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ARTICLES

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THE RISE AND RISE OF THE EASTERN KOEL IN THE ACT

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Abstract. *The rise in numbers of the Eastern Koel* (Eudynamys orientalis) *in the ACT from the initial observations in January 1981 to the present, as indicated by the number of records, is summarised. Records rose only slowly until the 42 in 2000-2001 led to the COG Rarities Panel removing the Koel from COG's List of Unusual Birds in 2001-2002. Records were lower in the four subsequent years, and it was not until 2005-2006 that records were estimated to exceed 100. Records plateaued for a few seasons and it was not until 2009-2010 that records began to rise more sharply, in particular in 2010-2011 following the wet spring of 2010 (over 350 records). Apart from declines in 2011-2012 and 2017-2018, records increased significantly each year, to a total of 1378 records in 2018-2019, the last year for which data are available. Together with the very significant rise in the number of Koel fledglings in 2020-2021 detailed in Holland (2021), they clearly illustrate that in the space of 40 years the Koel has become an established and very conspicuous breeding species, usually present in the ACT from late September to early April.*

This paper also briefly discusses some still unanswered questions about the Koel: do they return to the same spot each season? Do adult Koels interact with fledglings, especially late in the season? How many eggs does a female lay? It also discusses whether Red Wattlebirds (Anthochaera carunculata) *hosting Koel fledglings hold territories, given the now multiple examples of two or more fledglings seen together.*

1. Introduction

Given the very significant increase in the numbers of the Eastern Koel (*Eudynamys orientalis*) (Koel hereafter) fledglings/juveniles this 2020-2021 season (Holland 2021; this issue), it was considered very appropriate to summarise how the status of the Koel in the ACT has changed since the first reports of them in the early 1980s, just 40 years ago. This has been done through a search of the available literature, in particular the Annual Bird Reports published by the Canberra Ornithologists Group.

2. Summary of the Koel's first arrival and build up in the ACT

The first reports of a Koel in the ACT were summarised in a short note by the Editor under Odd Obs in *Canberra Bird Notes* (Hermes 1981). This includes the observations by Vance Russell from 1-8 Jan 1981 of a solitary male from the parkland between Curtin and Lyons, with other observers also seeing and hearing a bird (possibly the same individual) in Curtin, Hughes and Yarralumla. The note indicates that the only previous record in the Canberra region was in 1946 along the Cotter River, by Lamm and White.

The next report was of a male in Narrabundah from early Dec 1985, initially calling from 02:00 h to sunset, and last heard in the week beginning 28 Feb 1986 (Ross 1986). A female was also seen during that time, but her behaviour was less obtrusive. The ACT Bird Atlas (Taylor and Canberra Ornithologists Group 1992), for which data was collected between 1

Sep 1986 – 30 Aug 1989, included the Koel as a Minor Species, referring to the Ross note and adding, 'since then one or two have appeared in Canberra every summer.'

Summarising bird records in the ACT, Wilson (2000) notes the three references above and indicates that since then this species has been reported every summer, but it has never been numerous. This is clarified by the following, taken from COG's Annual Bird Report (ABR) for 1998-1999 (Canberra Ornithologists Group 2000), which notes, 'There have been 46 confirmed records since 1985-86; 2 in the 3 years 1985-88, 25 in the 3 years between 1988-1991, just 2 in the 4 years 1991-1995 and 17 since Jul 1995.'

The findings from all available ABRs since then have been summarised in Table 1. Note that the 2001-2002 ABR indicates that 1994-95 was the last year in which there were no records for this species. Since then, records had steadily increased, with a total of 42 reported last year (although not all were lodged for COG Rarities Panel endorsement – Table 1 indicates there were 32 of these). In response the Common Koel was removed from COG's List of Unusual Birds. It is also interesting to note that in that year, and in previous ones, many of the reports were from the southern suburbs, though in 2001-2002 GBS reports ranged from Ainslie and O'Connor in the north to Weston and Kambah in the south.

Table 1. Summary of the Increase in Koel numbers from 1998-1999 to 2018-2019

ABR Year	Observations		Timing		Comments	Reference
	General	GBS	General	GBS		
1998-1999	4 single birds	3 singles	3-17 Dec	1 wk Dec – 3 wk Jan	2 and 9 unconfirmed reports resp.	CBN 25 (4) Dec 2000
1999-2000	2 single birds (one a female)	14 records of singles? from 3 sites	21 Dec and 22-23 Jan	2 wk Nov – 4 wk Jan	2 and 5 unconfirmed reports resp.	CBN 26 (4) Dec 2001
2000-2001	1 single bird	9 records, all singles, from 4 sites	29 Dec	2 wk Nov – 1 wk Jan	1 and 31 (15 sites) unconfirmed reports resp.	CBN 26 (4) Dec 2001
2001-2002	9 single birds, all except 1 from south. suburbs	20 records from 11 sites (see text above)	27 Nov – 25 Dec	4 wk Nov- 3 wk Jan	Removed from List of Unusual Birds	CBN 27 (4) Dec 2002
2002-2003	2 single birds	34 records from 11 sites	16 and 27 Dec	2 wk Oct (3 sites) – 2 wk Jan	GBS numbers up (see text)	CBN 28 (4) Dec 2003
2003-2004	6 single birds	20 records from 11 sites	9 Nov – 24 Dec	5 wk Oct – 1 wk Jan	See text	CBN 30 (1) Mar 2005
2004-2005	No records	16 records from 6 sites	-	4 wk Oct – 2 wk Jan	Only 1 site recorded it consistently	CBN 31 (1) Mar 2006
2005-2006	15 records of mostly calling single males	Records from 31 sites, mostly of single birds	30 Oct – 26 Jan	4 wk Oct – 3 wk Feb	Maximum 3 together General, 3 X 2 birds GBS – see text	CBN 32 (1) Mar 2007

Table 1 continued on next page

Table 1 continued from previous page

ABR Year	Observations		Timing		Comments	Reference
	General	GBS	General	GBS		
2006-2007	30 records of 1-2 birds (23 by the same observer)	76 records from 24 sites	Not available	2 wk Nov- 2 wk Feb	First copulation record	CBN 33 (1) Mar 2008
2007-2008	28 records of single birds (14 by same observer)	1-2 birds recorded from 33 sites	20 Oct – 18 Jan	2 wk Sep – 2 wk Mar	Carwoola records	CBN 34 (1) Mar 2009
2008-2009	9 records including from the Cotter	1-2 birds recorded from 24 sites	25 Oct – 9 Feb	1 wk Oct – 4 wk Feb	First (four) dy Ainslie breeding records	CBN 35 (1) Mar 2010
2009-2010	28 records of single birds	1-2 birds recorded from 42 sites	22 Oct – 7 Mar	3 wk Oct – 3 wk Mar	3 breeding records of dy incl. Barbara Allan (Page)	CBN 36 (1) Mar 2011
2010-2011	79 records of up to 2 birds	1-3 birds from 37 sites	9 Oct – 2 Apr	2 wk Oct – 2 wk Apr	Much more breeding to 14 Apr!	CBN 37 (1) Mar 2012
2011-2012	Reporting rates down 66% on last year	Abundance rate down 11% on last year	23 Oct- 15 Mar	2 wk Oct – 2 wk Apr	Less breeding general, more GBS	CBN 38 (1) Apr 2013
2012-2013	76 records cf 37 records last year	325 records cf 251 records last year.	Observed between Sep and Mar	2 wk Oct – 2 wk Apr	1 breeding record General, 9 for GBS	CBN 39 (1) Apr 2014
2013-2014	Abundance is up 224% on last year	343 records from 44 sites	13 Oct – 29 Mar	1 wk Oct – 2 wk Mar	10 breeding records Gen, 14 for GBS	CBN 40 (1) May 2015
2014-2015	322 records up on 129 records last year.	397 records from 50 sites	18 Oct – 25 Mar	2 wk Oct – 3 wk Apr	13 breeding records Gen, 13 for GBS	CBN 41 (1) Jun 2016
2015-2016	482 records	478 records	18 Oct – 28 Mar	2 wk Oct – 2 wk Mar	-	CBN 42 (1) Apr 2017
2016-2017	591 records	443 records	Not clear – 30 Mar	2 wk Oct – 2 wk Mar	-	CBN 43 (1) May 2018
2017-2018	477 records	481 records	18 Sep – 17 Mar	4 wk Sep – 3 wk Mar	-	CBN 44 (1) Apr 2019
2018-2019	874 records	504 records	2 Oct – 17 Jun	2 wk Oct – 4 wk Mar	-	CBN 45 (1) Apr 2020
2019-2020	No ABRs yet available					

In 2002-2003 GBS records increased sharply. They included the earliest arrival to date (GBS 2 wk Oct – from three sites, two in Hughes and one in Aranda), and up to 3 birds in the GBS 3 wk Dec in Pearce. This was not sustained over the next two seasons; in particular 2004-2005 was a poor year (as it was in my local area - see Table 2), with only 1 site in Pearce recording Koels consistently (4 wk Oct to 1 wk Jan).

However, the 2005-2006 ABR notes that, if both the general and GBS records are combined, they showed records from a considerably wider spread of suburbs (24) than in previous years. The maximum number together in the General records was 3, comprising one adult and one immature male and one possible female on 15 Jan 2006 at the Macquarie oval. There was also one very notable record outside suburbia on 13 Jan 2006 on Boboyan Rd. In the GBS there were also 3 observations of 2 birds in Yarralumla, Weetangera and Weston, with records from February for the first time (up to GBS 3 wk Feb), and the abundance showing an enormous rise over the long-term average.

When taking into account that the General records in both 2006-2007 and 2007-2008 included the repeated entries by a single observer from the one site (see Table 1), the number of records overall had plateaued. Notable were the first breeding record (copulation observed on 1 Jan 2007 in Turner), and also 2 General records from rural Carwoola in 2007-2008. In that season there were also the earliest and latest records to date (GBS, 2 wk Sep to 2 wk Mar). Numbers noticeably dropped in 2008-2009, but there was an early record (25 Oct) from the Cotter Reserve (note the 1946 Cotter River record above), and also the first four dependent young (dy) found in Ainslie (Lenz *et al* 2009). Numbers recovered in 2009-2010, with a new latest departure of 2 adults in GBS 3 wk Mar in Curtin, and a further 3 breeding records of dependent young between 6 Jan (Ainslie) and 20 Feb (Page).

However, the significant increase in numbers started in 2010-2011. Table 1 shows that this was mainly the result of a steep rise in the General records, including the first records in April. Similarly, the last GBS record was in the 2 wk Apr. There were also 14 breeding records: the first being copulation observed on 30 Oct 2010 at Kama NR and the last being dy on 14 Apr 2011 in Scullin (by Grahame Clark). For the GBS there were four breeding records, the first being copulation on 1 wk Jan and the last dy 2 wk Apr (which starts on 9 Apr) in Curtin by Martyn Moffat; very late, as in the General records. These are now the latest breeding records of which I am aware, Martyn's of 6 Apr (presumably the same dy) being the previous latest (Holland 2011).

Note that the 2010-2011 ABR states that:

> …interpretation of the data is problematic, ..… Some of the apparent increase may well be a recording effort artefact. For example, Koels appear to be both charismatic and loud, and are therefore more likely to be reported on the COG chat line. 28 of the records are 'incidental' which is high compared with the proportion of incidental records for most other species. Many records are very likely to be repeat observations of the same bird in the same place over successive days. Of the 14 breeding records, 8 are very likely to have been of one breeding event and a further 5 records are likely to have been of a second breeding event.

However, as clearly shown by the records in subsequent years in Tables 1 and 3, 2010-2011 does seem to have been the year when numbers started to increase significantly, with people starting to notice more of them in their local areas. My records in Table 2 also show a similar increase from the same season. While it could have been attributed to the very wet

year following the breaking of the Millennium Drought, the 2011-2012 (also a wet year) General records declined, with reporting rates down 66% on the previous year, and only 2 breeding records. In contrast the GBS records were only slightly down, though there was an increase in breeding records: 9 records (presumably all dy) well inside previous times (from 4 wk Jan to 4 wk Mar).

The 2012-2013 ABR notes that this year reverted to recent general trends of increasing reporting rates. Distribution was also increasing but was generally contained within Canberra's suburban habitats. Table 1 shows the number of records and also that the first General sightings were in September (actual date not clear), for only the second time (see GBS for 2007-2008). Breeding records for General were well down but similar for the GBS. Again, all were well within previous times (1 wk Jan to 4 wk Feb), though adults (presumably) were observed for the third season in a row into the 2 wk Apr.

The 2013-2014 ABR states that this species is now an established part of Canberra's avifauna - so much so that the claimed sleep deprivation impact of its nocturnal calling has sparked public controversy about a mooted cull. However, while abundance (and breeding) was up steeply for the General records (see Table 1), abundance was only up 16% and breeding only slightly for the GBS. All observations were within previous times.

The 2014-2015 ABR repeats the statement about the mooted cull but adds that the Koel continues its rapid increase in numbers and distribution. Most of this seems to have come from General observations, though the GBS record of 1 bird in 3 wk Apr extends the latest sighting by around a week (Table 1). While the 26 breeding records were similar to those in Table 2 in Holland (2021; this issue), these are the last breeding records to be included in Table 1 as the latter, which were compiled through a more active search including involving the public, are considered the more reliable.

As can be seen in Table 1, numbers then increased further, though not uniformly. The 2018-2019 ABR numbers of 874 records in General (an 11-fold increase from 2010-2011) and 504 in the GBS represent the highest to date, showing that the Koel had clearly established itself in the ACT. Of note also are further adult sightings in September (from 18 Sep in General and GBS 4 wk Sep) in 2017-2018, and the winter sighting of a female on 17 Jun 2019 (see Section 3.1 of Holland 2021; this issue).

I have also checked eBird Australia records, but up to the end of 2005 it shows only 6 records from a total of 4 locations. While between 2006-2010 it contains records from 19 locations (3 in Bungendore), all are single records except for 3, one being Bungendore. Therefore, it is not a useful source for the early records, since during that time the vast majority were entered directly into the COG data system. Many users switched to eBird during the next decade, and the bulk of the later ABR records originated from eBird Australia.

The summary of my GBS and local Chapman/Rivett records in Table 2 closely reflects the increase shown in the ABRs above. Before the January 2003 fires, I recall they were in low and variable numbers, mostly aural records, with the occasional sighting of a male, in late spring or early summer, similar to the ABR pattern observed from 2005-2006 to 2009-2010.

As for the ABR records in Table 1, it can be seen that it was also in the wet year of 2010-2011 when observations started to increase. The species arrived three weeks earlier and

stayed until 30 Mar 2011 (still my latest adult sighting see Holland 2021; this issue). To 16 Dec 2010 the pattern had been quite normal with just 12 aural records, but after a quiet period of just over 1 month activity rose significantly with a male giving the *whoa whoa* call (which I recognised for the first time) on 18 Jan 2011. I first recognised a female calling *kek kek* on 11 Jan 2013, but the first female was not seen until 16 Jan 2014. This was shortly before I observed the first fledgling for the area on 23 Jan 2014.

Table 2 Summary of the Chapman/Rivett Eastern Koel records from 2004-2005.

Year	No obs.	Timing	Comments
2004-2005	Nil	-	-
2005-2006	10	8 Dec to 11 Jan	Call only except for 1-3 Jan 2006
2006-2007	1	26 Nov	Call only
2007-2008	8	13 Dec to 12 Jan	Mainly call – seen only on the last date
2008-2009	3	26-Nov to 9 Dec	Call only
2009-2010	10	21 Nov to 9 Jan	Call only except for male sighted on 2 Jan 2010
2010-2011	36	2 Nov to 30 Mar	Significant increase in early 2011 – see text.
2011-2012	53	23 Oct to 6 Mar	Similar, but observations more evenly spread
2012-2013	69	17 Oct to 17 Feb	Majority before New Year, only 14 in 2013
2013-2014	45	12 Oct to end Feb	Relatively few before fledgling on 23 Jan.
2014-2015	67	2 Nov to 28 Feb	Similar pattern as 2013-2014.
2015-2016	60	31 Oct to 10 Mar	Most in 2015.
2016-2017 to 2020-2021	almost daily in Koel season – see text below		

From 2016-2017 the numbers of observations were high, becoming almost daily in the Koel season, often with multiple sightings each day at the peak of the season. As described in Holland (2021; this issue) the earliest and latest observations in this period were on 4 Oct 2020 and around 11 Apr 2021 (the only season these were observed later than adults), respectively. The references quoted in this and earlier papers may be consulted for more details.

3. Discussion

From the above it is clear that numbers of Koel sightings in the ACT rose very slowly from the first records in early Jan 1981 and Dec 1985 to Feb 1986 with only around 50 records in total by 1997-1998. As shown in Table 3, while records were higher from 1998-1999 to 2004-2005, these ranged from between only 16 in 2004-2005 and 42 in 2000-2001. It should be noted that the latter season contains 32 unendorsed records, which led to the Common Koel being removed from COG's List of Unusual Birds, though records were lower in the four subsequent years.

It is difficult to directly compare the total numbers in seasons 2005-2006 to 2010-2011 as, with the exception of 2006-2007, GBS values have been recorded as the numbers of sites rather than records (see Table 1). Recording these as single records shows that total numbers hardly rose: a maximum of 116 for 2010-2011, compared with 106 (the actual number of records) in 2006-2007. Therefore, an average of 3 records from each GBS site, as suggested by the actual number of 2006-2007 GBS records in Table 1, was assumed for seasons 2005-2006 to 2008-2009 (see Table 3).

Table 3. Number of records from General and GBS, and total numbers.

ABR Year	Number of records		
	General	GBS	Total
1998-1999	4 (2)*	3 (9)*	18
1999-2000	2 (2)*	14 (5)*	23
2000-2001	1 (1)*	9 (31)*	42
2001-2002	9	20	29
2002-2003	2	34	36
2003-2004	6	20	26
2004-2005	0	16	16
2005-2006	15	31 (93)**	46 (108)**
2006-2007	30	76	106
2007-2008	28	33 (99)**	61 (127)**
2008-2009	9	24 (72)**	33 (81)**
2009-2010	28	42 (210)***	70 (238)***
2010-2011	79	37 (282)****	116 (361)****
2011-2012	37	251	288
2012-2013	76	325	401
2013-2014	129	343	472
2014-2015	322	397	719
2015-2016	482	478	960
2016-2017	591	443	1034
2017-2018	277	481	958
2018-2019	874	504	1378

*Unconfirmed records in brackets.

**Number of sites; numbers in brackets assumes an average of 3 records per GBS site (see text).

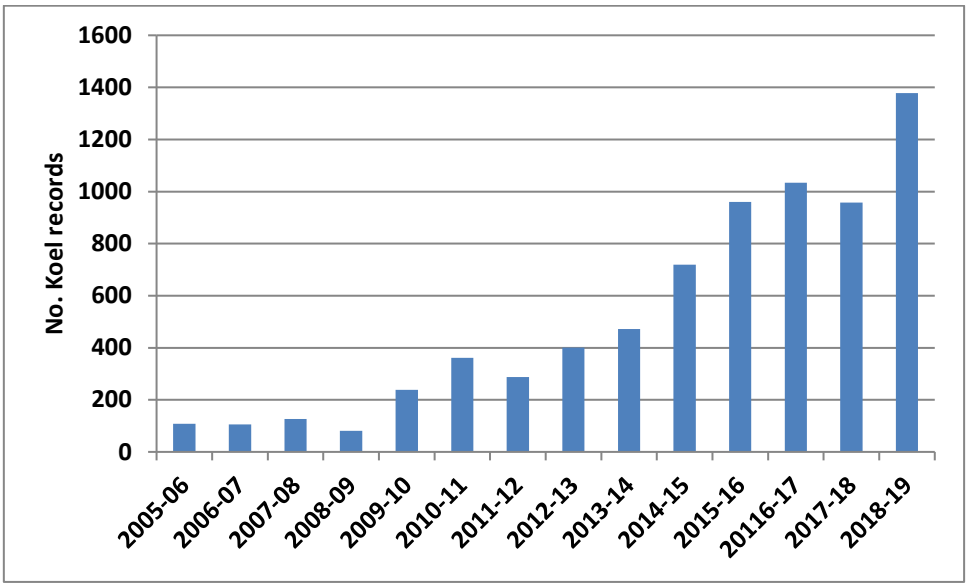
***Number of sites; number in brackets assumes an average of 5 records per GBS site (ssee text).

****Based on adjusting the 251 records for the 2011-2012 season from 89% to 100%.

Making this same adjustment, the maximum would be 190 records in 2010-2011, compared with 116 adding the General records and GBS sites. Considering that in 2011-2012 the GBS abundance was down by 11% (see Table 1), it seems a better estimation for 2010-2011 numbers would be to adjust the 251 records in 2011-2012 to 100% which arrives at a value of 282 for 2010-2011. This represents a multiplier of around 7.6, which can be justified as the number of GBS records to sites for the 2013-2014 and 2014-2015 seasons in Table 1 are close to 8. However, given the very low number of records in 2008-2009, it would seem more appropriate to multiply the number of 2009-2010 GBS sites by 5, noting that the resulting number of 210 in Table 3 is still much higher than in any previous season.

The adjusted number of records are shown in Fig. 1. Note that the graph starts from the 2005-2006 season, which was the first season to reach 100 records, with the maximum before that being 42 records for the 2000-2001 season. The values for the next 3 seasons plateaued before the rise in GBS records in 2009-2010, and then in General records in 2010-2011. While the latter reflects the wet spring of 2010, the GBS records seemed to first rise in the much drier spring/early summer of 2009 (260.8 mm vs 612.8 mm for Canberra Airport from July to December as totalled from http://www.bom.gov.au/climate/data. What is clear from Fig. 1 is that, after the decline in 2011-2012, numbers increased significantly each year to a total of 1378 records in 2018-2019, with only a slight decline in 2017-2018.

Figure 1. Adjusted number of Koel records from 2005-2006 to 2018-2019.



It is also interesting to track how, as the number of records rose, the Koel began to arrive earlier and stay longer. The first October arrival was in GBS 2 wk in 2002-2003 (at 3 sites). This remained the earliest until Koels were recorded from the GBS 2 wk Sep (which starts on 11 Sep) in 2007-2008. Only on 3 other occasions has the Koel been first recorded in September, at an unclear date in the General records in 2013-2014, on 18 Sep in 2017-2018 (see Table 1) and on 25 Sep in 2020-2021 (Holland 2021; this issue).

In contrast, the first record of the Koel staying until March was in 2007-2008 (GBS 2 wk), but from the 2010-2011 season it stayed until GBS 2 wk Apr (which starts on 9 Apr) for three successive seasons, and then until GBS 3 wk Apr (which starts on 16 Apr) in 2017-2018. From Table 1 the latest General breeding record is 14 Apr 2011, which compares with the latest GBS one, also from the same year, 2 wk Apr 2011 (which starts on 9 Apr).

