of the adult bird. Fig. 5 shows a juvenile bird.

Figure 3. Adult Pilotbird. Lyrebird Trail. Tidbinbilla NR, 5 Jun 2020. (*John Hurrell, Macaulay Library*)

Figure 4. Adult Pilotbird. Mist netting capture. New Chums Rd, Namadgi NP. 22 Feb 2014. (*Mary Mulcahy*).

Figure 5. Juvenile Pilotbird. Warks/Blundells Creek Rds, Namadgi NP, 21 Feb 2015. (*Shorty Westin, Macaulay Library*).

5. Behaviours

5.1 General

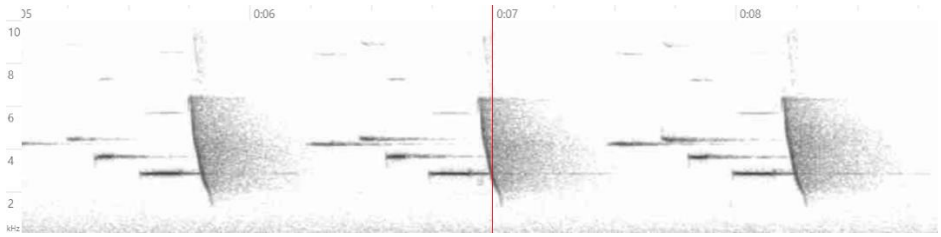
Pilotbirds are sedentary, with *HANZAB* (Vol. 6, p. 127) noting no apparent large-scale movements. They are shy, but can also be curious. In this author's experience, when flushed they fly only a short distance through the undergrowth before landing and moving away on foot. They may re-emerge and sometimes venture into the open to resume foraging if the observer waits quietly nearby.

Pilotbirds in the ACT and the COG AoI are reported singly, in twos and sometimes in small parties of up to five. At Sherbrooke Forest in Victoria they were found to occupy permanent, well-defined territories of 1.0-1.5 hectares (Zwart 1973, quoted in *HANZAB* Vol. 6, p.128). An interesting side note is the common name, Pilotbird. This refers to the idea that Superb Lyrebirds follow (*i.e.* are piloted by) Pilotbirds across the forest floor. In reality, the reverse

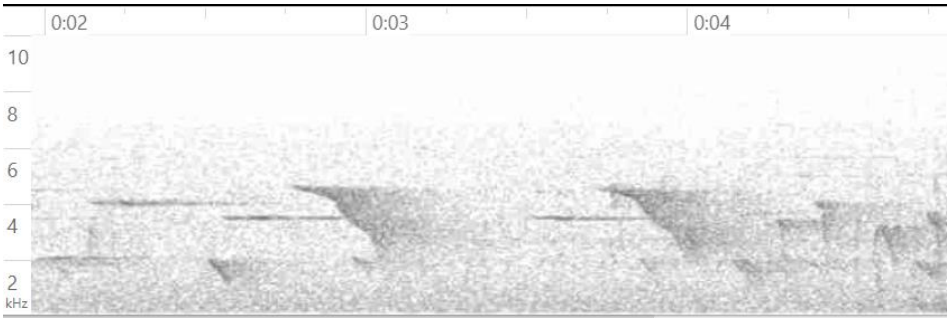
is true as Pilotbirds will forage where other ground-dwelling bird species have previously scraped away the surface ground litter (*HANZAB* Vol. 6, p. 127).

5.2. Voice

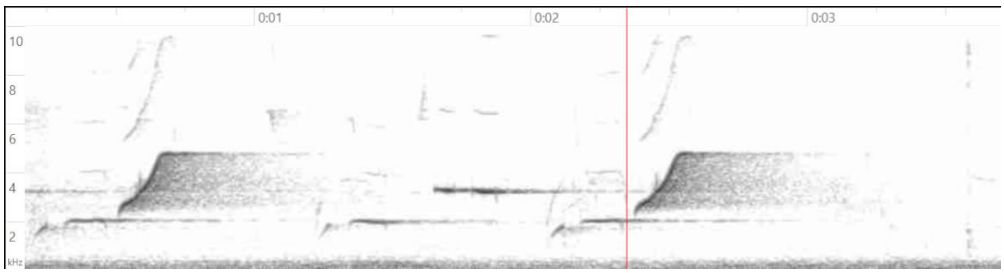
The song of the Pilotbird is a beautiful one - being rich, full and loud enough to carry for 200 metres or more through the forest. They sing more frequently in spring and early summer and in the author's experience multiple birds can be heard fairly easily in the right habitat at those seasons. They call less often on hot days in the summer and this author has heard the same individual call every 15-20 minutes during a hot afternoon. Pilotbirds are less vocal in winter, with *HANZAB* noting that their winter calls are quieter than the spring and summer calls.



Bimberi NR, NSW. Recorded 20 Dec 2020 by Z. Muller (*Macaulay Library*).
Click on the link for the full recording https://macaulaylibrary.org/asset/289937121



Two Sticks Rd, Namadgi NP, ACT. Recorded 29 Nov 2021 by B. Hawkins (*Macaulay Library*). Click on the link for the full recording https://macaulaylibrary.org/asset/392422291



Warks/Blundell's Creek Rds, Namadgi NP, ACT. Recorded 14 Jan 2019 by Anon. eBirder (*Macaulay Library*). Click on the link for the full recording https://macaulaylibrary.org/asset/135684181

Figure 6. Spectrograms of Pilotbird song.

Pilotbirds call from the ground or very close to the ground, often from dense shrubbery. However, male birds are also reported to call during the breeding season from tree branches up to 3 metres above the ground (*HANZAB* Vol. 6, p.129). There are several locally taken photos in *eBird* of what is probably this behaviour.

The following outline of Pilotbird songs and calls is guided by *HANZAB* but reflects the author's and other local birder's experiences as reported in eBird and to COG.

5.2.1. Adult song

Pilotbird song varies from three to five syllables and is described in field guides as "guinea-a-week". This rather prosaic phrase does not convey either the sweetness or the variety of the species' song. The spectrograms at Figure 6, all recorded locally, show some of the variety, though not the beauty, of Pilotbird song.

5.2.2. Other calls

The **alarm call** is described in *HANZAB* as a three syllable "witwit-wong" through this call is not often heard, at least not in the author's experience.

Contact calls include "wit-tui" though the birds will resort to their multi-syllable song if the distance is too great for the contact call to be heard. The author has likely experienced this, having heard multiple birds vocalising in call and response 100-150 metres apart.

Juvenile calls include a shriek if the nest is disturbed and a soft wheezing call when following parents.

5.3. Breeding

Breeding is not commonly recorded, either in the ACT or in the species' broader range in south-eastern Australia. This was noted for the ACT by Belten back in 1962 (and likely by other writers) and also by McComas Taylor in the ACT *Atlas* (Taylor and COG 1992). However, by 2002 *HANZAB* was able to report that breeding was "moderately well known" (Vol. 6, p. 129).

Pilotbirds nest on or near the ground, with the nest well hidden among dense vegetation. Nests are domed, with the entrance on the side. Some nests are near creeks and others hundreds of metres away from water. Birds are thought to be faithful to their immediate nesting area.

Two eggs are laid, with the female doing all the incubation though the male stays nearby. See *HANZAB* (Vol. 6, pp 129-132) for detailed information about all aspects of breeding.

Would-be observers of breeding activity should take care if seeing one bird feeding another, since *HANZAB* notes that males are known to feed females. Observers should look for the yellow gape of the juvenile, its shorter tail and untidy plumage when observing one Pilotbird feeding another. A juvenile is shown in Fig. 5.

5.3.1 Local breeding records

All **ten** breeding records for the period 1986-2021 are from the ACT, with no breeding reported in the COG AoI (Table 1). Three of the records are COG-only records and the other seven were first, or were only, reported in eBird.

Breeding has been reported in September, October, January, February and March. This is of interest because *HANZAB* reports that Pilotbirds breed between August and December. Our local records suggest that breeding could occur later than December in the ACT. *HANZAB* also notes that Pilotbirds can produce multiple broods in a season, with the period between fledging to independence being around two months. Therefore, it is possible that the

February 2017 breeding record for Warks Rd describes a juvenile from a December hatching. However, the March 2021 record is much less likely to describe a December fledging, and indicates an offspring from either a second or later brood.

Also of interest is the breeding record of 6 February 2016 that appears to tie in with two other eBird Checklists for the same location. Sixteen days earlier, Peter Milburn reported two Pilotbirds foraging together and interacting, with a brief display. Twenty-four days later, on 1 March, Christine D reported four Pilotbirds one of which "was possibly an immature". This suggests a successful breeding event.

Table 1. Pilotbird breeding records 1986-2021 (COG/eBird dataset.

Date	Location*	Breeding codes, Field notes	Observer
14/09/88	Corin Rd/Kangaroo Creek	COG record coded 'Nest Building'	E. Tulip
18/02/96	Bendora Dam, beginning of the walking track below dam	COG record coded 'Dependent Young'	J. Leonard
24/01/11	Blundells Creek Rd, Warks Road, Namadgi NP	COG coded 'Breeding Record'. eBird record coded 'FY (Feeding Young)' and coded one Juvenile and one Adult.	A. Smith
26/10/13	New Chums Rd**	COG record coded 'Breeding Record'	J. Brooke
21/02/15	Namadgi NP--Warks/Blundells Creek Roads	eBird record coded 'FL (Recently Fledged Young)'. No field note but this bird with yellow gape and short tail is shown at Figure 5 above.	S. Westin
06/02/16	Tidbinbilla NR--Lyrebird Trail	eBird coded 'CF (Carrying Food)'. Field note: "Carrying food repeatedly to nest. Nest under sticks and dry grass, sheltered by the edge of the walking path. We kept our distance."	S. Read, L. Read, J. Casburn, G. Chapman
03/01/17	Namadgi NP--Warks/Blundells Creek Roads	COG record coded 'Breeding Record' eBird record without a breeding code but a field note describes young bird with an obvious gape.	A. Smith
15/02/17	Warks Rd at bend at top**	COG record coded 'Dependent Young'. eBird-coded 'FL (Recently Fledged Young)'. Field note: "[We] first thought it was a dark rufous brown Scrubwren but a bit larger. [Bird with a] very short tail, prominent yellow gape. Scuttled away on ground. Then saw adult similar but with full tail held cocked".	COG Outing
19/01/21	Namadgi NP--Warks/Blundells Creek Roads	eBird-coded 'CF (Carrying Food)'.	S. Holliday
08/03/21	Tidbinbilla NR--Lyrebird Trail	eBird-coded 'FY (Feeding Young)'. Field note: "Young bird following and being fed by an adult".	S. Holliday

*Location names shown exactly as cited in the original record.
**Location in Namadgi NP.

6. Where are Pilotbirds seen or heard in the ACT and COG AoI?

The blue pins on the map at Fig. 7 show the 86 locations in the ACT and COG AoI where Pilotbird was reported between January 1986 and December 2021. This distribution accords closely with the distribution map shown in the ACT *Atlas* which covered the period September 1986 to August 1989.

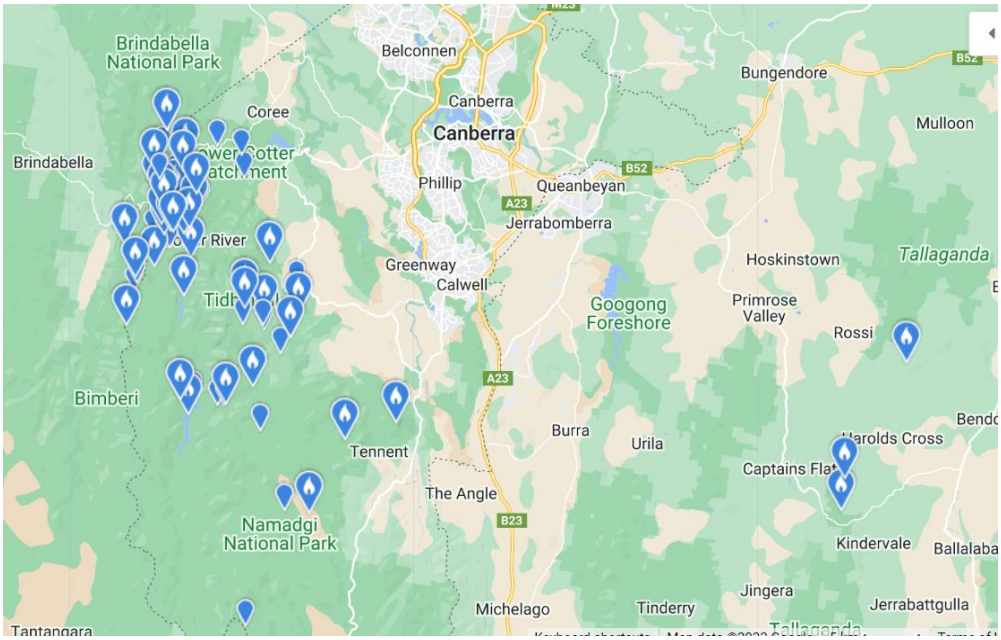


Figure 7. Locations where Pilotbird reported ACT and COG's AoI, 1986-2021 (eBird).

Between 1986 and 2021, most records for the ACT and COG AoI have come from Namadgi NP and Tidbinbilla NR. This is not unexpected, since these protected areas provide the habitat favoured by the species and also easily accessible for birders.

Pilotbird is also recorded in Brindabella NP and Bimberi NR in NSW, which directly adjoin Namadgi NP. However, there are far fewer records in these NSW reserves. This almost certainly reflects a lack of birder activity rather than a lack of Pilotbirds. The rugged nature of Brindabella NP and Bimberi NR and the relative lack of road access may explain this.

Further afield, Pilotbird is found in the COG AoI in the higher forests of the Tallaganda Range east of the ACT, though parts of its range in the Tallaganda Range were logged in the last five years and burnt by bushfires in 2020.

Of the 86 locations shown in Figure 7, 81 have less than five Pilotbird records. In contrast, the top five locations provide 42.6% of the total of 555 Pilotbird records for the ACT and COG AoI for 1986-2021. These top locations are:

1. Namadgi NP--Warks/Blundells Creek Roads
2. Lyrebird Trail, Tidbinbilla NR
3. Bendora Road (upper)
4. Bendora Dam
5. Corin Dam

7. When are Pilotbirds seen or heard in the ACT and COG's AoI?

Pilotbirds are reported in all seasons of the year, but most records are for spring and summer (Fig. 8).

The editor of the *Annual Bird Report* (*ABR*) speculated in 2020 that the preponderance of records for spring and summer (for all species, not just Pilotbird) suggests that birders go out less in winter and more in the warmer months (Fennell 2020, p.11). The same *ABR* also pointed out that the annual COG Blitz in late October may artificially inflate the number of spring records. This author adds that the propensity of some birders (herself included) to chase year lists could be inflating the number of January and February records. However, with regard to Pilotbirds at least, *HANZAB* (Vol. 6, p. 129) states that Pilotbirds are more likely to call in spring and summer, so perhaps the pattern of records across the seasons reflects the changing detectability of the species. More observer effort expended in the cooler months could help inform this matter.

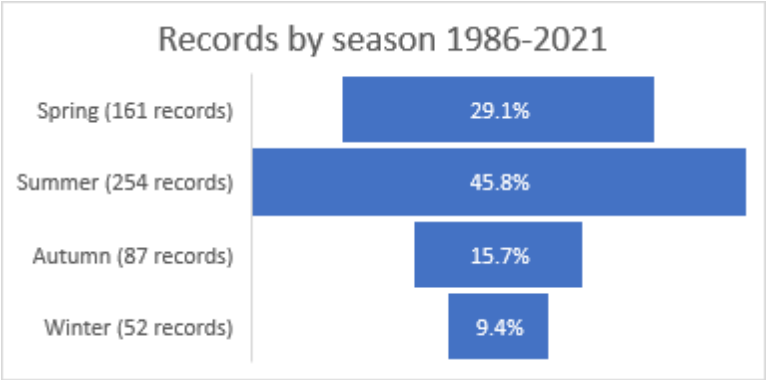


Figure 8. Records by season, ACT and COG AoI – 1986-2021 (COG/eBird dataset).

8. How is rarity assessed, and are Pilotbirds rare in the ACT and COG AoI?

Rarity is one of five statuses assigned to a species by COG (among other authorities), and is directly related to the species' Reporting Rate (RR). RR is calculated as the number of Checklists in which a species was recorded, divided by the total number of Checklists submitted for that same area and period of time. RR is expressed as a percentage.

Table 2: Translation between Reporting Rate and status. (ACT *Atlas* 1992).

Reporting Rate	Status
>60%	Very common
21-60%	Common
1-20%	Uncommon
0.01-1.0%	Rare
<0.01%	Very rare

Based on the RR, a species' status can range from 'Very common' to 'Very rare', as shown in Table 2. These statuses and the RRs associated with them were used in the ACT *Atlas* (1992) and continue to be used in the *ABRs*.

Interestingly, neither the *ABR*s nor Bird Info on the COG website explain RR or the statuses based upon it. This is not helpful to general readers of the *ABR* or to users of the COG website. While the information is in the ACT *Atlas*, most readers will not know to seek it there. The information may be in other COG publications or elsewhere on the website, but if so, this author didn't find it – the point being that such information should be readily available.

Table 3 shows the RR for Pilotbird for the ACT and COG's AoI for the decade years ending 30 June 2021, and the Checklist data from which this was calculated (the annual number of Checklists that include Pilotbird, and the total number of Checklists for that year). This information was sourced from the *ABRs* up to bird year 2018/19. Information for the final two years was not available from COG and was sourced from *eBird* (See the Appendix).

It is clear from the RRs in Table 3 that Pilotbird is correctly described as a rare species in the ACT and COG AoI. There is variation in RR from year to year, but the RR averages at 0.26% over the ten years. The *ABR* for the 2018/19 year reported that the RR was "remaining steady at a low level" (COG 2020, p. 6). It was not stated what this level was, but it can be calculated as 0.16% from data in that *ABR*. The *ABR* for the 2016/17 year (COG 2018) gives the 30-year RR for Pilotbird as 0.40%.

Table 3. Pilotbird Reporting Rates - ACT and COG's AoI. (*ABR*s and eBird).

Year	No Checklists with Pilotbird records (Sightings)	Total no Checklists (Sheets)	Reporting Rate	Status
2011/12	9	3,865	0.23%	Rare
2012/13	13	4,500	0.29%	Rare
2013/14	33	4,709	0.70%	Rare
2014/15	18	7,857	0.20%	Rare
2015/16	18	11,621	0.15%	Rare
2016/17	18	14,153	0.13%	Rare
2017/18	27	12,113	0.22%	Rare
2018/19	26	16,092	0.16%	Rare
2019/20*	21	16, 246	0.13%	Rare
2020/21*	70	18,087	0.39%	Rare

* Data for 2019/20 and 2020/21 were not available from COG so were sourced from eBird – see Appendix.

9. Pilotbirds are rare, but are they hard to find?

The Reporting Rates above demonstrate that Pilotbird is rare in the ACT and COG's AoI. Quite apart from rarity, they are also elusive, slipping away into dense vegetation often before an observer has viewed them. They do not often take to flight, so would-be observers are not alerted by wing whirr or a flight call.

Despite rarity and elusive habits, Pilotbirds are fairly readily found in their wet forest habitat in the ACT and COG's AoI. This is demonstrated by the much higher RR for the species in their top five local locations (5-32%: Table 4) compared to the overall RR for the ACT and COG's AoI (Table 3). Only eBird data was used for this as the COG data were not available.

Table 4. Top five locations. All observers, 1 July 2011-30 June 2021 (eBird).

Location	Total no. of records (sightings). All observers	Total no. of Checklists (sheets). All observers	Reporting Rate. All observers
1. Namadgi NP-Warks/Blundells Creek Roads *	65	378	17%
2. Lyrebird Trail, Tidbinbilla NR	63	206	30%
3. Bendora Road (upper)	17	49	32%
4. Corin Dam	4	23	17%
5. Bendora Dam	1	18	5%

* This location name refers only to the hotspot centred on the intersection of Warks and Blundell's Creek Rds and not the whole length of these roads.

Table 5. Top five locations, the author's data, 1 July 2011-30 June 202. (eBird).

Location	Total no. of records (sightings). The author	Total no. of checklists (Sheets). The author	Reporting Rate. The author
1. Namadgi NP-Warks/Blundells Creek Roads	19	54	35%
2. Lyrebird Trail, Tidbinbilla NR	2	3	66%
3. Bendora Road (upper)	4	4	100%
4. Corin Dam	5	5	100%
5. Bendora Dam	0	1	0%

These data therefore suggest that the Pilotbird can be considered Uncommon to Common in its preferred habitat, using the status definitions of Table 2.

Birders can increase the likelihood of encountering Pilotbirds by learning to recognise their calls and song. As discussed in Section 5, the calls are loud and distinctive. Once their calls are known, multiple birds can be identified quite readily in the right habitat, especially in spring and summer. The author's personal Pilotbird records for the same top five locations are shown in Table 5 and show the difference that a good knowledge of Pilotbird calls will make to a birder's personal Reporting Rate.