4. Some unanswered questions

As this paper and the related 2020-2021 ACT Koel season summary paper (Holland 2021; this issue) are likely to be my final ones on ACT Koels, it is also worth discussing some aspects of Koel behaviour and breeding which still need further study.

4.1. Do Koels return to the same site each season?

This was a question raised on 22 Nov by John Harris when a male had returned to pretty much the same spot in Nicholls (see Section 3.1 of Holland 2021; this issue). While I have been keeping a very close local watch on adult and fledgling Koels over the past seven seasons, I have not been able to discern any clear pattern from their presence in my GBS site or at other spots favoured by them, such as the rear of 12 Themeda Pl Rivett, and the laneway between this and Melia Pl. However, there is some support for this theory based on Jerry Olsen's and Alberta Hayes', and possibly the Pfitzners', experience (see Section 4.5 of Holland 2021; this issue).

While it is really a question that can only be answered by a much more scientific study than the "Citizen Science" one I have been co-ordinating, *i.e.* through banding or otherwise

clearly identifying individual adults, there is some evidence for this occurring in the literature.

Graeme Chapman (2016) notes that, when he lived near Mt Coochin in the Glasshouse Mountains of southern Queensland, a male Koel had centred his territory in a group of huge mango trees near their house. Whether it was the same male year after year was not easy to prove, but the territory was occupied for at least 10 years. However, Graeme knew of another instance near Brisbane where a banded individual returned to the same place year after year. This may be the same as the statement in Maller and Jones (2001) that in Brisbane at least some individuals are known to return annually to the same location and at a similar time in the season (R Nattrass, personal communication). It also appears that this may be the same bird as the Koel first banded as a chick in 1991, which then returned to the same place for at least the two following seasons, as described in more detail in Jones and Nattrass (2001).

4.2. Interaction of adult Koels with fledglings, especially late in the season

As noted in Section 4.8 in (Holland 2021; this issue), in the 2020-2021 season Christine D.'s was the only example I am aware of adult Koels being close to juveniles in March. While on 15 Jan John Harris posted that he was making similar observations to those he made last season (Harris 2020), these observations were made in mid January, well before the end of the season. It is not known how long John's observations continued beyond that.

Interestingly Maller and Jones (2001) comment that 'there are persistent reports, which are difficult to verify, of possible parent-fledgling interactions' (R Nattrass, unpublished). Jones and Nattrass (2001) discuss this in more detail, *i.e.* whether the examples of Koels calling in February as detailed by Maller and Jones (2001) were produced by the young Koel's biological parents having returned to the vicinity of nests they may have parasitised earlier. If so, they suggest these visits may provide the fledglings with an opportunity for auditory imprinting prior to the northward migration. While this is one of the theories last discussed in Section 5.4 of Holland (2020), and by Harris (2020), unfortunately the reference they cite (Brooker and Brooker 1994) does not contain this statement.

In contrast, based on their observations Abernathy and Langmore (2016), citing Jones and Nattrass (2001), state: 'While this has never been confirmed and could simply be a function of male territorial behaviour (males could be calling near parasitised nests to defend their nesting territories from other Koels), the fact that males do sometimes call close to Koel young may allow the young to imprint on the proper vocalisations.'

On 13 Jan Geoffrey Dabb drew my attention to the very interesting comments on post-fledging behaviour posted by Chris King on *birding-aus* that morning: 'Alan Morris posted this response recently to a Facebook photo of a Koel, and I confirmed with him that it is Ok to post it. The parent Koels usually re-connect with their young at this time when they wean them off the largely insect diet of the Wattlebird and Friarbird hosts and onto the fruit diet of figs, berries, cherry tomatoes and other fruits! They then depart northwards with their families.'

This information extends well beyond the observations we have made so far in Canberra, so I e-mailed Alan seeking further details. Unfortunately, while Alan acknowledged my e-mail, the promised further information was never forthcoming. Christine D. has indicated that she has watched the young begging Koels arrive in her fig tree and they seem to work out for

themselves that they can eat the figs. They also do it when their Red Wattlebird *(Anthochaera carunculata*; RWB hereafter) host is away searching for food for them, and gradually eat more on their own, and soon do not need to be fed by the RWB. So, from her observations no help from an adult Koel has been seen or was needed.

A search of the literature reveals very few examples of adult Koels feeding their own fledglings.

Brooker and Brooker (1989) note that Chisholm and Cayley (1929) recorded adult Koels 'in attendance' on a young bird fostered by Olive-backed Orioles (*Oriolus sagittatus*). I note the latter authors' comments under *Eudynamys orientalis*: 'Koel. – A pair visited the back yard of the boarding house every morning during our stay and made the welkin ring with their weird calls. They were in attendance on a young bird whose foster-parents were a pair of Orioles.' Steve Read also alerted me to a couple of examples in the literature of Asian Koels (a different species, or at least sub-species) doing the same, as well as other cuckoos, in particular the Pallid Cuckoo (see Lorenzana and Sealy 1998; Monga 2007).

So, there is at least one precedent, though Ruth's male in Theodore (see Section 4.3 of Holland 2021; this issue) is the first local observation for an adult Eastern Koel seen to adopt and feed a Koel fledgling.

In summary, despite the bumper Koel fledgling season there is very little new information on the interaction of adult Koels with fledglings beyond that summarised in Section 5.4 of Holland (2020). This is a very interesting area, and the questions cannot be answered by the "Citizen Science" study I have been co-ordinating.

4.3. How many eggs does a female lay?

Based on the reports of two or more fledglings close together, sometimes very similar in appearance (see Section 4.10 of Holland 2021; this issue), this season in particular the question I first asked in Section 6.8 of Holland (2015) has arisen: does a female lay in more than one nest? As Higgins (1999) states that, 'A female may lay in many nests in a season.', I obtained the reference quoted (Gosper 1964). Based on his Magpie-lark (*Grallina cyanoleuca*) host study, Gosper concludes, 'During a season as many as five young Koels have been reared in what appears to be the territory of one pair of adults. This indicates that a female may produce a number of eggs.'

Surprisingly, it seems to be the only example available from the literature, and while there's very little solid information, it appears very similar to the ACT experience, especially during the 2020-2021 season. Michael Lenz (personal communication) has indicated that as far as he could tell there was only a single female in his Gungaderra Creek corridor study in Franklin (Lenz 2021), where 4 young fledged from RWB nests, all from a relatively small area. While I have no precise figures, the drop off in calling from mid January (see Section 3.2 of Holland; 2021; this issue) would suggest that one or at most 2 females were involved in the egg laying for the majority of fledglings close to home seen from the last week in February about 35 days later (*i.e.* about the egg laying to fledgling period).

The extension of this question is, could female Koels lay more than one egg at the same time in a single nest? Abernathy and Langmore (2017) state, 'Host nests may be parasitised by more than one Koel female, but eviction behaviour by Koel chicks ensures that only one Koel nestling survives.' Also, Abernathy *et al* (2017) state, '…female Koels would be

unlikely to lay twice in the same nest because the first Koel nestling to hatch would evict all other eggs and young from the nest (Higgins 1999).' That had been my understanding.

However, Higgins (1999) quotes Brooker and Brooker (1989): 'Usually only one egg per nest, occasionally more than one egg per nest, though probably not laid by the same female; E/1 X 120 nests, E/2 X 5,' and further: 'Occasionally nests contain more than one chick' (Hindwood 1930). While I can find the statement in Brooker and Brooker (1989) about 1 egg in 120 nests and 2 eggs in 5 nests, it does not state: 'though not probably laid by the same female.'

Hindwood (1930) simply states: 'Whilst it seems probable that the young of the genera *Eudynamys* and *Scythrops* will eject their fellow nestlings, there are several records of more than one young Koel in a nest.' He continues: 'With the giant Channel-Bill as many as 4 immature birds have been noted occupying the same nest.' Hindwood does not provide a specific reference other than to note at the end: 'Most of the facts relating to parasitism of nesting birds have been recorded by G. W. Allen in his admirable book *Birds and their Attributes*, and by Friedmann, who in his recently published *The Cowbirds*, 1929, discusses the subject at length.' So, it is not clear whether Hindwood refers to the Common Koel (as it was then) or another species.

On this point, Wikipedia *(2021)* quotes several papers from the *Journal of the Bombay Natural History Society* which indicate that Asian Koels (a separate species, or at least sub species) usually lay only one egg or two in a single nest, but as many as seven to eleven eggs have been reported from some host nests (mainly crows).

Virginia Abernathy (personal communication, 23 Jul 2021) has clarified that her research identified some occasions when 2-3 eggs were laid in the same nest. Only one nest ever had 3 different Koel eggs, but not all at the same time. She suspects that a female Koel removed one of the Koel eggs and laid a new one. The eggs in that nest changed every day and she saw at least 2-3 females in the area. She doubts that a female would be very successful if she did lay two eggs in the same nest because the Koel chicks would probably try to remove each other from the nest. She noted that Koels are terrible at competing with nest mates, as she discovered in cases where they were unsuccessful at removing the RWB chick. So, her guess is: 'if there were cases of multiple parasitism, probably only one Koel chick still made it and the eggs were likely laid by different females. Of course, we would need to do a DNA test to be sure.'

Shorty's observation in Section 4.10 of Holland (2021; this issue) possibly provides the first local example of two eggs being laid in the same nest, and both fledging. However, support for his suggestion that his local RWB pair may have adopted a second abandoned fledgling after being attracted by its begging comes from the Jones and Nattrass (2001) description of adult Noisy Friarbirds adopting a fledgling (see Section 4.7 of Holland 2021; this issue). Also, Brooker and Brooker (1994) note that Figbirds other than the foster parents may feed the loudly calling youngsters.

So a pair of RWBs feeding two fledglings is something to keep an eye out for in the future, though the number of Koel eggs in a single nest, or the number of nests in which a single Koel female might lay, could only be determined by studies such as DNA investigation.

4.4. Do RWBs hold territories when hosting Koel fledglings?

An interesting question I first raised in Section 6.6 of Holland (2015) is whether RWBs actually hold breeding territories when hosting Koel fledglings. My impression again was that those feeding young Koels did not appear to hold any territories at all. However, a more careful examination of my observations in my garden and local area reveals that this impression was based on those towards the end of this season, when as noted in Section 6.5 of Holland (2015) territorial defence/aggression seems to break down (note also the supporting reference of Lenz *et al.* 2009). There were only two occasions, both still in 2020 and well before the first Koel fledgling, when I observed more than one set of RWB fledglings within my GBS site, and both were separated by close to 100 m, so were likely different territories.

There were no such sightings in 2021, though on two occasions (on 3 and 8 Feb) I had a RWB fledgling within 20 m of my resident Koel fledgling present from 22 Jan to 12 Feb. However, on 7 Feb I had 2 Koel fledglings within my GBS site, and for the first half of March there were also two Koel fledglings, often close together (see Section 4.4 of Holland 2021; this issue), fed by different RWB hosts, though no RWB fledgling was observed near them during the period.

It does appear that the 2 or more Koel fledglings seen together as outlined in Section 4.10 of Holland (2021; this issue) were responsible for my impression of the absence of RWB territories. My 4 fledglings together on 26 Mar were possibly mostly independent ones moving through on migration (though one was still seen being fed by a RWB on 25 Mar), and the three together in Hall on 26 Feb were also late season fledglings. However, apart from the early pair in Theodore, there were 4 examples of two fledglings together in January (Jenny Bounds in Weston, Jonette McDonnell in Duffy and the two lots together at Isabella Pond). There were also 6 further examples in early February (see Section 4.10 of Holland 2021; this issue), all of which, together with multiple Koels fledglings seen together in previous seasons, suggests a breakdown of RWB territories when they are hosting Koel fledglings, including relatively early in the season, due to their greater food demands.

Michael Lenz (personal communication) has indicated that, in his breeding study at the Gungaderra Creek corridor site in Franklin (Lenz 2021), he could assign a Koel fledgling to a RWB territory only in one case. For the later 3 it was not clear, especially as over time the young moved around and were followed by their host.

In contrast Steve Wallace seemed to be able to separate his Fraser fledglings by their territories, as did Duncan McCaskill in Giralang. However, Shorty's experience was that a second pair of RWBs came in when his resident pair was feeding two Koel fledglings (see Section 4.10 of Holland 2021; this issue). Again a more detailed study would be needed to clarify this.

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References

Abernathy, V.E. and Langmore N.E. (2016). Observations on the breeding behaviour of the Pacific Koel in relation to its newest host. *Canberra Bird Notes* 41: 124-134.

Abernathy, V.E. and Langmore N.E. (2017). The first stages of coevolution between a brood parasite and its new host: are naïve hosts defenceless? *Emu Austral Ornithology* 117: 114-129.

Abernathy, V.E, Troscianko, J. and Langmore N.E. (2017). Egg mimicry by the Pacific Koel: mimicry of one host facilitates exploitation of other hosts with similar egg type. Journal of Avian Biology: 48(11) DOI:10.1111/jav.01530

Bounds, J. (2021) Summer of the 18th Koel. *Canberra Bird Notes* 46: 223-226.

Brooker, M.G. and Brooker, L.C. (1989). Cuckoo hosts in Australia. *Australian zoological review* 2: 1–67.

Brooker, M.G. and Brooker, L.C. (1994). Cuckoos. In 'Cuckoos, Nightbirds and Kingfishers of Australia'. (Ed. R. Strahan). (Angus and Robertson: Pymble.)

Canberra Ornithologists Group (2000-2020) Annual Bird Report. *Canberra Bird Notes* 25-45.

Chapman, G. (2016) Graeme Chapman Natural History Photographer Ornithologist. https://www.graemechapman.com.au/library/viewphotos.php?c=310 (accessed 16 August 2021).

Chisholm, A.H. and Cayley, N.W. (1929) The birds of Port Stephens, N. S. W. *Emu* 28: 243-251.

Gosper, D. (1964) Observations on the Breeding of the Koel. *Emu* 64: 39-41.

Harris, J. (2020) Observations on a Koel adult male and fledgling interaction. *Canberra Bird Notes* 45: 316-317.

Hermes, N. (editor) (1981) Common Koel. *Canberra Bird Notes* 6: 95.

Higgins, P.J. (Senior Ed.) (1999) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 4 *Parrots to Dollarbird*, p. 760. Oxford University Press, Melbourne.

Hindwood, K.A. (1930) Observations on the Habits of Cuckoos. *Emu* 30: 17-21.

Holland, J. (2011) "What to watch out for this month," *Gang-gang*, May, pp. 1-2.

Holland, J. (2015) Further observations of Eastern Koel fledglings in Rivett during the summer of 2015. *Canberra Bird Notes* 40: 147-161.

Holland, J. (2020) Summary of the 2019-2020 Eastern Koel Season in the ACT. *Canberra Bird Notes* 45: 293-310.

Jones, D.N. and Nattrass, R (2001) Notes on interactions between Common Koels and their hosts. *Corella* 25: 60-61.

Lenz, M. (2021) The bird community of the Gungaderra Creek wildlife corridor in suburban Franklin, ACT, during the 2020/2021 breeding season. *Canberra Bird Notes* 46: 171-198.

Lenz, M., Haygarth, S. and Oren, Y. (2009) The first breeding records for the Eastern Koel *Eudynamys orientalis* in Canberra. *Canberra Bird Notes* 34: 93-102.

Lorenzana, J.C. and Sealy, S.G. (1998) Adult brood parasites feeding nestlings and fledglings of their own species: a review. *Journal of. Field Ornithology* 69:364-375.

Maller, C.J. and Jones, D.N. (2001) Vocal behaviour of the Common Koel, *Eudynamys scolopacea*, and implications for mating systems. *Emu* 101: 105-112.

Monga, M. (2007) Adult Koel feeding a juvenile. besgroup.org/2007/05/18/adult-koel-feeding-a-juvenile-koel/ (accessed 16 August 2021).

Ross, D. (1986) A record of Koels for Canberra. *Canberra Bird Notes* 11: 109.

Taylor, M. and Canberra Ornithologists Group (1992) *Birds of the Australian Capital Territory – an atlas.* Canberra Ornithologists Group Inc., Canberra. p. 199.

Wikipedia (2021) Asian Koel. https://en.wikipedia.org/wiki/Asian_koel (accessed 16 August 2021).

Wilson, S. (2000) *Birds of the ACT: Two Centuries of Change*. Canberra Ornithologists Group Inc., Canberra. p. 43-44.

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SUMMARY OF THE 2020-2021 EASTERN KOEL SEASON IN THE ACT, WITH RECORD NUMBERS OF FLEDGLINGS

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Abstract. *Adult and fledgling Eastern Koel* (Eudynamys orientalis) *presence and behaviour in Canberra during the spring/summer of 2020-2021 are summarised. Probably due to the much more favourable conditions than in 2019-2020, both sexes of Koels arrived slightly earlier than usual and numbers of locations built up rapidly, including some more distant rural locations than usual, the furthest being 7.5 km S of Michelago. However, adults seemed to have been much quieter than previously, with few cases of multiple birds calling/interacting reported. The peak of the adult activity was around the New Year, with limited subsequent reporting of adults. Two females were still observed in early April. Further information on the variety of adult calls is given.*

It was, however, the most remarkable season for reports of Koel fledglings: a total of 365 (328 different and 37 possibly so), over 4 times higher than in any previous season, the previous maximum number was 87 (5) in 2018-2019. A feature was the very prolonged season, with a fledgling first reported on 31 Oct. There was a very steep increase from mid January. About 75% of fledglings were first observed from 1 Feb; close to 50% were reported in that month, and a further 75 (15) new fledglings were first observed in March. This compares with the previous maximum number of 6 fledglings first reported in March for the 2017-2018 season. A further 4 (3) fledglings were first observed in April, the last live new one on 10 Apr, and the last fledgling seen on 24 Apr, around 10 days later than previously. The season was much longer than any previous, close to 6 months, compared with about 3.5 months for the longest previous ones. It appears that the very good conditions allowed many Red Wattlebirds (Anthochaera carunculata) *to have a fourth brood, of which Koels took advantage.*

There were many examples of 2 or more fledglings being close together (maximum: 4 within 20 m). Many more fledglings were reported from the creek corridors, urban lake reserves or peri-urban locations, compared with a single one last season. Eight young Koels were first seen in the nest, the last one fledging very late, on 18 Mar. Remarkably, it was the third successive season that the same apparent pair of RWBs had raised a young Koel first seen in the nest within the same territory in Cook. RWBs were again the main confirmed or expected host, but there is now a third ACT example of the Noisy Friarbird (Philemon corniculatus) *as host. There was a single example of the strongest evidence to date of Magpie-larks* (Grallina cyanoleuca), *as well as possibly Noisy Miners* (Manorina melanocephala), *being local hosts. Most notably a fledgling was fed mixed fruits from a feeder by a male Koel, a rare example of an adult feeding a fledgling. Another fledgling was seen eating cheese, and a probable Magpie-lark host in the same garden appeared to be feeding a different Koel fledgling cheese. Both are the first local reports of this food being taken. There were many examples of fledglings feeding themselves on fruit, with berries and figs being popular. There were 7 examples of fledglings drinking from bird baths, despite the much cooler and wetter season. There have also been further cases of Koel fledglings interacting with other species, mostly the Pied Currawong* (Strepera graculina).

1. Introduction

For six years I have published observations of fledglings and associated adult Eastern Koel (*Eudynamys orientalis*, Koel hereafter) activity and behaviour in Chapman/Rivett (Holland 2020a), and for three years summaries of these aspects for the wider Canberra area as well (Holland 2020b). For the 2019-2020 season, these were combined in a single paper (Holland 2020c, and references therein). This paper summarises observations in the ACT area for the 2020-2021 season, and in particular highlights the unprecedented numbers of fledglings reported, including observations on their activity and behaviour.

2. Methodology

The information in this paper is again based on comments posted on the COG chat line, correspondence directly with me, and my more detailed observations from Chapman/Rivett.

3. Observations of adult Koels' arrival, activity and departure

3.1. Adult Koels arrival, activity and departure

From around sunrise on 25 Sep Mark Clayton heard the first Koel male calling from just outside his GBS area in Kaleen. The second report was of a male heard in Campbell by Joan Lipscombe on 30 Sep. The first observation of a female was mine in Rivett on 4 Oct. By 12 Oct Koels had been reported from 21 suburbs (compared with just 3 in the 2019-2020 season), and from over 45 locations by the end of the month, compared with 28 last year. This included some rural locations such as the Gigerline NR and the Molonglo Gorge.

Birds continued to arrive and by the end of November they had been reported from around 65 ACT and nearby locations according to the eBird Australia map, and by the end of December this had increased to over 80 locations. These included reports from much more distant rural locations such as the Uriarra Woodland, Naas Rd at Apollo Rd, and Illianga and the nearby Baroona wetlands (by Sandra Lauer on 17 Nov and 24 Jan, and 26 Nov, respectively).

The latter two locations are particularly noteworthy as they are 7.5 km S of Michelago, the furthest rural reports S of Canberra in the COG Area of Interest (AoI) of which I am aware, though the Boboyan Rd record, on 13 Jan 2006 (see Section 2 of Holland 2021; this issue), may be similar. However, the eBird Australia map also shows 5 records of a single bird in and around Cooma between 13 Nov and 9 Jan (as well as 2 birds on 10 Jan), and a single bird at Jindabyne on 20 and 22 Dec 2020.[1] Unfortunately, there are no further details for any of these most southerly inland sightings, which are all presumed to have been adults.

Despite their very widespread presence, there were very few reports, either directly to me or on the COG chat line, of Koel activity. Females again arrived early, but there is little information on the extent of male *ko-el* versus *whoa* calling. On 15 Dec Geoffrey Dabb made a general comment that there was probably more calling activity around Narrabundah by females than usual. They were, he reported, quite mobile, perhaps restless, or anxious. On 29 Dec Christine D. noted that over the past month in Flynn she had heard a lot of Koels calling. After some weeks of a *koel-ing* male prior to that, suddenly there were all kinds of calls, lots of *wirras* and *keeks*, and also some *yips*. In the previous week she had often heard 4 or more birds calling.

[1]The eBird Australia map also shows records from Cooma of 4 birds on 24 Dec 2016, and a single bird on 10 Dec 2017, but again without any details.

On 22 Nov John Harris posted that his male Koel was back with a vengeance, starting his strident *wirra-wirraing* at 04.30 h in Kangaroo Close Nicholls. He wondered if it was the same one as in previous years, preferring the same locality and the same tree (Harris 2020). There was the usual frantic agitation from the Red Wattlebirds (*Anthochaera carunculata*, RWB hereafter). They seemed to recognise and react to the *wirra-wirra* call. A few days after the male started calling, two females turned up and that seemed to make the RWBs even more frantic. The most interesting observation was that the two females fought. They both came to the male's tree but one female immediately attacked the other and tried to drive it off.