10. Impact of bushfires on Pilotbirds in the ACT and COG's AoI

In March 2022, Pilotbird was listed as Vulnerable under the Commonwealth EPBC Act. The related C*onservation Advice* stated that the main factor making the species eligible for the listing was the likely population decline caused by the 2019/2020 bushfires (Department of Agriculture, Water and the Environment, 2022 p. 1).

The listing applies across the species' entire range, but does not necessarily reflect all locations in that range. In the ACT, areas of prime habitat escaped burning in 2020, with Pilotbird continuing to be reported from multiple locations. Indeed, a year after the fires in 2020/21, the RR for the overall ACT and COG AoI was higher (at 0.39%) than for every year in the previous decade, except 2017.

This likely reflects the pattern of the fire destruction, with locations such as Blundell's Creek Road and the Lyrebird Trail escaping the fires in 2020 (though both were burnt in 2003). Recovery rates after the fires would be dependent on the level of fire intensity and the patchiness of that intensity, which in turn would determine how many local populations survive the fire and go on to recolonise regenerating areas (Read, S.M. *pers. comm*. 2022). Pilotbird is also known to make active use of eucalypt forest regrowth (*HANZAB* Vol 6 p. 126) which would assist recolonisation.

Also of interest is literature reporting the time taken for Pilotbird populations to recover after fire. In severely burnt Mountain Ash (*Eucalyptus regnans*) forest, it was four years before Pilotbirds returned to long-term monitoring plots (Lindenmayer *et al*. 2018), and in the Brindabellas in the 1990s the population was 10% of pre-fire levels in the three years post-fire, and 30% in the subsequent three years (Baker *et al.* 1997).

11. Conclusion

The Pilotbird is a fascinating and charismatic species of our middle-altitude forests despite, or perhaps because, it is heard more often than it is seen. The species is undoubtedly rare in the ACT and COG's AoI, and the 2020 bushfires are predicted to have had a significant effect on their populations throughout their range.

Nevertheless, it is easier to encounter Pilotbirds in suitable habitat than the average birder might assume. Indeed, analysis of Reporting Rates indicates that the species is uncommon to common in its preferred habitat. The species is shy, and can be hard to see in its thickly vegetated habitat, but once the calls are known multiple birds can be detected reasonably readily in the right habitat, especially in spring and summer in the ACT and COG's AoI.

As an aside, the Lewin's Rail is another local species that is designated as rare and is also elusive. It too is probably more numerous in suitable habitat than local records indicate.

Birders are therefore encouraged to become familiar with the varied songs and calls of the Pilotbird and to use this knowledge to help them locate the species in potential forest habitat. Nowadays learning the song is straightforward, as recordings of the song of both races are included on both the Pizzey Knight and the Morecombe field guide apps as well as on eBird and other web resources.

Birders are also encouraged to spend time looking or listening for Pilotbirds in locations with potential habitat - not just in the heavily birded Lyrebird Trail at Tidbinbilla and Warks and Blundells Creek Roads in Namadgi NP.

Further afield, the COG AoI in NSW has only 28 Pilotbird records over the entire 1986-2021 period. This presumably indicates that tall wet forest in areas of the COG AoI are not as accessible by road as Namadgi NP, but perhaps also reflects that records for these locations will not count on a birder's ACT year list! More visits into the AoI would start to address the lack of data for those areas. The Tallaganda Range one hour east of Canberra also has records of Pilotbird but very few birders consistently visit that area. The Tallaganda area also contains other interesting tall forest bird species, so is well worth visiting.

Also useful would be more visits to Pilotbird habitat in autumn and winter, as most records are submitted for spring and summer. While Pilotbirds do call more often and more loudly in spring and summer, they will still call and/or be seen at other seasons.

Lastly, birders should contribute to citizen science by submitting their sightings to COG, eBird or Birdlife Australia. Data collection and reporting is an important contribution birders can make to help inform decision-making in support of the species. As well as the satisfaction of contributing data, birders will also find great enjoyment in their encounters, visual or auditory, with this charming but vulnerable local species.

Acknowledgements

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Appendix. Data sources

Both COG and eBird data were used, with an almost record-by-record comparison of the two files producing a consolidated dataset of 555 records. The original files were:

- **407** COG records (sightings) for Pilotbird. The first record was 15 March 1986 and the last 25 June 2019. The file received from COG in February 2022.
- **445** eBird records (sightings) for Pilotbird. The first record was 12 January 1986 and the last 13 December 2021. The file was received from eBird in January 2022.

There was strong overlap between the two files. This is unsurprising, given the *ABR* reported that 94.4% of COG data for the 2018/19 year were sourced from eBird (Fennell 2020 p. 1). The year before, the *ABR* reported that "most" records in the COG database were submitted by eBird users (Fennell 2019 p. 1). It is known that eBird use in the ACT has further increased since 2020.

Creation of the consolidated dataset required removal of duplicate records and addition of other records. 163 eBird records were added for the period 1 July 2019 to 31 December 2021, along with a small number of records for the decades before 2019 but added since 1 July 2109. As noted above, nearly all COG data are now sourced from eBird. It was therefore considered that any Pilotbird records reported only to COG since 2019 would be so few in number as not to affect the data analysis.

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AN EXAMINATION OF A SUPERB PARROT (*POLYTELIS SWAINSONII*) FLIGHT PATH BETWEEN A WOODLAND BREEDING AREA AND SUBURBAN FORAGING AREAS IN THE AUSTRALIAN CAPITAL TERRITORY

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Abstract. *We report on the routine use of a flight path by Superb Parrots* (Polytelis swainsonii)*. We devised a survey protocol to count parrots using the flight path. That data was used to estimate the timing of key events in the breeding season, and those estimates were directly compared to known breeding season timelines from the northern ACT in 2015-16. We examined the direction of parrot group movements, which indicated parrots were possibly roosting in the suburbs. We comment on the apparent high number of non-breeding parrots, the limited resource of suitable nesting hollows, and assumptions concerning population status. The use of multiple flight paths out of the breeding location was discussed. We found some unusual and unexpected results concerning parrots calling in flight. We comment on flight behaviour and landscape element use. We obtained access to concurrent radio-tracking information from a PhD study, which was used to assess or verify our findings, assumptions and suggestions. We comment on the need for further research.*

1. Introduction

The Superb Parrot (*Polytelis swainsonii*) is a large, slender-tailed, fast-flying parrot. Its range extends across the Riverina and south-west slopes of NSW into northern Victoria and reaches south-east to the ACT. The species is listed as vulnerable under relevant national, state, and ACT legislation. In the ACT region, the species occupies critically endangered box-gum grassy woodlands, which are subject to significant loss or modification.

Historically, the south-eastern extent of the range of the Superb Parrot reached into the north-western part of the ACT. Davey (1997) summarised historic sighting and breeding records. Survey work conducted by Taylor and COG (1992), Martin (1996), and Davey (1997) indicated that its range extended to the Wallaroo area, just outside the ACT's northern border, with low numbers of sightings and no evidence of breeding in Canberra.

The Superb Parrot is considered a migratory species, as individuals routinely leave the ACT area in winter, moving west and north to central NSW (Webster 1988; Webster & Ahern 1992). Records summarised by Davey (1997) clearly showed that the species is absent in winter, arriving in the area in late August to early September, and departing in late January to early February.

Records of the species in suburban Canberra began to increase in the late 1990s, with post-breeding dispersal of parrots into the north-western Belconnen area each December and January. An apparent influx of parrots was observed and documented at the end of the 2005-06 breeding season, with much discussion about the substantial number of individuals, and

the extent to which they were found across Belconnen and into the southern suburbs (Lashko 2006).

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Importantly, the species was suspected to have extended its breeding range southwards, to the Molonglo Valley (C. Davey, pers. comm.). This was discovered somewhat accidentally while research on Brown Treecreepers was being undertaken. Davey (2012) suggested that the parrots started breeding in the central Molonglo Valley area from the 2006-07 breeding season onwards.

Subsequent survey work documented breeding in the Molonglo Valley and in Gungahlin (Davey 2011; Davey 2012). Another extension of breeding range was discovered on the 'Spring Valley' property on the south side of the Molonglo River (Eco Logical Australia 2014). Further extensions of breeding have since been recorded in the northern ACT, with a breeding population at Throsby being studied in detail (Rayner *et al*. 2016; Rayner *et al*. 2017).

Coinciding with the extension of breeding activity was the significant increase in sightings across Canberra. Hotspots were identified, including a significant roost site at North Watson (Mears 2016), and a significant foraging area at the grounds of the Australian Institute of Sport precinct in Bruce.

Clusters of records are dotted around the ACT, particularly in the north. More recently, sightings have increased in the southern suburbs of Canberra, with quite a few records in winter. A detailed account of the increase in Superb Parrot numbers, the broadening of distribution, and possible changes to migratory habits is currently being compiled (A. Overs, in prep.).

1.1. Movements

The Superb Parrot is a highly mobile species. In the Riverina, it breeds in River Red Gums (*Eucalyptus camaldulensis*) along watercourses and flies up to ten kilometres into nearby box woodlands to forage (Webster 1988). This type of movement is less common on the south-west slopes where breeding and foraging both occur in box-gum grassy woodlands.

Rayner *et al*. (2016), radio-tracked the movements of six adult parrots over a 17-day period in November and December 2015. The research team found that they followed very similar pathways of movement and utilised common areas for foraging. However, the report stated that how social behaviour and landscape connectivity contribute to these observed patterns of movement, and the relative importance of each, was unclear (Rayner *et al*. 2016). Foraging locations were predominantly located within the urban boundary, among street trees and urban green space. The longest distance travelled was approximately nine kilometres from Throsby to Kaleen. Superb Parrots moved within and outside reserves, and land tenure did not appear to influence movement patterns. Importantly, the tracked parrots made multiple trips to the North Watson area, where Mears (2016) observed and documented roosting.

1.2. Observations

We suspect that the parrots known to breed in the Molonglo Valley are routinely using flight paths from the valley to Belconnen, to access abundant food sources throughout the broader suburban matrix.

We moved into our home at 2 Mataranka Street, Hawker, in January 2011. From an array of records kept by the author (AO), Superb Parrots were a regular occurrence in the suburb. Conversations on the Canberra Ornithologists Group email chatline reflect their presence in multiple locations in Belconnen including Hawker, Cook, Macquarie, the Belconnen Town Centre, and Bruce.

In recent years, the number of records at our home has increased. We have sometimes observed so many parrots in a single day that we have simply lost count.

To add to the potential numbers, we estimate that we are not recording a significant percentage of individuals or groups of parrots because they are not calling. We have simply by chance observed groups of five to eight male parrots flying silently and very quickly over our home.

Our friends Wendy Whitham and Lloyd Hooper live just 250 metres further along Mataranka Street. They report seeing and hearing Superb Parrots more often in spring-summer (nearly every day) than in winter (once a fortnight), which is similar to our observations at home. However, in contrast, the frequency and numbers recorded are somewhat lower than ours - Lloyd reports typically seeing on average one group of less than ten parrots a day, with flight direction variable (Lloyd Hooper, pers. comm.).

Based on our observations, a quick check of records in the area, and discussions with other birders nearby, we suspect that parrots are routinely crossing the urban fringe along the south-western side of the suburb of Hawker. Our home is in this zone and directly under the flight path. Reconnaissance observations revealed a substantial number of Superb Parrots passing into and out of the suburb of Hawker multiple times a day, between the southern end of Dungowan Street and the corner of the houses near William Hovell Drive, a zone spanning approximately 500 metres.

There are many records and anecdotal reports of parrots in the suburbs of Higgins and Holt, and the Belconnen Golf Course, to the north of the valley. There are also many records in and near The Pinnacle Nature Reserve and Kama Nature Reserve to the east and south, respectively.

Our observations suggested that parrots were rarely flying to The Pinnacle Nature Reserve, instead flying directly into Hawker. Several eBird records show them in the woodlands around the old Weetangera cemetery, on the western side of William Hovell Drive. There are multiple scattered records in the suburbs of Holt and Higgins further to the west. However there is little to suggest a distinct pattern of movement from the valley to those suburbs. One of the observers for this study resides in Higgins, just 800 metres north of the western end of the study site; she has recorded only one Superb Parrot there since 1984 (A. Milton, pers. comm.).

Importantly, Davey (2012) suggested that movements appeared to occur along three flight corridors. The first is between the Pine Ridge homestead and Belconnen Golf Course area, south-east to the central valley. The second is from the central Belconnen area south-west to the central valley. The third is from the eastern Belconnen area south towards the Molonglo River. Davey (2012) added that parrots were occasionally observed leaving the central valley and flying south across the Molonglo River.

2. Study aims

This study aimed to gauge the extent of Superb Parrot commuter traffic between the Molonglo Valley breeding sites and feeding areas in the Belconnen suburbs. We particularly wanted to compare our sex ratio data, which essentially identifies the breeding cycle stage, to known breeding season data from north Canberra.

Specific objectives were to:

- Develop a survey protocol for counting parrots using a flight path;
- Record the parrots flying between the valley and the suburb;
- Use the sex and age ratio data collected to establish a breeding season timeline;
- Document patterns of movement between the valley and the suburb;
- Document the prevalence of parrots calling in flight; and
- Document use of various landscape features.

3. Methods

3.1. Survey site description

Our survey site was established on the Bicentennial National Trail (BNT) reserve (Fig. 1), along the edge of the suburb of Hawker.

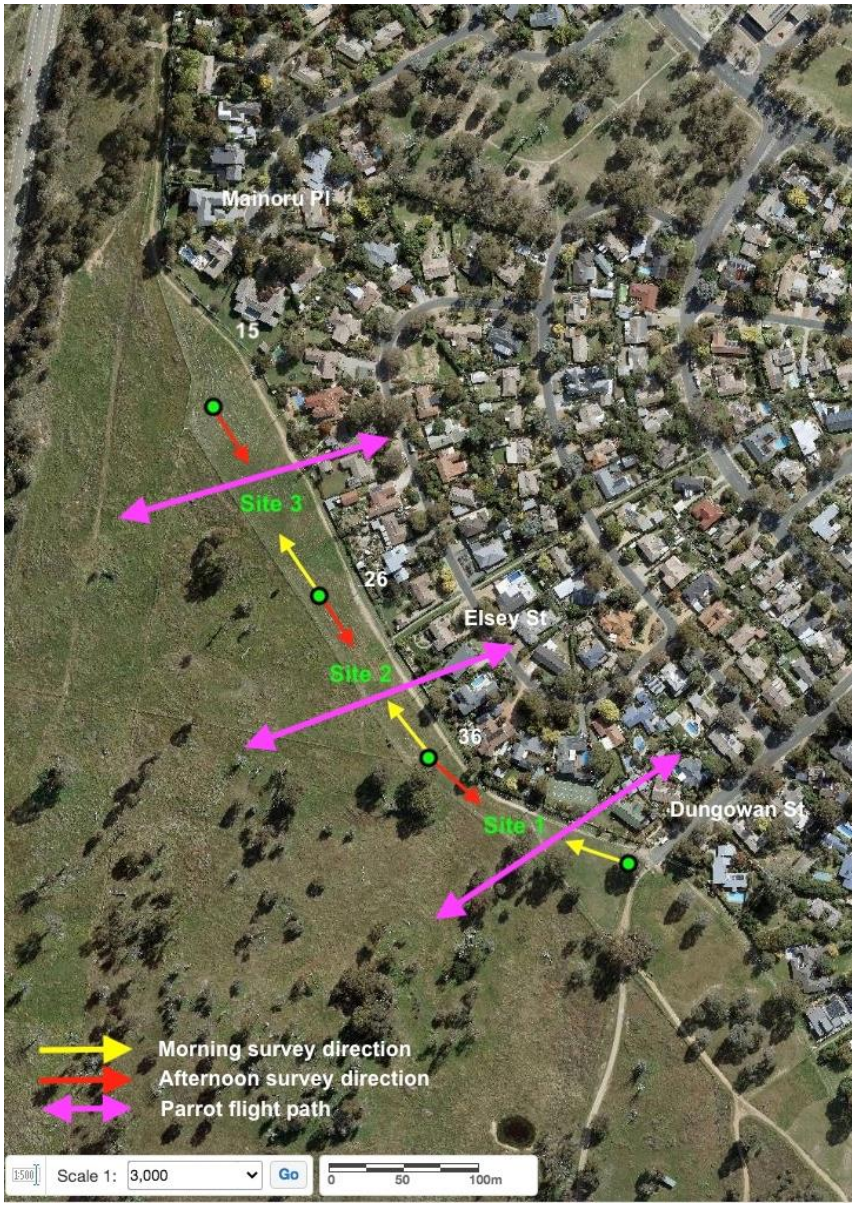

Figure 1. Superb Parrot flight path and survey sites.

This reserve occupies a strip of land between the rear of the suburban houses to the north-east and the grazing leasehold property called 'Kama' to the south-west. The width of the reserve varies between 20 and 60 metres. Survey sites were established in the reserve with each providing excellent views of parrots flying into and out of the suburb.

Survey site 1 is approximately 145 metres long, beginning a few metres from the locked gate at the southern end of Dungowan Street (-35.2513, 149.0318), and ending just behind 36 Elsey St (-35.2507, 149.0304). Site 2, which is approximately 130 metres long, begins at that point, and ends just behind 26 Elsey St (-35.2498, 149.0296). Site 3, which is approximately 155 metres long, commences at that point, and ends behind 15 Mainoru Place (-35.2485, 149.0286).

The difference in distance between points takes into account slight variation in terrain, allowing the observer to see the whole site. We considered the distance of approximately 150 metres to be the maximum for being able to identify male and female parrots in flight

without the use of binoculars. The flight of the parrots is often too quick to get a good look with binoculars.

Observers sat looking along the site, or perpendicular to the flight path, allowing them to see parrots flying through the site from either direction. Observers faced north-west in the morning, and south-east in the afternoon. This allowed them to keep the sun behind them, allowing maximum chance of identifying males and females rather than simply seeing silhouettes. Observers were still examining the same site, but from the other end during the afternoon.

Five survey sites were originally proposed, with an additional site at each end. Further preliminary observations from our home in Hawker support the fact that parrots rarely fly into the suburb any further east than the houses on the east side of Dungowan Street. From our home vantage point, parrots are not observed beyond Dungowan Street over Ambalindum Street or Marrakai Street. This observation is supported by a resident (and member of the survey team) on the east side of Dungowan Street (S. Bottomley, pers. comm.). There are scattered records throughout The Pinnacle Nature Reserve but certainly not the volume that would warrant an examination of a particular flight path. The same situation applies at the western end, with very few parrot movements.

However, if an observer did encounter parrots moving just beyond the ends of site 1 or site 3, those parrots were noted on the data sheet. For observers facing into site 1 in the morning, or into site 3 in the afternoon, the maximum observable distance outside the site was around 10 metres. This occasionally occurs when looking over one's shoulder, on hearing a parrot calling. Observers facing beyond the end of site 1 in the afternoon, or beyond the end of site 3 in the morning, were able to record movements just outside those sites, to an additional distance of 20-50 metres.

3.2. Observers

For the surveys, we sought volunteer observers who were familiar with Superb Parrots, able to readily distinguish them from other parrot species, and able to identify them by call and by sight (including identification of sex), without the aid of binoculars. There will always be a certain level of variability in skill, but its effect can be mitigated through the use of particular field survey design protocols, such as those employed in multiple studies over a significant period of time at the Australian National University (see Lindenmayer *et al*. 2002; Cunningham *et al*. 1999, 2008; Lindenmayer *et al*. 2009).

To reduce any potential bias, observers were randomly allocated to survey sites and time slots. We attempted to limit observers surveying at the same site on the same day, and avoid having them survey at the same time from one week to the next. However, some personal and logistical preferences were accommodated.

3.3. Survey timing

The timing of surveys is often critical to the likelihood of detecting the target species (Bibby *et al*. 1992). To maximise the chance of detection, survey activities should be conducted at the time of day when the target species is most vocally or behaviourally active (DEWHA 2010). Most diurnal birds are generally more vocal and active earlier in the day, with calling often starting before sunrise (Keast 1984; Bibby *et al*. 1992; Slater 1994; Drapeau *et al*. 1999).

Superb Parrots in the Molonglo Valley were noted to be active and leaving nest sites within half an hour of sunrise (C. Davey, pers. comm.). Additional observations indicate that breeding males and females may leave the nest at first light and return to feed young within three hours (L. Rayner, pers. comm.).

Based on this knowledge, and, again, mirroring other relevant bird survey protocols (Lindenmayer *et al*. 2009), counts were conducted in the first three to four hours after sunrise, after which levels of vocalisations by birds tend to decrease (Cunningham *et al*. 2008). A sample of three hours out of the day was deemed to be representative of the highest activity for Superb Parrots, which would maximise our records. Two hours in the morning, within the first four hours after sunrise, were identified. We made an adaptation to the protocol, adding an additional hour in the evening to identify parrots feeding in the late afternoon and moving to breeding sites or roosting sites.

The timing of the three sessions was:

- one hour, commencing 45 minutes after sunrise;
- one hour, commencing 135 minutes after sunrise;
- one hour, commencing 90 minutes before sunset.

Surveys were conducted once a week, from late September to mid January. We considered that once a week would be representative, allowing two or three days of observations during each key stage of the parrot breeding cycle. Logistically, weekly surveys were essentially the maximum effort, given the availability of the modest number of volunteer observers.

3.4. Data recording

3.4.1. Number of parrots, sex ratio, age ratio

Upon encountering a parrot or group of parrots flying through a site, observers recorded the time of the encounter, the number of parrots, the number of males and females, and the number of young. Occasionally, sex or age could not be identified. However, the number of parrots was still recorded.

The following parrot species are present in the area, sometimes in substantial numbers: Australian King Parrot (*Alisterus scapularis*), Crimson Rosella (*Platycercus elegans*), Eastern Rosella (*P. eximius*), Red-rumped Parrot (*Psephotus haematonotus*), and Rainbow Lorikeet (*Trichoglossus moluccanus*). Superb Parrots are easily identifiable and separable from other parrot species, including in flight, when perched, and by call.

Importantly, observers were able to communicate with each other via UHF radios, with brief checks being made in order to determine, should there be any doubt, exactly which site a group of parrots was passing through. This worked extremely well, ensuring no parrots were missed, and effectively eliminating double counting of parrots.

3.4.2. Flight direction

Observers recorded the direction of flight, either *To Belconnen* or *To Molonglo Valley*. If a parrot arrived at a survey site and turned back to the direction it came from, it was recorded as flying to its original destination. We subsequently refer to an instance of a group of parrots passing through a site as a movement.

3.4.3. Calling

Higgins (1999) summarised knowledge of Superb Parrot calls, acknowledging that there have been no studies, and calls and repertoire of the species are not fully described. Higgins (1999) described the Superb Parrot's main '*currack*' call, as a loud and penetrating contact call, which is often given in flight. Menkhorst *et al*. (2017) described the contact call as a rolling, grating '*currack-currack*' with a husky quality. Importantly, both references stated that individuals are often heard before being seen by observers.

Despite the approach of parrots often being given away by calling, observers remained vigilant during each survey period, keeping a sharp eye out for parrots moving through without calling. Whether parrots called or did not call was recorded.

3.4.4. Tree use

Higgins (1999) summarised movement information for Superb Parrots. The species moves in small, compact flocks, with direct flight. When making local foraging movements, they usually move along wooded corridors, and rarely cross large areas of open ground. Clearance of corridors that facilitate local and longer movements is considered a threat to the species (Higgins 1999).

Superb Parrots have been observed resting in large trees in house yards, the BNT reserve, or in the leasehold property. Tree use, including type of activity and duration, was recorded.

3.5. Full-day counts

The team of volunteer observers conducted a full day of surveys twice during the season, to give us a benchmark of parrot movements and numbers. A full day gave us an opportunity to assess our sample counts of three hours per day as appropriate and representative of any given day. The two full days of counts were conducted on 8 October and 19 November. Volunteers surveyed in two-hour sessions, and were again randomly allocated to sites and times over the two days.

3.6. Multiple site counts

At a broad scale, there are multiple potential pathways out of and into the Molonglo Valley breeding area. Although there are a substantial number of parrots using a flight path over Hawker, there must also be movements out of the valley via other pathways to other areas. To gain a snapshot of the use of other potential pathways, we conducted counts at seven sites surrounding the valley that were additional to our main three sites. The locations of the ten sites are presented in Fig. 2.

On 27 November, we conducted a one-hour count, during the first counting session of the morning, at all ten sites. A second count was undertaken on 4 December, during the second counting session of the morning. However, the limited number of volunteers available on 4 December meant that we targeted sites 7-10 (given that we know that parrots use sites 1-3, nearby site 6, and sites 4-5 in The Pinnacle Nature Reserve).

The specific site location details are:

- Sites 1-3, our regular sites, as described above;
- Site 4, at The Pinnacle NR, on the Dowling Track (southern boundary track) at the junction with the Macrorhyncha Track;

- Site 5, at The Pinnacle NR, further along the Dowling Track, at a high point overlooking Kama NR to the south-west;
- Site 6, on the BNT, near the old Weetangera cemetery;
- Site 7, on the BNT, on the south side of Drake-Brockman Drive, opposite Kinsella Street;
- Site 8, on the BNT, near the entrance to Pegasus riding school;
- Site 9, on the BNT, near the vineyard entrance, opposite 152 Drake-Brockman Drive; and
- Site 10, on the BNT, beside Pro Hart Drive, 100m west of the Spofforth Street intersection.

Ideally, we would have established survey sites under possible additional flight paths for weekly counts. However, it was simply not practical to conduct counts at all ten sites each week due to the limited availability of experienced observers.

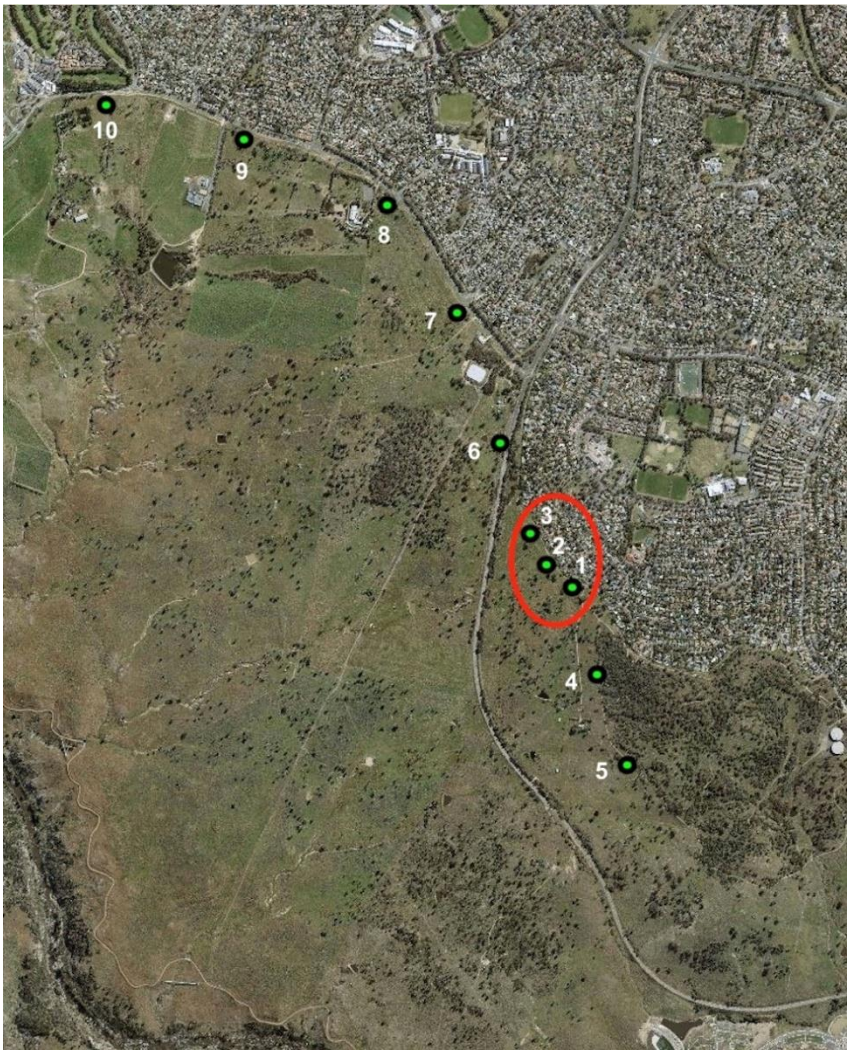

Figure 2. Location of parrot survey sites. Standard survey sites 1-3 circled in red.

3.7. Supporting information from other research

A PhD candidate at the Australian National University, McLean Cobden, has been conducting his doctoral research on Superb Parrots for the last couple of years. As part of

his work, he has been radio-tracking parrots, essentially extending the proof-of-concept tracking done by his supervisors (Rayner *et al.* 2016).

Our study was undertaken over several months covering the breeding season of 2021. Since the completion of our study, we have been fortunate enough to be given early access to some preliminary tracking data from Mr Cobden's research, and he has generously permitted us to discuss some of his findings. We have essentially used Mr Cobden's observations and expert opinion to "ground-truth" our observations, findings, and assumptions. His comments on various aspects of our study are incorporated into the relevant parts of our discussion.

4. Results and discussion

4.1. Full-day counts

4.1.1. 8 October

On 8 October, dawn was at 06:04, sunrise at 06:30, sunset at 19:12, and dusk at 19:38. There were close to 14 hours of observation at the three sites, totalling 42 hours of observation. The number of parrots and number of movements, hour by hour, for 8 October, are presented in Table 1.

Table 1. Total number of parrots and movements for a full day of counts, 8 October.

Hours	Number of parrots				Number of movements		
	Male	Female	Unknown	Total	To MV	To Belc.	Total
06:00-07:00	20	7	0	27	9	2	11
07:00-08:00	37	6	0	43	24	3	27
08:00-09:00	26	0	0	26	4	7	11
09:00-10:00	17	0	0	17	6	3	9
10:00-11:00	21	4	0	25	5	6	11
11:00-12:00	6	0	0	6	1	5	6
12:00-13:00	12	8	2	22	2	5	7
13:00-14:00	7	1	0	8	3	3	6
14:00-15:00	9	0	0	9	3	2	5
15:00-16:00	11	0	0	11	7	2	9
16:00-17:00	15	0	0	15	6	3	9
17:00-18:00	15	1	0	16	5	6	11
18:00-19:00	30	1	9	40	12	9	21
19:00-19:40	1	0	0	1	0	1	1
Total	**226**	**28**	**11**	**265**	**87**	**56**	**143**

Of the 265 parrots counted during the day, 226 were male, 28 were female, and 11 were of unknown sex. Weather conditions were ideal for observation and identification. We were pleasantly surprised by the high number of parrots and movements in the full day of counts.

For 8 October, our three sample one-hour counts would have been at 07:15-08:15, 08:45-09:45, and 17:42-18:42. The data for those times were extracted and are presented in Table 2.

Table 2. Number of parrots and movements for three one-hour counts, 8 October.

Hours	Number of parrots				Number of movements		
	Male	Female	Unknown	Total	To MV	To Belc.	Total
07:15-08:15	25	6	0	31	14	6	20
08:45-09:45	21	0	0	21	7	3	10
17:42-18:42	29	0	9	38	11	8	19
Total	**75**	**6**	**9**	**90**	**32**	**17**	**49**

This was a useful exercise to determine a baseline of how many parrots we were likely to encounter. We attempted to select survey times that would maximise our opportunity to encounter parrots. In our nominated three hours we encountered 30 parrots per hour, in 16.3 movements per hour. An average across the full day was 18.1 parrots per hour, in 9.7 movements per hour; we acknowledge that numbers and movements are unlikely to be uniform across the day.

4.1.2. 19 November

On 19 November, dawn was at 05:20, sunrise at 05:46, sunset at 19:51, and dusk at 20:20. There were 15 hours of observation at the three sites, totalling 45 hours of observation. The number of parrots and number of movements, hour by hour, for 19 November, are presented in Table 3.

Of the 150 parrots observed across the day, 86 were male, 19 were female, and 45 were of unknown sex. Weather for that day was very overcast, with occasional light drizzle, amounting to very poor light conditions that added a significant degree of difficulty in identifying the sex of some parrots. However, the male to female ratio of approximately 9:2 of identified parrots was consistent with the breeding season time frame, indicating that hollows were still occupied by females.

For 19 November, our three sample one-hour counts would have been at 06:31-07:31, 08:01-09:01, and 18:21-19:21. The data for those times were extracted and are presented in Table 4.

In our nominated three hours we encountered 15 parrots per hour (in 8.3 movements per hour). An average across the day was 10 parrots per hour (in 5.7 movements per hour); again, we recognise that numbers and movements are unlikely to be uniform across the day.

4.1.3. Number of movements as a function of time of day

Acknowledging that parrot numbers and movements are unlikely to be uniformly distributed across daylight hours, we examined the number of movements as a function of time of day. We analysed the hourly count data from the two full survey days, utilising the *R* package *Activity: Animal Activity Statistics* (Rowcliffe 2019).

Table 3. Total number of parrots and movements for a full day of counts, 19 November.

Hours	Number of parrots				Number of movements		
	Male	Female	Unknown	Total	To MV	To Belc.	Total
05:20-06:00	3	0	3	6	1		2
06:00-07:00	4	3	0	7	3	0	3
07:00-08:00	3	3	12	18	10	1	11
08:00-09:00	2	3	12	17	6	2	8
09:00-10:00	2	3	0	5	3	0	3
10:00-11:00	4	3	3	10	5	2	7
11:00-12:00	4	0	2	6	4	0	4
12:00-13:00	4	0	1	5	4	0	4
13:00-14:00	4	1	1	6	5	0	5
14:00-15:00	7	2	0	9	5	0	5
15:00-16:00	13	0	2	15	4	4	8
16:00-17:00	19	0	0	19	6	3	9
17:00-18:00	10	0	6	16	8	1	9
18:00-19:00	5	1	3	9	6	0	6
19:00-20:00	2	0	0	2	1	0	1
20:00-20:20	0	0	0	0	0	0	0
Total	**86**	**19**	**45**	**150**	**71**	**14**	**85**

Table 4. Number of parrots and movements for three one-hour counts, 19 November.

Hours	Number of parrots				Number of movements		
	Male	Female	Unknown	Total	To MV	To Belc	Total
07:15-08:15	7	5	9	21	11	1	12
08:45-09:45	2	3	12	17	6	2	8
17:42-18:42	3	1	3	7	5	0	5
Total	**12**	**9**	**24**	**45**	**22**	**3**	**25**

Table 5: List of data frames and the number of movements and number of individuals each represents.

Data frame	Scope	Movements	Individuals
day1out	2021-10-08: To Belconnen	54	101
day1in	2021-10-08: To Molonglo Valley	85	158
day2out	2021-11-19: To Belconnen	14	26
day2in	2021-11-19: To Molonglo Valley	70	123

Four data frames, *day1out*, *day1in*, *day2out* and *day2in* were generated, representing the two flight directions on the two survey days. Each row within the data frames represents a flock

movement past the observer. The number of total movements and number of individuals represented by each data frame is listed in Table 5. The data frames generated were further modified to expand the movement records to an individual record for each parrot. This means that there were multiple rows within the data frame where there was more than one individual in a movement. These expanded data frames were then subjected to the *fitact* function that generates a density activity pattern over a 24-hour period.

Fig. 3 shows the raw numbers of individuals flying past the observer as a function of the time of day in one-hour blocks, for full days of observations, and for direction of the flight.

Our interpretation is that, as expected, the movements are not distributed across the daylight hours in a smooth fashion. There appear to be differences both in terms of the time of the movement and the abundance of the movement between the two full days of counts when direction is the same, or for direction of movement when the date is the same.

The function *fitact* fits a kernel density to the time of events and estimates an activity index. For the four groups of movements, full day of observation by direction, the activity indices are listed in Table 6, together with estimates of their standard errors and 95 percent confidence interval.

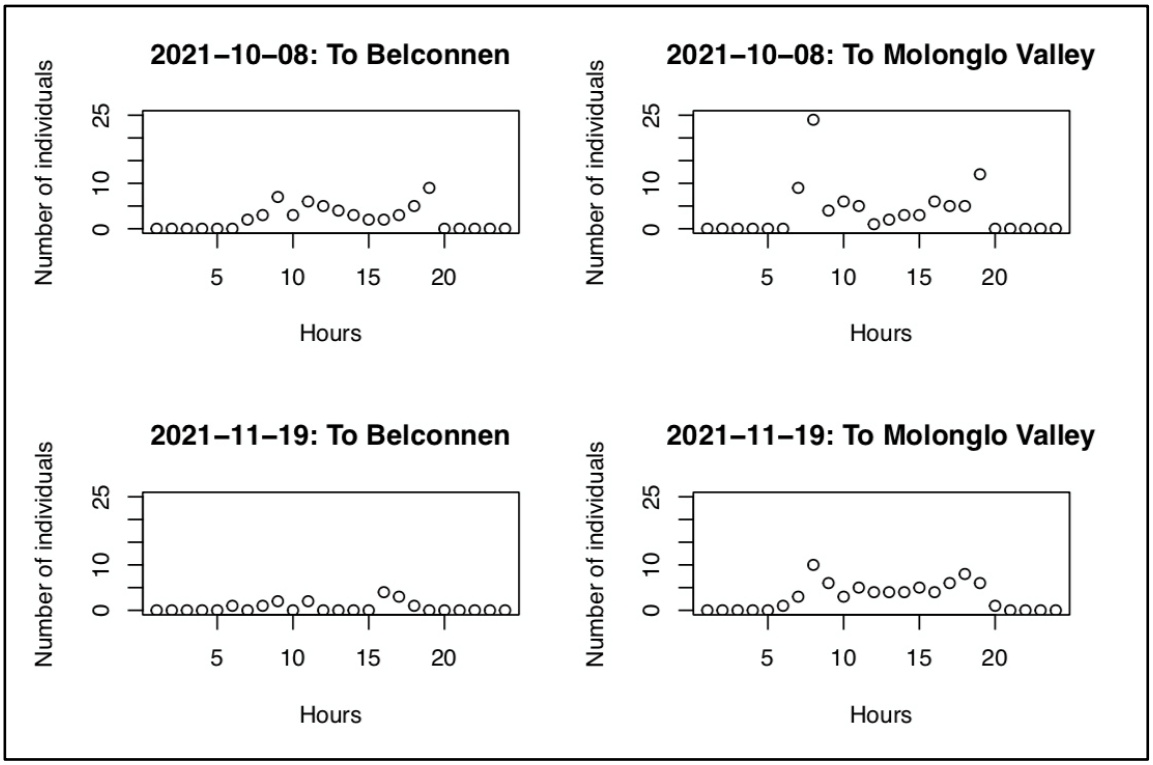

Figure 3: Number of individuals per hour flying past the observers on the two dates of all-day observation and categorised by the direction of flight.

Activity measures provide a numerical index that is a reflection of the evenness of the activity across the 24-hour period. Values of one reflect uniform distribution of activity and values close to zero reflect those situations where activity is confined to a very short period within the 24 hours. From Table 6, the four periods of interest can be grouped into two different types of movement. The *To Belconnen 8 October* and *To Molonglo Valley 19*

November have a more peaky pattern of activity in contrast to the other two periods when activity appears to be more evenly distributed across the daylight hours.

Table 6: Estimates of activity based on the first date (8 October 2021) and on the second date (19 November 2021), and the direction of flight.

Scope	*activity*	SE	lcl.2.5%	ucl.97.5%
2021-10-08 To Belconnen	0.382	0.035	0.275	0.405
2021-10-08 To Molonglo Valley	0.199	0.020	0.161	0.241
2021-11-19 To Belconnen	0.148	0.044	0.097	0.267
2021-11-19 To Molonglo Valley	0.306	0.045	0.221	0.395

While there are six comparisons listed in Table 7 not all make biological sense. The important ones are those where one factor (Date or Direction) is held constant and the other changed. We can test the difference between two patterns of activity using the function *compareCkern* (Ridout and Linkie 2009).

The first of these tests is reported in Table 8 and is testing the difference between the top two panels of Fig. 4. Travel to Molonglo Valley appears to be confined to early morning and early evening when compared to the travel to Belconnen which is more consistent across the day. Note that this phenomenon is further discussed below in *4.3. Movements*.

Table 7: The differences between estimates of the activity based on the date of observation and direction of travel with their standard errors, the Wald statistic and the probability that the difference is different from zero.

	Comparison	Difference	SE	W	p
1v2	2021-10-08 To Belconnen v 2021-10-08 To Molonglo Valley	0.183	0.040	20.871	0.000
1v3	2021-10-08 To Belconnen v 2021-11-19 To Belconnen	0.234	0.056	17.277	0.000
1v4	2021-10-08 To Belconnen v 2021-11-19 To Molonglo Valley	0.076	0.057	1.767	0.184
2v3	2021-10-08 To Molonglo Valley v 2021-11-19 To Belconnen	0.051	0.049	1.102	0.294
2v4	2021-10-08 To Molonglo Valley v 2021-11-19 To Molonglo Valley	-0.107	0.049	4.712	0.030
3v4	2021-11-19 To Belconnen v 2021-11-19 To Molonglo Valley	-0.159	0.063	6.264	0.012

Table 8: Comparison of the pattern of activity of flight direction on 8 October.

Comparison	obs	null	seNull	pNull
2021-10-08 To Belconnen v 2021-10-08 To Molonglo Valley	0.632	0.904	0.032	0

The second of these tests is reported in Table 9 and is testing the difference between the left-hand panels of Fig. 4. Comparison of the pattern of travel to Belconnen on the two full days of observation suggests that early in the season travel is more evenly spread across the day than late in the season when the majority of the activity is confined to the late afternoon.

Table 9: Comparison of the activity estimates of flocks flying to Belconnen on 8 October with that based on 19 November.