On 4 Jan Jenny Bounds had 5 adult male Koels carrying on (calling and posturing) in the deciduous tree in her rear neighbour's yard in Weston (Bounds 2021). With Christine D.'s above and mine in Section 4.4 below, these were the maximum number of adults reported this season.,. It is interesting, however, that the peak of the adult activity seems to have been around the New Year.

On the evening of 23 Jan, John Layton heard a remarkably loud burst of *wirra wirra calls* in his Holt garden. When he went to investigate he noticed a female Koel perched on a fence 25 metres away. Immediately a male alighted and presented her with a piece of apricot which she accepted. The male immediately left to return a moment later with a red berry but this time the female ignored him and flew away.

Following this, there was very little reporting of adult activity. Male and female Koels were still reported calling in Yarralumla, Higgins and west Kambah on 19-25 Mar, and the last male reported was one in Christine D.'s fig on 29 Mar. However, there were two reports of females in April, the first on eBird from Peter Bijlmakers of one still being chased by 2 RWBs at the Upper Stranger Pond on 2 Apr. On 4 Apr Julian Reid saw a Koel feeding on red/black berries of an unidentified hedge in Dickson. When he tried to get a closer look, it flew deeper into the hedge and gave the female *kek kek kek* call.

At the time, apart from the female seen on 17 Jun 2019, these were the latest sightings of females of which I am aware, the latest male being reported on 8 Apr 2019 (Holland 2020b). However, the COG Annual Bird Reports (ABR) reveal that in three seasons from 2010-2011 a Koel (sex unknown) stayed until GBS 2 wk Apr (which starts on 9 Apr), and then until GBS 3 wk Apr (which starts on 16 Apr) in 2017-2018 (see Table 1 in Holland 2021; this issue).

Despite the very good season, John Layton's above was one of the few reports of adult Koels eating food. The most interesting other one was from Ben Harvey who on 13 Mar forwarded some photos to me of an adult female regurgitating the pits of some unidentified red fruits at the ANBG. It was getting a little harassed by RWBs, and coughed up at least three separate pits in 10-15 minutes. Ben wondered if it was regular behaviour for this species. I was unaware, but the internet provides examples of a female Eastern Koel regurgitating palm seeds (Kivaren 2008), and a more general reference for the related Asian Koel regurgitating these and other seeds (BESG 2009).

There were also a couple of further examples of adults drinking at bird baths. On 2 Feb Joan and Trevor Lipscombe posted that that morning a silent adult male Koel was on their back lawn in Campbell, and then drank from a water bowl. On 10 Feb Julie McGuiness' eBird list

noted that an adult female drank in the bird bath and investigated cherry tomato plants in her garden in North Lyneham.

3.2. Chapman/Rivett observations, particularly of Koel calls

In the absence of other information, my observations around Chapman/Rivett may serve as a *de facto* summary of the ACT adult Koel season. After seeing a female (and hearing *kek keks* later) on 4 Oct, I heard *kek keks* again on 13 Oct, my first *whoa* the day after, and all three calls on 15 Oct. Following this, the vast bulk of my observations were aural, with females being seen on about 21 days to 11 Feb, and males only on 12 days to 31 Jan. These were all single birds except for the aggregation described below, two females on 25 Oct, and a male and female together on 20 Dec. A freshly dead female was found later that afternoon. For a few days I recorded less calling, and only from males, but the previous level was reached soon after that.

A maximum of 4 birds (mostly males) had been heard on several occasions before the only noisy aggregation that I witnessed at 06:34 h on 30 Dec at the end of Woollum Pl Rivett. There were at least 3 *whoaing* males and 2 *kek kekking* females chasing each other into Woollum Cres. This lasted until at least 06:37 h. Interestingly, 15 minutes later I located my first Koel fledgling at the rear of 37 Angophora St, about 175 m away. From the sounds, there were 5 more local noisy associations from 2 to 11 Jan, with an estimated maximum of 3 birds, but I did not actually see them.

There is also limited information on calling during the 2020-2021 season. On 3 Nov Diana White noted that a female Koel was very obvious and noisily 'clucking' (a call she had heard for the past two seasons, see Holland 2020c) in the Mulberry and Chinese Elm in her Narrabundah garden for the past few days. Early on the morning of 18 Dec, a male Koel flew past Barbara Allan, strongly *ko-elling*. Then a female appeared, 'clucking like a domestic chook does after laying'. This could be the same as Diana has recorded above. Though I am not sure if any of the calls I have described below sound like a chook 'clucking' after laying, it is further evidence that females have such a range of calls.

All the other calling observations are mine. A new and very different call for me is best described as a faster, very bubbly/liquid version of *whoa* (*wock wock wock* or preferably *wek wek wek*) that I first heard around 07:00 h on 11 Nov from the rear of 12 Themeda Pl Rivett. A possible male flew away, but I could not be sure which sex made this call, despite hearing it again at different spots on 14-16 and 20 Nov, the latter also with *kek keks* at the same time from the same tree.

I heard this call again on 8 Dec when I flushed a bird from the rear of 12 Themeda Pl which *wek wek wekked* in the bushes there and next door for over 3 minutes. I thought it was a female Koel, but could not see it clearly in the foliage. It was heard again there early on 11 Dec, and at varying locations, including my GBS site, on 8 days between 10 Dec and 1 Feb.

While I never confirmed it, I suspected that a female was giving this call, and some similar calls I had heard in 2019, the faster *wuk wuk wuk* on 15 Nov and one of two females giving a very fast *queck queck queck* call on 16 Dec (Holland 2020c), though on the second occasion I noted it as a further example of the difficulty of telling the sex of the birds. Chapman (2016) notes that the male occasionally gives another call, a loud 'wheck' included in one of his sample calls. To my ears it certainly sounds very like the same call I was hearing this season.

I also have further examples of calls first reported in the 2019-2020 season (see Section 3.2 of Holland 2020c). I saw a female making a 'wow' call on 4 occasions, first on 25 Oct, then on 29 Oct, 13 Nov and 24 Jan (also some growls – see below). On 22 Nov there were some *kek keks* close to our house after which a series of *oo-aars* or lengthened *wows* were heard. On checking, a female was flushed to our plum tree, where it was seen uttering one *oo-aar*, then sitting quietly there for about 30 minutes, before flying off with some *kek keks* and a couple of *oo-aars*.

On 8 Dec I heard some growls and later some growl-like *warks*, before a female flew over to Rivett with soft *kek keks* and another *wark*. More growls were heard on 18, 29 (a female was seen giving it) and 30 Dec, and on 24 (again a female, in my notes as wows/growls) and 31 Jan (on this occasion a male was seen giving them).

There was only one example of a female possibly giving a male call. On 11 Nov a female was seen *kek kekking* while flying, with a single *whoa* (presumed to be from the same bird) in the middle. Also, on 24 Nov there were some very close *ko-els*, sounding much like *whoas*. Finally, *kek keks* were heard both before daylight and after dark on 11 Jan, and after dark only on one other occasion, on 25 Nov. *Whoas* were heard after dark on 6 occasions from 30 Dec to 13 Jan, but 25 times before daylight from 21 Oct to 24 Jan. *Ko-el* calls were still heard on 8 days after New Year, most from 1 to 12 Jan, and then on single occasions on 23 and 25 Jan.

Calling activity dropped significantly from mid January, and then further again from mid February. The last distant *whoas* were heard on 23 and 25 Feb, but then only on 11-12 Mar (again not close), with distant *kek keks* heard on 25 Feb and then on 8 Mar, but then closer to home on 11 and 18 Mar. So, despite the very significant fledgling activity from the last week of February in my local area (see Section 4.4 below), adult activity was very quiet.

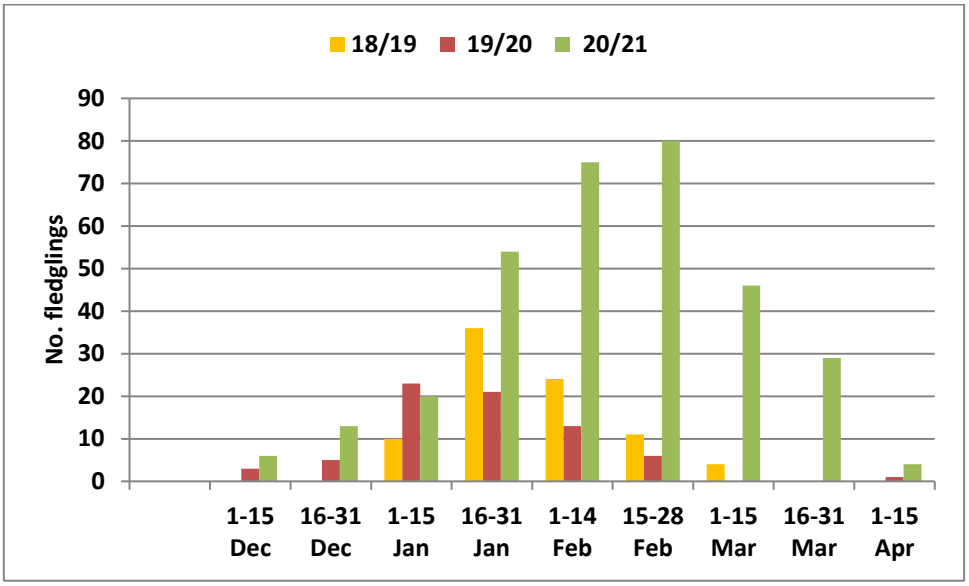
4. Eastern Koel fledglings reported for the Canberra area in the 2020-2021 season

4.1. Fledgling numbers

It has been a most remarkable season for reports of Koel fledglings, with a total of 365 coming to my attention, over 4 times higher than in any previous season, the previous maximum being 87 (92 if 5 possibly new ones are included) in 2018-2019. Of these 328 were definitely different ones, as determined by a very careful examination of their reported locality within a suburb (including distance from others reported nearby at a similar time), the date and their description, including behaviour, in order to eliminate any possible double counting; and 37 were possibly different, usually due to the lack of their exact location within a suburb where another had been reported close to the same time. The first of these was reported on 31 Oct, and the last on 24 April.

At nearly 6 months, this is the longest Koel fledgling reporting season by far, *cf* around 3.5 months for the 2015-2016, 2017-2018 and 2019-2020 seasons. By 31 Dec, 20 fledglings had been reported, compared with the previous maximum of 8 in the 2019-2020 season. By 15 Jan, 40 fledglings had been reported (*cf* 29 last season), but there was a very steep increase from then, and by 31 Jan 94 different (and 2 possibly different) fledglings had been reported, already more than in any previous season.

Figure 1 Half monthly numbers of first reports of new Koel fledglings in the past three seasons.



While the 155 fledglings [75 new in first half and 80 in second half of month; plus 17 (10 and 7 respectively) possibly new] first observed in February were nearly double these numbers, the really remarkable feature was that the season continued considerably later than previously. There were 75 new fledglings (46 and 29 new; as well as 10 and 5 possibly new, respectively, for the first and second halves) first observed in March. A further 4 new (and 3 possibly new) were first observed in April, the last alive new one on 10 Apr.

Fig. 1 (which does not include the possibly new fledglings) clearly demonstrates both how numbers were considerably greater for the 2020-2021 season, and also that numbers peaked much later than in the two previous seasons (which are very representative of those preceding). Previous studies show that the maximum number of first reported in March was 6 for the 2017-2018 season (Holland 2018a), and this compares with only the single new fledgling reported after 1 Mar (actually on 1 Apr) in 2019-2020.

4.2. Fledgling locations and numbers

Table 1 provides a summary of the number of fledglings per district and the suburbs/locations within these for the 2020-2021 season (for comparison with the four previous seasons see Table 2 in Holland 2020c). Details of individual fledglings have again not been tabulated for this season due to their sheer size,[2] but the highlights of the 2020-2021 season are summarised below this Table.

As can be seen, by far the most Koel fledglings were reported from Belconnen: 112 definitely new and 7 possibly new, comprising close to 1/3 of the total number. This is a very large district by comparison with the much smaller Weston Creek, for which the 50 (10) was greater than the much larger Tuggeranong's 44 (5) contribution. Any comparison is best made with the next highest season's total (2018-2019) of 87 definitely new (see Table 2 and Section 5.2, Holland 2020c). From this it is clear that fledgling numbers were

[2] A series of Tables with details of each fledgling is available on request.

significantly higher in all districts (Belconnen by over 90!) except for South Canberra, where they are only slightly higher.

Table 1 Location and number of Koel fledglings for the 2020-2021 season

District	Number (possibly new in brackets) in each suburb/location
Belconnen	112 (7): Aranda 5, Belconnen Town Centre 1, Bruce 3 (1), Charnwood 1 (1), Cook 2 (1), Dunlop 2, Evatt 4, Florey 5, Fraser 11 (2), Flynn 8, Giralang 6, Hawker 5, Higgins 6, Holt 1, Kaleen 8, Macgregor 16 (2), Macquarie 1, Mackellar 2, Melba 3, Mt Rogers 1, Page 9, Scullin 1, Spence 3, The Pinnacle 1, Weetangera 4. West Belconnen Horse Paddocks 2, West Belconnen Pond 1.
Gungahlin	30 (1): Amaroo 1, Casey 2, Harrison 1, Franklin 4, Hall 6, Gungahlin Town Centre 1, Ngunnawal 6, Nicholls 5, Palmerston 2 and Yerrabi Pond 2 (1).
North Canberra	31 (2): Ainslie 4 (1), ANBG 1, Braddon 1, Campbell 3, Dickson 5, Glebe Park 1, Lyneham 1, North Lyneham 2 (1), O'Connor 2, Turner 4 and Watson 7.
South Canberra	20 (5): The Causeway 1, Griffith 3 (2), Forrest 1, Jerrabomberra Wetlands 7 (2), Molonglo Reach 1 (1), Narrabundah 3, Red Hill NR 1, Symonston 2, and Yarralumla 1.
Woden	28 (3): Chifley 2, Curtin 9, Deakin 3 (1), Farrer 1, Garran 1, Hughes 3, Isaacs (1), Lyons 5 (1), Mawson 3 and Phillip 1.
Weston Creek	50 (10): Chapman 14 (4), Duffy 6, Fisher 2, Holder 7, Narrabundah Hill 1, Rivett 10 (5) and Weston 10 (1).
Tuggeranong	44 (5): Banks 1 (2), Bonython 1, Chisholm 2, Fadden 3, Gilmore 1, Gowrie 1, Greenway 1, Isabella Pond 5, Kambah 12, Lions Youth Haven along the Kambah Pool Road 1, Macarthur 2 (1), McQuoids Hill 1, Monash 1, Oxley 2, Upper Stranger Pond 1, Theodore 5 and Wanniassa 4 (2).
NSW	11 (1): Greenleigh 1, Karabar 1, Queanbeyan 6 (1), Jerrabomberra 3,
Other	3 (3): Bushfire Memorial Stromlo 1, Coombs Pond 1, Tharwa 1, unknown (3).
Total	**328 (37)**

Mark Clayton contributed the most, with a total of 49 (35 new, 14 possibly new) fledglings, many coming from his monitoring of the Australian Bird Identification (ABID) and the Canberra Wildlife Photography sites on Facebook, and the various apps on his phone. This accounts for the high number of possibly new fledglings in his total as, apart from the photo asking for identification, often only the suburb was available, and it may have been the same as another recent report from the same suburb. This compares with my personal contribution of 32 (23, 9) fledglings (see Section 4.4 below, this notes the difficulty I had in determining which of my Chapman/Rivett were definitely different from the last week in February).

Several other people also contributed significantly to these totals, in particular Peter Christian, who reported a total of 15 (2) fledglings from NW Belconnen, including 11 from Macgregor alone. Close behind was Steve Wallace who reported a total of 13 (1), including 10 from Fraser, slightly to the N of Peter's observations. Barbara Allan reported a total of 11 different fledglings, 9 of them from around her place in Page, and Alison Milton's total of 8 fledglings were also mostly from N/NW Belconnen. Thus close to 50 of this district's total were reported by these 4 observers.

It should be made clear that the above contribution of 131 (105, 26) fledglings, over 1/3 of the total, was not the reason for the exponential growth in the number reported this season. The methodology for obtaining these numbers was much the same as in previous years, and from correspondence, often directly with me, it was clear that many observers had observed more Koel fledglings in their garden or local area, or for the first time. This was also clear

from the large number of postings on ABID and other sites seeking identification of the species this season, compared with just 7 for ABID in the 2019-2020 season.

It is also supported by the 39 new suburbs/locations this season which were not previously included in Table 2 of Holland (2020c). These include several Town Centres (Belconnen, Gungahlin, Greenway), as well as Glebe Park Civic, but more importantly there were many more fledglings reported (21, 3) from the 15 creek corridors, urban lake reserves or peri-urban locations, compared with just the single one (Isabella Pond) last season. Importantly, of the 5 reported from this location this season, 4 (2 times two several hundred metres apart) were first recorded on the same day (23 Jan) by Ryu Callaway and Sandra Henderson.

Other such sightings close to the suburban edge were made near the Wickens Place car park of Mt Rogers, near the de Salis St entrance of the Pinnacle, at the West Belconnen Horse Paddocks and the West Belconnen Pond, the Gungaderra Creek corridor in Franklin, on the edge of the Red Hill NR (see further Section 4.7 below), Narrabundah Hill (where Jean Casburn and I observed one about 50 m into the reserve from the stile at the NE corner), Upper Stranger Pond and Coombs Pond.

Among the fledglings furthest from houses was the one observed on 20 Mar by Gail Neumann and Daryl Beaumont in the Hall Common, about 250 m to the E of Hall Village, and the one (confirmed by ranger Ben Harvey) near the café/new Banksia garden area of the ANBG in early March. Another was at McQuoids Hill NR, 250 m from Allchin Circuit Kambah, seen by Ryu Callaway on 28 Jan. It flew further into the NR when approached. Also included is the one reported on 15 Feb by Helen Cross about 1 km SW of that location at the Lions Youth Haven along the Kambah Pool Road, opposite part of the Gleneagles Estate about 400 m to the S, and the one reported at the bushfire memorial at Stromlo on 25 Feb by Alison Mackerras, over 300 m W of the new suburb of Wright.

The fledglings most distant from human habitation were those at the Jerrabomberra Wetlands NR, from where they have been reported for 3 of the four previous seasons (not in 2019-2020). Most of these would be more than 500 m from substantial buildings. In particular this applies to the one reported by Sandra Henderson on 12 Mar when she walked down along Dairy Rd to the ‘no access’ gate along the Molonglo River, and found a begging Koel in the vegetation not far from the gate, on the edge of the river. This is close to where we heard one on the COG Molonglo Reach boat trip a month earlier on 14 Feb. I have now labelled the other one heard further downstream on this trip as possibly new, as on further reflection I could not rule out that it was one of the Noisy Friarbirds (*Philemon corniculatus*) present, as to my ears one of their adult calls is closest to the fledgling Koel’s begging.

Either way these 3 fledglings were a considerable distance from buildings, though plenty of food for either adults or independent young is likely to have been available. The furthest south a fledgling has been reported to date is Tharwa, where Ned Johnston reported one (possibly more) on 18 Feb. This is around 4 km SSW of Banks, the most southerly Canberra suburb where fledglings were also reported for the first time this season. This is all consistent with the much more distant rural locations where adults were reported this season, including Illianga and the Baroona wetlands, 7.5 km S of Michelago (see Section 3.1).

As I have noted previously, the very high numbers above are likely to be a considerable underestimate of the actual number of Koel fledglings for the 2020-2021 season. This is underlined by the numbers for Queanbeyan/Karabar/Jerrabomberra, for which I had only 2 reports of fledglings until 27 Mar, when Maryanne Gates provided me with 5 more, based on those brought into Wildcare Queanbeyan.

Unfortunately, I do not have the number ACT Wildlife may have received for care, but I expect these to have been considerably higher, particularly for March, the month from which the bulk of Wildcare's came, possibly because of the considerable number of fledglings moving N during that time. As an example, ***Timothée*** Bonnet found a roadkill in Dickson on 12 Dec, and on 22 Jan there was a posting on Canberra Nature Map (CNM) of one found on the road in Garran and relocated to a nearby bush. It was not able to fly, so the poster proposed to return the next day to take it to injured wildlife.

4.3. Details of very early fledglings and very late ones.

As noted above the first fledgling was reported on 31 Oct, and the last on 24 April.

Through Jean Casburn, Ruth reported a Koel fledgling, at first small enough to hold in the hand, in her Theodore garden from 31 Oct. She noted that a female came at the same time but did not stay. Shortly afterwards the male Koel came and fed on mixed fruits at her double-storey feeding stand, as he had done for the past 5 years. The young Koel was attempting to feed itself but took food from the bill of the male Koel. This behaviour continued, with the birds then coming in at 05:00 h and late evening to feed from the stand. The male drove off all other birds except the young Koel. Interestingly, there were no RWBs, the most likely host, present in the garden during this time.

This is 5 weeks earlier than any previous fledgling that I am aware of. Abernathy and Langmore (2017) give a maximum of 37 days from egg-laying to fledging. Working back from 31 Oct means that, at the latest, the egg was laid early in the last week of September, just before the first reported arrivals (as noted above, the first reports were of a male calling on 25 and 30 Sep). From the photos provided on 23 Nov, about 3 weeks later, Geoffrey Dabb estimated it was about the correct size for having fledged around the end of October.

On 9 Dec Jean Casburn relayed the news that there were now 2 young birds: the male came first, calling *ko-el*, followed by the young birds 'screaming and squawking'. I am not clear when the second one appeared, but from the videos taken around 10 Dec Geoffrey Dabb agreed that they were female fledglings, based on their head patterns and lack of black shoulders, though they were now fully grown birds. This lasted until around Christmas, but on 24 Feb Jean indicated that while there were 2 young birds being fed by RWBs. Interestingly, the earlier fledgling was said still to be present and the adult male still attentive to it.

So, the origin of these 2 very early fledglings remains somewhat of a mystery, particularly since no likely host such as the RWB seems to have been present at the time of the sightings. While there are a number of recent local observations of Eastern Koel fledglings being fed by their RWB hosts or taking food themselves from feeding areas (Holland 2020c), Section 4.2 of Holland (2021; this issue) shows that there are very few examples of adult Koels feeding their own fledglings.

Other early reports were from Julian Read, who in the second half of November had a pair of RWBs raising a Koel chick in the nest near his Dickson house. It fledged and was present nearby for most of December. One of Jonette McDonnell's fledglings was first heard and seen in early December and stayed near their house in Duffy, fed by 2 RWBs, until at least 30 Dec, and on 16 Dec Lindsay Hansch indicated that he saw a juvenile Koel following a RWB around in Jerrabomberra a couple of weeks previously. All these 5 chicks/fledglings were earlier or around the same time as the previous earliest, Ryu Callaway's well-feathered nestling on 3 Dec 2018, and Martyn Moffat's fledgling in Curtin first seen in the GBS week of 4 Dec 2018 (Holland 2018a). The ABRs from 1998-1999 to 2018-2019 (Holland 2021; this issue) contain no earlier reports.

As noted above, 4 new fledglings (and 3 possibly new) were first reported in April. On 1 Apr Peter Christian found a new begging young Koel in Coutie Place Macgregor. As noted below (Section 4.4) I still had 2 possibly new fledglings on 3 and 5 Apr, respectively. On 8 Apr Steve Wallace had a brief sighting of a non-begging young Koel in his Fraser garden. As he could not be sure it was the same one that he had not seen since 31 Mar, it was also designated as possibly new.

On 10 Apr Alison Milton heard and then photographed a begging young Koel still being fed by RWBs near her Higgins garden. On 13 Apr John Leonard posted a photo of a juvenile Koel in Lyons, taken by a work colleague on 9 Apr, and on 18 Apr I was shown the dead one by my near neighbour, which was likely to have deceased around this time (Section 4.4).

The final observations of young Koels were by Alison Milton, who last saw her Higgins bird on 20 Apr. It was still begging but she did not see or hear it again. Peter Christian's Macgregor fledgling was last heard on 21 Apr, when he noted that it seemed to have been 'deserted' by the RWBs, as there were none within hearing distance for a period of at least 10 minutes. However, Peter's last sighting was of his Dunlop fledgling on 24 Apr, which was still calling and sitting in the sun in the early morning with two RWBs in close attendance (also soaking up some rays!). He had first observed this one on 28 Mar when it had a 3/4 grown tail.

According to Holland (2020c) the previous latest recorded departures of fledglings were on 3 Apr 2020 and 6 Apr 2011, with at least two (and possibly all) already independent. However, the ABRs from 1998-1999 to 2018-2019 (Holland 2021; this issue) indicate that the latest GBS dy was in 2 wk Apr 2011 (which started on 9 Apr), reported in Curtin by Martyn Moffat. This is almost certainly an extension of the 6 Apr record. The ABRs also show the latest dy in the General records on 14 Apr 2011. Whether this bird was independent, unlike the Dunlop fledgling still being attended by RWBs on 24 Apr 2021, is unknown. In either case, the latter has extended the latest breeding record by 10 days.

4.4. Brief summary of personal observations, mainly in Rivett/Chapman

As for adult Koel observations, the details below of my own local fledgling sightings may be of value, as they mirror the ACT pattern.

My personal tally of 32 (23 new, 9 possibly new) fledglings was counted over a very long season of over 3.5 months, far longer than any previously. Of these, 26 (19, 7; close to three times as many as in any previous seasons) were observed in Chapman/Rivett within the area with a radius of around 1 km from our Chapman house defined previously in footnote 1 in

Holland (2020a). The other 6 (4, 2) were observed outside this area, in Chapman (3), Farrer, Isaacs and the NE edge of Narrabundah Hill (see Section 4.2).

The first local fledgling was heard in Rivett on 29 Dec. The next was not until 22 Jan, when one was present in my GBS site until 12 Feb. Two were seen close together in my neighbour's plum tree on 7 Feb. By 17 Feb the local tally was just 9 fledglings, interestingly all except those in my garden at the periphery of my defined area. Three of them were heard only on single occasions.

Up to that point, the season had been fairly normal. Given that I had only ever recorded 1 fledgling in March (and heard only on 1 Mar!), I expected perhaps one or two more. I certainly was not expecting the flood of observations from 22 Feb to the middle of the significant rain event a month later on 21 Mar. During this time I had multiple records of 11 (7, 4) fledglings, all much closer to home. Two of these were close together within my GBS site, another was centred on Ordell/Monkman Sts Chapman 250 m to the S, and at least 6 (including 2 seen together on one occasion and possibly heard on others) were centred 300 m to the ENE, at the rear of 12 Themeda Pl Rivett. The latter has been a site of significant adult and fledgling Koel activity in past years.

Figure 2. Example of a very light-coloured fledgling from Kambah *(Matthew Frawley)*.

As there were six- to seven-day breaks between 3 groups of sightings there, it was extremely difficult to determine exactly how many different fledglings there were, with the final number determined based on differences in appearance and behaviour. Finally, there was the fledgling first discovered as a nestling at 20 Angophora St, nearly 400 m to the NNE of my home on 17 Mar, as detailed separately (Section 4.5).

After the significant rain event (115 mm at my place), I expected all Koel fledglings would have gone, but daily from 24 to 30 Mar I still had 2 different fledglings in my GBS site, with remarkably 4 close together (within 20 m) on 26 Mar (see Section 4.10), and one still seen being fed by its RWB host on 25 Mar. After this I still had good views of 2 probably different and possibly new fledglings in my GBS site on 3 and 5 Apr. I expected these to be the last, but on 18 Apr a near neighbour showed me a dead juvenile Koel in some bushes at the edge of 38-40 Chauvel Circle, less than 50 m outside my GBS site. He said he had first seen it about a week before. It was not fresh but not too badly decomposed, so could have been still alive on 10-11 Apr, 5-6 days after my previous sighting.

4.5. Koel chicks first found in nests

As might be expected, given the excellent season, there have been more nestlings observed than previously. The first of these was Julian Reid's in Dickson in the second half of November, as mentioned in Section 4.2. Next John Brannan forwarded a photo taken by a friend on 21 Dec of a Koel chick in a RWB's nest in a golden delicious apple tree in his Weetangera back garden (it fledged the next day).

On 26 Dec Mark Clayton informed me that on that day's ABID site there was a record from Jerrabomberra, NSW, of a very young chick which appeared to have fallen out of a nest (and was identified by a nestling specialist). Later Maryanne Gates forwarded it to me as one of those taken into care by Wildcare Queanbeyan, noting it as a 2-day old chick which fell (or was pushed?) from the nest - the very good news is that it was successfully raised and released on 7 Feb 2021.

On 9 Jan Jerry Olsen forwarded a photo of a Koel chick in one of the 2 RWB nests in Cook he had been monitoring from early December. Geoffrey Dabb confirmed that this had fledged and was being fed on 10 Jan, being found about a metre above the nest. Most interesting is that Jerry clarified that it was the third successive year that a Koel fledgling had been raised from the 'Kardu Complex' territory, but from 3 different nests. In contrast, the other nearby 'Kumm Pl' nest he was watching, which had fledged a Koel in 2019-2020, had 2 RWBs babies from the same nest in 2020-2021. This was earlier in the season and the nest was no longer occupied on 9 Jan.

Barbara Allan had two similar observations in Page. On 29 January she informed me that the RWB nest in a neighbour's gum contained a Koel chick, quite filling the nest. By 2 Feb it had fledged and was 'bleating' from a nearby gum. On 7 Feb Barbara informed me that she was watching another RWB nest from which strange (hissing) sounds were emerging, but nothing yet was visible. On 11 Feb she indicated that she would have to try and get someone to record Koel-in-the-nest begging, as it was so odd and so very different (it was still hissing). Both parents were feeding the nestling that morning, but there was still no sign of it, even though the nest was modest in size and was used previously and successfully this season by RWBs. However, on 13 Feb the baby Koel was lifting its beak visibly in the nest and had stopped the odd hissing sound. It was now uttering the usual begging call.

On 18 Feb Steve Wallace informed me of his first Koel chick still in the nest in Fraser. It was being fed by RWBs and was well feathered, so he expected it would soon leave. It was out of the nest the following day but stayed close to it. The adults were still checking for faecal output and it was presenting its rear end. It was mostly quiet but did make a 'hissing' sound when the adult was nearby, and a weak begging call when being fed. Steve made a

video of the young Koel but this did not pick up the quieter calls (he could see the throat moving but could not hear it).

Around 16:20 h on 15 Mar I heard possible begging which I traced to a large gum on the verge of 20 Angophora St Rivett. It was slow, and not continuous, and I could not locate it despite several minutes looking, including on my return around 16:48 h. The next day I returned about the same time, but could not locate it, despite almost continuous begging low down in the tree. The begging stopped when a RWB came close and probably fed it.

From 08:20 h on 17 Mar there was begging in the same spot until 8:30 h. It stopped, and was silent even when a RWB came in low and seemed to feed it, but started again after the RWB left. A possible nest overhanging the street was identified (there were 3 other bigger ones higher up). Begging continued, softer and rather intermittently (no hissing sound was ever heard), until a RWB arrived at 8:48 h and fed it in the nest, which I could then confirm. I checked again with binoculars at 12:26 h, and could easily see the nest and at first a shortish barred tail, and from the other side a golden crown with black around the eyes.

I was very excited as this was my first Koel nestling, despite having observed over 50 fledglings in the local area over 7 seasons. When I checked again the next day the nest seemed empty, and then a very soft begging led me to a fluffy, very short-tailed fledgling level with the nest but about 5 m away from it at 8:47 h. At 17:53 h on 19 Mar I found a very cute, quite small fledgling with golden crown and relatively well-formed tail, begging relatively loudly while sitting quite boldly in an open position about 2.5 m high in an exotic tree at the front of 18 Angophora St (so it had moved >30 m).

I last found it at 13:35 h on 21 Mar begging in an open position in the same tree, looking quite small and wet. This was in the middle of the very wet period (115 mm over 5 days), and despite much checking over the next week I was unable to find it again, and I suspect this very cute fledgling did not survive.

The above eight examples raise the number of young Koels first seen in the nest that I am aware of from 13 to 21. The most remarkable was Jerry Olsen's record: the third successive season in which the same apparent pair of RWBs reared a young Koel first seen in the nest in the same territory. When I mentioned this on the COG chat line, Alberta Hayes informed me that, when they were living in Ngunnawal, the RWBs that nested in their trees raised consecutive Koels every year for at least 3 years.

While I included the first two years of Alberta's fledglings in my summary of the 2018-2019 season (see Table 1 in Holland 2020b), I was not aware of the third year. As the original nesting tree was chopped down, it would have been a different nest, and it is not clear whether they were all first seen as nestlings. Mark Clayton also informed me that Gil and Marion Pfitzner again had a Koel fledgling in their front yard in Evatt, for the fifth year in a row, but I have no other details so do not know if any fledglings were first found in the nest.

4.6. Fledglings feeding themselves independently as well as drinking

In Section 4.5 of Holland (2020c) I summarised observations of Koel fledglings in the 2019-2020 season taking food either from feeding tables or available in the garden, and also for the first time drinking from various water sources in gardens etc. I thought this was due to the particularly hot and dry season, but there have been further examples of both from this

much cooler and wetter season, when supplementary feeding would have been less important. Certainly few, if any, seemed to have been as bold and tame.

The fledglings which came to feed on Ruth's mixed fruits at her double-storey feeding stand in Theodore (see Section 4.3 above) is one of two examples of which I am aware of fledglings coming to feeding tables this season. The other is the second young Koel (with RWB hosts this time) in Penny Olsen's Turner backyard, which came down on 10 Feb to independently take cheese from her feeding table (the interaction with a Magpie-lark (*Grallina cyanoleuca*) is summarised in Section 4.9). Penny's observations of a Magpie-lark taking cheese to feed her first Turner fledgling (see Section 4.7 below) should also be noted, as to my knowledge these are the first examples of cheese being fed to a Koel.

Interestingly, on 23 Jan, Charmian Lawson indicated that her Holder fledgling was not eating the Australian Magpie's (*Gymnorhina tibicen*) mince this year (Holland 2020c). She assumed there was enough other food for it, noting that there seemed to be plenty of soft fruit, though their wild fruit had all gone. There were certainly many examples of fledglings eating fruit this season, berries seeming to be a particular favourite.

From 22 Jan to 19 Feb one of Jonette McDonnell's fledglings was helping itself to the blackberries in their Duffy garden, as well as demanding food from its RWB hosts. On 8 Feb Robin Hide's Ainslie fledgling was sitting on the sunscreen over their raspberries. and then flew into the plum tree. While Helen Cross' fledgling (see Section 4.2 above) assumed the quivering and begging postures when its host, a RWB, came close, it did not get fed while she was watching. Instead, it flew to the nearby creek and ate some blackberries. It then flew up to what she guessed was its old nest, sitting in it and hanging around it.[3]

On 18 Feb Roger Curnow informed me that for about a week the two fledglings in his Higgins garden had been independent of their parent hosts and spent much time eating blackberries, and on the same day Kurt Luthi noted that a young Koel which had been calling in Florey for several days was seen pecking at *Viburnum tinus* berries. On 28 Feb Alison Mackerras observed a Koel chick eating hawthorn berries 2 metres from her verandah rail in Weston, chirping occasionally. While RWBs were also in the tree, they were not interacting with the fledgling, so it may have been independent. John Harris' fledgling eating elderberries is detailed in Section 4.8 below.

Figs were also a popular food source. Christine D.'s observation of the adult-fledgling interactions in her Flynn fig tree on 17 Feb is described in more detail in Section 4.8. On 24 Feb Mark Clayton informed me of a sighting from Chisholm of 2 fledglings (noted as a pair) eating figs. On 10 Mar Christine D. informed me of two juveniles coming to her fig tree, and on 17 Mar she noted that a friend had a juvenile Koel in her fig tree in Weston.

On 17 Mar Jacky Fogerty posted a photo on CNM of a juvenile Koel picking figs from a tree in Hughes and eating them on the ground. There was no sign of a foster parent, so she thought it might be fending for itself. She posted further photos of it in the fig tree taken on 19 and 27 Mar, noting that it often visited. On 28 Mar Mark Clayton forwarded correspondence with Sue Newbery about a young Koel in the fig tree at her parents' place in Ngunnawal, though she still saw a RWB taking food to it that day (this is the second

[3] Interestingly, when Jonette McDonnell's other January fledgling first arrived in the garden it took up residence in an old Australian Magpie's nest - Jonette said it looked right at home.

example this season of a young Koel feeding itself while still dependent). Finally, also in March, Julian Reid saw an independent juvenile/immature Koel feeding on his figs in Dickson.

Other examples of fledglings being fed or taking fruit by themselves include John Harris' observations. On 31 Dec he posted that his plums and elderberries were not yet ripe, so the RWBs were feeding the squawking juvenile on ornamental plums in Nicholls. This is the third example of a young Koel being fed fruit rather than meat (see Section 4.5 of Holland 2020c). On 26 Feb John Harris saw another juvenile Koel eating plums in Ngunnawal, and on 1 Feb John Brannan informed me that the fledgling in his Florey garden was still giving the occasional begging chirp, but also feeding itself on fallen plums. There were numerous RWBs around, but he had not seen or heard it being fed, so he thought it might be on the cusp of being fully independent, though its flying skills still left a great deal to be desired.

On 25 Feb Rosemary Blemings forwarded correspondence with Chris Drury about a juvenile Koel feeding on the grapes on his back deck in Fraser. Jenny Bounds' observations of a fledgling attempting to eat two different types of buds (Bounds 2021) is also noted. The good food sources are a possible reason for the unprecedented and extended breeding season.

The most interesting example of fledglings drinking is provided by the two fledglings in Jenny Bounds' Weston garden during January. One, which was present for most of the month, preferred to drink from one of her pedestal bird baths, the more secluded one, shaded with shrubs above. She did not see it bathing, and it seemed to ignore another bird bath on a pole, 1.5 m up in the open under an ironbark. However, the other less frequent fledgling visitor was seen taking water from another nearby deep water bowl on the ground (Bounds 2021).

Other instances include Sue Beatty's photo of her fledgling on a raised bird bath in her Holder garden on 10 Jan; Deb and Rod Ralph's photos of a fledgling drinking at a bird bath on the ground in a grassy open situation in their Macarthur garden on 20 Feb; and another photo of a fledgling drinking from a bird bath on the ground in a similar situation at the Gungahlin Town Centre, posted by Petal on CNM on 19 Feb. One also visited a bird bath in Nick Payne's Griffith garden on 7 Mar, and around the same time Richard Jeremy's fledgling drank from a bird bath on several occasions in his Palmerston garden.

While I did not actually see them drink, my first personal observation of fledglings near water was on 9 Mar, when 2 fledglings were begging together within a metre of each other on the edge of a water feature in a garden in Rivett, just within my GBS site. These two fledglings, distinctly different in age, size, appearance and call, were present in my GBS site for the first half of March, but this was the only time I saw them so close together.

4.7. Koel hosts

Again, in many cases RWBs were the confirmed host, and the most likely host in many more, since in other reports RWBs were often around but not actually seen to feed the young Koels. However, there were three cases which seem to involve other hosts.

The clearest of these was the photos taken on 12 Mar in the Red Hill NR posted on CNM by Jacky Fogerty. While it was not clear from the photos, her notes stated: 'Koel fledgling (I think) begging and being fed by friar bird host (glimpsed in photos 1 and 5). Sorry I did not

get a clear photo of feeding.' She separately confirmed that the Noisy Friarbird was the host. This is only the third example of this species being the host, the most recent one being Ian Baird's in O'Connor in 2017 (Holland 2017).

On 24 Jan Penny Olsen informed me that she had been feeding Magpie-larks in her Turner garden over many years, but that their latest chick appeared to be a Koel. She had heard the Koel peeping loudly for a few weeks and first sighted it on 18 Jan – it had fledged and was in a deciduous tree in the neighbour's backyard. The male Magpie-lark flew in and appeared to feed cheese to it, but she could not quite see through all the foliage. Then she clearly saw both birds perching on adjacent branches a foot or so apart. The Koel was begging (more quietly than earlier) and leaning towards the Magpie-lark. At the time Penny was not aware of the significance of this observation, and as this was the last sighting of this fledgling, unfortunately she was not able to be completely sure as she did not actually see the food being passed.

However, it appeared that the RWB could be eliminated as the host: while at least one RWB used to come for cheese, she had not seen it since before Christmas. Also, while the Magpie-lark still came for food, it stopped taking mouthfuls of cheese away at about the same time. So, the evidence is strong that this is the first example of Magpie-larks being the host in the ACT.

On the morning of 28 Feb Geoffrey Dabb found Rob Parnell standing on his Narrabundah nature strip photographing a dependent Koel in a street tree. Rob mentioned that 'a Noisy Miner (*Manorina melanocephala*) was near it'. Geoffrey noticed a Noisy Miner was face to face with the begging bird, appearing to feed it, but he could not be sure. Soon after, 2 other Noisy Miners appeared and evicted the young Koel. They were definitely not feeding it. No RWBs were seen or heard during this episode.

While Geoffrey did not regard this as reportable by itself, as the birds were seen face to face, this is the third possible example of Noisy Miners hosting a Koel in the ACT, the two previous cases being summarised in Section 5.3 of Holland (2020c).

A possibility is that the Noisy Miners were not the host but were reacting to its begging (John Leonard's example of one reacting to a fledgling described in Section 5.6 of Holland (2020b). A possible example of a Pied Currawong (*Strepera graculina*) feeding a fledgling, and reference to a list in HANZAB of species feeding Koel fledglings when they were not the original host, is in Section 5.5 of Holland (2020b). A remarkable example of Noisy Friarbirds first approaching the cage of a Koel fledgling in care, and then up to 3 adults successfully attending it when the cage was opened to allow access, is detailed in Jones and Nattrass (2001).

4.8. Interactions of Koel adults/fledglings

Despite the almost exponential rise in the number of fledglings this season, there are very few examples of adults interacting with them or even being close. I have no personal examples of this, despite the many fledglings I observed, including for long periods in and around my garden. However, the most interesting one is the male Koel helping the two fledglings feed from Ruth's Theodore bird feeder in November/early December, with the male still attentive to one of them in mid February (see Section 4.3)

On 31 Dec, when John Harris posted about the RWBs feeding ornamental plums to his fledgling (see Section 4.6 above), he also noted that he could still hear the male reported on 22 Nov (see Section 3.1 above) all the time. He had not yet seen them together, but when he heard the juvenile, he also heard the male a short distance away. He suspected that the RWBs feeding the juvenile harassed the male if it came close. If it did eventually come closer, he suspected it may not be until the juvenile was independent.

On 15 Jan John Harris reported clearer interaction between the juvenile Koel and the adult male behind his house in Nicholls. It confirmed his observations last year of an adult male Koel purposefully interacting with a juvenile Koel (Harris 2020). That week his elderberries had started to ripen, and since the ornamental plums were virtually finished the juvenile Koel was now eating them. The male Koel, which had been '*wirra wirraing*' for months, had now taken up residence in the eucalypts behind his house 'in order to keep contact with the juvenile'. John was unable to creep up on the juvenile, as whenever he approached it, it flew to the tree where the male was.[4]

The only other examples are from Christine D. On 17 Feb she noted that the figs in her tree in Flynn were starting to ripen, and the Koels were quickly on the scene. That day the female was there, and a very loud '*Keek keek keek*' would erupt from just outside the window. A bit later a juvenile appeared, looked on for a while, then flew in and started to eat a fig. It did not call at all. Then suddenly the male appeared, and there was a bit of a fluster just out of view, before the juvenile flew to the outer edge of the tree. It sat there fluttering and making an unusual call, something like the excited begging call just before it is fed. Then it was silent. She noticed the female ignoring everything, while the male looked around for a fig. Eventually it found the fig the juvenile had been eating, and started eating that. The juvenile flew off, and then the female hopped up to where the male was eating, and he hopped away so that she could eat that fig.

On 10 Mar Christine updated me that she had since had up to 3 juveniles in and around her garden. That day she had seen the male, the female and one of the juveniles. All were now mostly silent except for the occasional alarm call, and she thought at least two juveniles were still around the day before. On 17 Mar she noted that the male and one of the juveniles were still present, and mentioned in her eBird post of 19 Mar that one male was often eating figs, or perched in a nearby tree. Another male with a shorter tail arrived, and the original male chased it away. Then a juvenile arrived, from the photos it appeared to be a fairly advanced male given all the back around the shoulders etc. On 25 Mar her eBird list indicates that a juvenile and male were still seen in her fig tree, the former for the last time, while the male remained until 29 Mar.

Christine's are the only observations of adults and fledglings/juveniles close together in March. John Harris' observations were made in mid January, well before the end of the season. However, on 22 Feb Mark Clayton advised me of a photo of a fledgling in Curtin with a male Koel in the background.

4.9. Interactions of fledglings with other species

There were many more examples of fledglings interacting with other species. On 11 Jan Christine D noted that she had seen Satin Bowerbirds (*Ptilonorhynchus violaceus*) visiting her garden frequently for most of last year, and now that some of the figs were ripe they

[4] Unfortunately no further details are available.

were eating them. A couple of weeks earlier, she had noticed the Koel fledgling in the fig tree. It was aggressively chasing two Satin Bowerbirds away from the tree, but they would just return to it. The previous interactions of fledglings with Satin Bowerbirds are summarised in Section 5.4.3 of Holland (2018b), but this is the first time a fledgling has been observed acting aggressively towards them.