Comparison	obs	null	seNull	pNull
2021-10-08 To Belconnen v 2021-11-19 To Belconnen	0.401	0.830	0.056	0

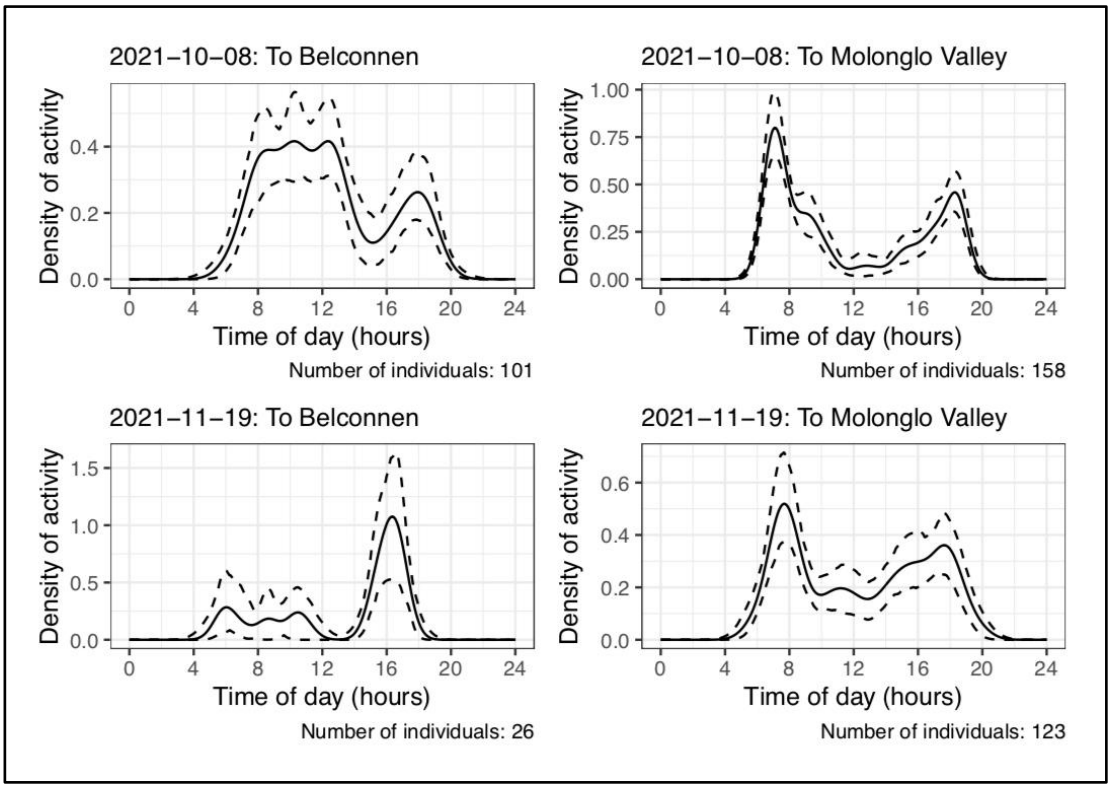

Figure 4: Activity profiles of Superb Parrots flying to or from Molonglo Valley as a function of the time of day. Note that these activity profiles are based on the number of individuals flying past the observer, so large flocks tend to generate peaks in apparent activity. Note the change in vertical scale between the panels.

4.2. Multiple site counts

Table 10 summarises the number of parrots and number of movements at the ten survey sites surrounding the Molonglo Valley.

Our data set suggests that parrots are indeed using other flight paths out of the valley. The limitation of volunteer numbers meant we could not focus on regular counts at other flight paths to determine the extent of their use. However, we have determined that parrots are leaving the valley in multiple directions, although the number of movements remains unknown for now.

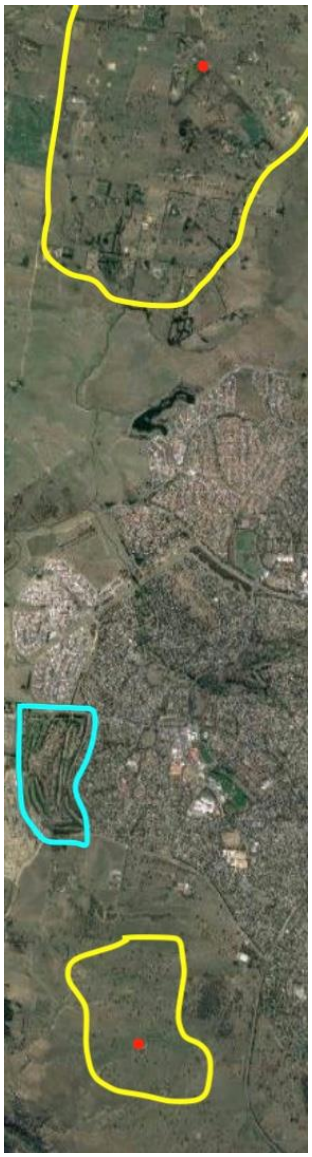

Figure 5. Wallaroo to Molonglo Valley - a possible flight path.

Examining preliminary data from the tracking of several breeding male parrots in the Molonglo Valley, McLean Cobden was able to confirm for us that a routinely used flight path does indeed exist over study sites 1, 2, and 3 (M. Cobden pers. comm.). However, there are several other flight paths out of the valley, with a likely, well-used flight path around sites 8 and 9 (M. Cobden pers. comm.). Even with the confirmation of the existence of additional flight paths, the most commonly used path appears to be that over survey sites 1, 2, 3, and 6 (M. Cobden pers. comm.).

Up until the mid-1990s, the Wallaroo area just outside the ACT was the south-eastern limit of the Superb Parrot's range. Martin (1996) described the Captains Hill Zone at Wallaroo as the minimum area of importance for Superb Parrots, including the known breeding sites and the surrounding treed area. Davey (2012) reported on a possible flight path between the Molonglo Valley and the Belconnen golf course area.

We suggest that the zone between Wallaroo and the Molonglo Valley may have been an avenue for dispersal of parrots that led to the establishment of the Molonglo Valley breeding site.

We also speculate that the zone may have been in continuous use as a flight path, possibly extending to the late 1990s (just prior to the reported influx of parrots into the ACT).

Referring to Fig. 5, the Captain's Hill Zone at Wallaroo is bounded in yellow to the north, with the red point marking the iconic Serbian Orthodox monastery in the middle of the zone. To the south is the central Molonglo Valley breeding area bounded in yellow, with the red point marking the centre of the area (please note, the graphic representation is an approximation). The distance between the two red points is approximately 11 kilometres. The distance between the boundaries is approximately seven kilometres.

Survey site 10, located on the southern edge of the golf course (bounded in blue), is approximately six kilometres south of the Wallaroo area. Although our data for the site is not substantial, the high number of Canberra Ornithologists Group records and eBird records at the golf course would suggest that it may form part of a flight path, and that it may possibly be a long-used path, serving as a link from Wallaroo to the Molonglo Valley.

Again referring to preliminary data from the tracking of several breeding male parrots, there is no evidence to suggest the existence of a flight path between the golf course and the Wallaroo area (M. Cobden pers. comm.). However, these observations and data do not exclude the possibility that the Molonglo Valley parrots initially dispersed from the Wallaroo area in search of suitable breeding areas.

Table 10. Number of parrots and movements at ten survey sites surrounding the Molonglo Valley.

	27/11/2021 (6:28am-7:28am)		04/12/2021 (7:57am-8:57am)	
Site	**Number of parrots**	**Number of movements**	**Number of parrots**	**Number of movements**
1	5	3	7	4
2	9	5	5	2
3	9	3	8	3
4	0	0	-	-
5	0	0	-	-
6	3	2	-	-
7	0	0	-	-
8	0	0	1	1
9	9	3	4	1
10	0	0	10	4
Total	**35**	**16**	**35**	**15**

Parrots are now regularly observed in Wanniassa and other southern Canberra suburbs, including in the winter months. These records may be of parrots that are breeding or suspected to be breeding in the southern parts of the Molonglo Valley (including the properties 'Spring Valley' and 'Huntly').

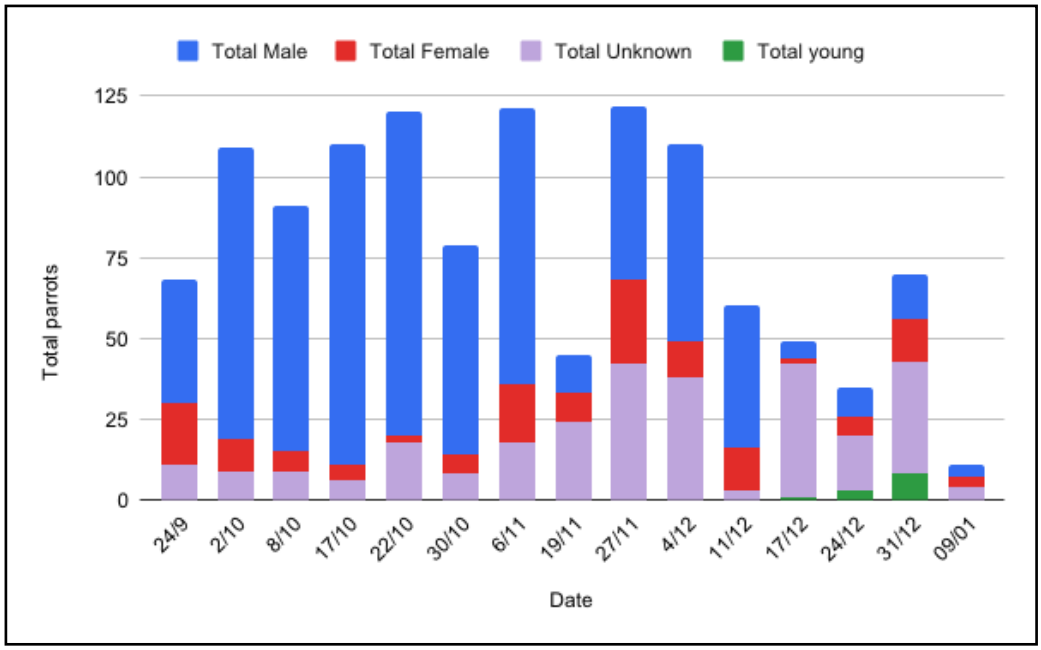

Figure 6. Total number of parrots per day (data is aggregated for three hours of counts and for all three survey sites).

4.3. Parrot numbers

For the analysis of parrot numbers, we excluded the additional records from the two days of full counts, and the records from the extra sites, leaving a total of 584 records. Fig. 6 presents

the total number of parrots per day (three hours of counts), with each day total broken down to males, females, sex unknown, and young. The data is aggregated for all three survey sites.

4.3.1. Weather impacts

Canberra experienced its second consecutive La Niña year, with a wet spring-summer of 2021-22. Wet weather forecasts often meant moving the weekly survey day forward or back by a day. Occasionally we had to persevere with the conditions available just to get a day's counts completed.

Poor weather conditions, including cloudy and overcast skies, scattered showers, drizzle and light rain, sometimes made parrot sex identification difficult. The poorest weather conditions unfortunately led to the following circumstances:

- We lost a survey day scheduled for 14 November, with consistent rain across the four-day window of volunteer availability.
- On 19 November, the total parrot count was extremely low, with half of the individuals going unsexed. (Temp 18°C, apparent temp 18°C, humidity 62%, wind 10kmh NW, cloudy and light rain).
- On 27 November, we had the highest count of unsexed parrots across all survey days. (Temp 8°C, apparent temp 6°C, humidity 83%, wind 10kmh SE, cloudy and brief precipitation).

4.3.2. Sex ratio

The number of parrots of known sex per day (three hours of counts) is presented in Fig. 7.

We attempted to associate particular changes in relative numbers with known behavioural characteristics and particular breeding season milestones.

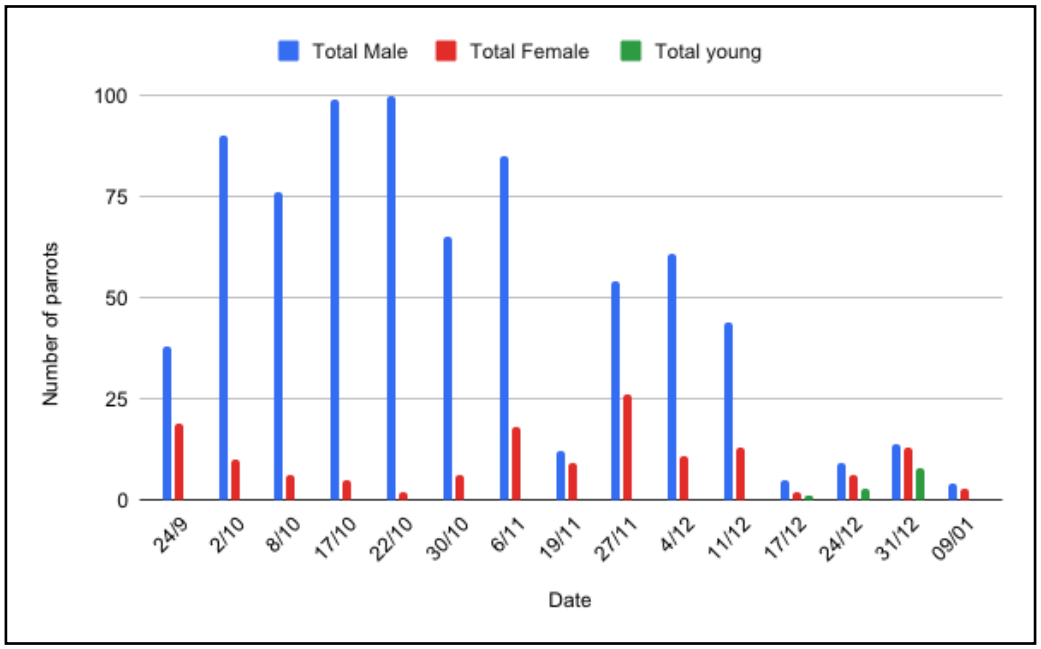

Figure 7. Number of parrots of known sex per day (data is aggregated for three hours of counts and for all three survey sites).

The first survey day on 24 September revealed a substantial number of females still in groups utilising the flight path. Of the 68 parrots counted, 38 were male, 19 female, and 11 unsexed. The ratio of 2:1 in favour of males suggested that hollow occupation by females had most likely commenced. We speculated that beginning the surveys a week or two earlier would reveal an even higher proportion of females.

The key indication that breeding occupation of hollows had commenced was the dramatic difference in counts between 24 September and 2 October. Of the 109 parrots counted on 2 October, 90 were male, 10 female, and nine unsexed.

In just over a week, the small number of females observed essentially halved, dropping from 19 to 10. Conversely, the number of males observed almost tripled, jumping from 38 to 90. This increase is not an increase in total numbers of males *per se*, rather, it is a relative increase in the number of times a certain number of males made multiple journeys from foraging areas to nest sites to feed sequestered females.

The highest count for males coincides with the lowest count for females, on 22 October. Of the 120 parrots counted, 100 were male and only two were female. However, 18 were unsexed.

Higgins (1999) reported the incubation period is around 20-22 days. With our speculative commencement of egg-laying at around 2 October, we suggest that the almost total absence of females on 22 October may be at the key point in the breeding cycle where hatching occurs and females are brooding vulnerable nestlings.

Higgins (1999) reported that the female broods closely for the first two weeks. The male feeds the female in the first week, and feeds the young thereafter. We found that females started to reappear in counts in November, as they began to rejoin groups of parrots flying to forage. The substantial increase in females counted on 6 November is approximately two weeks after our speculative hatching date.

The fledging period is around 40 days, although periods of four to five weeks were reported in captive parrots (Higgins 1999). By 27 November, five weeks after our suggested hatching date, the majority of females were leaving the nest to forage. At that point the nestlings are large enough and feathered enough to be able to remain in the nest hollow without the female brooding.

4.3.3. Age ratio

Based on our roughly calculated timeline of breeding milestones, we expected young to be out of nest hollows in the first week of December. There appeared to be a delay, with young parrots not recorded until two weeks later. The first young parrots appeared on 17 December: two flying with one adult female and two adult males. It is possible, and perhaps highly likely, that some young did fledge earlier, and those family groups dispersed from the breeding sites to other areas not associated with our flight path.

On 24 December, three of 13 groups had young:

- three young with a male and female
- one young by itself
- two young with a male

On 31 December, eight of 23 groups had young:

- one young with a female
- at least one young in a group of 14
- one young by itself
- three young with one male and four females
- one young by itself
- one young with a male and female
- three young with two females
- two young with one female

Counts were vastly reduced, and highly variable, at fledging time. Numbers dropped to almost zero in early January, as the parrots are no longer tied to nesting sites in the valley. This matched our observations from our home in previous years.

With family groups leaving the breeding area, there was an increase in records of parrots, including sightings of dependent young, across suburban Canberra at that time. Given the abundance of food in the La Niña year, parrots were feeding in many other parts of the ACT. There were records from locations such as Campbell Park, and many records in the Weston Creek and Molonglo suburban areas.

4.3.4. Breeding season comparison.

Rayner *et al*. (2016) reported that the 2015 breeding season in Throsby and Spring Valley extended from late September through to mid-December, with the first confirmation of an active nest (containing eggs) at Throsby on 7 October. Rayner *et al*. (2017) reported that the 2016 breeding season in Throsby and Spring Valley extended from mid October through to early January (Fig. 7), with the first nest initiated on 21 October.

Figure 8. Superb Parrot breeding season timelines.

Our breeding season timeline essentially fitted in between the 2015 and 2016 seasons documented by Rayner *et al*. (2016; 2017). The decline in females in our counts from 2

October onwards may indicate onset of egg-laying at that time, which aligns with the 2015 season. However, our fledging period is later than the 2015 season, aligning with the 2016 season. Again, it is highly likely that young fledged up to two or three weeks earlier and dispersed elsewhere.

Fig. 8 presents a Gantt chart styled comparison of the breeding season timelines adapted from Rayner *et al*. (2016; 2017), at the top and middle, with our estimated timeline from this study at the bottom. The 2016 chart includes a nestling period, which was not included in the first chart. We adopted this inclusion for our 2021 season.

4.3.5. Absolute numbers

Our analysis of breeding events is based on the relative differences in our count data. We have very little chance of ascertaining absolute numbers of parrots that reside or breed in the Molonglo Valley.

However, we have gained access to preliminary survey data from PhD research currently being conducted in the area. Breeding site information suggests that there are approximately 15 breeding pairs in the Molonglo Valley (M. Cobden pers. comm.).

Given that we have an approximate breeding population baseline, we attempted to rationalise the actual number of parrots residing in the Molonglo Valley. Revisiting the full day count data from 8 October, presented in Table 1, we counted 265 parrots (226 male, 28 female, 11 sex unknown), in 143 movements, across the 14-hour day. According to our speculative breeding season events, 8 October falls in the incubation period, with breeding females occupying hollows.

We have two assumptions:

- There are 15 breeding pairs of parrots; and
- Males feed incubating females two to three times a day (Higgins 1999).

Assuming 15 males make three feeding trips per day, originating from the nest site and passing over our site each way, 90 males would be counted. That is significantly fewer than our day's count of 226 males. During the short period when the female stays with the vulnerable nestlings, the male is provisioning the female and the young and is likely to make additional trips. Add a fourth trip (120 males counted) or even a fifth trip (150 males counted), and we are still 106 or 76 males short of the 226 counted in total. Boost the breeding male number to 20, and four feeding return trips accounts for 160 males counted, again well short of the total. We do acknowledge that parrots may use the flight path for round trips into Belconnen that may not strictly be associated with provisioning incubating females.

We suggest that there may be a high number of unpaired male and female parrots in the population, and that these individuals remain associated with the loose colony or breeding aggregation in the valley. Lack of breeding hollows may restrict breeding opportunities for younger, inexperienced parrots. Competition with other bird species, possums, and bees for precious hollows may further limit those opportunities.

Both paired and unpaired individuals may play altruistic roles in the care of young in a loose colony. Significantly, Rayner *et al*. (2016) observed adult males feeding the fledged young

of other pairs. Rayner *et al*. (2016) also observed signs of crèching behaviour, where multiple young gathered under the care of an unrelated adult. The potentially high number of non-breeding individuals we encountered may be undertaking similar roles in the Molonglo Valley.

4.3.6. Non-breeding parrots

The small breeding colonies close to Canberra may certainly be attractive to non-breeding parrots, and the desire to stay close to a colony may be high. We considered a suggestion that non-breeding parrots that cannot secure a suitable breeding hollow may disperse more widely in search of hollows, rather than remaining close to an existing colony. However, this may not be easily achievable, and is perhaps highly unlikely.

Superb Parrots are certainly quite selective in choosing a hollow for nesting; they prefer larger trees with many hollows, and the preferred nest hollows are deep, with wide floors and wide entrances (Stojanovic *et al.* 2021). However, suitable hollows are rare in the landscape, are essentially all occupied, competition for them is intense, and they are predicted to become more uncommon in the future (Stojanovic *et al.* 2021; Manning *et al.* 2004, 2013). Stojanovic *et al.* (2021) suggested that Superb Parrots may already face shortages of suitable nest hollows (and the trees that support them), and predicted effects of habitat degradation and low tree recruitment are likely to exacerbate this problem. Climate change, which may result in a contraction of range, may further exacerbate competition for nests in smaller areas of climatically suitable habitat (Stojanovic *et al.* 2021).

An alternative suggestion is that unpaired parrots, or those pairs that cannot find a nesting hollow, may resort to remaining in suburban Canberra where there are suitable roost sites and an abundance of food sources.