Figure 3. Example of a very golden fledgling very typical of the season from Isabella Pond (*Tee Tong Teo*).

On the evening of 10 Feb, Penny Olsen reported that her second fledgling was feeding on the cheese on her feeding table (see Section 4.6 above), but when 'her' Magpie-lark arrived, the Koel started begging. The Magpie-lark seemed a bit startled but ate a shred of cheese and soon flew off. The only possible previous similar example was John Leonard's Noisy Miner's behaviour with a fledgling described in Section 5.6 of Holland (2020b).

On 23 Jan a Sulphur-Crested Cockatoo (*Cacatua galerita*) perched on Rosemary Blemings' cables in Flynn, then approached her young Koel. It hung around for 10 minutes and then it went so close to the fledgling that it withdrew into the cover of the trees. The cockatoo went into the foliage and the Koel moved further away, still calling. Jenny Bounds' observation of a fledgling giving a shrieking call, not unlike an adult Koel, in response to a Sulphur-Crested Cockatoo coming close should also be noted (Bounds 2021).

In late January, Michael Robbins was watching a fledgling in Kambah before it flew away to avoid being further mobbed by Pied Currawongs and Noisy Miners. Early in March Noisy Miners objected to Steve Read's fledgling in Lyons, before flying off (see also Geoffrey Dabb's fledgling's eviction by Noisy Miners in Section 4.7 above).

Most examples of interactions were with Pied Currawongs, the most interesting observations being on 6 Mar by John Brannan, whose still dependent fledgling in Florey went quiet and literally pulled its head in, turning into a large ball plus tail when a curious Pied Currawong approached it. Also of interest is Jenny Bounds' observation on 4 Jan of her fledgling keeping very quiet while the host RWBs were harassing Pied Currawongs (Bounds 2021), and for some time afterwards.

On 2 Feb Robin Hide briefly saw a fledgling in Ainslie before it was quickly hustled away by a Pied Currawong, and his different fledgling on 28 Feb was similarly being hassled. On 8 Feb Mark Clayton's well-advanced juvenile in a tree in his Kaleen backyard was being harassed by Pied Currawongs. On 17 Feb a constantly begging young Koel in Christine D.'s fig tree in Flynn was being harassed by two Pied Currawongs before a RWB came and chased them away. On 8 Mar Philip Veerman's fledgling in Kambah appeared to be attended by 4 RWBs and was watched closely by Pied Currawongs.

On checking some begging calls very close to my house on 27 Mar, I saw a large, long-tailed fledgling fly out of a plum tree pursued by up 4 Pied Currawongs to a gum about 20 m away, where it continued to call while the currawongs were very noisy. Also, on 28 Mar a Pied Currawong swooped at a fledgling on the top of a bush in a neighbour's yard.

4.10. Multiple fledglings together

A feature of this season was the many examples of two or more fledglings seen together. The largest group was 4, seen within 20 m of each other in my garden on 26 Mar. At around 09:40 h I could hear one close and then saw one in a wattle from the front door. It soon flew off, but on approaching closer I saw another at much the same spot, and then a very mature fledgling on a neighbour's back fence about 10 m away. Both flew off, but I could still hear begging in the wattle and flushed a fourth fledgling at 09:42 h. This was during the period 24-31 Mar, after the very significant rain event, when I recorded 2 likely different fledglings in my garden every day (but never really close together). I suspect most of these were moving through on their migration north.

On a Canberra Field Naturalists outing on 26 Feb, Alison Milton reported three Koel fledglings, all in the same Hoskins St yard in Hall. She saw only two but another member saw a third; two were together and the third on the porch banister (Rosemary Blemings confirmed this later).

There were many reports of two close together, some of them mine. At about 15:58 h on 7 Feb, I heard the fledgling which had been present in my garden since 22 Jan begging, and saw fly it to my neighbour's plum tree. It appeared to be fed in the tree by a RWB. However, when it appeared in better view it was followed by a second, almost identical very golden fledgling (both with very little black on the head yet, so probably females). For 10-15 seconds they sat within 2 metres of each other, before the second chased the first away. Only the first was still begging quite softly.

On 12 Feb I heard begging in a Wallington Retirement Village garden at the NE side of the corner of Bangalay Cres and Casuarina St Rivett, and easily found a fledgling at the top of a ripe blackberry bush. A second fledgling could be heard low in a small fig several metres away, and I obtained short but reasonable views. Again, both were quite similar gold and black, with a golden head with black only in the middle. On 3 Mar there were two begging calls in the rear garden of 12 Themeda Pl Rivett and two fledglings were seen within 5

metres of each other at 16:20 h. The first was quickly fed by a RWB, and the second was similar but larger.

In the first half of March I had two begging fledglings in my garden. These were quite different in age and appearance, and while I could often hear them begging together or sequentially, the only time they were really close together was on 9 Mar at a neighbour's water feature (see Section 4.6).

Other examples of 2 birds very close together include Ruth's of Theodore in early December, and again in late February, as detailed in Section 4.3; Jenny Bounds' very similar two in her Weston garden during January mentioned in Section 4.6 (Bounds 2021); the two pairs of fledglings at Isabella Pond on 23 Jan described in Section 4.2; Roger Curnow's two in Higgins in mid February (see Section 4.6); and Mark Clayton's 2 in Chisholm on 24 Feb (Section 4.6).

Of the other examples not previously mentioned the most interesting was on 7 Feb when Shorty found 2 fledglings together in his Symonston garden, being fed by the single pair of RWBs. He assumed that it was his resident pair as they both looked rather worn out and ratty with feathers missing from their heads. On 9 Feb Shorty made a further sighting of 2 fledglings but with 4 RWBs. While two of them looked quite healthy, he was not sure if the other pair fed the young, as he only saw his pair feeding them. Why the other pair of RWBs were there was unclear, as he noted that his pair did not usually tolerate others in their territory. He wondered if the other one was abandoned by its hosts and both young Koels were now being looked after by his RWBs.

Others include Jonette McDonnell, who on 22 Jan had two begging fledglings, one in her Duffy garden and the other next door, and Joan and Trevor Lipscombe's observation of two young Koels in their Campbell garden on 2 Feb. They were moving silently and openly but independently, between perching on various trees and wires or hiding in the denser trees, flying away and then returning to the garden. On 9 Feb Peter Christian reported 2 young Koels close together in Macgregor. The first bird was being fed by a RWB, and the second bird around 20 metres away was being chased away by a second RWB.

On the same day Mariko Buszynski reported that she had seen two young Koels in her Hughes garden. They looked very similar, almost golden coloured and heavily striped. There was no interaction between them, but the one that had been present previously was independent and had not been seen to be fed, while the second was well hidden and actively fed by RWBs. On 8 Mar Terry Munro could hear and see a new fledgling being fed in his Watson garden, whereas the one there from 2 Mar sounded different and was not fed. On 29 Mar Greg Wood had 2 fledglings, identical to his eye, together in his Chapman garden.

There are also plenty of examples of multiple Koel fledglings heard or seen within an area though not necessarily together. On 22 Feb Barbara Allan reported 4 fledglings within a 200 m radius of her Page garden, and on 28 Feb Alison Mackerras had 3 around her garden in Weston, including the one eating hawthorn berries (see Section 4.6 above). Another was being fed by RWBs in a eucalypt 40 metres away, calling constantly, and yet another was 80 metres further down the street, also being fed by RWBs and calling constantly.

Peter Christian's many fledglings in Macgregor and Steve Wallace's in Fraser (see Section 4.2) also included fledglings close together, for example see Peter's above, and on 20 Feb

Steve had two very close together. On and after 16 Feb Michael Lenz had 3 fledglings, all fledged within the past week, at the Gungaderra Creek corridor in Franklin (Lenz 2021). Others also noted 2 or more fledglings reasonably close together at the Jerrabomberra Wetlands NR from mid February.

5. Discussion

5.1. Possible reasons for the unprecedented fledgling season

As can be seen in Table 2, the total of 365 (328 definitely new) fledglings for the 2020-2021 season is about 4 times as many as reported in any other season, i.e. the maximum total of 92 in the 2018-2019 season. Though the 2019-2020 numbers may have been larger than this except for the very hot, dry and smoky conditions, the 2020-2021 season represents around 50% of the total fledglings of the seven seasons. This was also a much longer season than any previous, nearly 6 months, compared with the around 3.5 months for the previous longest seasons, though only two chicks/fledglings had been reported by the beginning of December.

So why was it such a remarkable season, with an almost exponential growth in the number of fledglings? It certainly cannot be explained by increased adult activity. As noted above (Section 3.1), it was a rather quiet season for them, with comparatively few reports of the noisy multiple adult Koel associations/interactions characteristic of the previous few seasons (Holland 2020c). In particular, limited adult activity was reported after about mid January. It may be that observers had by now grown accustomed to them and did not report them. However, I suspect that, as males and females arrived at much the same time, breeding began very soon after. The season does provide further circumstantial evidence that, if Koels are very noisy, RWBs may be more alert to them (see Section 5.1 of Holland 2020a).

Table 2. Fledgling statistics for the 2014-2015 to 2020-2021 seasons.

Season	Number*	First	Last	"Local"
2014-2015	25	-	-	3+
2015-2016	29	14 Dec	31 Mar	2
2016-2017	56 (8)	1 Jan	22 Mar	7+
2017-2018	84	3 Dec**	26 Mar	7
2018-2019	87 (5)	3 Jan	14 Mar	3
2019-2020	72***	15 Dec	3 Apr	10
2020-2021	328 (37)	31 Oct	24 Apr	19 (7)
Total	681 (50)	-	-	51 (7)

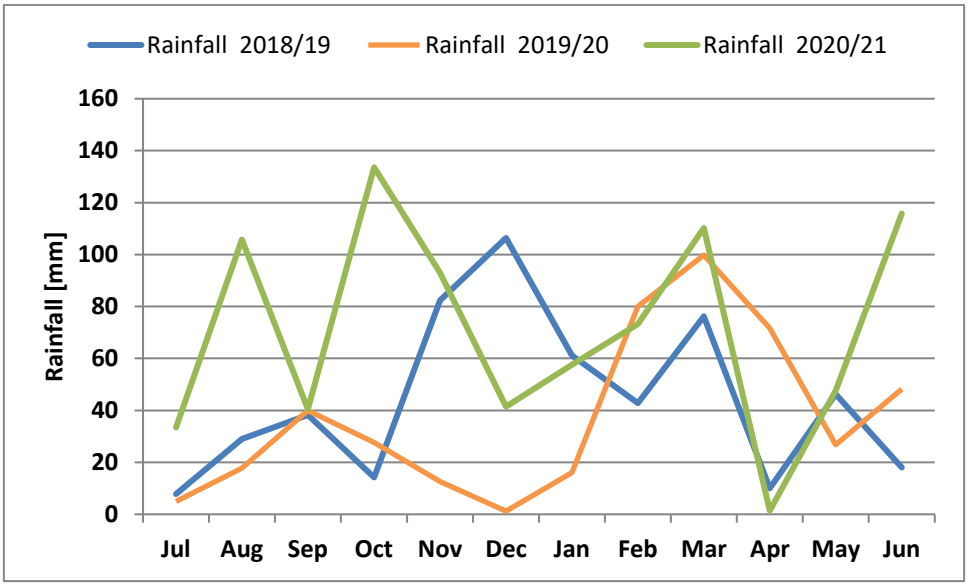
* Those in brackets ( ) are possibly new as double counting could not be eliminated

** A chick still in nest, but the first fledgling within the next GBS week

*** Three have been added from Ngunnawal, Holder and Evatt (Alberta Hayes, Sue Beatty and the Pfitzners, respectively) to the total in Holland (2020c), as they were only reported this season

The weather is likely to have played a major role. A comparison of rainfall for the 3 most recent seasons at Canberra Airport is given in Fig. 4 (Bureau of Meteorology 2021). This has been drawn in financial rather than calendar years to better reflect the rainfall during and around the Koel seasons. The very dry period from April 2019 (in blue) through to January 2020 (in orange) can clearly be seen. The rainfall in February and after was too late to affect the 2019-2020 Koel season, due to the previous very hot, dry and smoky conditions.

Figure 4. Monthly Rainfall Values for the past three financial years.



It should also be noted that, apart from the wet spring in 2016, which also coincided with the first significant increase in fledglings (see Holland 2017), all of the seasons I have summarised previously were in drought years. This is clearly shown by the yearly rainfall totals from 2018-2019 to 2020-2021 were 450.0, 466.6 and 760.4 mm, respectively

As might be expected, temperatures in the 2020-2021 season were also much lower than in the two previous seasons, as shown in Table 3. The mean maximum temperatures from October 2020 to March 2021 (in bold), with one exception (November 2018), were all lower than in the two previous seasons. However, it is not clear that both the higher rainfall and lower temperatures fully explain a fourfold increase in the number of fledglings, or why it such a prolonged season, with many more late fledglings.

Table 3. Monthly mean maximum temperatures for the past three financial years.

Season	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
2018-2019	13.3	13.9	18.0	22.8	24.5	29.3	34.5	29.1	26.0	22.6	16.6	14.1
2019-2020	13.7	14.2	18.8	23.6	26.8	31.7	31.7	27.7	23.4	18.9	15.0	13.5
2020-2021	13.2	12.8	17.6	**20.3**	**25.1**	**25.4**	**28.1**	**26.1**	**23.0**	20.8	16.4	28.1

It was certainly a very good season for fruit, as indicated by the number of different types of fruit fledglings were seen to eat (Section 4.6).

5.2. Did RWBs have a fourth brood in the 2020-2021 season?

Their RWB hosts also had a very good breeding season, as noted by Michael Lenz, who found 24 territories in his breeding study at the Gungaderra Creek corridor site in Franklin (Lenz 2021). In this study, first broods (*i.e.* presence of fledglings) were determined as between late September and late November, second broods from early November to late December, and third broods from early January to mid February. The four Koel fledglings

were only observed in their third broods, two of which had earlier raised their own young.[5] The last three Koel fledglings were first observed on 16 Feb. Given that after this date about 160 more Koel fledglings were still first observed, this raises the question of whether many RWBs had a fourth brood (not necessarily all successful - see Lenz 2021) during this season.

My last RWB fledgling was begging very loudly (sounding very much like a young Koel) on 8 Apr. I had been hearing it at the corner of Casuarina and Goodenia Sts Rivett since 1 Apr. There was also at least one RWB fledgling still at the rear of 12 Themeda Pl on 21-28 Mar, one in the gardens around 4 Pavonia St Rivett on 22-24 Mar, as well as one within my GBS site in Chapman on 21-24 Mar. These sightings of at least 4 different RWB fledglings were all during or after the 115-mm rain event, indicating that at least some survived this.

By contrast, the RWB fledgling season in my local area is often over by mid February or early March at the latest. On 10 Mar, Christine D. reported a still begging dependent RWB and its parents in her Flynn garden, and her eBird lists show an adult and juvenile RWB present up to 27 Mar. Unfortunately, I do not have reports from any other observers as it was not something we concentrated on. However, it does seem that the very good conditions led to an extended RWB breeding season, with a likely fourth brood for many, and that the adult Koels took advantage of it.

5.3. Other issues

These are discussed under ‘Some unanswered questions’ in Section 4 of the accompanying paper (Holland 2021; this issue).

5.4. Main features of the 2020-2021 ACT Koel season

In summary, the key features of the 2020-2021 ACT Koel season were:

- Probably due to the much more favourable conditions, both sexes arrived slightly earlier that usual, and numbers of locations built up rapidly. By the end of December they had been reported from over 80 ACT and nearby locations on the eBird Australia map, including some rural locations much more distant from Canberra, the furthest of these being 7.5 km S of Michelago.
- However, adults seem to have been much quieter than previously, with few reports of multiple birds calling/interacting. The peak of the adult activity was around the New Year. Following this there was limited reporting of adult activity, though females were still observed on 2 and 4 Apr, respectively.
- Further information (mainly from the author) on the variety of calls is provided. There were also two further examples of adults drinking at a bird bath, and for the first time of an adult female regurgitating the pits of some unidentified red fruits.
- It has, however, been the most remarkable season for reports of Koel fledglings, with a total of 365 (328 definitively different and 37 possibly so), over 4 times higher than in any previous season, the previous maximum number being 87 (5) in 2018-2019.
- While it was the most rapid build-up in fledgling numbers to date, the main feature was the very prolonged season.

[5] As noted in Section 4.5., Barbara Allan also found a Koel fledgling in the nest that had been used to raise RWB fledglings earlier in the season.

- There was a very steep increase from mid January, but around 75% of fledglings were first observed after 1 Feb. Almost 50% were reported in February, and a further 75 new fledglings (as well as 15 possibly new) were first observed in March. This compares with 6 for the 2017-2018 season, the previous maximum number first observed in March.
- A further 4 new (and 3 possibly new) fledglings were first observed in April, the last live new one on 10 Apr, and the last fledgling on 24 Apr, some 10 days later than in any previous season.
- With a fledgling first reported on 31 Oct, the season was much longer than any previous one, almost 6 months, compared with around 3.5 months for the longest previous seasons.
- There is evidence that the very good conditions led to an extended RWB breeding season. It is likely many had a fourth brood, and that the Koels took advantage of that.
- There were many examples of 2 or more fledglings observed very close together (maximum of 4 within 20 m), as well as further examples of multiple fledglings in a relatively small area, though not necessarily together.
- There were also many more fledglings (21, 3) reported from the creek corridors, urban lake reserves or peri-urban locations compared with the single one last season.
- There were eight examples of young Koels first seen in the nest, the last fledging very late on 18 Mar. The most remarkable record was the third successive season that the same apparent pair of RWBs had raised a young Koel first seen in the nest within the same territory in Cook.
- Again, the RWB was the main confirmed or suspected host, but there was now a third ACT example of the Noisy Friarbird as the host. There was a single example of the strongest local evidence to date of the Magpie-lark hosting Koels, as well as further possible evidence of the Noisy Miner as host.
- While there were several instances of fledglings staying in gardens for up to a month, there was less dependence on food being left out than in the previous very hot and dry season, as might be expected given the much more favourable conditions.
- The most notable example was a very early fledgling being fed by a male Koel on mixed fruits from a feeder in a Theodore garden, the first local example of an adult feeding a fledgling. The other example was a fledgling eating cheese left out in Turner. Earlier a probable Magpie-lark host in the same garden appeared to be feeding a fledgling cheese. These are the first local examples of this food being taken.
- There was a further case of a fledgling being fed fruit (plums) by its RWB host, and many examples of fledglings independently eating fruit, in particular berries and figs. There were also 7 further examples of fledglings drinking from bird baths, despite the much cooler and wetter season.
- There was one instance of an adult male Koel calling near or associating with a fledgling, but this was in mid January. At the only site (Christine D.'s fig tree), where adults and juveniles were observed together in March, there was no evidence that a male was trying to imprint its call, or was waiting to escort it north.

- There have been further cases of Koel fledglings interacting with other species, mostly the Pied Currawong.

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References

Abernathy, V.E. and Langmore, N.E. (2017). The first stages of coevolution between a brood parasite and its new host: are naïve hosts defenceless? *Emu - Austral Ornithology* 117: 114-129 (2017)

BESG (Bird Ecology Study Group) (2009) Asian Koel regurgitates seed. https://besgroup.org/2009/01/19/asian-koel-regurgitates-seed/ (accessed 16 August 2021).

Bounds, J (2021) Summer of the 18th Koel, *Canberra Bird Notes* 46: 223-226.

Bureau of Meteorology (2021) Monthly rainfall for Canberra Airport 2018 to 2021. http://www.bom.gov.au/climate/data/ (accessed 5 July 2021).

Chapman, G. (2016) Graeme Chapman Natural History Photographer Ornithologist. https://www.graemechapman.com.au/library/sounds.php?c=310&p=118 (accessed 16 August 2021).

Harris, J. (2020) Observations on a Koel Adult Male and Fledgling Interaction. *Canberra Bird Notes* 45: 316-317.

Holland, J. (2017) Changing adult behaviour and significant increase in Eastern Koel breeding in Canberra in the summer of 2016-2017. *Canberra Bird Notes* 42: 281-292.

Holland, J. (2018a) The 2017-2018 Eastern Koel season. III. Observations of adult and fledgling behaviour in wider ACT. *Canberra Bird Notes* 43: 263-273.

Holland, J. (2018b) The 2017-2018 Eastern Koel season. II. Detailed observations of adult and fledgling behaviour in Deakin and Narrabundah. *Canberra Bird Notes* 43: 263-273.

Holland, J. (2020a) The 2018-2019 ACT Eastern Koel Season. I. Adult and fledgling behaviour in Chapman/Rivett and Narrabundah. *Canberra Bird Notes* 45: 111-124.

Holland, J. (2020b) The 2018-2019 Eastern Koel Season. II. Adult and fledgling behaviour in wider Canberra. *Canberra Bird Notes* 45: 125-143.

Holland, J. (2020c) Summary of the 2019-2020 Eastern Koel Season in the ACT. *Canberra Bird Notes* 45: 293-310.

Jones, D.N. and Nattrass, R. (2001). Notes on interactions between Common Koels and their hosts. *Corella* 25 (3): 60-61

Kivaren (2008) https://www.birdsinbackyards.net/forum/Surveys-and-interesting-sightings/Koel-feeding-habit (accessed 16 August 2021).

Lenz, M. (2021) The bird community of the Gungaderra Creek Wildlife Corridor in suburban Franklin, ACT, during the 2020-2021 breeding season. *Canberra Bird Notes* 46: 171-198.

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GANG-GANG OBSERVATIONS DURING THE 2020-21 BREEDING SEASON, CANBERRA, ACT

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Abstract. *A citizen science project was started in 2017 after a 2014 survey of Gang-gangs* (Callocaphalon fimbriatum) *in the ACT. The project's aim was to locate and monitor Gang-gang breeding sites in peri-urban Canberra. During 2020-21 we monitored 34 sites using* ad hoc *observations from volunteers, inspecting sites using an endoscopic camera and seven motion detection cameras set up near breeding hollows.*

Breeding success at 76% was the same as in the previous season. We were able to determine the causes of nesting failure, document nest-site competitors, assess time spent and when Gang-gangs were most likely to be visible at the nest site.

1. Introduction

Following a citizen science study of the distribution and abundance of the Gang-gang Cockatoo (*Callocephalon fimbriatum*) in the ACT (follow the link The Gang-gang Survey - Canberra Birds to access the survey results), surveys to obtain further information on breeding within the local region were conducted during the 2017-18 and 2018-19 seasons (Davey *et al.* 2019) and again during the 2019-20 season (Davey and Mulvaney 2020). Information from reports submitted to Canberra Nature Map and visits to known breeding sites are reported here for the 2020-21 breeding season.

2. Methods

2.1. Equipment

We relied on three sources of information: first, from the general public who had participated in previous surveys or submitted observations to Canberra Nature Map. In most cases these were *ad hoc* observations, usually collected before and after working hours. Where there was a report of a Gang-gang at a possible nest site, the contributor was asked to maintain regular observations at the site. Where regular visits by Gang-gangs were reported, the site was visited by one of the authors to confirm the location and status of the site.

Second, we purchased a wi-fi endoscopic camera, which we attached to an eight-metre pole, here referred to as the 'pole camera'. Images were transmitted to an app located on a mobile phone. With care and patience, it was possible to monitor activity within a hollow. Although this caused some disturbance, any sitting bird either stayed or perched in a nearby tree until we left, and then immediately returned to the hollow. The advantage of the endoscopic camera was that a site could be monitored at any time. All of the sites that we were aware of could be monitored in this way.

Finally, a grant made available through the Canberra Birds Conservation Fund contributed to the purchase of six motion detector cameras, which has allowed us to describe activities at various known nesting sites in some detail. An additional camera, batteries and SD cards were provided on loan from ACT Parks and Conservation Service.

The HyperFire 2 cameras with passive infrared motion detector and a night-time infrared illuminator were placed at various known Gang-gang nesting sites. Images were taken of any movement at the hollow entrance day or night. The cameras were usually placed 3-4 m from the entrance, attached to a nearby branch. Each camera was loaded with a 32GB SD card, which in most cases provided enough space to continue operations between visits. The advantage of the cameras was that continual monitoring of activity at the hollow entrance was possible and valuable information could be obtained on site competitors. Care was needed to set up the cameras, to ensure that the hollow entrance was visible but with leaf and branch movement reduced as much as possible. The disadvantage was that the cameras had to be serviced and the SD card removed to check that the camera was still properly aligned. This meant that someone with tree-climbing experience (LR) had to be available to set up the camera and check the SD card and batteries. In addition, Gang-gangs were curious when cameras were first set and on occasions interfered with the placement.

2.2. Image analysis

From the seven cameras, we obtained 268,064 images that were visually checked. Many of the images were of no value because the camera was triggered by moving foliage, but for all valid images the site, date and time of any activity was recorded in an EXCEL spreadsheet. For each Gang-gang pair the activities of the male and female were assessed separately. Activities noted included time of arrival and departure and all visits and interactions with other species. On some occasions the images indicated an arrival time without a corresponding departure time and *vice versa*, owing to a quick entry or departure from the hollow. Because of this missing information the time spent in the nest site could not be assessed, so analysis concentrated on the amount of time a bird was visible at the hollow entrance.

3. Results

3.1. Breeding success

As the study progressed, more breeding hollows were identified. There were eight known sites in 2017-18, 10 in 2018-19, 25 in 2019-20 and 34 in 2020-21 (Table 1). For the 2020-21 season, 17 known nesting sites were not reused and seven were reused. Larissa hollow was visited but not used in 2019-20, but was used in 2020-21 and an additional 9 were found.

Of the 17 used sites, 15 were located within the Red Hill Nature Reserve and adjoining Hughes open space, one on the slopes of Black Mountain and one at the Pinnacle Nature Reserve. The motion detection cameras were placed on the six sites that were known to be previously successful and at Larissa.

From the 34 known sites 17 were used in 2020-21 and at least 13 were successful in producing fledged young (76%), with a sex ratio of 9 males to 7 females (Table 2). For the previous year calculations are complicated but there were 24 monitored sites, of which 17 were used and 13 were successful (76%); (see Davey and Mulvaney 2020). At five sites young were found on the ground. Not including those young that were found on the ground and relocated, the sex ratio of fledglings for 2019-20 was 10 males to 7 females.

Table 1. Breeding categories for 34 Gang-gang hollows during 2017-18, 2018-19, 2019-20 and 2020-21: Located in subsequent years (0), Site not used (1), Visits but outcome unknown (2), Regular visits but no clutch (3), Young but not known to fledge (4), Young fledged (5).

Site name	2017-18	2018-19	2019-20	2020-21
Tree 66	5	5	5	5
Long hollow	4	4	1	1
Small hollow	4	4	5	3
Duck down	5	5	5	5
Mistletoe	2	5	1	1
Red Box	2	5	5	5
Norm's	0	5	1	1
Track hollow	4	4	1	1
Gully hollow	0	4	1	1
Sandy's	4	2	1	1
Roy's hollow	0	0	5	1
Davidson's	0	0	5	1
Sandy 2	0	0	5	3
Birch	0	0	5	1
Tree 51	0	0	5	3
Mt. Ainslie	0	0	5	1
Federal Golf Course	0	0	5	4
Mugga 1	0	0	5	1
Mugga 2	0	0	5	1
Bass Gardens	0	0	5	1
Tree 4, ANBG	0	0	5	1
Tree 10A, ANBG	0	0	4	1
Tree 2 ANBG	0	0	4	1
Larissa	0	0	1	3
Pump station	0	0	3	1
Francis St	0	0	0	5
Flinders St	0	0	0	5
Saudi	0	0	0	5
RWAV	0	0	0	5
Little Roy	0	0	0	4
Pond	0	0	0	5
Isaacs	0	0	0	5
Helen's	0	0	0	4
Pinnacle	0	0	0	5

Table 2. Breeding success of sites during the 2020-21 Gang-gang Cockatoo breeding season.

Site name	Number chicks at hollow	Sex	When fledged	Comments
Tree 66	2	M,F	6/7 Jan	
Duck down	2	F, F	8/12 Jan	
Red Box	2	M, F	1/3 Jan	
Sandy 2				Not successful
Tree 51				Not successful
Small hollow				Not successful
Larissa				Not successful
Francis St	1	M	16 Feb	Very late
Flinders St	2	M, M	19 Jan	
Saudi	2	M, M	14 Jan	
RWAV	1	M	ca 30 Jan	
Little Roy	?	?	ca 15 Jan	
Pond	2	F, F	16/17 Jan	
Isaacs	1	F	ca 6 Jan	
Helen's	1	?	?	
Pinnacle	1	M	27 Jan	See Davey (2021)
Federal Golf Course	1	?	?	

Of those sites that were not successful in 2020-21, one became flooded. One was usurped by Common Myna (*Acridotheres tristis*) and then by Eastern Rosella (*Platycercus eximius*)**,** one was taken over by Common Brush-tailed Possums (*Tricyosurus vulpecula*), whilst Larissa was abandoned. There were three sites where we were aware, due to the pole camera, of young in the hollow. They were not seen to fledge but are here regarded as successful.

3.2. Tree measurements

Information on tree and hollow measurements from fifteen Gang-gang breeding hollows were presented in Davey and Mulvaney (2020). During the present reporting period an additional eight sites were assessed, see Appendix I.

Of interest was that in previous years all known sites were in live trees. For 2020-21 there were four sites in dead or virtually dead trees. Sites measured after the 2019-20 breeding season were assessed in January/February 2020 and of the 15 sites two were occupied by Australian Wood Duck. The eight 2020-21 season sites were not measured until August 2021 and from six of the climbed trees two were being used by Wood Ducks and one by a Brush-tailed Possum.

3.3. Camera-monitored nest sites

Cameras were in place at six sites from 26 Sep with three through to mid-January. On 12 Oct a camera was placed at **Larissa**. The cameras did not cover the entire period at the sites due to camera malfunction, slippage, wind problems and the availability of resources to

climb trees and change SD cards and batteries as required. Gang-gangs chewing at the tape which held the cameras in place were responsible for much of the initial slippage.

Tree 66. This site produced two fledglings the previous year. The camera was set up on 26 Sep but slipped on 3 Oct and was not relocated until 4 Nov. From on-ground *ad hoc* observations, incubation started around 22 Oct with hatching sometime around 28. The nestlings were first recorded by the camera at the hollow entrance on 26 Dec, with fledging of the first chick on 6 Jan and the second chick the next day.

Duck down. This site produced two fledglings the previous year. The camera was set up on 26 Sep but soon slipped and so no useful images were recorded until 12 Oct. Camera images, *ad hoc* observations and the pole camera indicated that incubation started around 25 Oct with hatching around 24 Nov and final fledging by 12 Jan - a period of 11 weeks. In the 10-day period before egg-laying, during the site-establishment period, the male spent much more time visiting the site than the female but very little time in the hollow. The female was first seen in the hollow at night on 24 October. Over the incubation period from 25 Oct to 24 Nov, there was no indication that the female needed to protect the site at night, apart from when the nestlings first hatched.

The adult male was not seen after the first female chick fledged on 8 Jan, and the female alone tended and fed the remaining female nestling until it fledged on 12 Jan.

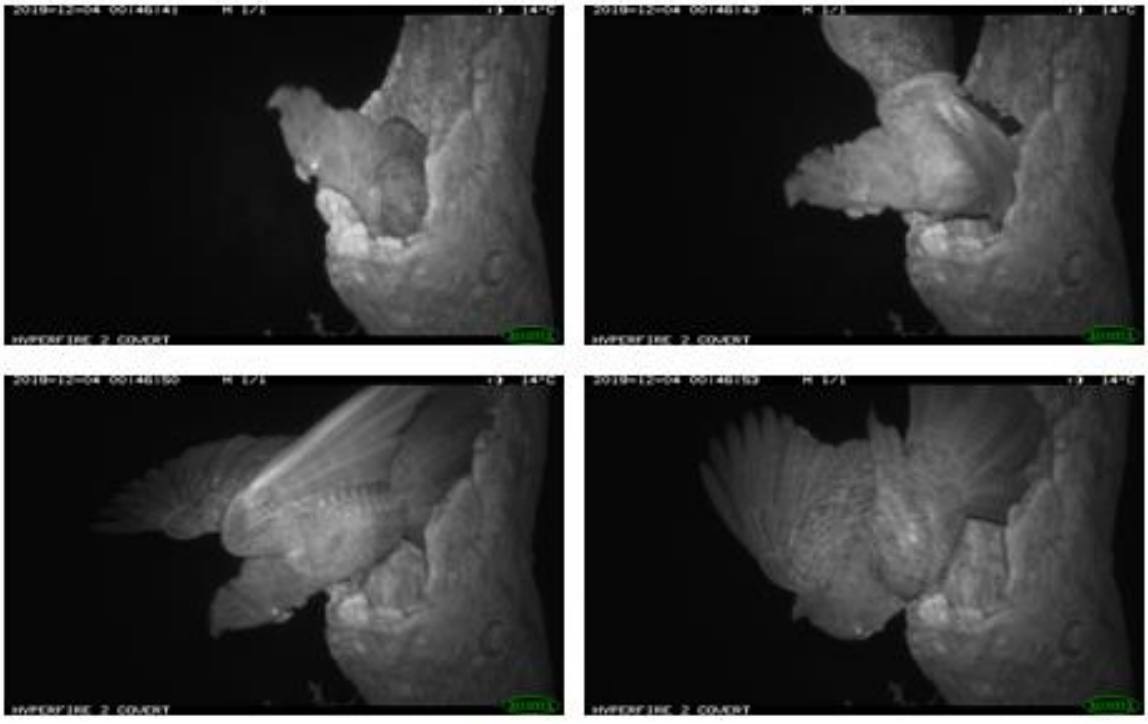

Figure 1. Four consecutive images of female Gang-gang defending nestlings at Red Box, 4 Dec 2020.

Red Box. This site produced two fledglings the previous year. The camera was placed at the site on 26 Sep but unfortunately was set too high. Although the hollow entrance was not visible, it was possible to document when Gang-gangs were visiting the site as they perched above the entrance. No images were collected between 8-28 Nov. The camera was moved and the SD card replaced on 28 Nov. From *ad hoc* observations and images from the pole

camera, hatching occurred around 14 Nov, with both birds regularly visiting the site and entering the hollow. At that time Crimson Rosella (*Platycercus elegans*), Eastern Rosella, Australian King-Parrot (*Alisterus scapularis*) and Noisy Miner (*Manorina melanocephala*) were visiting the site, and the Sulphur-crested Cockatoo (*Cacatua galerita*) and Australian Wood Duck (*Chenonetta jubata*) were particularly aggressive.

Between 3-6 Dec the female was particularly active at night, defending the hollow against a predator that the camera could not record but presumably a possum. On 4 Dec the female was continually on the alert from 00:33 – 02:00 h and again on 5 Dec from 21:45 through to 01:30 h the next morning (Fig. 1).

Nestlings were first seen at the hollow entrance on 26 Dec, with the male chick fledging on 1 Jan and the female on 3 Jan. In contrast to **Duck down**, after the male chick fledged the adult female was not seen again during the day but returned at night to mind the remaining chick. The adult male fed the female nestling during the day.

Sandy 2. This site produced one fledgling the previous year. A Gang-gang pair was observed showing an interest in the site so a camera was set up on 26 Sep. The next day the site was inspected in detail with the pole camera, to find the hollow filled with 25 cm of water (4.5 litres). The pair were recorded regularly visiting the site but not entering the hollow, so on 2 Oct a hole was drilled at the base to allow water to drain. Although this was successful the hole soon clogged and the eucalyptus chips at the base remained very wet. Images were captured up to 17 Oct, when the camera malfunctioned. The images indicated regular visits by a Gang-gang pair but the birds showed a reluctance to enter the site. By the end of October an inspection with the pole camera again indicated water at the base of the hollow, with no indication that the Gang-gang pair had taken up residence. A Sugar Glider was regularly recorded at the site by the camera and may have contributed to the pair's lack of interest.

Tree 51. This site produced one fledgling the previous year. *Ad hoc* observations indicated a pair of Gang-gangs visiting the hollow so a camera was set up on 26 Sep. Although the male spent much time at the hollow entrance, he was very reluctant to enter and the female spent very little time at the site. A Common Ring-tailed Possum (*Pseudocheirus peregrinus*) paid a night visit to the site on 29 Sep and again on 5 Oct. A Brush-tailed Possum was recorded also visiting the site at night. The Gang-gang pair never occupied the site and by 21 Oct were only recorded very occasionally, with no indication that the female spent the night at the site. From 22-31 Oct there were no Gang-gang visits but from 1-10 Nov the site was again being regularly visited, again with no indication of any nocturnal occupancy. From plumage differences, the latter series of visits was by a younger pair. The camera stopped working after 10 Nov but *ad hoc* visits and inspection with the pole camera indicated that the site was not used during the 2020-21 season.

Small hollow. This site produced one fledgling the previous year. The camera was placed at the site on 27 Sep, at which time a pair of Gang-gangs was regularly recorded in and out of the hollow. On the night of 27-29 Sep a Brush-tailed Possum and Sugar Glider (*Petaurus breviceps*) were recorded visiting the site at night, but there was no indication that the female was occupying the site at night. There were no further visits after 6 Oct by the Gang-gang pair, although in addition to daily visits by Galah (*Eolophus roseicapillus*), Sulphur-crested Cockatoo and Eastern Rosella, a Common Myna pair started to inspect the site.

From then until 28 Oct the site was dominated by the Common Myna pair, although the Eastern Rosella pair was also visiting. On 18 Oct a Common Myna was recorded removing an Eastern Rosella egg from the hollow (see Fig. 2), and the Common Myna pair were

recorded nest-building on 20 and 21 Oct, with a second egg removed on 24 October and a third on 27 October. From 28 October onwards, the Common Myna showed no further interest in the site, leaving the Eastern Rosella pair in residence.

On 4 Nov there were two Eastern Rosella eggs in the nest, which had increased to seven eggs by 15 Nov. The eggs had hatched by 2 Dec and chicks were still present in the nest on 19 Dec. The eventual fate of the Eastern Rosella clutch is unknown but most likely fledged.

Figure 2. Common Myna removing Eastern Rosella egg from Small hollow, 27 Oct 2020.

Larissa. The previous year, from on-ground *ad hoc* observations, it was apparent that a Brush-tailed Possum usurped the site. By late September 2020 a Gang-gang pair was again showing interest, so on 12 Oct a camera was placed at the site. There was a Brush-tailed Possum with young in residence. Camera images indicated that at that time a Gang-gang pair and a female Australian Wood Duck were entering and leaving the hollow during the day.

From on-ground observations it became apparent that the Gang-gang pair was also inspecting a near-by hollow, possibly due to competition from the Brush-tailed Possum and the Australian Wood Duck. This hollow appeared to be unsuitable, so to encourage the use of the deeper, better insulated Larissa hollow, a trunk collar was placed round the tree on 16 Oct to prevent further access by the Brush-tailed Possum.

By 22 Oct two duck eggs were noted, possibly laid between 13 and 16 Oct, but no duck down had been deposited, indicating that the Wood Duck had abandoned the clutch and therefore the eggs had not been incubated. From then on, there were no apparent visits by the female Wood Duck and the barrier was successful in preventing access by the Brush-tailed Possum, but unfortunately from that date due to a camera malfunction there were no further images.

Ad hoc observations from the ground indicated that the Gang-gang pair continued to show an interest in the site until early November. On 28 Nov the two Australian Wood Duck eggs and the camera were removed.

To our surprise the eggs contained well-formed dead Australian Wood Duck chicks about a week off hatching. Given there had been no further interest shown by the Australian Wood Ducks and the lack of down, the eggs must have been incubated by the Gang-gang pair having mistaken the eggs for a clutch of their own. This may not be surprising as the two eggs represented a normal sized Gang-gang clutch.

3.4. Site competitors

From *ad hoc* observations, camera images, pole camera images and information from Higgins (1999), the dates of the three sites that fledged young were categorised as the Establishment, Incubation or Rearing period. For the four sites that were not successful, all were regarded as the Establishment period.

Table 3. Number of days (%) hollow competitors visited Gang-gang nesting sites during three nesting periods. (A) Successful sites, (B) Failed sites.

(A) Successful sites

Nest site	Red Box			Duck down			Tree 66		
Period	**Esta-blishm.**	**Incuba-tion**	**Rea-ring**	**Esta-blishm.**	**Incuba-tion**	**Rea-ring**	**Esta-blishm.**	**Incuba-tion**	**Rea-ring**
Dates camera at site	26/9-14/10	15/10-14/11	15/11-3/1	26/9-24/10	25/10-24/11	25/11-12/1	27/9-21/10	22/10-22/1	23/11-7/1
No. days with Gang-gang images	9	25	30	14	31	35	6	8	17
Australian Wood Duck	11	40	3						
Galah	11							13	12
Long-billed Corella									6
Sulphur-cr. Cockatoo	44	60	13	36	26	3			12
Rainbow Lorikeet							17	13	6
Australian King Parrot	11				6				
Crimson Rosella		20		50	32	11	17	38	12
Eastern Rosella	44	8		43	35	11	50		12
Noisy Miner	22	20	10				67	13	12
Common Myna			3			3			
Sugar Glider							33	13	
Brush-tailed Possum		4			3	3			
Ring-tailed Possum									
Possum spp.		12	40	r		6			18

(B) Failed sites

Nest site	Sandy 2	Small Hollow	Tree 51	Larissa
Period	**Establishment**			
Dates camera at site	26/9-17/10	27/9-7/10	26/9-10/11	12/10-29/10
No. days with Gang-gang images	21	11	16(9*)	14
Australian Wood Duck	19			15
Galah	38	64		
Long-billed Corella				
Sulphur-cr. Cockatoo	19	82	44 (0)	
Rainbow Lorikeet				
Australian King Parrot			0 (11)	
Crimson Rosella	10	36	6 (11)	
Eastern Rosella	5	82		
Noisy Miner	5			
Common Myna		9	0 (11)	
Sugar Glider	38	9		
Brush-tailed Possum	5	18	13 (0)	7
Ring-tailed Possum			31 ())	
Possum spp.				

*Number of days Gang-gangs present (number of days not present). See text for explanation

Due to camera failure, camera not aligned, and periods when no pictures were taken, and due to full SD cards or low batteries, images were not available for all days covered by the various periods. The proportion of days for each period that recorded nest competitors visiting a site is shown in Table 3.

Ten bird species, the Sugar Glider and two species of possum were recorded, with the number of visits varying with species and period.

At **Red Box,** eight bird species were recorded. The Australian Wood Duck, Sulphur-crested Cockatoo and Noisy Miner were the most common visitors, and possums were particularly frequent during the Rearing period. At **Duck down,** five bird species were recorded; the two species of rosella and the Sulphur-crested Cockatoo being the most common. Again, possums were more frequent visitors during the Rearing period. At **Tree 66,** seven bird species were recorded, the most common being Rainbow Lorikeet (*Trichoglossus moluccanus*), Crimson Rosella and Noisy Miner. Among the marsupials, the Sugar Glider was most frequently recorded during the Establishment period, and possums were again most common during the Rearing period. In all cases, the Eastern Rosella mostly visited during the Establishment period.

Among the four unsuccessful sites, at **Sandy 2** the Galah was the most common. The Galah, Sulphur-crested Cockatoo and Eastern Rosella were the most common at **Small hollow**. **Small hollow** was of particular interest because the tree contained many hollows, and Sulphur-crested Cockatoo, Common Myna, Eastern Rosella, Australian Wood Duck and Striated Pardalote also nested at the site.

At **Tree 51,** images were available over 25 days and there was a period of nine days when no Gang-gangs were recorded visiting the site. It is therefore possible to divide the period into one of 16 days with Gang-gang present and nine days when they were not. Of the four bird species that visited the site, all were infrequent except for the Sulphur-crested Cockatoo, which only visited when Gang-gangs were present. The two possum species also visited only when the Gang-gangs were present.

3.5. Time spent visible

For each nesting period, every second or third day was analysed, where images were available throughout the day for those sites that successfully fledged young. The period and amount of time when either a male or female Gang-gang was visible either perched or in the hollow entrance was analysed. The time spent visible was divided into four periods; sunrise -08:59, 9:00-11:59, 12:00-14:59 and 15:00 h -sunset (Table 4).

Gang-gangs were visible at a nesting site for only short periods of time. For instance, the average amount of time visible during the Rearing period at **Tree 66** between 12:00 and 14:59 h was 23 minutes.

Pairs could be seen at the nesting site at any time of the day with no obvious overall preference. During the Establishment period the most likely time to see one of the adults at **Tree 66** was between 9:00 and 15:00 h, virtually any time of the day at **Duck down** and from mid-day to sunset at **Red Box**. During the incubation period, although the pairs were less often visible, for **Tree 66** and **Red Box** the most likely time was after mid-day, but before mid-day at **Duck down**. During the rearing period, at **Duck down** the birds were

seen very infrequently. At **Tree 66** the most likely time was after mid-day, whilst for **Red Box** this was between 9:00 and 15:00 h.

Table 4. Average number of minutes/day Gang-gangs visible for three nest sites and four time periods.