We suggest that this is the point where one must be careful in making assumptions about what is happening with the population.

To the average birder or wildlife photographer, a greater number of Superb Parrots encountered in suburbia may indicate that the species is able to adapt to, even thrive on, alternative food sources. Significant roost sites, now including many overwintering parrots, may provide more evidence of adaptation to suburbia. Further, those increased numbers might be considered a measure of breeding success, an attempt at re-colonisation of a former range, or perhaps an adventure into new territory. However, this may not necessarily be the case.

Almost 20 years ago, a field trip report written for COG's newsletter, *Gang-gang*, claimed that the Superb Parrot was "clearly a farmland adapting species", and that it was "clearly able to share and prosper in a human modified habitat". Similarly, in more recent times, social media posts have suggested that the species is often encountered in suburban Canberra, therefore it must be "doing just fine". In response to the trip report, Crawford (2003) wrote that the statements failed to recognise the threatening processes of breeding habitat loss and modification, and that the species may be in that particular environment because there is no alternative. Crawford (2003) further explained that the presence of a species in a particular habitat does not necessarily mean it is actively choosing to be there, nor that it is actually surviving well, or "doing just fine".

4.4. Group size

We encountered Superb Parrots on 745 occasions, with group size in the range 1-15. The mean group size was 2.02 (SD of 1.51). Fig. 9 shows that single parrots accounted for almost half of the records.

Higgins (1999) reported flock size to be 10-30 parrots, occasionally as many as 60, with much larger flocks observed in the non-breeding season.

We expected group size in this study to be modest, given we were observing parrots commuting between a relatively small breeding location and suburban feeding sites. We note that four of the five groups of ten or more parrots were encountered in December and comprised adults and young.

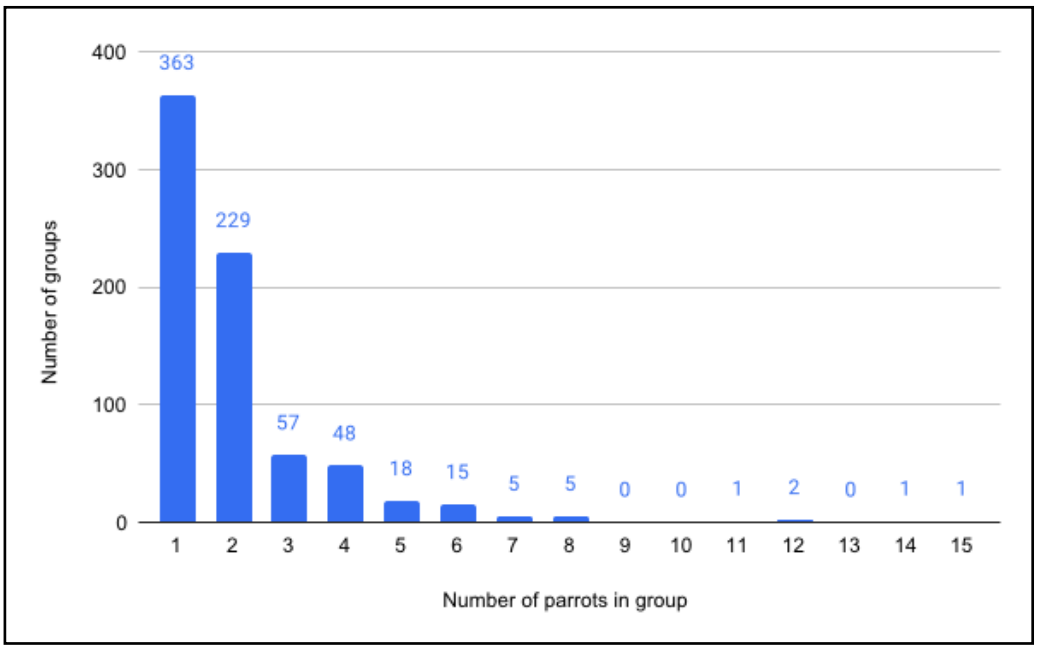

Figure 9. Number of groups of parrots in each group size.

4.5. Movements

For the analysis of parrot movements, we excluded the additional records from the two days of full counts, and the records from the extra sites, leaving a total of 584 records. Fig. 10 presents the total number of movements and direction of movements per day (data is aggregated for three hours of counts and for all three survey sites).

There was a pronounced imbalance in the direction of movements: movements to the Molonglo Valley considerably outnumbered movements to Belconnen. This was an unexpected result.

To dig deeper, we returned to the examination of movements recorded during the full day of counts on 8 October. In particular, we scrutinised movements early in the morning and late in the evening, on the premise that parrots were likely to roost at nest sites. Higgins (1999) described social organisation, stating that it is complex and not fully understood. The relevant points are:

- Outside the breeding season, the birds congregate in small flocks;

- Females leave flocks to nest and return when chicks are well developed;
- During nesting, males feed together and travel to feed females;
- Male feeds female two to three times per day, at the nest or in nearby tree;
- Males with mates on nests appeared to mostly stay near the nests;
- Males may spend nights in the nest;
- Wide roaming flocks of males could consist of mated and unmated males, or they may be in separate flocks; and
- Male flocks break down as males join females and young in flocks.

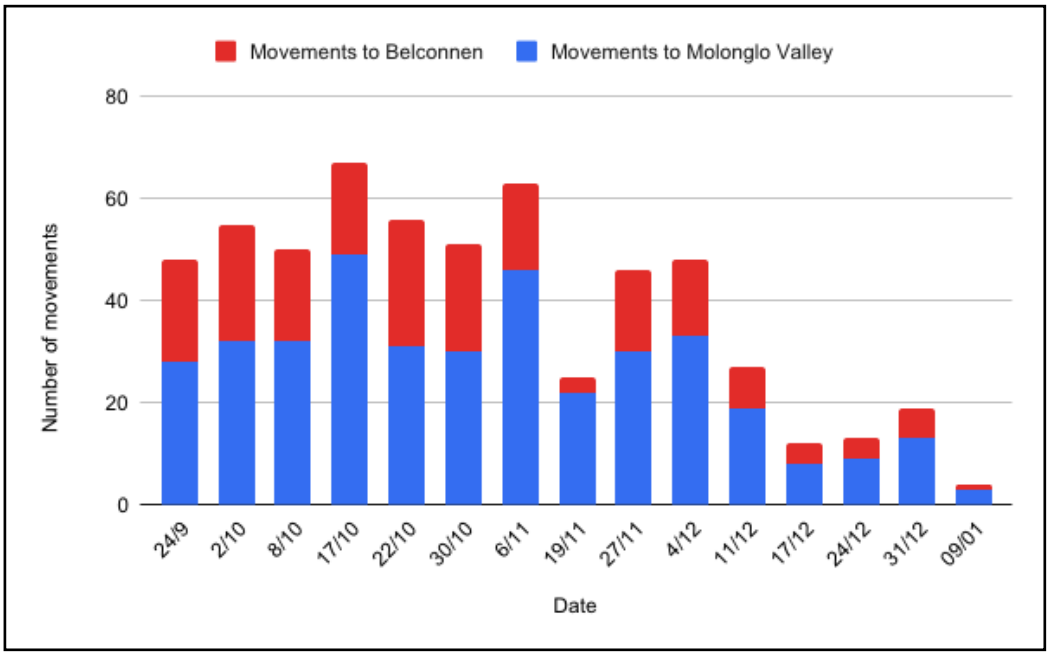

Figure 10. Total number of movements and direction of movements (data is aggregated for three hours of counts and for all three survey sites).

For the morning of 8 October, there were two movements recorded just before sunrise (06:30). In the hour from the first movement at 06:23, there were 24 movements of 51 parrots, of which only two movements of three parrots (all male) were to Belconnen and 22 movements of 48 parrots (41 male, seven female) were to the Molonglo Valley. The 41 males were in groups of seven, seven, and three, as well as eight duos and eight singles.

The numbers from the morning hour were astonishing. The first movement was two males flying to Belconnen. This is what we expected would occur for the next hour or so. However, over the 20 minutes from 06:29, three female duos and groups of two, seven, and three males were observed flying to the valley. The only other movement to Belconnen was a single male at 06:42.

We expected movements to Belconnen to far outnumber movements to the Molonglo Valley. However, the opposite was obviously the case. We suggest several possible explanations. The immediate thought was that parrots had roosted in the suburbs overnight, rather than at the nesting sites in the valley, but this may be contrary to known behaviour. The second suggestion was that those particular parrots were perhaps unmated individuals, and not necessarily tied to a nesting site. We also considered the possibility that parrots left the valley early, via another flight path and returned to the valley via our flight path, in a broadly circuitous route. However, there would have been very little time for males to get

into the suburbs, feed, then return to the valley to provision females in nest hollows, in the 30-40 minutes after first light.

We suspect that there may be a significant number of breeding and non-breeding parrots that roost in the suburbs. Radio-tracking data presented in Rayner *et al*. (2016) showed a substantial number of movements between the breeding location at Throsby, and a roost site at North Watson approximately four kilometres to the south. Mears (2016) observed parrots at that roost site in December 2015 and January 2016, documented a significant number roosting there over the course of four weeks in April and May 2016, and added some additional records in November 2016. We suggest that a similar model of movements between breeding, roosting, and feeding locations may apply in our area.

For the evening of 8 October, the last movement was 12 minutes before sunset (19:12). In the hour prior to the last movement at 19:00, there were 21 movements of 40 parrots, of which nine movements of 11 parrots (seven male, four female) were to Belconnen, and 12 movements of 29 parrots (23 male, one female, five unsexed) were to the Molonglo Valley. The 23 males were in groups of eight, three, three, two, two, and five singles.

The evening numbers appeared to exhibit more typical behaviour, as we would have expected most movements to be to the valley, again on the assumption that males with mates roost at nesting sites. The number of movements each way was similar. However the number of parrots flying to the valley was almost triple that of those flying to Belconnen.

Once again referring to preliminary data from the tracking of several breeding male parrots in the Molonglo Valley, it is evident that Belconnen golf course is a popular roosting spot (M. Cobden pers. comm.). We suggest that it is possible that the potentially significant number of unmated parrots (see section *4.3.5.*) may also be occupying roosts away from the breeding area.

Another popular roosting spot appears to be John Knight Park on the eastern shore of Lake Ginninderra in central Belconnen (M. Cobden pers. comm.). Interestingly, a straight line from John Knight Park to the central Molonglo Valley passes over directly over survey sites 1 and 2, and over our home.

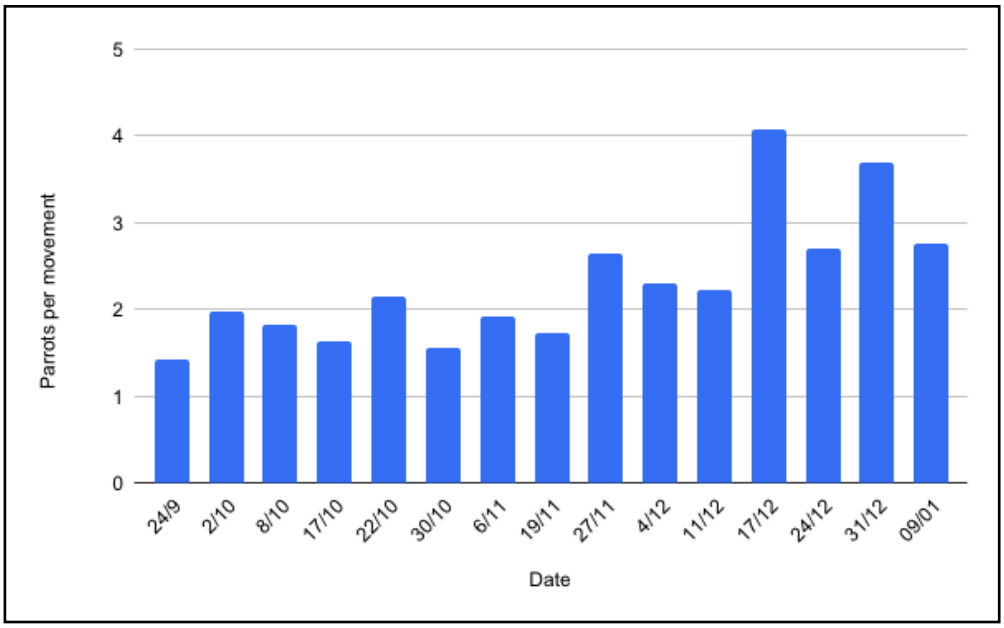

Figure 11. Number of parrots per movement (data is aggregated for three hours of counts and for all three survey sites).

Fig. 11 shows the number of parrots per movement for each day (data is aggregated for three hours of counts and for all three survey sites). That number increases slightly as females begin to leave nest hollows routinely in late November. The four days with the highest number of parrots per movement are the last days of the survey, during the fledging period, as multiple young join parents and other parrots in foraging groups.

We broke down the movement data to determine if parrots preferred one site over another in either direction. Fig. 12 shows the percentage of movements, and Fig. 13 shows the percentage of parrots, to the Molonglo Valley increased considerably from site 1 to site 2, with a further increase, albeit less dramatic, from site 2 to site 3. Possible reasons could be landscape-related: the parrots might follow a safe path into town, but return by a more direct route.

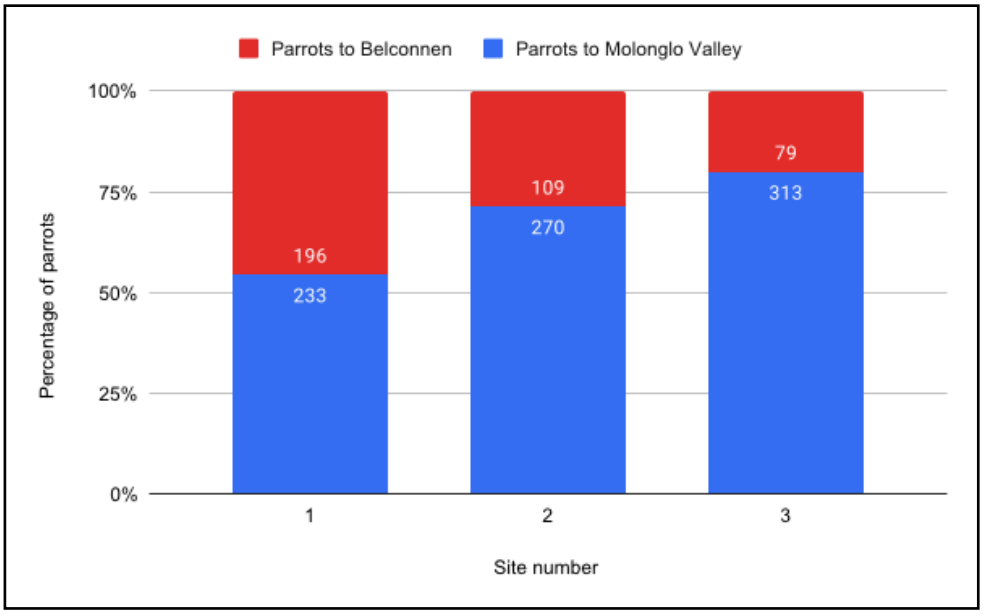

Figure 12. Percentage of movements in each direction, per site (raw numbers are shown in white)**.**

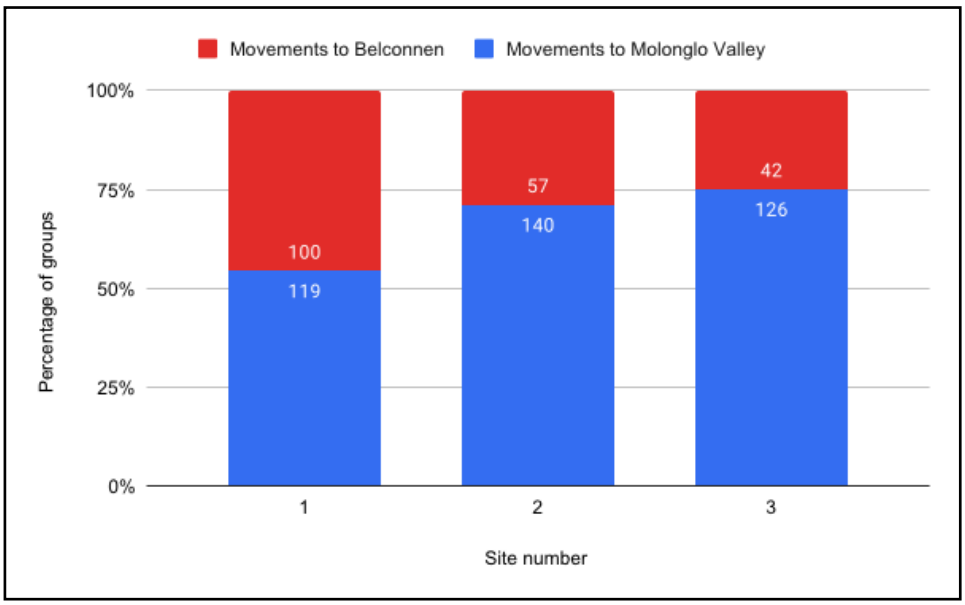

Figure 13. Percentage of parrots in each direction, per site (raw numbers are shown in white)**.**

4.6.1. Flight behaviour

Superb Parrots flying from the Molonglo Valley to Belconnen flew very low as they came up a reasonably steep slope, with some groups using a deeply incised gully line. The map and chart combination in Fig. 14 illustrates just how steep the slope is. The point in the gully is 580 metres above sea level, and the high point on the edge of the suburb is at 656 metres above sea level. The distance between the points is 1,289 metres. The elevation ratio is 1:17 (for every 17 metres horizontal distance, gain one metre in elevation), giving a grade of 5.9 percent.[1]

Figure 14. Elevation profile between breeding sites in the Molonglo Valley and the highest point in the flight path at the edge of Hawker.[2]

The author (AO) observed several groups flying up the gully examined in Fig. 14, into site 2, and onward into the suburb. One group was flying so low that the parrots had to lift to fly over the standard- height farm fence, then again to fly over the rear fence and the roof of a house backing the trail reserve. There was no indication that any parrots flew above canopy height when heading to Belconnen. Most flew two to five metres above the ground.

There were several records, particularly at site 3, of parrots returning to the valley from Belconnen at or above canopy or powerline height, and maintaining a level flight as the slope fell away to the south-west. It appeared that those parrots then remembered that they should maintain close association with tree canopy cover, and quickly dropped down into the valley, disappearing from view over the tree-lined William Hovell Drive.

4.7. Calling parrots

Birds call for many reasons, including to advertise and defend a territory, and to attract a mate (Catchpole and Slater 2010). Further, birds utilise calls to warn of predators, maintain

[1] Elevation Grade Calculator (https://www.omnicalculator.com/construction/elevation-grade)
[2] Elevation profile created using HeyWhatsThat Path Profiler (www.heywhatsthat.com/profiler)

contact between individuals, recognise individuals in a colony, court prospective mates, and beg for food (Catchpole and Slater 2010).

We found the Superb Parrot's use of contact calls in flight quite intriguing. Parrots called to keep in contact with one another, whether separated by a short distance, or even flying side by side. Large groups often featured several parrots calling.

Some observers noticed a difference in call volume. The contact call was given quietly by individuals in small, compact groups, whereas the call was quite loud and strident from individuals in loose flocks or aggregations. Single parrots were rarely silent, and called in flight often and at full volume, despite no other parrots coming before or after.

Occasionally, large groups were silent. For example, a chance observation at home revealed a group of eight males that flew silently into the suburb down the length of Dungowan Street, barely 1.5 metres above the road surface. An example from the surveys was a group of 12 parrots arriving at site 1, briefly perching, and departing, with no calling whatsoever.

For the analysis we used the full set of 745 records, which included records from the two full count days and extra site counts. All records were based on the assumption that parrot calling was independent of time of day. The records for the first full day of counts, on 8 October, showed 108 groups called and 31 groups did not call. Fig. 15 clearly shows the records of groups calling were distributed across the whole day. In the half hour to sunrise at 06:30 there were two groups of two parrots that did not call, and in the half hour with sunset at 19:12 there was one single parrot that did not call.

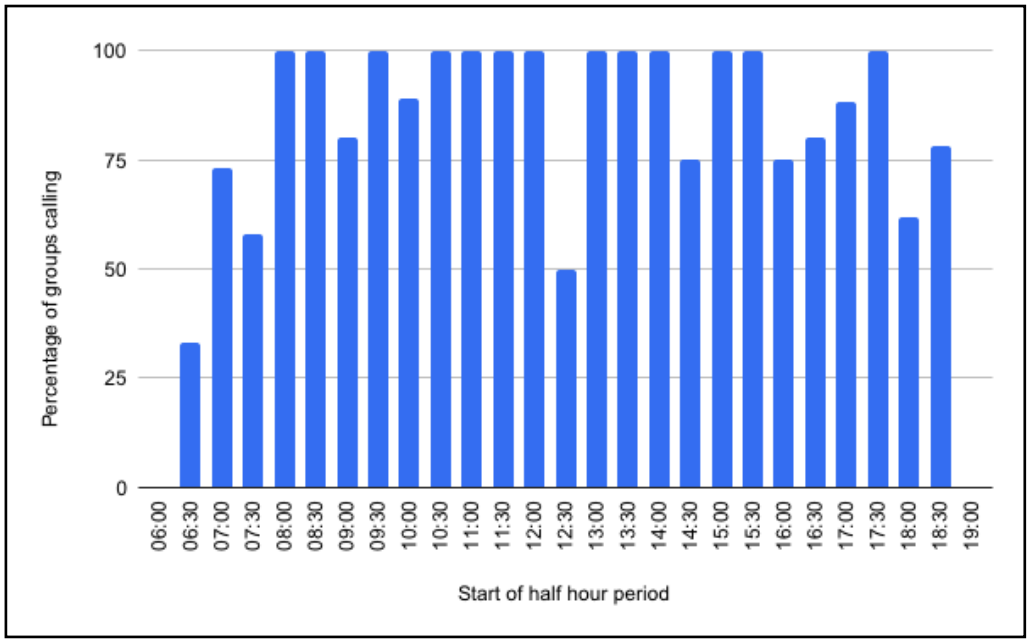

Figure 15. Percentage of parrot groups that called, per half hour.