Site	Period	No. days	Time of day			
			SR-08:59	09:11-11:59	12:00-14:59	15:00-SS
Tree 66	Establishment	6	4	13	40	11
	Incubation	6	4	4	11	17
	Rearing	7	12	10	23	25
Duck down	Establishment	6	23	46	9	48
	Incubation	10	12	9	2	8
	Rearing	11	3	3	2	6
Red Box	Establishment	6	4	22	29	19
	Incubation	9	4	2	15	13
	Rearing	9	8	18	11	9

Discussion

Since the start of the 2017-18 breeding season, we have located 34 Gang-gang nesting sites within peri-urban Canberra. The sites have been located at Bass Gardens and on Mt Ainslie, Black Mountain, Red Hill, Mugga Mugga, ANU and the Pinnacle Nature Reserves. For the 2020-21 breeding season 17 sites were identified, of which nine were new. Seventeen sites previously known to have been successful were not used in 2020-21.

Table 5. Mean monthly maximum temperature (^{0}C) and rainfall (mm) at Canberra Airport.

Temp. (^{0}C)	Oct	Nov	Dec	Jan	4-month mean
2018 -19	22.8	24.5	29.3	34.5	27.8
2019 - 20	23.8	26.8	31.7	31.7	28.5
2020 - 21	20.3	20.3	25.4	28.1	23.5
Rainfall (mm)	**Oct**	**Nov**	**Dec**	**Jan**	**4-month mean**
2018 -19	14.2	82.9	106.4	61.6	66.3
019 - 20	27.6	12.6	1.2	16.0	14.4
2020 - 21	133.6	93.0	41.4	57.6	81.4

Of 18 sites that were used in 2019-20 only seven were reused in 2020-21. This pattern was similar to 2018-19, when of 10 known nesting sites only four were reused in 2019-20. The reason for this high turn-over rate is unknown, though flooding of hollows during wetter

years may be a contributing factor. Of interest was that in 2020-21 five of the new locations were in dead or virtually dead trees; previously all sites were in live trees. The climate data from the Canberra Airport (Table 5) indicates that the six-month 2020-21 breeding period (Sept-Feb) was significantly cooler and wetter than the previous two seasons, which may have influenced hollow choice or nestling/egg survival. Some hollows may be unsuitable in wetter years because of flooding, while in hotter years insulation provided by live trees may be of more importance. Breeding success was the same in 2020-21 (76%) as the previous year (76%). This is surprising considering the very hot, dry conditions during 2019, when we found young dead or still alive fallen from tree hollows, and taking account of the difference in the number of dead trees used in 2020-21 compared with the previous year.

Remote cameras were placed at seven sites. Three were in place throughout the season, whilst the remainder were removed once it became obvious that the sites were not being used by Gang-gangs. Initially, there were difficulties at all sites when cameras fell or became misaligned (largely because of Gang gangs chewing the tape). We overcame these problems by threading a metal strap through the camera casing and nailing it to the branch. Even so, coverage was not continuous, due to problems associated with leaf and branch movement, resulting in unwanted images that soon filled up the SD cards. When the camera was set too close to the hollow entrance, we missed information on the time spent by adults at the site, and a more distant position increased the leaf/branch problem.

The remote cameras were not ideal, as they could only be serviced and checked by climbing the nest tree, and they appeared to miss information where an individual quickly arrived and entered the hollow or departed quickly. This appeared to be more of a problem at the low light levels of dawn and dusk.

Owing to problems associated with movement of leaves and branches, it is not feasible to set the camera further away from the hollow entrance. It is therefore possible that on some occasions Gang-gangs were visible but not within view of the camera, although observations suggest that on arrival or departure on most occasions the birds remain close to the hollow entrance and so would be visible to the camera (C. Davey *pers. obs*.).

Problems associated with competitors varied between sites. Interference by Sulphur-crested Cockatoos, Crimson and Eastern Rosellas and Brush-tailed Possums occurred at virtually all sites, while Australian Wood Duck, Long-billed Corella, Rainbow Lorikeet and Ring-tailed Possum appeared to be site-specific. Presumably nest competitors that visited throughout the nesting period were species that were nesting nearby. If so, competition will depend on the location of the site in relation to other hollow-bearing trees. Those sites in trees with few hollows, or with few hollows nearby, will receive fewer visits by competitors. Those competitors that only visited sites during the early part of the season, *i.e.* Australian Wood Duck, were searching for nesting sites, whilst others that visited throughout the nesting period, i.e. Crimson and Eastern Rosella, Sulphur-crested Cockatoo, may have been attempting to remove resource competitors from their territory.

Small hollow was located in an *E. blakelyi* that contained many hollows, with Sulphur-crested Cockatoo, Eastern Rosella, Common Myna, Australian Wood Duck and Striated Pardalote nesting. It is probable that Eastern Rosellas were successful in evicting the Common Mynas because there were other suitable Myna sites in the tree.

The 23 site measurements measured over the last few years show a great deal of variation in tree species used, height above ground entrance measurements and chamber depth. The single relatively consistent measurement is floor diameter of the chamber (15-24, n=15 from 18 measurements).

Although the sample is small, half of the climbed sites inspected in August were already occupied. Between August and third week in October, when GG start to lay, many of the competitors for nest hollows have yet to breed so increasing further the pressure for GGs to find suitable, empty hollows with an appropriate chamber size.

The high apparent turnover of nest sites cannot be explained without individually marked pairs. On occasion it is noticeable that, if a site is not used in a particular year, a pair is located in a site not far away the next year. Our lack of data makes it difficult to come to any conclusions but in the case of **Tree 51** and **Helen's**, **Sandy** and **Sandy 2** and **Roy's hollow** and **Little Roy** this may well be so. There have been only two sites that have successfully raised young over four consecutive breeding seasons, presumably with the same Gang-gang pairs in residence, and only three (possibly four) sites that were successful in 2019-20 and in 2020-21.

The camera images supported the observations by others, see Higgins (1999), that the female alone occupies the site at night. Many of the images at all sites showed the aggressive interactions between the nesting female and possums. The possum visits may have been short but some interactions were over extended periods through the night. The role of the female in protecting the eggs and young must be a major factor in the breeding success of the Gang-gang.

The amount of time spent visible outside the hollow was assessed to provide some idea of the most profitable time to confirm hollow use. Most casual observations by members of the public are likely to occur before and after working hours, but for the three nest sites that successfully raised young the time when one or both adults were visible depended on individual pairs and whether they were establishing the site, incubating or rearing nestlings, so it is not possible to determine the most appropriate time to visit. The small amount of time when adults are visible highlights the difficulty of locating and assessing the status of Gang-gang nesting sites. This difficulty can only be overcome by multiple visits at different times of the day.

Acknowledgements

In addition to the many observers who submitted observations to Canberra Nature Map, we would like to thank McLean Cobden for his tree-climbing skills and Jacky Fogerty and Jenny Tyrrell for contributing their observations and retrieving fallen cameras. We would particularly like to thank Roy McDowall who managed to locate six of the new sites. We would also like to thank Helen Cross for observations at **Helen's** and at **Tree 51,** and Barbara Allan and John Brannan for observations at the **Pinnacle**. Cameras were purchased through a grant made available by the Canberra Birds Conservation Fund. We would also like to thank Michael Lenz and Kevin Windle for editorial comments.

References

Davey, C., Mulvaney, M., Fogerty, J., Tyrrell, T. and Tyrrell, J. (2019) Breeding of Gang-gang Cockatoo in suburban Canberra. *Canberra Bird Notes* 44: 210-220.

Davey, C, and Mulvaney, M. (2020) Report on a survey of breeding activity of the Gang-gang Cockatoo within urban Canberra 2019-2020. *Canberra Bird Notes* 45: 224-231.

Davey, C. (2021). Observations of a Gang-gang pair nesting at the Pinnacle Nature Reserve. *Canberra Bird Notes* 46: 85-86.

Higgins, P. J. (Ed) (1999) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 4: *Parrots to Dollarbirds.* Oxford University Press, Melbourne.

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APPENDIX I. **Gang-gang breeding hollow measurements.**

Tree		Hollow						Chamber		Branch trunk circumf. (cm)	Notes
					Entrance						
No.	Species	Location	Type	Height above ground (m)	Height (cm)	Width (cm)	Perch lenth (cm)	Depth (cm)	Floor diam. (cm)		
Pinnacle	Dead	P	S	6.0							Not climbed
Francis	Eb	T	H	6.0	25	32		34	20	138	Mostly dead, pos
Flinders	Eme	P	H	8.5	24	18	70	72	24	87	W/Dee
Little Roy	Em	T	H	4.5	20	19	165	65	20	137	
RWAV	Er	P	H	8.0	14	12	55	45	26 est.	120	W/De
Pond	Dead	P	S	4.5	16	15		64	22 est.	65	
Saudi	Dead	P	H	7.5	10	7	93	33	22, est.	86	
Isaacs	Dead	P	S	8.0							Not climbed

Tree species: D-dead; Eb-*E(eucalyptus) blakelyi*; Er- *E.rossii*; Em- *E. mannifera*; Ee- *E. elata*; Eme- *E. melliodora*; Ebo- *E. bicostata*; E.mac-E. *macrorhyncha*
Hollow location: T- Trunk, P- Primary limb, S- Secondary limb
Hollow type: H- Hollow in trunk, S- Spout, C- Chimney
W/De- Wood Duck with eggs, W/Dee- Wood Duck eggs, Pos- Brush-tailed Possum

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MY BIRD-MAGNET YARD: A SUMMARY OF OBSERVATIONS FROM MY HOME NEAR THE URBAN-RURAL FRINGE IN NORTH CANBERRA

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Abstract. *I report on bird species observations from my home in north Canberra. Factors affecting species richness are outlined, with Garden Bird Survey counts and habitat edge effects providing further context. The location of the property and the immediate study area is discussed in detail, at a broader landscape scale, and within the suburban matrix context. The yard and garden characteristics are discussed in detail. Species count data from the site is outlined. Species richness is very high. Daily checklist data for 28 days gave a mean number of species of 33.8 per day. A list of bird species encountered in the study area is provided, with comments on the species that are resident, those that reside nearby and visit often, and species that visit seasonally. Breeding events in the study area are also discussed.*

Introduction

My family and I moved into our home in Hawker, ACT, in January 2011. It is our second home, and hopefully our last (I do not wish to move house ever again!). We were very excited about the move for many reasons, with one key reason being the wonderful garden and the plentiful bird life. We were not disappointed.

Occasionally, I would report to the COG email chat group about my bird observations at home. Several people encouraged me to write something more substantial about my bird magnet yard. The timing seems appropriate, given just over ten years of observations. During that time, I have recorded 100 species.

Species counts and habitats

It is not uncommon to record such a high number of species at a given property in many parts of Canberra, the Bush Capital. For example, Richard Allen has recorded 173 species over 27 years at his home in Curtin, and Shorty Westlin has recorded 115 species over just eight years at his home in Symonston.

Davey and Nicholls (2009) stated that the factors that may influence species composition and frequency of occurrence or observation at a particular site include suburb age, location of site within the suburb matrix, type of garden, tree and housing density, observer experience and species detectability.

Davey and Nicholls (2009) also summarised research conducted in Canberra on avian species richness in relation to particular habitat variables:

- Stein (1982) found that species richness and diversity were positively correlated with total cover and negatively correlated with areas of paved or built-on surfaces, also

noting that the retention of original trees reduced the impact of urban development or hastened the recovery of the bird community.

- Munyenyembe (1989) found that bird species diversity increased with age of suburb (in response to changes in habitat conditions over time, not as a direct response to suburb age *per se*), and that the number of all species except exotics decreased with distance from native vegetation.

Some locations have a high species count thanks to the variety of habitats at those sites. Richard Allen's site is right on the urban-rural fringe, where the houses back onto horse paddocks, and includes a creek corridor. This is an excellent example of an edge effect, or an ecotone, where the edges of the different habitats merge, giving that zone a higher species diversity than either of the individual habitats.

My counts

My record-keeping has ranged from the obsessive or fastidious to the haphazard or lackadaisical. I have Garden Bird Survey records, and records on scraps of paper, in multiple notebooks, and in a spreadsheet. I also have an excellent memory! I have used the 20-minute, two-hectare count method, and more recently, have been recording counts on eBird. Being very quick and easy to use, the eBird system has certainly changed my habits.

Of particular interest at my home is the high species richness that is regularly recorded during random counts. I sometimes extend the 20-minute count, until I no longer record a new species for five minutes or so. Plotting the number of species over time on a graph usually gives a curve that rises sharply, then flattens out as fewer new species are encountered.

Bird counts in early to mid morning proved to be extremely fruitful. During seven counts, mostly in spring and summer, the mean number of species was 28, (range=14), in a mean survey period of 22 minutes (range=15). A count on 28 September 2019 yielded an astonishing 35 species in 20 minutes. A count on 20 February 2021 yielded 31 species in 18 minutes, with an additional six species encountered in the following two hours.

Dawn chorus bird counts, conducted between first light and shortly after sunrise, were also very species rich. I find the dawn chorus counts important as an indicator of the species fully utilising the site (i.e. overnight). During another seven counts, mostly in late summer to winter, the mean number of species was 19.6 (range=11), in a mean survey period of 32 minutes (range=40).

In very recent times, particular circumstances (e.g. retirement and Covid lockdown) have allowed me to complete a comprehensive daily checklist. For 28 daily counts, the mean number of species was 33.8 (range=12, SD=2.57). The highest daily count was 40 species.

The data sets are admittedly small, and the analysis quite rudimentary. However, there is no doubt in my mind that the counts are representative of the bird community that exists in this area.

With regard to detectability of birds, I rely on sound as much, if not more, than sight while conducting bird surveys. I even sometimes struggle to write down my bird list fast enough, as I rapidly recognise the calls all around me. However, sight remains vitally important to

pick up species that do not call frequently. My observations suggest that several species might go undetected at my home without sight records. During a recent 20-minute count, I saw five small groups of Australian Wood Ducks[1] fly silently up and down Dungowan St at head height. Common Starlings return silently to a roost approximately 70 metres to my north each day. There is substantial Superb Parrot traffic over my home in spring-summer, and I estimate that approximately half of the birds I have observed called in flight. I would miss many records of species like these if I relied on calls alone.

Site location

My home is at 2 Mataranka Street in Hawker, in the district of Belconnen in the northern ACT
(-35.25, 149.03).

In a broader landscape context, my home is in a well vegetated suburb, and close to the urban-rural fringe. To the south-west is open woodland and grassland of varying levels of quality or disturbance. To the north-east is the major portion of the suburb of Hawker, and the greater Belconnen suburban area.

The woodland habitats beyond the urban fringe include:

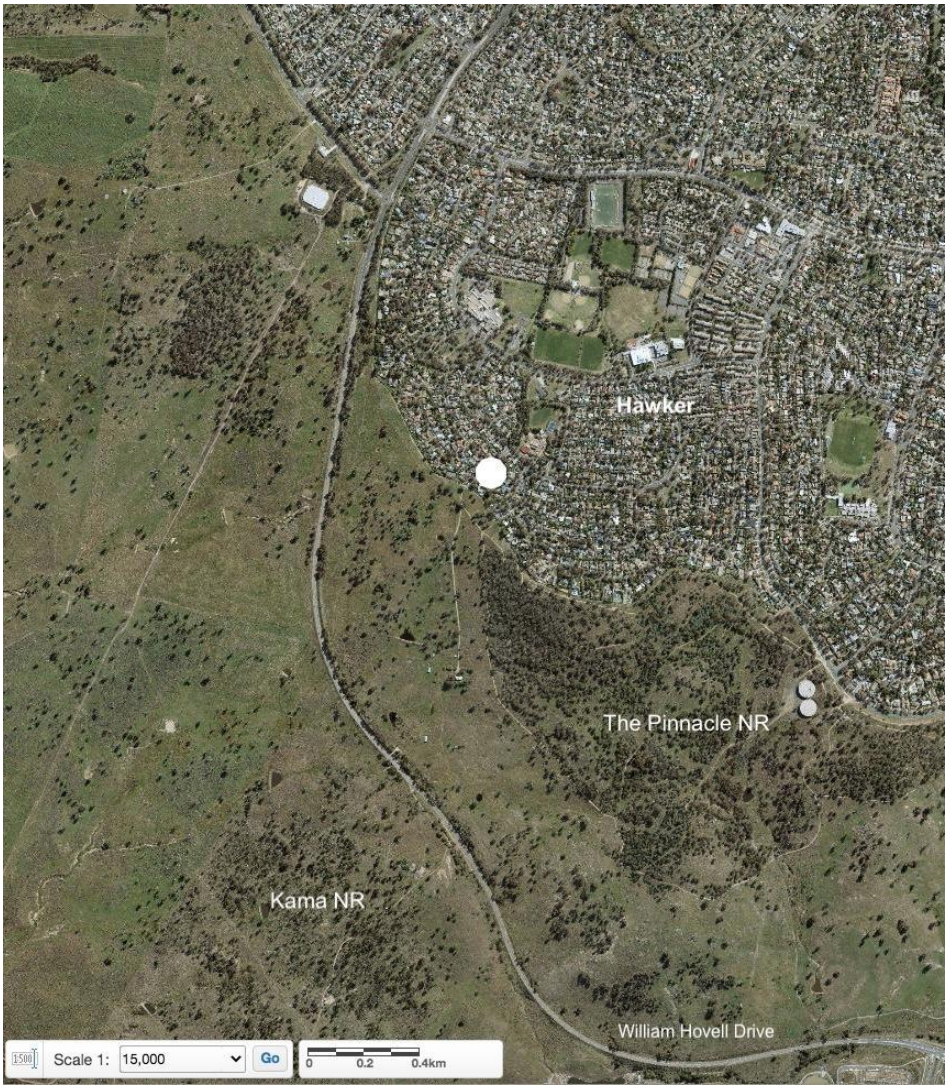
- a 60-metre wide zone carrying the Bicentennial National Trail that runs along the southern edge of the suburb;
- the north-western corner of The Pinnacle Nature Reserve (300 metres to the south of my home);
- 'Kama' leasehold property (150 metres south-west of my home);
- beyond that leasehold property is Kama Nature Reserve, on the south-west side of William Hovell Drive;
- 'Lands End' leasehold property, on the west side of William Hovell Drive (500 metres west of my home).

To the north of my home is a complex matrix of open spaces and low- to medium-density housing. The substantial network of open spaces throughout the suburb incorporates Hawker Primary School (just 80 metres away), Belconnen High School, Hawker College, Hawker playground park, Hawker district playing fields, Hawker International Softball Centre, and Hawker Football Centre enclosed field (1.1 kilometres away and bordering Belconnen Way). Significantly, the majority of these facilities are surrounded by planted native trees and shrubs, and connected by wide, tree-lined walkways. That open space network covers approximately 43 hectares of the 190-hectare suburb.

Site description

The majority of properties in the immediate area (Dungowan St, Ambalindum St, Mataranka St, Elsey St, Erldunda St) feature significant cover of mature trees and shrubs, with very few expansive lawns. Garden vegetation is a mix of natives and exotics. Street trees are all native, with Argyle Apple (*Eucalyptus cinerea*) quite common. Aside from the primary and secondary arterial roads (Murranji St and Erldunda Cct, respectively) through the suburb, most of the streets are narrow, and there are very few footpaths or nature strips.

[1] Scientific names are given in the annotated lists below.

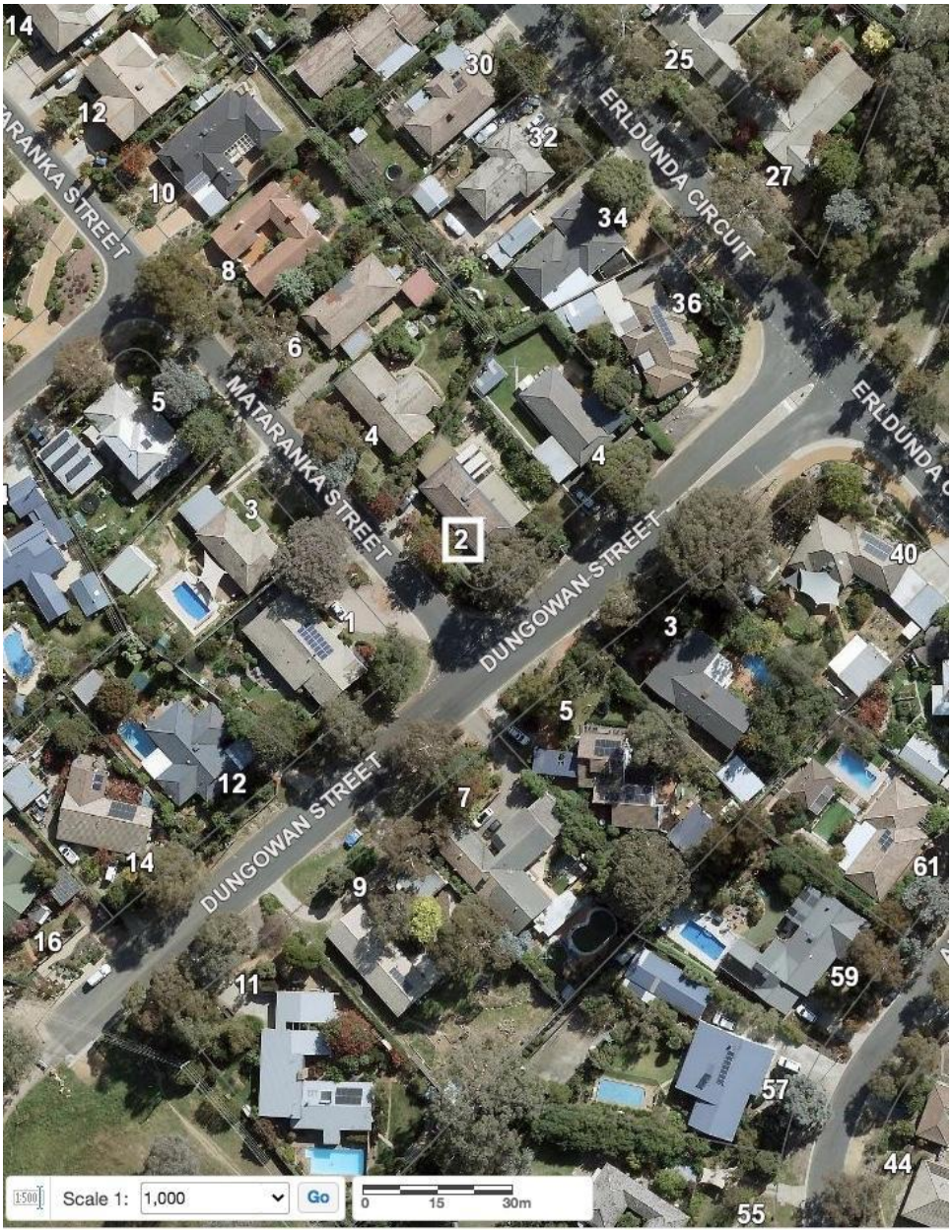


Map 1. Location of my home (white circle) in the suburb of Hawker, with surrounding woodland landscape [ACTmapi].