Table 11 breaks down the prevalence of calling by Superb Parrots according to group size. Of the 745 groups of parrots observed, 517 groups (69.4 percent) called in flight.

A very high 75.5 percent of single parrots called in flight. A possible explanation for this figure may be that single parrots are calling more often in an attempt to regain contact with other parrots (the *Hey, where is everyone?* call).

We broke down groups of two parrots into groups that consisted of a male and female, and groups that consisted of two parrots of the same sex. Just over 71 percent of male and female *pairs* called in flight, whereas 56.5 percent of *duos* of either sex called in flight. A possible explanation for this difference may be that a male and female together could be a breeding pair, and that those pairs call more often as part of their pair bond maintenance behaviour. Alternatively, duos of either sex possibly called less in the comfort of knowing that as long as another parrot was flying alongside there was less need to call to maintain contact.

In contrast to the smaller groups, 80 percent of the larger groups featured calling parrots. The key purpose of this high incidence of calling could be to maintain flock cohesion. This may be even more important when newly fledged young parrots make up a significant proportion of a larger group (the *Everyone stay together!* call).

Further, we note that more than one parrot called in many group situations. However, it was very difficult to determine exactly which parrots were calling, unless the group passed very close to the observer. Even when close, an observer often has only a very short window of 2-3 seconds to count the parrots in the group, identify the sex (and age), without trying to pick which individuals called.

Table 11. Prevalence of calling in flight by Superb Parrots, according to group size.

Group number	Group type	Total number of groups	Number of groups calling	Percentage of groups calling
One	One parrot	363	274	75.48 %
Two	Two parrots (male and female)	52	37	71.15 %
Three	Two parrots (same sex)	177	100	56.50 %
Four	Three to six parrots	138	94	68.12 %
Five	Seven or more parrots	15	12	80.00 %
	Total	**745**	**517**	**69.40 %**

A generalised linear model (McCulloch and Searle 2001) was fitted to the data in Table 11 where the combined number of groups calling and the number of groups silent are the response variable. We fitted three models:

- A null model (equivalent to fitting a global mean);
- A two-level model (groups one, two, four, and five versus group three) which suggested that the probability of getting a result equal to or more extreme than that observed was very small ($p < 0.0001$); and
- A five-level model, which is also significantly different from the null model ($p = 0.0004$).

The difference between the two-level and the five-level models was not significant (p = 0.36).

Our interpretation is that group three *Two parrots (same sex)* is different from the other groups. The probability of calling in the other four groups appears to be the same.

We recognise that we were observing groups of parrots for very short periods of time, perhaps ranging from as little as 4-5 seconds up to 15-20 seconds, or even longer if a group alighted in the study site for any reason. Those windows of observation potentially cover a small fraction of a journey some parrots may undertake, and we can only assume that calling between individuals in a group occurs at some stage during those longer journeys.

Approximately 70 percent of parrot groups called in flight. Those distinctive calls drew the attention of our observers, often well before the parrots came into view or indeed crossed our survey sites. Further, we are very confident that, given the survey protocol we devised, we did not miss counting parrots that did not call. We are also confident that the prevalence of calling we discovered is typical or representative of behaviour of parrots undertaking movements along routinely used flight paths. We would be keen to see this assertion tested at other significant flight path locations.

4.7. Tree use

Superb Parrots used trees in the BNT reserve and the adjacent leasehold property for resting, feeding, preening, courtship, and staging or gathering.

4.7.1. Resting

Parrots occasionally alighted in trees, appearing to rest. The decision to stop to rest was irrespective of flight direction. There were 98 records (13.4 percent of 732 total records) of parrots stopping in trees in the reserve or leasehold property. Rest periods ranged from 30 seconds to 10 minutes, with most typically around two to three minutes.

There were four additional resting records: three records of parrots stopping to rest in backyard trees, and one record of a parrot stopping to rest on a powerline. This was the only record of a parrot using any human-made structure, whereas most other species of parrot routinely utilised powerlines and poles, farm fencing, backyard fences, roofs, television aerials and satellite dishes. Observations outside this study (by AO) showed Superb Parrots occasionally perched on farm fences, but rarely on any other infrastructure.

4.7.2. Feeding, preening, courtship

We observed just one instance of parrots actively feeding in a tree. Four males actively fed on lerps in a Yellow Box (*E. melliodora*) for 10 minutes. There were three records of parrots feeding on the ground. One male rested in a ‘Kama’ paddock tree for seven minutes before flying to the ground, where it fed for 30 minutes on grass seed.

Autopreening was observed only a few times, and then only very briefly. Allopreening was not observed (and was not reported in the literature).

We observed one instance of courtship or pair bond maintenance. On 2 October at 16:30 hours, a male and female alighted in a tree; the male unsuccessfully attempted to feed the female eight times in five minutes.

4.7.3. Staging

In addition to the records described above, we recorded 15 instances of staging, where individuals stopped briefly to wait for others to arrive, before departing together towards the Molonglo Valley. There was no evidence of staging on movements to Belconnen. The records were in late October to November, and consisted of aggregations of two to five parrots. There was one aggregation of nine males in the first week of November. On one occasion, two parrots heading to the valley perched briefly before departing in different directions.

Figure 16. Individual trees utilised by Superb Parrots for resting, preening, feeding, courtship, and staging.

Fig. 16 shows the trees used by Superb Parrots. The behaviour of parrots utilising tree cover for myriad reasons in this study reaffirms the value and importance of scattered trees. Lindenmayer (2022) stated that, given the extent of land clearing, all native vegetation in temperate woodlands is important for birds, even patches as small as a single paddock tree. A comprehensive examination of Superb Parrot nest trees showed that scattered paddock

trees in the agricultural matrix are vitally important breeding habitat for the species (Manning *et al.* 2004). A single, isolated paddock tree may be a last resort for a nesting site for the species. However, that tree may act as a vital stepping stone in a foraging journey, or indeed a migratory journey, across a fragmented landscape (Fischer and Lindenmayer 2002). The importance of remnant, fragmented woodlands, including scattered and isolated paddock trees, cannot be underestimated.

5. Conclusion

Our study achieved some significant outcomes. The development of a simple survey protocol for monitoring the use of a flight path was the key first step in the collection of useful data. That data allowed us to estimate the timing of particular events in the breeding season. There were some surprise outcomes as well, the most perplexing of which was the movement of groups between the breeding site and the suburbs. The apparent high proportion of non-breeding parrots was unexpected. Another intriguing surprise outcome was the examination of calling by parrots.

As should happen with any research, many questions arose during the course of this study. Many questions remain unanswered pertaining to the use of flight paths. How often do they use the same flight path? How many flight paths are routinely used? Which particular population demographic uses which path? Are there fundamental usage differences between breeding and non-breeding parrots? Does flight path use vary according to food source abundance at the other end of the path? Where are parrots roosting once the young have fledged? Are there distinct movement patterns by family groups and social groups after fledging? What are the key landscape features being used after fledging?

Further questions have arisen concerning the importance of various landscape connectivity linkages. Are parrots risk averse, avoiding very large expanses of cleared land? Are there bottlenecks, where moving parrots are funnelled through a particular area, utilising the only remaining connection in the landscape? What would be the outcome for the species if those critical bottleneck features were removed? Can those bottlenecks be replicated through restoration efforts to enhance broader use of the landscape?

With the advent of radio telemetry for tracking several decades ago, we have been able to track the movements of many living things. On a global scale, we have tracked seabirds[3] and waders[4]. In Australia, on a regional scale, we have tracked Australasian Bitterns[5] and Little Eagles[6]. As the technology improves, transmitters and power supplies get smaller and last longer. Researchers in Europe recently tracked nocturnally migrating moths using transmitters as light as 270 milligrams (Menz *et al*. 2022). Tracking devices have been used to examine flock behaviour in migrating species (Dhanjal-Adams *et al*. 2018). At the local or specific landscape-feature scale, research has been conducted on flight path behaviour in Budgerigars (Karmaker *et al*. 2020).

The Difficult Bird Research Group[7], based at the Australian National University, is leading the way in Superb Parrot research. Rayner *et al*. (2016) successfully trialled GPS loggers on Superb Parrots to track local foraging movements of six breeding adults. That 2016 report

[3] www.seabirdtracking.org
[4] www.cerdi.edu.au/TrackingtheMigrationofLathamsSnipe
[5] www.bitternsinrice.com.au/tracking-bunyip-birds/
[6] Environment ACT - Little Eagle https://bit.ly/3cR9wVw
[7] www.difficultbirds.com

admitted that it was unclear exactly how social behaviour and landscape connectivity contribute to patterns of movements. The research group aims to extend this work across the entire breeding range, to broaden knowledge of movement pathways, population structure, responses to climate change, and the relationship between population and nesting hollow resources. McLean Cobden, is currently working in this field and is incorporating the use of tracked parrots in his research, as previously discussed. Early tracking data has shown a significant number of parrots overwintering in Canberra, and the first migration movements have been recorded (M. Cobden, pers. comm.).

Knowing exactly where individuals of a species move to, how long those journeys take, and how particular landscape features facilitate those journeys is vital to conservation efforts. More investment from governments in the implementation of radio telemetry techniques is required to further our knowledge of the movement of Superb Parrots in their highly fragmented habitat. More transmitters on more parrots will determine local and migratory movements, which will in turn identify landscape features that are crucial to those movements.

6. Acknowledgements

We are extremely grateful to have utilised the vast experience and significant data analysis skills of Dr A.O. (Nick) Nicholls. Nick provided complex statistical analysis, interpretation, and associated commentary for several aspects of this study.

Our heartfelt thanks and profound gratitude go to the dedicated volunteers who, alongside us, counted parrots for this study: Lia Battison, Stephen Bottomley, John Brannan, Jean Casburn, Chris Davey, Sandra Henderson, Tim Johnson, Sue Lashko, Suzannah Macbeth, Rod Mackay, Nick Mayo, and Alison Milton. This committed band of volunteers put in an outstanding effort, completing many hours of counts, sometimes very early or late in the day, occasionally under less than ideal circumstances, and backing up or covering absences at short notice.

We express our sincere gratitude to McLean Cobden and Laura Rayner for sharing their invaluable experience with the species, and providing access to confidential and sensitive breeding site and radio-tracking information.

Anthony thanks Chris Davey for contributing useful suggestions and advice on some aspects of the study.

Elliott thanks Charles McIntosh for advice and support pertaining to data manipulation and analysis.

Our thanks to Wendy Whitham and Lloyd Hooper for their insights on parrot activity at the other end of the street.

We thank the Canberra Ornithologists Group for permitting access to data and reports for use in this study.

Maps were produced using ACTmapi (www.actmapi.act.gov.au).

Finally, we thank the editors, Michael Lenz and Kevin Windle, for providing constructive feedback, and for massaging the manuscript into shape for publication. Further, Anthony thanks Michael for his encouragement and support in persevering with publishing this and other papers.

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NOTES

Canberra Bird Notes 47(2) (2022): 152-155

FEASTING ON PHASMIDS: AN EYEWITNESS ACCOUNT OF A PACIFIC BAZA IN CANBERRA

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It was a mild winter's afternoon on 27 Jul 2022, approximately 14-18° Celsius, with the sun shining, so I decided to visit 'my' local nature reserve, Red Hill (Red Hill's ecology contains a range of both mature and regenerating Yellow Box/Red Gum Grassy Woodland). Upon arrival I commenced my usual path, and as I walked, I could hear Noisy Miners (*Manorina melanocephala*) in the distance, issuing half-hearted alarm calls. On Red Hill this often indicates the presence of a predator, such as a Red Fox (*Vulpes vulpes*) or an Australian Raven (*Corvus coronoides*), or perhaps more optimistically, a Brown Goshawk (*Accipiter fasciatus*). It was a 50/50 call on whether to investigate further, but I decided to explore anyway, just in case.

As I approached the Noisy Miners, I saw a medium-sized raptor execute a casual gliding swoop in the canopy overhead. At first glance it resembled a Brown Goshawk, but upon further observation, a more intriguing image began to emerge. The raptor was tolerant of my presence, and it continued to move casually through the canopy, sometimes alighting on various branches at the extremities of trees quite violently, robustly, with wings splayed, as it vigorously searched for its prey (Fig. 1). These repeated glides revealed the raptor to have notable dark barring on its chest and the underside of its wings (Figs. 2 and 3). On the 'topside', the raptor had a range of greys and browns, much like a Brown Goshawk (Fig. 4), but quite strangely, the raptor's facial features gave the strong impression of a Pallid Cuckoo (*Cacomantis pallidus*). Upon later consultation of various bird books, I learned that the cuckoo-like features of this species have been noted by other authors and observers too (Figs. 2 and 3). The raptor had piercing yellow eyes, but undoubtedly, the most distinctive feature to the naked eye, was a small, unusual crest, a small knob at the back of the head, thus removing both Brown Goshawk and Pallid Cuckoo from the list of possible identities. It was a Pacific Baza (*Aviceda subcristata*). As far as I am aware this is the first confirmed record for the ACT and for COG's AoI.

The Pacific Baza continued to forage among the canopy, with some success, and after some persistence with my camera, the mystery prey item was revealed to be in fact phasmids, or 'stick insects', a surprising revelation to me (Figs. 5 and 6). I continued to observe the raptor with some degree of appreciation and delight as it feasted on a prey item that, until now, had successfully eluded the eyes of Red Hill's ravenous avifauna residents during the lean winter months.

I saw the Pacific Baza again the next day. I had lodged the record and photos with Canberra Nature Map. This alerted other birdwatchers. During the morning of 29 Jul it was seen and photographed by a number of birders, the last time it was observed in the area.

Accepted 2 November 2022

[1] **All photos by the author.**

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Canberra Bird Notes 47(2) (2022): 156-158

BLUE-FACED HONEYEATER (*ENTOMYZON CYANOTIS*) BREEDING EVENT IN CANBERRA

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In the afternoon of 2 October 2022, I received an eBird alert for Blue-faced Honeyeaters (*Entomyzon cyanotis*). Rob Magrath mentioned juvenile birds, one having a tail of 40% length. I made the plan to go out the next morning to get my tick and hopefully see the young birds. As Floriade was on, I went out fairly early to make sure I could park before the rush, and not long after arriving I could hear the calls of the subject birds.

A short walk from the car I spotted an adult (Fig. 1) and soon heard a young bird. As I approached the area I saw two large juveniles, one with a short tail that I estimated as half-length and a second one with what looked to be a full-length tail. I could hear another young bird and discovered it high up in a eucalypt. I was a tiny chick with a very short tail and looked too small to fly yet (Figs. 2 and 3).

Fig. 1

My attention was then distracted when I spotted another tiny chick on a nest (Fig. 4). It started to hop along the nest branch and then proceeded to clumsily climb the tree, making me fear it would fall (Figs. 5 to 7). Soon after an adult flew in from the North but was chased away by two other adult birds and headed back northward. Perhaps it was attracted by the young calling or was a parent of the other juveniles that I saw earlier. I noted the other two adults only once. I continued my observations and soon sighted two immature birds (Figs. 8

[1] **All photos by the author.**

and 9), one having some blue around the eye (Fig. 9). This added to my total of nine birds seen. The adults were seen feeding the tiny chicks (Fig.2) but after further observations I noted that the immature birds (Fig. 3) were also feeding the chicks. My photos only showed spiders for the food supply. I ended up spending around an hour observing the birds and I was fascinated by their behaviour.

In my opinion, this may not be the first time they have bred in Canberra, but it is the first confirmed breeding event. The only other documented breeding of Blue-faced Honeyeaters in our area is a record from Yass (Serafin 2018).

Reference

Serafin, B. (2018) Breeding of Blue-faced Honeyeaters in Yass, NSW. *Canberra Bird Notes* 43: 210.


Fig. 2


Fig. 3


Fig 4


Fig. 5


Fig. 6


Fig. 7

Fig. 8

Fig. 9

Accepted 8 December 2022

COLUMNIST'S CORNER

Canberra Bird Notes 47(2) (2022): 159-160

Birding in Cyberspace, Canberra Style

While most readers of this column are probably not farmers, undoubtedly most share your columnist's interest in new digital resources about wild native birds. In this context, you may be interested in the **BirdCast app**, a tool released in late 2021 used to estimate bird occupancy on farms: https://www.sustainablefarms.org.au/resources/birdcast-tool/. It has been developed by our friends at the ANU Sustainable Farms initiative:

> *BirdCast is a scenario planning tool for biodiversity on farms. Using decades of data on more than sixty birds, BirdCast indicates which birds may live in woodlands on your farm in spring and demonstrates the potential for biodiversity in a range of scenarios.*
>
> *… The bird occupancy estimates created by BirdCast are suitable for remnant box-gum grassy woodland or planted eucalypt woodland on grazing or mixed farms in the NSW South West Slopes and parts of the Central West, Murray-Riverina and north east Victoria.*

And

> *Use BirdCast to estimate birds that live in your farm's woodland, create a report, and see how it compares to the birds you've seen. Also use BirdCast to estimate, and compare, which birds might live on your farm after some management interventions:*
>
> - *addition or removal of nearby woody cover (i.e., vegetation restoration or land clearing)*
> - *addition of new planted woodland areas*
> - *interventions that prevent or enable Noisy Miners to occupy a woodland area.*

Considering the range of stresses being placed on south-east Australia's woodlands, particularly in the farming country, this app may well assist farmers to better care for their land in the interests of biodiversity, as well as farming productivity.

In an earlier column in this series (*CBN* 43(3) (2018): 307-8) I drew attention to some new resources that have been made available to help make windows safer for birds, reflecting the fact that 'Window collisions kill more than 500 million birds each year in the U.S. alone'. The wonderful BBC podcast series **30 Animals That Made Us Smarter** has dealt with this topic in recent years. The 29 July 2019 episode, titled 'Spider and window glass', sought to answer the question 'How can we prevent millions of birds from being killed by flying into windows?', and provided the answer: 'The solution could rest with spiders': https://www.bbc.co.uk/programmes/p07hy453. It is a fascinating discussion of the nature of spiders' webs, and how their design and construction could help us to create new types of windows that will reduce the distressing bird-kill that we see far too frequently.

Another BBC '30 Animals …' podcast of interest to birders is 'Barn owl and drone', first broadcast on 3 October 2021 https://www.bbc.co.uk/programmes/p09xhnjw : 'Learning from Lily the owl—could she help small aircraft cope with turbulence? Scientists hope what they've learnt about barn owls might help with the design of drones.'

In August 2022 we heard of the sad passing of Muriel Brookfield, a long-term stalwart of the Canberra Ornithologists Group. In her obituary, drafted by Barbara Allan and published in the November 2022 issue of COG's newsletter *Gang-gang*, Barbara wrote that, '… Muriel participated in excursions with the ANU women's birdwatching group and ensured its observations reached the COG databases'. While your columnist has never had any contact with the ANU women's birdwatching group, I understand that it has operated for many years, providing much pleasure to its participants, as well as contributing data for monitoring the birds on the ANU campus.

In this context, I draw attention to the **Women Birders Australia Facebook Group**: https://www.facebook.com/groups/womenbirdersaustralia. At the time of writing, it had some 1,900 members. It is a closed group, meaning that one must apply to be a member and be accepted for membership by the Group's administrators. Given the long-overdue increasing levels of attention being given nowadays to both gender diversity and to the need to strengthen women's voices across our society, the description of the Group is of considerable interest:

> *This is a group for women birders in Australia, or visiting Australia. We invite women to join, share your photos of wild birds in Australia, ask questions and get help identifying birds. Also feel free to share articles about birds and birding.*
>
> *We want this to be a group for women, about women and with women's voices. This is our space to shine! All of us have found it difficult at times to find a comfortable space in the male-dominated world of birding. Women's style of birding is sometimes at odds with male style, and is often silenced (or we silence ourselves) as a result. In this group, women's style rules and our voice is loud.*
>
> *We think that women's style of birding is supportive, generous, friendly and humble. So please be like that when you post, when you reply or comment. Remember that we are all learning, and those at early stages of learning are sensitive to rebuke or perceived criticism. Be gentle.*
>
> *Women Birders Australia is a women's only birding group. We welcome all women regardless of age, race, ability or gender diversity.*

Perhaps there is an important message here for all of us about the need to be sensitive to how we engage in our birding, so that the pastime is inclusive, and welcoming to all.

T. alba

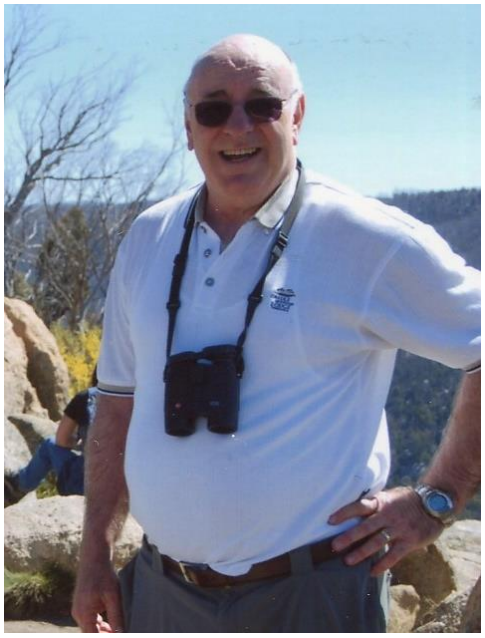
This column is available online at http://canberrabirds.org.au/publications/canberra-bird-notes/. There you can access the web sites mentioned here by clicking on the hyperlinks.

To join (subscribe to) the *CanberraBirds* email discussion list, send an empty email message to canberrabirds-subscribe@lists.canberrabirds.org.au. To unsubscribe, either permanently or temporarily, send an email message to canberrabirds-unsubscribe@lists.canberrabirds.org.au. If you wish to re-subscribe after being unsubscribed temporarily, simply follow the 'subscribe' instructions above.

The *CanberraBirds* list's searchable archive is at http://bioacoustics.cse.unsw.edu.au/archives/html/canberrabirds.

Canberra Bird Notes 47(2): 161-162

Vale Bruce David Lindenmayer OAM (16 February 1936 – 4 November 2022)



Members were saddened by the news of the passing of a long- term member and friend of COG, Bruce Lindenmayer.

Bruce served the group officially in many ways but he will be remembered particularly for his generous, friendly and supportive manner. Bruce was engaged with people especially when talking about his passion, birds.

Bruce was an active member of COG for over 30 years. He was President of COG from 1990 to 1992. Bruce served on the COG Committee again from 2011-12 to 2015-2016 and the Steve Wilson Medal Committee for six years from its inception in 2014 until 2021, when he stood down in his 85th year. Bruce was sometimes been heard to say, that after 30 years in many roles in COG, he final reached his zenith by being appointed "tea person" for COG Meeting Nights, a role he filled for many years. On the night of the awarding of his Steve Wilson Medal he named COG as the organisation that was the most important to him in his 50 years in Canberra.

Bruce was raised in regional Queensland. He moved to Melbourne and then to Canberra in 1969. At that time Gungahlin was sheep paddocks but destined to be a new town. Community groups including COG were active in a campaign to save Mulligans Flat from future housing development.

Bruce is widely and appropriately acknowledged as the early driving force behind the decision to ensure that the unique environmental value of the Mulligans Flat precinct was formally recognised and protected. Bruce, as COG's representative on the Conservation Council Executive, compiled and edited the submission to the ACT Government proposing Mulligans Flat for a reserve, which brought together data, including important data about threatened woodland birds from COG's ACT Bird Atlas.

In December 1992 Bruce wrote an article in CBN on the campaign in which COG played a major role, to preserve the woodlands at Mulligans Flat. With Jenny Bounds, visits were organised to the area with appropriate politicians and ACT government officials including Bill Wood the ACT Environment Minister, Michael Moore MLA and John Langmore MP (the local Federal Member

and member of COG). Jenny took over from Bruce as President of COG and they both then represented COG on the Conservation Council and kept the pressure on for a reserve to be formed. Mulligans Flat Nature Reserve was formed in 1995. Bruce's other COG interests included woodland management, cat containment and exotic bird control. Bruce was active in the Common Myna Action Group (CMAG).
As past Chief Minister Jon Stanhope wrote, "While there is much about Bruce of which his family can be proud we are all in his debt because of his unrelenting commitment to the protection and preservation of Mulligans Flat."

Our thoughts go to Bruce's family, in particular to his partner Ann, children David, Phil and Anne, grandchildren Thomas and Lucy, Michelle and Sean, Ryan, Nina and Zoe and great grandchild Emilia.

Thank you Bruce for your friendship, wise counsel and contribution to COG. Vale Bruce.

Neil Hermes, 14 December 2022
hermes.neil@gmail.com

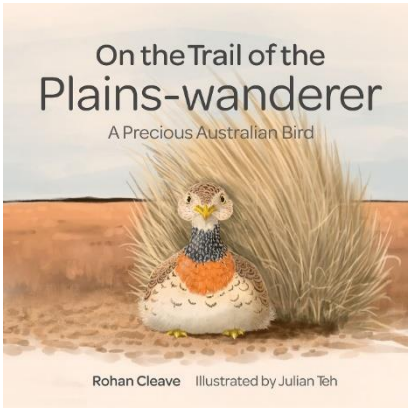
BOOK REVIEWS

Canberra Bird Notes 47(2) (2022): 163-164

CSIRO Publishing has recently released four books aimed at primary school children, two non-fiction and two fiction.

Reviewed by *SUE LASHKO, Cook ACT 2614 (smlashko@gmail.com)*

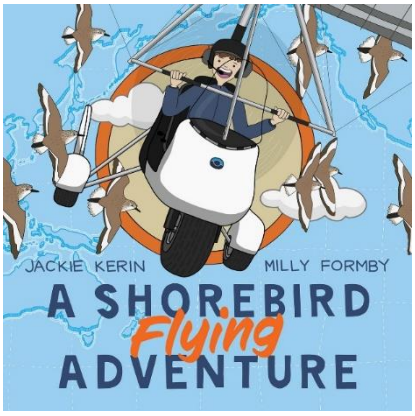
***On the Trail of the Plains-wanderer*. By Rohan Cleave, illustrated by Julian Teh.** CSIRO Publishing, September 2022. ISBN: 1486314481. Hardback, 32pp. Au$24.99.



Many members enjoyed Julian Teh's talk, 'Introducing the Plains-wanderer', at the May COG meeting. This was a lovely segue into the book *On the Trail of the Plains-wanderer*, beautifully illustrated with life-like drawings by Julian and written by Rohan Cleave, a zookeeper at Zoos Victoria.

The book covers the Plains-wanderer's uniqueness as the only species in the family Pedionomidae, its habits and habitat, and the threats to its survival. While 2021-2022 was a very productive breeding season for Plains-wanderers, this is not usually the case, so in the past some wild birds were collected for captive breeding in zoos. How do you replace the warmth and softness of the male parent's feathers? – use a feather duster of course (the accompanying illustration is wonderful). The target audience is 6- to 9-year-olds but the stunning illustrations would appeal to any bird lover.

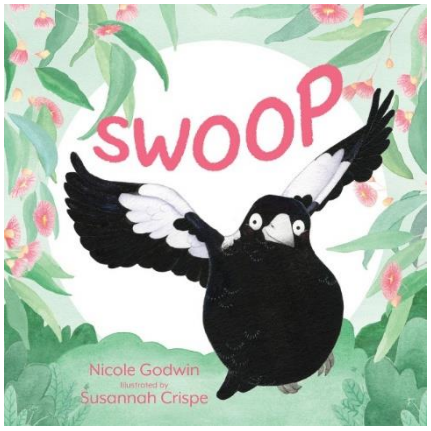
***A Shorebird Flying Adventure*. By Jackie Kerin and Milly Formby.** CSIRO Publishing, June 2022. ISBN: 9781486314492. Hardback, 32pp. Au$24.99.



This book features Microlight Milly (based on the co-author), who loves birds. Her favourites are migratory shorebirds, a girl after my own heart! – and like me, she advocates sketching birds as a great way to get to know their main features. The book is crammed full of interesting facts, without going into too much detail for a young audience. The illustrations of migratory and resident waders, while stylised, show the main features very clearly, and the illustration of the parts of a bird and feather groups is perfect for the book's target audience. My favourite illustration is a double-page spread showing a cross section of the shoreline with 10 species of wader, their bill position as they feed and their prey. Migration, breeding and conservation are also covered. Did you know that just before migration shorebirds shrink their gut and leg muscles to make more room for fat? And do you know what rhynchokinesis is? While the target audience is again 6- to 9-year-olds, there is much in this book for all lovers of waders. As Milly flies off in her microlight, she tows a banner – SHOREBIRDS ARE AWESOME! – how true.

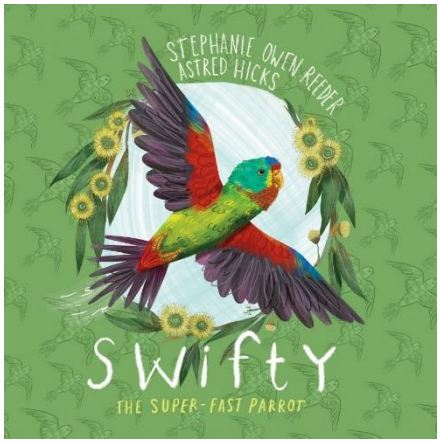
Pilot, zoologist and BirdLife Australia Migratory Shorebird staff member, Milly Formby has started her flight around Australia to help spread the word about shorebird conservation. As part of Wing Threads' Flight Around Oz, Milly will be stopping at key wetlands around Australia to raise awareness about how awesome shorebirds are! You can follow Milly's adventures at https://www.facebook.com/wingthreads] (Source: Birdlife Southern NSW)

***Swoop*. By Nicole Godwin, illustrated by Susannah Crispe.** CSIRO Publishing, September 2022. ISBN: 9781486315697.Hardback, 32pp. Au$24.99.



This is a fictional tale aimed at 5- to 9-year-olds. As the title suggests, the hero of the story is a swooping magpie who "has one job. One desire. One purpose. KEEP THE EGGS SAFE." To him, all passers-by are potential egg thieves, no matter what disguise they are wearing. The often humorous illustrations will appeal to young readers and adults alike.

***Swifty The Super-fast Parrot*. By Stephanie Owen Reeder, illustrated by Astred Hicks.** CSIRO Publishing, October 2022. ISBN: 978148315918, Hardback, 32pp. Au$24.99.



This is a fictional tale full of interesting facts aimed at 6- to 9-year-olds. COG members will remember Dejan Stojanovic's talk when he showed us footage of sugar gliders predating Swift Parrot nests in Tasmania. This was the fate of Swifty's two siblings, but Swifty survives to fledge, grow and then fly across Bass Strait with other Swift Parrots. As she follows the blossom trail north, she reaches Canberra where she "cavorts around a fluttering flag" on Parliament House, before continuing her journey to Sydney. Here she crashes into a window, but is rescued and later returned to the wild.

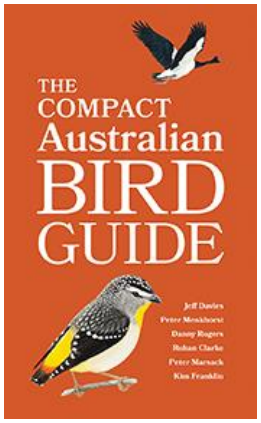
After winter on the mainland, the Swift Parrots return to Tasmania to search for nesting hollows, which are in short supply. Swifty moves on to Bruny Island, where she "finds the perfect place to nest" on an island that is free of sugar gliders.

This book touches on migration and what to do with an injured bird, as well as the factors contributing to the Swift Parrot being critically endangered - predation, by sugar gliders and cats, and habitat loss.

Canberra Bird Notes 47(2): 165-167

***The Compact Australian Bird Guide*. By Peter Menkhorst, Danny Rogers, Rohan Clarke, Jeff Davies, Peter Marsack and Kim Franklin.** CSIRO Publishing, Clayton South, 2022.
ISBN 9781486312245 RRP $34.99

Reviewed by DAVID DEDENCZUK, Narrabundah ACT (*david.dedenczuk@gmail.com*)



With *The Compact Australian Bird Guide* (CABG), CSIRO Publishing, the authors and the illustrators have created an excellent new Australian birding resource. I have trialled it in the field in NSW and in the ACT, with pleasing effect. I have heard several positive opinions on its use from other birders, who are finding it similarly useful.

Portability and field usability

The CABG has many of the attributes of its parent resource, *The Australian Bird Guide* (ABG)[2], without the weight of the latter. This compactness makes it easier to carry and to manage in the field. It fits easily into a day-pack and can be quickly deployed, even when one is handling binoculars, a notebook, camera and other birding paraphernalia. Another birder has expressed her pleasure in finding that the CABG fits easily into her handbag. It is well-made, well-bound and hard-wearing. It is clearly made for tough Australian conditions, and for me, it recently demonstrated its robustness in rainy and muddy Mulga woodland north of Bourke. The cover is made of tough waxy, water-resistant material, and can withstand some light rain – a useful attribute in La Niña-affected 2022 eastern Australia. The bright red cover means that the book is more easily relocated if dropped or misplaced.

When encountering a bird of uncertain identity, the CABG readily demonstrates its utility. In the field, I found myself quickly checking the index at the back of the book to check a bird of suspected identity, before turning to the allotted page to confirm or dismiss my possible identification. Personally, I find this method of using the CABG more to my preference than using the quick reference guide at the front of the book. I feel the quick reference guide might be of more use for new birders, who may not be familiar with groups of birds.

Text

The CABG has the essential features of field guide – without devoting unnecessary space to expansive ornithological discussion. The introduction is very concise, but useful nonetheless. It effectively sets out the background to the handbook, and its *raison d'être*. The introduction adequately describes its compilation and structure.

The introduction provides some useful pointers regarding ethical birding, which in times of birding's growing popularity, is all the more important. Users should take a moment to read and consider these pointers, so as to minimise disturbance of birds in the field.

The authors and artists have distilled the species accounts to an effective minimum. All the essential ABG elements have been retained – including description, voice, distribution map

[2] See review by H. Perkins in *Canberra Bird Notes* 42(2) (2017): 223-227.

and probability-of-encounter indicator. In the field, I found that the species accounts provided an elegant sufficiency of information regarding all the birds that I encountered and then sought to identify.

Artwork

As the text points out, the ABG artwork has been largely retained for the CABG, with some updates and improvements. Therefore, as with the ABG, the artwork accompanying the species accounts is superb. The artists' skill in rendering accurate illustrations of the birds is wonderful to behold and actual plumage colours have been faithfully reproduced. For many species, there are illustrations of the bird in standing, perching and flying positions.

Where useful, the artists have set out beautifully drawn and painted pictures of adult male, adult female, immature and juvenile birds. In some cases, such as the thornbills, the artists provide useful close-up illustrations of particular body parts, such as rumps and tails, to aid identification.

There are many fine bonus images of certain birds undertaking particular activities in their habitat – such as Yellow-tailed Black-cockatoos gouging trees in search of grubs, or Banded Stilts foraging in shallow water. The artists have, at times, provided pictures to aid in differentiating between similar species.

As a bonus, the artists have included useful quick illustrative guides of particular groups of birds – including terns, tube-nosed seabirds, raptors and shorebirds. There is an interesting summation of aerial insectivores. Users of the book will benefit from studying these comparative illustrative guides. The authors and artists have judiciously limited description of subspecies to a few significant species only (*e. g.* Crimson Rosella).

CABG in comparison with the ABG

The genius of the CABG is in the compilers' excellent judgement in exercising decisions about what content to bring over, and what to omit from the ABG. They have very judiciously and successfully distilled the expansive and comprehensive ABG information into what is essentially a concise handbook. The ABG contains much information which may suit the slightly more advanced birder, and the ABG is best consulted following fieldwork – say in a car, in a motel or in an armchair at home. By contrast, the CABG enables contemporaneous consultation while actually in the field.

Consistent with the CABG's compact format, the compilers have necessarily focussed on the approximately 700 species that are resident or regular visitors to the Australian mainland, Tasmania, and surrounding seas accessible within a day trip by boat. The compilers have removed descriptions of birds found in Australia's external territories, or those which are vagrants or rare occasional visitors to Australia. Birders who undertake fieldwork in the external territories, will find the species for those locations in the ABG itself.

The CABG improves on the first edition of the ABG in several other ways – one of which is improved listing of birds in the index. The CABG index lists the common names of birds alphabetically, but by group. For example, all the rails are listed together, under rails in 'r'. The first edition ABG had a different system, setting out full common names in alphabetical order - for example, Buff-banded Rail is found under 'b'. I understand that this improvement may already have been made in the second edition of the ABG.

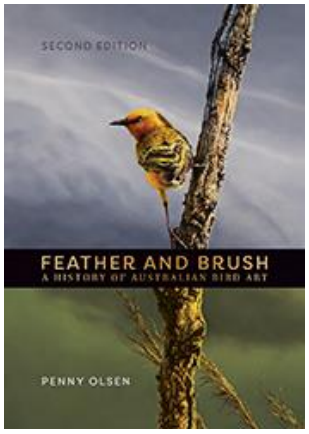
Summary

In summary, the CABG is a wonderful thing – a superb distillation of its parent book, the already superb ABG. The CABG captures all of the essential elements of the ABG and presents them in a concise, compact, portable form – ready to be carried and used in the field by birders new and experienced alike. Every Australian birder should avail themselves with a copy of this handbook.

Canberra Bird Notes 47(2) (2022): 168-173

Feather and Brush: A History of Australian Bird Art. **By Penny Olsen.** 2nd Edition. CSIRO Publishing, May 2022. ISBN 9781486314171, Hardback, 352 pp., AU$69.99.

Reviewed by JULIAN ROBINSON, Narrabundah, ACT 2604
(julian.robinson@internode.on.net)



In this second edition of *Feather and Brush*, Penny Olsen covers the history of bird illustration and art in Australia from indigenous artists to the present. The new edition is a plump, moderately large format (215mm x 305mm) hardcover of 352 pages, 120 more than the first. The publisher's note says there are now 400 images of which 200 are new, so it's a substantial update — a luscious and absorbing volume with the breadth and depth to appeal to anyone with even a modest interest in birds or art. Owners of the first edition, now twenty years old, will be sorely tempted.

As well as bird art and its Australian history, there's science, social history, an introduction to the developing technologies of art production and reproduction, interesting peripheral anecdotes and some fascinating insights into art more generally. Some of the big art questions are considered incidentally — What is art? Is there a difference between art and illustration? Is realism worthy, or does it define a work as 'not art'? Can photography ever be art? Olsen wisely, or necessarily, does not directly dwell on these questions which come up most often as asides and in artists' comments, with no conclusions the only possible outcome.

The book is arranged more or less chronologically with a couple of thematic excursions that don't get in the way of the reader's capacity to keep track. After a brief introduction that includes some new but short material on indigenous art, the second chapter covers the period of white exploration from 1600 until just before the first fleet – a time when oceanic exploration was at its peak and illustrators were beginning to be included on ships to record what was found.

Chapter 3 takes us to 1800, a period to which Olsen ascribes 'The Escape of Natural History Study', in which most bird art was by 'Convicts and Officers'. Chapter 4's art, by contrast, is assigned to the 'Settlers and Surveyors' of 1800 to 1840, covering the age of squatters and inland exploration.

Chapter 5 departs from chronology to give a separate account of European artists who drew, engraved and painted Australian birds without the benefit of ever being in Australia. Strangely distorted parrots, unrealistic backgrounds and a very odd kookaburra are partly the result of artists working from shrunken skins and badly stuffed specimens, or copies of copies of other artists' works. A few living birds in zoos and private collections were available to some and this may explain the better depicted birds of the period, though perhaps not one particularly fine hand-coloured engraving, quite beautiful, of a Turquoise Parrot that Olsen points out seems to have been blessed with an Orange-bellied Parrot's orange belly. (Reviewer's postscript: In fact, many Turquoise Parrots have varying degrees of orange belly, some quite extensive, so the artist here was probably correct in this regard).

Chapter 6 covers 'The Australia-based Artist-cataloguers, 1840 – 1900' while, in another chronological side-step, Chapter 7 is devoted to European-based artists in the longer period

1840 to 1940. We meet John and Elizabeth Gould in both, thanks to their travel between Europe and Australia at the beginning of this time.

Olsen suggests that the first half of the twentieth century was 'lean times … for natural history artists' due to the influences of photography and modernism. Chapter 8 covers that period and is a short one. Fortunately, there were exceptions to the leanness she identifies, including the birth of the first Australian field guides and the activities of some artists like Neville William Cayley and Ellis Rowan. I was particularly struck by some of Rowan's beautiful paintings for *The Birds of Australia* (1911), but Olsen proves her point by noting that this book was otherwise mostly illustrated with photographs.

Elizabeth Cogley

Chapter 9 covers the second half of last century, when the emergence of ecology as a science and conservation as a goal spurred a renaissance in bird illustration and art. This was truly good times, with not just more art, but new styles of art. Images began to have a sense of movement, sometimes implied as a 'frozen moment' caught during the process of obvious activities. Two standout examples are Humphrey Price-Jones' Peregrine Falcon attacking a pair of Grey Teal and Krystii Melaine's unusual and wonderful preening Malleefowl. Both are a world away from the statuesque styles of earlier times. Backgrounds became more detailed and often more realistic. Some artists veered into impressionism, others embraced realism or headed towards ultra- and hyper-realism. Famously influential names emerged — Robin Hill, Raymond Harris-Ching, Peter Slater, William T. Cooper — and, as Olsen describes, a 'flock of artists with a passion for birds and a commitment to their art'. Olsen contends that this renewed artistic activity faded towards the end of the century, but she seems to be referring only to books. A collection of stunning paintings of the 1990s suggests that artistic effort was alive and well, but in the form of wall art rather than books.

Chapter 10 diverts once more from chronology (and from exciting new painting styles) to an interesting and well-illustrated roundup of the history of Australian field guides and handbooks.

The final Chapters 11 and 12 introduce us to what I would call contemporary bird art. Olsen distinguishes between living and departed artists, but they all worked in the last 20 years, so are, in the popular sense, 'contemporary'. Chapter 11 includes comparatively detailed biographies of four notable artists and a summary of the events and artists working in the period 2000–2020. Chapter 12 devotes a two-page spread to each of 52 living artists, combining a brief biography with examples of their artworks. Some are not previously published so this is a first opportunity for most of us to view some stunning and original works.

Readers will approach such a substantial volume in different ways. For some it will be an illustrated history book, to be read from cover to cover. Others might see it as a source of intermittent inspiration and satisfaction, to be dipped into when time allows. It could be a reference book, or a picture book.

I jumped straight to the last two chapters for what turned out to be a visual and even emotional feast. As an enthusiastic photographer of birds I sometimes strive for the same things as many of the contemporary artists describe – hoping to strike an emotional response in the viewer through composition and structure, or portraits that convey something of the bird's environment, its situation, or past or future or even state of mind, or revealing their home life and behaviour. Perhaps even, to use a word that is overused here and elsewhere, the 'essence' of a bird. I would argue that painters as a whole have greater success than photographers because, given sufficient skill, they can arbitrarily tweak and augment their images for impact while a photographer is more or less stuck with what was presented at the moment they clicked the shutter. There's no shortage of discussion (outside this book) on the relative merits of brush *vs* camera in achieving those goals, but ultimately the same goals are shared by anyone with intent, whatever means they are using.

With this in mind it might be possible to understand my anticipation as I waded into the contemporary artists. All the works were new to me and there was a genuine thrill at the moment of turning each page to a new artist, most often to be met with an image or two that shocked, surprised or satisfied. It's a hundred pages of thrilling discovery – a variety of Australian bird artists, images and birds that I doubt you would find anywhere else. Many of us would have this book just for its last chapter.

Some of my heightened reactions while reading that section were in response to works that happened to resonate with photos of similar subjects that I'd once sweated over in the digital darkroom. The paintings were invariably an improvement on what I'd managed to achieve and thus doubly impactful for me. One example is a small reproduction of an Orange-bellied Parrot, glowing and brilliant in the gloom of a particularly dark and stormy night. The little parrot is perched on an old-fashioned travel trunk under a black umbrella and a black sky. The bird is luminescent, strong and vulnerable all at once, an unsubtle but quite affecting depiction of artist Brian Looker's stated intent – *'Preparing to Head North' reflects the stormy weather ahead for the endangered, migratory parrot*. (Fig. 1, left). Years ago I produced a photo of a juvenile OBP with the same theme and style, though of course without the travel gear. I posted it with the sentiment "Good luck little bird…" to encapsulate similar feelings about the vulnerability and beauty of this bird (Fig. 1, right). The comparison between my photo and Looker's painting is an example of how painted art can heighten or expand the impact of a similar photo by adding more than was literally there.

Olsen is saved from having to consider whether to include photographs in this book by its title, but the relationship between bird art and photography is interesting and complex, and *Feathers and Brush* still provides plenty of material on the subject to ponder. In the early 1900s when illustration was the main game, the appearance of bird photography put a damper on painting and drawing activity because it seemed obvious, at first, that photographs must provide a superior representation of reality. But painting survived and later flourished as the realistic artists recognised the advantage of being able to improve lighting or to choose better poses or presentation to show desired features, while what I call the evocative artists realised that they could show more depth and feeling than a photograph could normally manage. The most obvious influence of photography on art was its ability to capture and transport accurate models on which to base a painting. No longer relying on dead birds, quick sketches or half-remembered glimpses, artists could freeze a moment in a photo and later analyse, copy and modify to heart's content. The result was more accurate images, particularly of dynamic action, and there are several excellent examples in the book. Other artists such as Philip Farley and William Ritchie successfully aimed to emulate or even improve on the 'reality' of photography.

Figure 1. Orange-bellied Parrot: Painting by Brian Looker (left) and photo by Julian Robinson (right). See also text.

A less obvious photographic influence that is illustrated but not mentioned in the text is the use of bokeh or out-of-focus areas in front or behind the bird, to isolate and emphasise the subject. It is a familiar and integral part of long-lens photographic images and so it seems odd to us that something so ubiquitous could not have been seen at all until the camera arrived. But the images in the book confirm that until the twentieth century, backgrounds were de-emphasised not by loss of focus, but by fading, vignetting and reduced detail. Modern painters, having borrowed bokeh, seem to divide on its use – some do and some don't.

In reading this book, my initial interest was in the images and their stories rather than the history of bird art, which explains my starting at the end. However, once back at the beginning I found the major historical part to be so interesting and absorbing that I read the whole in a sitting. The writing is lucid and straightforward without being dry, and comprehension and cohesion is helped by the author's ability to use sometimes clever segways to provide necessary continuity, so that we seem to be reading a believable story rather than a series of historical facts.

Within the historical chronology, other themes emerge on the purpose and development of the art itself. We can pick two different intentions in bird art from its beginning, one illustrative and educational, and the other evocative and arty. Their relative importance and

how they are expressed has varied with time and technology, and there is plenty of overlap, but the same primary motivations still apply today. The illustrative and educational aspect was once about scientific recording but now is also associated with generating an awareness of birds and their place in the world, their environmental significance and the risks they face. Evocative works were originally popular in style, aiming to show off the exotic birds to be found in the new world. Today they have become 'artier' and more emotive, with the intended impact often directed at generating a love of birds and the desire to understand them more and take more interest in them. In this sense, some evocative art has become educational.

Scientific illustration has always tried to be realistic, but evocative art has shifted and diverged along multiple paths. There has been a constant tension between 'realistic' art and freer expression, and realism itself has evolved several manifestations, with 'highly realistic', ultra- and hyper-realism all mentioned. The desire to capture movement or impressions takes some artists towards impressionism, or abstract or semi-abstract. Whimsy and humour have probably been present throughout, but there are more examples here from the contemporaries than early times. I had not known that Edward Lear was a very capable bird artist but on learning that would have expected to find whimsy in his work. However both of his examples here are technically impressive but whimsy-free.

Peter Trusler

Between the historical and contemporary, there are so many works in this book that the reader could spend many happy hours in tracing different styles, motivations, materials, influences, theories and artists before settling down to simply enjoy the images. I started preparing a list of my favourites but had to give up, there are so many gifted artists, beautiful images and wonderfully rendered species.

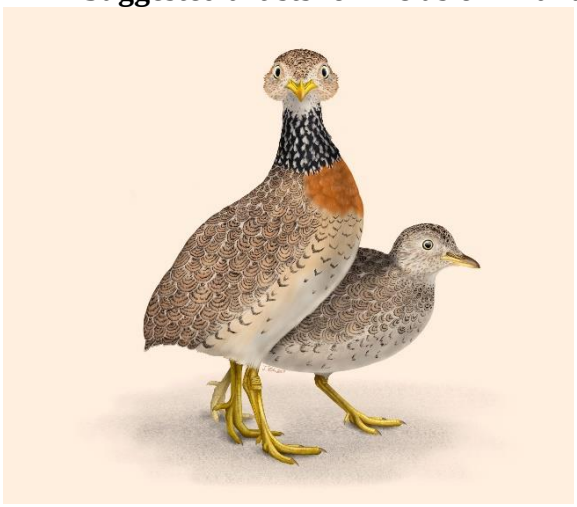
The species that artists have chosen as their subjects have also changed with time and fashion, though parrots, apparently, never fall out of favour. Via early artists, we are offered several extinct species that we will never see any other way. As well as the parrots, there are plenty of fairywrens, owls and pardalotes and a surprisingly wide range of other birds, though with an understandable emphasis on those with maximum human-perceived beauty, and rarer or threatened species. This probably explains why the only thornbills are Yellow-rumped. Oddly, these appear in four different works, only one of which reminded me of a Yellow-rumped Thornbill. Readers will no doubt disagree but in my view only John Cotton's sketches in 1844 managed to get them right. Sadly, he never managed to get his book published, a fate that seems to have been repeated often in the history of Australian bird art.

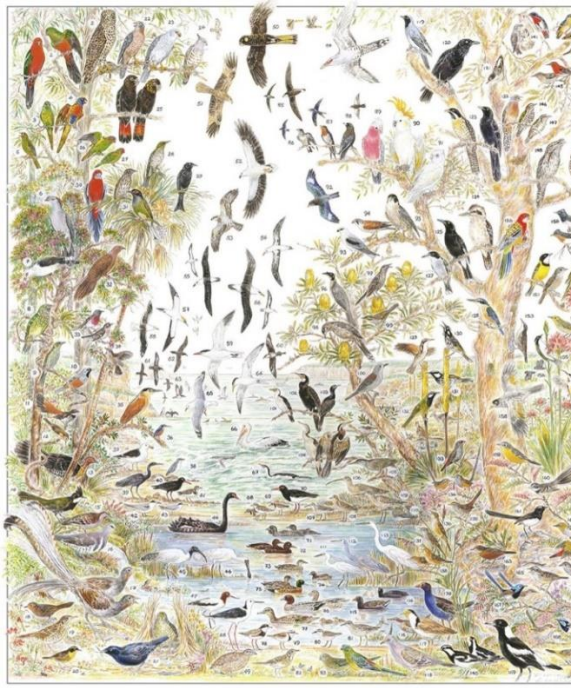
Art books live and die on the quality of their printing, and happily the reproductions in this edition are excellent. Many images are full page though inevitably a majority are smaller in order to fit so many in the available space, but I did not feel any lack on this score. A couple of images are noticeably darker than they appear in the books for which they were created, but otherwise the artworks seem to be accurately reproduced and a pleasure to view. A comprehensive index that covers birds, artists and publications makes navigation easy and

the extraordinary glossary offers the interested reader or researcher a lifetime of further investigation.

Feather and Brush is a book to treasure, and, at $70 RRP, a bargain. In the hope of encouraging a further edition, I offer three suggestions for next time: Julian Teh for his fabulous Plains Wanderers, Jimmy Dvate who muralised my juvenile OBP on a Melbourne wall and who has many other stunning birds on walls and silos around south-east Australia, and Fiona Lumsden whose beautiful posters showing the birds of various regions take years to complete (and include up to an amazing 170 species on a poster-size page).

Suggested artists for inclusion in a future revision of *Feather and Brush*.



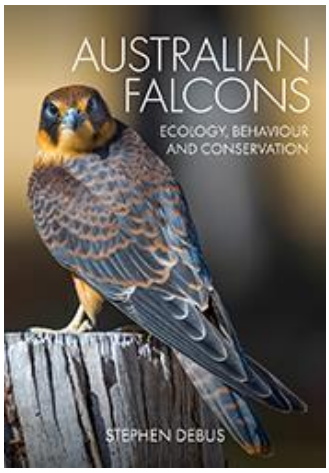


Above: Julian Teh
Right: Fiona Lumsden
Below: Jimmy Dvate

Canberra Bird Notes 47(2): 174-175

***Australian Falcons: Ecology, Behaviour and Conservation.* By Stephen Debus.** CSIRO Publishing, November 2022. ISBN: 9781486315765. Paperback, 232pp. Au$49.99.

Reviewed by *MICHAEL LENZ, Lyneham ACT 2602 (michael.lenz.birds@gmail.com)*



The falcons (genus *Falco*, Falconidae) are represented in Australia by six resident species. Five of those are endemic (Nankeen Kestrel, Brown Falcon, Australian Hobby, Grey Falcon, Black Falcon), and the Peregrine Falcon is endemic at the subspecies level. For general information on their biology, one has to go back to the 1993 HANZAB volume 2. Many studies of these species have since been conducted and published but the literature is not necessarily accessible to a wider audience. Thankfully, Stephen Debus has compiled, synthesised and summarised the recent research. The book is not a replacement for the HANZAB text, but it adds to it and is to be read in conjunction with it. It is hoped that a better understanding of the autoecology of our falcons will benefit their conservation and management. As top predators, they are important indicators of the health of the environment. Stressing the need for conservation and their management is a recurrent theme throughout the book, as the population trend for all species is downwards. The exception is the Peregrine Falcon, whose population seems to have stabilised.

One further raptor species has been included, owing to its kestrel-like hovering: the falcon-shaped Black-shouldered Kite, which belongs to the genetically very different hawks (Accipitrae). This inclusion is most welcome and will be of special interest to Canberra birdwatchers after an exceptional breeding season of Black-shouldered Kites in our region.

The book follows a similar approach to the one taken in *Australasian Eagles and Eagle-like Birds* (Debus 2017). The species sections are organised under headings similar to those in HANZAB. A "Commentary" section for each species is added. There Debus summarises key points and issues, draws some comparisons with other species outside Australia, points out gaps in our knowledge and suggests future research. This is a most valuable section.

The text for each species is accompanied by impressive photos taken by David Whelan, often showing the birds in action. The photos for the Grey Falcon were provided by several other photographers. In this context it is worth repeating Stephen's comment that photos of falcons (and birds of prey in general) at nests are no longer required just for the sake of the photo. The danger of disturbance to the detriment of the brood is too great. Photos of Australian birds of prey at nests have been published many times, most notably by David Hollands (2003 and 2021).

The most fascinating accounts are those of the Grey Falcon and the Black Falcon. Both species were only poorly known at the time that the HANZAB volume was published.

Knowledge of the Grey Falcon, occurring in very low numbers over a very large area in the arid and semi-arid zones of Australia, was advanced mainly by Schoenjahn's 14-year study, but also by other researchers. The latest assessment gives the global population at just 1000 mature individuals. The species has adapted to its arid environment in ways that are unique

in the genus *Falco*: minimal activity levels, a highly specialised diet (only birds), high heat tolerance in the nestlings, extended parental care, ground roosting, high mobility (partly to find a mate) and other features.

For the Black Falcon, more information is now available on its breeding distribution, status and threats. It has been recognised that it is a breeding migrant in the dry season to the Top End (NT), a winter visitor to the Gulf Plains in NW Queensland, and a breeding resident in southern Victoria. The species account is also used under "Commentary" to visit the topic of sexual size dimorphism in falcons, most raptors and owls.

Just one topic from the section on the Peregrine may be worth mentioning: the top speed in a stoop has been evaluated with Australian data from GPS-trackers on free-flying birds: 190 to 271 km h^{-1} (M. Calvin) *versus* the value of 200 miles per hour/320 km h^{-1} suggested for decades, derived under rather artificial conditions.

The main body of the volume concludes with a photo-essay on the various stages of the breeding cycle in falcons. This is followed by the chapter on the Black-shouldered Kite, with the same level of detail as for the falcons.

An 'Epilogue' gives an overview of the threats to each species. Most in danger are arid-zone endemics and endemic bird-hunters. Even the populations of the Nankeen Kestrel and Brown Falcon are in decline. The list of threats is all too familiar (not all apply to all species): agricultural poisons, rural land clearing and removal of paddock trees, collision with human infrastructure (including barbed wire fencing), habitat degradation by marginal agriculture and pastoralism in the arid and semi-arid zone, and problems caused by other farming practices, predation by feral cats (and possibly) foxes, climate change, inadequate protection and environmental legislation, interference and competition from some over-abundant larger species, such as cockatoos and corvids, and disturbance of active nests by photographers.

The book is made even more valuable by a comprehensive Bibliography of publications since HANZAB (full citations in contrast to HANZAB): books, references for each species, including the New Zealand Falcon, and for the Epilogue.

The book provides a wealth of new information on all aspects of the biology of the Australian falcons and the Black-shouldered Kite. However, in most cases large-scale and long-term population studies, which are available for overseas species, are still lacking in Australia.

For any birdwatcher, encounters with falcons are among the highlights of an outing. Here is a book that will help you to better understand them and the uncertain future they face.

The book is highly recommended.

Canberra Bird Notes 47(2) (2022): 176-177

RARITIES PANEL NEWS

2022 has continued to be a surprising period for unusual birds in the ACT and surrounds, COVID notwithstanding. The highlight was undoubtedly the Pacific Baza recorded on Red Hill in July, firstly on Canberra Nature map then subsequently by many COG members and others on eBird. Bazas had not previously been recorded in the ACT. It is a species generally found in the tropics and subtropics, so quite what it was doing in Canberra in mid-winter is hard to fathom. It is a very distinctive species, especially when perched, with a bright yellow iris, a prominent erectile crest, and wings and tail extending below the branch. The head, neck and throat are grey, the belly covered in bold brown horizontal bars on white. In flight, the carpal joints are carried well forward.

A second surprise was the much-recorded Blue-faced Honeyeater breeding event in Acton Park in October, first recorded by Rob McGrath on 2 October. While this species is being recorded with increasing frequency in our area, this was probably the first recorded breeding in the ACT. Shorty Westlin posted a comprehensive series of photographs on eBird, showing three adults, two immatures and five juveniles.

Another "first" for the ACT was the heavily-recorded Blue Bonnet at John Knight Park, Belconnen, in Aug-Sept, in the company of Red-rumps. Despite its lack of a leg-band, the Panel determined that the "very approachable" bird was most probably an aviary escapee and hence will not be added to the ACT list.

The Magpie Geese at Wet Lagoon may have been birds dispersing from the Lachlan.

The Panel has been delighted with the flurry of recent records of the Brush Bronzewing. This species has never been common but a tally of the records for the ten years prior to the Panel's 2020 review of the unusuals list showed fewer than 10 records, hence it was added to the list. And the records have flowed in, so the species will most probably be dropped again at the next revision. Just a few of the records which were accompanied by photographs are listed here.

While the Channel-billed Cuckoo and the Scarlet Honeyeater are no longer on the "unusuals" list, it is pleasing to see them being recorded from time to time. The Common Sandpiper is back for the third year at its usual haunts in south Canberra. In November were also recorded: Whiskered Tern at Fyshwick sewage farm and 3 Red-necked Stints at Canturf.

ENDORSED LIST 101, DECEMBER 2022

Magpie Goose (*Anseranas semipalmata*)
2, 12 Oct, Jane Roberts, Wet Lagoon

Pacific Baza (*Aviceda subcristata*)
1, 27 July, Roy McDowell, Red Hill (canberra.naturemap.org/sightings/4439699; see also this issue, pp. 152)

Brush Bronzewing (*Phaps elegans*)
1, 10-11 Dec, Steve Read and others, ANBG
1, 27 Dec, Lachlan Read, Bendora Rd
Diamond Dove (*Geopelia cuneate*)
1, 27 June, Lyndon Howe, Parkwood - status unclear

Blue Bonnet (*Northiella haematogaster*)
1, 31 Aug, Sophie Orzechowski, John Knight Park – escapee

Indian Ringneck (*Psittacula krameria*)
1, 21 Nov, Queanbeyan, Brian Brown – escapee, albino mutation

Blue-faced Honeyeater (*Entomyzon cyanotis*)
1, 29 June, Richard Allen, Curtin
9, 3 Oct, Shorty Westlin, Acton Park (see also this issue, pp. 156)
1, 5 Dec, Rainer Rehwinkel, Stockdill Dr

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Canberra Bird Notes

Canberra Bird Notes is published three times a year by the Canberra Ornithologists Group Inc. and is edited by Michael Lenz and Kevin Windle. Major articles of up to 5000 words are welcome on matters relating to the biology, status, distribution, behaviour or identification of birds in the Australian Capital Territory and surrounding region. Please discuss any proposed major contribution in advance. Shorter notes, book reviews and other contributions are also encouraged. All contributions should be sent to one of those email addresses:

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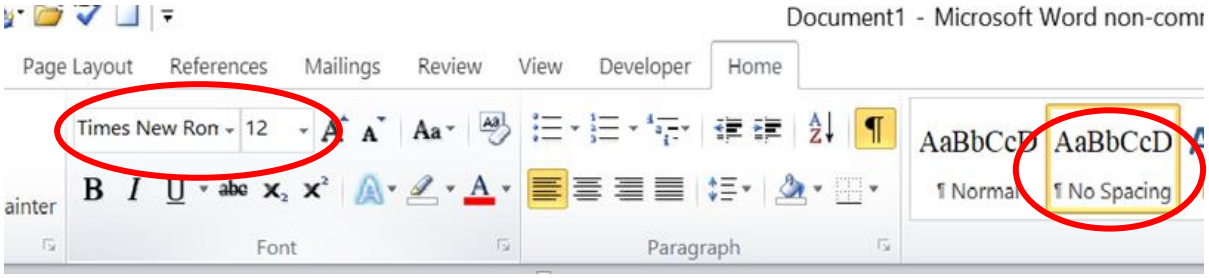

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