The suburb was established in 1972, and houses built in my immediate area in 1974, so planted trees are approaching 50 years of growth. There are many remnant eucalypts in the area, particularly in the parks. The 'Christmas Tree', a massive Yellow Box (*Eucalyptus melliodora*) in Dungowan St, has a diameter at breast height of 1.75 metres, making it more than 350 years old (Banks, 1997).

My garden

My home sits in the middle of an 810-square-metre corner block. I inherited an eclectic mix of garden vegetation, approximately 40 percent native, 60 percent exotic. We are slowly adding more native plants. The front and eastern side yard has a raised bank covered in shrubs that provides screening from the street corner. The rear yard has some lawn, a paved area, fruit trees and various low shrubs. The north-western fence line is a 'hedge', comprising multiple native and exotic species.



Map 2. Location of my home (white square) on the corner of Mataranka St and Dungowan St, Hawker [ACTmapi].

Native plants include:

- a large eucalypt, planted when the house was built;
- mid-storey shrubs, including westringia, grevillea, callistemon, correa; and
- low shrubs, including philotheca, grevillea, correa.

Exotic plants include:

- large individuals of Liquid Amber, Chinese Pistachio;
- well established fruit trees, including apricot, apple, lemon, lime, peach, feijoa, ornamental pear, cherry; and
- various large and small shrubs, including Mexican orange blossom, smokebush, cotoneaster, viburnum, prunus, may, lilac, weeping elm, rhododendron.

There are three cultivars of *Correa* present; one flowers profusely in summer, the other two in winter. The flowering times of three species of *Grevillea* are staggered. It is these flowering natives that keep birds like the Eastern Spinebill present all year round.

Variation in habitat structure plays a key part in the presence or absence of particular birds. Some species prefer complex habitat structure, while others thrive in less complex environments. Noisy Miners and Yellow-rumped Thornbills are routinely observed at Hawker Primary School, where the habitat is open grassy areas with a substantial number of mature native trees, and relatively few shrubs. My garden, and the gardens surrounding me, are very complex in structure, and are home to Brown Thornbills, which rely on mid-storey shrubs, and White-browed Scrubwrens, which rely on dense low-storey cover. Despite the proximity of the school to my home, just 80 metres away, I rarely encounter the miners or Yellow-rumped Thornbills in my yard (I can, however, hear the miners down at the school). Equally, the scrubwrens and Brown Thornbills are rarely encountered on the school property. However, if one patrols the narrow ecotone, all four species may be encountered.

Water

I provide clean water in two bird baths, which are situated in the front garden. Water is very much the main attraction for many birds. In the warmer months there is a steady stream of visitors to the baths for most of the day.

Food

I have put out seed for the parrots and other birds a few times in the past, but have not done so for around eight years. Two neighbours feed the birds most days. I still have a large sheltered feeder on a pole in the front yard which, despite not having seed in it for many years, is visited quite often by rosellas as they do the rounds of the neighbourhood.

Nesting materials

I provide some hair/fur as potential nest lining material (kindly donated by the family dog), in a small basket hanging in the shrubs near the bird baths. Superb Fairy-wrens, Eastern Spinebills, and Red Wattlebirds have been observed taking the hair.

Predators

There are three cats belonging to neighbours, all unfortunately outside cats. However, they are all old, well fed, and wear bells. I'm confident that predation by cats in the area is low. However, predation by Pied Currawongs is significant. I have also observed a Brush-tailed Possum raiding a Magpie-lark nest for the eggs.

The birds

Below is an annotated list of birds seen in or from my yard. I have grouped them by method or frequency of encounter, and listed the species in taxonomic order. I provide a brief discussion on certain species. I also discuss breeding at particular addresses in the immediate area. Please refer to Map 2 for orientation.

Everyday birds

These species are generally encountered often, usually every day. A few species might be encountered on five or six days out of seven, but often enough to be considered everyday birds.

Australian Wood Duck *Chenonetta jubata*	Regular commuter, flying back and forth between 'Kama' dams and the green grass at the primary school and playing fields. Uses Dungowan St as the flyway, sometimes streaking past below head height.
Crested Pigeon *Ocyphaps lophotes*	Up to five pairs visit, one pair is a breeding resident. That pair had mixed success in the backyard of 4 Mataranka, where currawongs took nestlings. One breeding attempt last season in a dense grevillea in my eastern side garden produced one young.
Masked Lapwing *Vanellus miles*	Resident at the primary school. Heard often. Occasionally flying over.
Laughing Kookaburra *Dacelo novaeguineae*	Resident family group, whose roost has been in multiple locations over the ten years; as close to home as 30 metres, in the Christmas Tree, or up to several hundred metres away in 'Kama'.
Gang-gang Cockatoo *Callocephalon fimbriatum*	Have become a daily occurrence in the last few years, whereas 8-10 years ago they were seen/heard every couple of weeks. Largest group was 25 birds in June this year, possibly a group of winter birds from the ranges.
Galah *Eolophus roseicapilla*	Fly over multiple times a day, and up to 100 birds, yet only one pair visits the bath occasionally; I suspect that pair breeds in a large remnant eucalypt just 50 metres away at 6 Mataranka (the tree is known as the 'Block of Flats' given the number of hollows and birds that breed in them!).
Little Corella *Cacatua sanguinea*	Usually heard every day. Observed groups of 2-20. Moved to the everyday category in the last few years. Occasionally roosts with the Sulphur-crested Cockatoos.
Sulphur-crested Cockatoo *Cacatua galerita*	Dozens each day, roosting in a large eucalypt in the backyard of the house directly opposite at 5 Dungowan. They disperse widely during the day. A pair has just commenced breeding in the largest hollow in the 'Block of Flats'.
Red-rumped Parrot *Psephotus haematonotus*	Feed on the grasses at the primary school. Steady stream of birds moving between the school and 'Kama'. Visit the baths often, particularly when it is hot, bringing young for a week or two.
Crimson Rosella *Platycercus elegans*	Multiple pairs reside in the area, possibly sustained by backyard feeders. Love the baths, preferring the shallower of the two.
Eastern Rosella *Platycercus eximius*	Resident pairs in the street. Not quite as common as the Crimson Rosella. Another daily bather. Breeding suspected in the 'Block of Flats'.
Rainbow Lorikeet *Trichoglossus moluccanus*	Substantial population in the suburb. Largest group observed was 23 individuals. They like apricots. Have never come to the baths. Breeding suspected in the 'Block of Flats'.

Superb Parrot *Polytelis swainsonii*	A regular commuter across this part of the suburb, particularly in spring and summer. Birds move to and from breeding areas in the Molonglo valley and feeding areas in Belconnen, notably the AIS area. Numbers drop to once every few days in winter, increasing again throughout August. Some days there have been so many birds going to and from, I have simply lost count. Stopped in the yard a couple of times.
Australian King-Parrot *Alisterus scapularis*	Only small numbers, 2-6 birds, most of the year, supplemented by winter birds from the ranges.
Satin Bowerbird *Ptilonorhynchus violaceus*	Up to five birds at a time. Known bowers at 15 Mataranka (170m away) and 55 Ambalindum (150m away). Blue bottle caps marked with my address have been removed from my front yard and turned up in the bower at 15 Mataranka. An adult female visited often last spring and summer to bathe, and to shred every flower off the small-ish Feijoa tree. It took her six days to finish off all the flowers, and she carried plenty of them back to her nest, sometimes returning every ten minutes. The path she flew took her between 1 and 3 Mataranka, into the back of 12 or 14 Dungowan, or possibly an Elsey St backyard.
Superb Fairy-wren *Malurus cyaneus*	Two resident family groups, one on the east side, one to the west. Occasional skirmishes in the front garden. Last season, the east family bred in dense shrub cover at the very front of 9 Dungowan. I suspect the west family breeds in the dense cover at 6 Mataranka. Families with multiple young come to the baths.
Eastern Spinebill *Acanthorhynchus tenuirostris*	At least three pairs of birds in the immediate area, with many other birds across the southern part of the suburb. Nesting sites not known, but suspected to be very close by; very young birds come to the baths. Nesting is suspected in the front yard of 3 Dungowan (S. Bottomley, pers. comm.).
Red Wattlebird *Anthochaera carunculata*	Common throughout the suburb, with territories bumper to bumper! Resident pair has nested in a small paperbark in the front garden of 5 Dungowan, and in a casuarina and an Argyle Apple at 1 Mataranka.
Spotted Pardalote *Pardalotus punctatus*	Present all year in small numbers. Young birds observed at the baths.
Striated Pardalote *Pardalotus striatus*	Present all year in small numbers. Breeding suspected in the ‘Block of Flats’.
Weebill *Smicrornis brevirostris*	Several resident pairs, one of which is suspected to have nested each season in a huge eucalypt at 1 Mataranka.
White-browed Scrubwren *Sericornis frontalis*	Two resident pairs, one on the east side, one to the west. Multiple territory battles in early spring. Juveniles observed, but breeding sites unknown. I suspect the west pair breeds in the dense cover at 4 and 6 Mataranka.

Brown Thornbill *Acanthiza pusilla*	A resident pair, heard and seen often. Use the bath occasionally. Young observed, but I have no idea where the nest site is. Possibly in the backyard of 4 or 6 Mataranka with the scrubwrens.
Pied Currawong *Strepera graculina*	Successfully raised young on two occasions, nesting in the eucalypt on the east side of my block. Other years, the pair of currawongs has nested at 1 Mataranka, in the front yard of 4 Dungowan, or in the Christmas Tree opposite them.
Australian Magpie *Gymnorhina tibicen*	Another species with bordering territories throughout the suburb. My resident family is a pair and an extra male who seems to be tolerated because of his crippled foot. Nest in yard at 7 Dungowan. Visit often for a bath. They like cheese.
Grey Butcherbird *Cracticus torquatus*	Heard often, seen rarely. I've been advised that they breed in the park at the other end of Mataranka St, and that they are fed by some nearby residents.
Willie Wagtail *Rhipidura leucophrys*	Two pairs. One nest site at 3 Dungowan. Forage in the yard often. Pair brought three young to the bath last summer.
Grey Fantail *Rhipidura fuliginosa*	Without marking individuals, it is very difficult to know what is happening with fantails. I suspect I have over-wintering birds each year, possibly including Tasmanian birds. Then there are several weeks with none, before others appear in spring to breed in the nearby woodlands and visit often. Lots of young birds in late summer.
Magpie-lark *Grallina cyanoleuca*	Two resident pairs with multiple nest sites in the area. Love the baths.
Australian Raven *Corvus coronoides*	An everyday bird, with a pair tending to come from the south-east, possibly breeding in large trees on the fringe.
Silvereye *Zosterops lateralis*	Resident all year, supplemented by chestnut-flanked birds in winter. Observed pairs with multiple dependent young at 14 and 16 Dungowan.
Common Starling *Sturnus vulgaris*	Roost of 50 plus birds in Erldunda St for many years. Breeding suspected in the 'Block of Flats'.
Common Myna *Acridotheres tristis*	Possibly only four birds in the area. Often see and hear the pair suspected of breeding in the 'Block of Flats'.
Common Blackbird *Turdus merula*	Breeding resident pair at 4 Mataranka St. Varying levels of breeding success, often just supplying the currawongs with protein.
Red-browed Finch *Neochmia temporalis*	Frequent visitor, becoming an everyday bird over the past two years. Bathe and drink often. Up to eight birds at a time.
House Sparrow *Passer domesticus*	Not often encountered in my yard, but a pair heard and seen often at 5 Dungowan, possibly attracted to the bird feeder.

Visitors that are resident nearby

Tawny Frogmouth *Podargus strigoides*	Only heard twice in the first seven years. Heard and seen more often over the last three years. Breeding pair is known to use several nesting trees in the trail reserve and just over the fence in 'Kama', right near the end of Dungowan St.
Australian Owlet-nightjar *Aegotheles cristatus*	Two records in the yard. A handful of records of a bird heard in Dungowan St. Heard a bird calling from a tree hollow in the western end of The Pinnacle once on a walk.
Southern Boobook *Ninox boobook*	Heard often, most months of the year. Birds seen in the street, when one has been heard and we pop outside for a look! Several years in a row a pair bred close by, possibly in The Pinnacle, and brought three to four young into the street, roosting in several locations. Despite hearing birds often over the last four years, have not seen or heard a juvenile. Known to breed many years ago in the 'Block of Flats' (I. Thomas, pers. comm.).
White-throated Treecreeper *Cormobates leucophaea*	Occasionally ventures out of The Pinnacle to the trees in the trail reserve and into Dungowan St, coming down as far as number 5. One record of a young bird in the backyard.
Brown-headed Honeyeater *Melithreptus brevirostris*	For the past five years, a family or two of birds will come into the suburb in mid December with young birds in tow, and spend a couple of months foraging in the suburban trees and shrubs. They use my bath several times a day during that time. The most recent breeding season was successful for many species, including these birds; they turned up late, in mid January, with 17 birds in the group. I suspect two families with two successful broods.
White-plumed Honeyeater *Ptilotula penicillata*	An unusual species that seems to move about locally. Can be encountered in the woodlands to the south. Some years a pair will reside in my area for many weeks at a time, possibly related to a flowering event nearby.
Noisy Miner *Manorina melanocephala*	Heard every day from the primary school. Seen flying over 34 Erldunda to 6 Mataranka to harass residents of the 'Block of Flats'.
Yellow-rumped Thornbill *Acanthiza chrysorrhoa*	A surprisingly rare visitor, given birds present at the primary school and along the trail reserve. Only encountered a few times a year. Prefer more open habitats. I documented a successful breeding event at the primary school in winter 2010, with two young fledged on 9 August (before I lived in the suburb).
Striated Thornbill *Acanthiza lineata*	A little gang of birds will visit a few times a year. One dry summer, the gang came every day for a few weeks. Otherwise, random or unpredictable encounters.
Buff-rumped Thornbill *Acanthiza reguloides*	Similar to the Striated Thornbill, random or unpredictable encounters. May visit daily for a week, then not for another 6-9 months.

Scarlet Robin *Petroica boodang*	A pair of birds often seen along the fences and powerlines at 16 Dungowan and the rear of 34-40 Elsey. A male was seen once on the corner at 1 Mataranka.
Double-barred Finch *Taeniopygia bichenovii*	A group of around 20 birds resides at the rear of 36 and 38 Elsey, with their home range extending across the trail reserve and into 'Kama'. I might hear them once a month from home. A handful of birds have visited on around 6-7 occasions.

There is a small group of species that are not resident in the area or nearby, but are encountered perhaps once a month to once every six months. Yellow-tailed Black-cockatoos (*Zanda funerea*) did not make an appearance for the first five years or so. Random groups of birds, often just a trio, then started to pass through every now and then. They are now encountered once a month. Recent bushfires and habitat loss are possibly responsible for the change in movement patterns. Pacific Black-ducks (*Anas superciliosa*) are encountered around once a month, but not with any pattern or predictability. Rock Doves (*Columba livia*) are seen on the very odd occasion, most likely individuals that live in Page and are often seen circling the Hawker shops. Straw-necked Ibis (*Threskiornis spinicollis*) are seen occasionally, in groups of 6-20. They are regular morning feeders on the Hawker playing fields in winter, often up to 60 individuals at once.

Seasonal visitors

White-throated Needletail *Hirundapus caudacutus*	Multiple times every summer, flying over in front of storms. Occasionally quite low, to the point where their flight is audible.
Eastern Koel *Eudynamys orientalis*	Present every spring-summer, with the first fledgling raised by Red Wattlebirds in 2020, a few houses down the street.
Dollarbird *Eurystomus orientalis*	Last spring migrant to arrive and first to leave. At least one pair every year. Probable breeding site in the Hawker playground park opposite the college. Often observed perched on power lines at the rear of Elsey St houses, overlooking the trail reserve and 'Kama'.
Sacred Kingfisher *Todiramphus sanctus*	Spends a lot of time at the northern end of the Pinnacle and into the yards backing the trail reserve. Seen foraging in the backyard of 16 Dungowan, occasionally ventures down as far as 5 Dungowan St. Far carrying call easily heard from home.
White-naped Honeyeater *Melithreptus lunatus*	Every autumn, however, there are far fewer individuals than Yellow-faced.
Noisy Friarbird *Philemon corniculatus*	Visit often during spring and summer, particularly at the baths; will feed for a week or two in early December in a very large Silky Oak (*Grevillea robusta*) just 35 metres away at 5 Mataranka.
Yellow-faced Honeyeater *Caligavis chrysops*	Every autumn. Some years, only small numbers; other years hundreds of birds a day. A couple of individuals overwintered in 2016.

Golden Whistler *Pachycephala pectoralis*	Altitudinal migrant. At least one bird present every day from March to September. As many as four birds at once.
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	Seen and heard every day during spring-summer; bred successfully the last two years in tall eucalypts in front of the primary school just 80 metres away.
Masked Woodswallow *Artamus personatus*	Three to four times over spring-summer. Small number of birds mixed in with a larger flock of White-browed Woodswallows.
White-browed Woodswallow *Artamus superciliosus*	Three to four times over spring-summer.
Rufous Songlark *Cincloramphus mathewsi*	Only one record prior to last summer, when a bird took up residence and was heard calling daily in the grassy woodland in the trail reserve and 'Kama', near the end of Dungowan St and the entrance to The Pinnacle.
Welcome Swallow *Hirundo neoxena*	Once or twice a week over spring-summer.

The following migrant species have been recorded just a few times each, often on arrival in spring, and then occasionally/randomly throughout spring and summer: Shining Bronze-cuckoo (*Chalcites lucidus*), Pallid Cuckoo (*Heteroscenes pallidus*), White-throated Gerygone (*Gerygone olivacea*), Western Gerygone (*Gerygone fusca*), Olive-backed Oriole (*Oriolus sagittatus*), Rufous Whistler (*Pachycephala rufiventris*), White-winged Triller (*Lalage tricolor*), Dusky Woodswallow (*Artamus cyanopterus*), Leaden Flycatcher (*Myiagra rubecula*).

There are quite a few species on the 'occasional visitors' list [number of times in brackets]: Spotted Dove (*Spilopelia chinensis*) [3], Fork-tailed Swift (*Apus pacificus*) [2], Channel-billed Cuckoo (*Scythrops novaehollandiae*) [1], Horsfield's Bronze-Cuckoo [1], Fan-tailed Cuckoo (*Cacomantis flabelliformis*) [2], Barn Owl (*Tyto alba*) [3], Black-shouldered Kite (*Elanus axillaris*) [1], Wedge-tailed Eagle (*Aquila audax*) [3], Little Eagle (*Hieraaetus morphnoides*) [1], Collared Sparrowhawk (*Accipiter cirrocephalus*) [1], Rainbow Bee-eater (*Merops ornatus*) [1], Nankeen Kestrel (*Falco cenchroides*) [1], Australian Hobby (*Falco longipennis*) [1], Long-billed Corella (*Cacatua tenuirostris*) [8], Musk Lorikeet (*Glossopsitta concinna*) [1], Crescent Honeyeater (*Phylidonyris pyrrhopterus*) [2], New Holland Honeyeater (*Phylidonyris novaehollandiae*) [2], Fuscous Honeyeater (*Ptilotula fusca*) [2], Grey Shrike-thrush (*Colluricincla harmonica*) [5], Grey Currawong (*Strepera versicolor*) [2], Rufous Fantail (*Rhipidura rufifrons*) [1], Satin Flycatcher (*Myiagra cyanoleuca*) [2], Restless Flycatcher (*Myiagra inquieta*) [1], White-winged Chough (*Corcorax melanorhamphos*) [3], Mistletoebird (*Dicaeum hirundinaceum*) [4].

There are three woodland species resident in The Pinnacle Nature Reserve that I have not encountered in the suburb. Southern Whiteface (*Aphelocephala leucopsis*) and Speckled Warbler (*Pyrrholaemus sagittatus*) are often seen in the western portion of The Pinnacle. I have observed both species in the Bicentennial Trail Reserve, within metres of the rear fences of Marrakai St homes. I have also seen both right down to the fence line on the boundary track on the south-western side of the nature reserve. The third species, the Varied Sittella (*Daphoenositta chrysoptera*), has not been seen/heard by me in the suburb in ten

years, however, my neighbour saw a group of birds once in the backyard of 3 Dungowan St (S. Bottomley, pers. comm.).

Other wildlife

There is plenty of other wildlife in the immediate area. The following species have been recorded on my block (with the exception of the last two frogs which were across the street):

Eastern Grey Kangaroo (*Macropus giganteus*)
Swamp Wallaby (*Wallabia bicolor*)
Short-beaked Echidna (*Tachyglossus aculeatus*)
Brush-tailed Possum (*Trichosurus vulpecula*)
Chocolate Wattled Bat (*Chalinolobus morio*)

Marbled Gecko (*Christinus marmoratus*)
Eastern Blue-tongued Lizard (*Tiliqua scincoides scincoides*)
Delicate or Grass Skink (*Lampropholis delicata*)
Grass or Garden Skink (*Lampropholis guichenoti*)

Peron's Tree Frog (*Litoria peronii*)
Smooth Toadlet (*Uperoleia laevigata*)
Common Eastern Froglet (*Crinia signifera*)
Spotted Marsh Frog (*Limnodynastes tasmaniensis*)

My neighbours at 5 Dungowan have had Eastern Brown Snakes (*Pseudonaja textilis*) visit on three occasions, all removed by a professional.

References

ACT Government (2019) *ACT Native Woodland Conservation Strategy and Action Plans*. Environment, Planning and Sustainable Development.

Banks, J.C.G. (1997) *Tree ages and ageing in yellow box*. In: Dargavel, J. (ed.) Australia's Ever-Changing Forests III. Proceedings of the third national conference on Australian forest history. Centre for Resource and Environmental Studies, Australian National University, Canberra, pp. 35-47.

Davey, C. (2012) *Distribution, abundance and breeding status of the Superb Parrot* (Polytelis swainsonii) *during the 2011-12 breeding season, central and lower Molonglo Valley, ACT*. Report prepared for the Canberra Ornithologists Group (COG).

Davey, C. and Nicholls, A.O. (2009) Preliminary analysis of the relationship between GBS site species richness and Google Earth derived environmental data. *Canberra Bird Notes* 34: 149-157.

Eco Logical Australia (2014) *Molonglo NES Plan Superb Parrot Survey – Baseline survey 2013*. Prepared for Territory and Municipal Services, ACT Government.

Munyenyembe, F., Harris, J. Hone, J. and Nix, H. (1989) Determinants of bird populations in an urban area. *Australian Journal of Ecology* 14: 549-557.

Stein, J. (1982) *Bird species distribution in relation to suburb habitat characteristics - Canberra*. BSc. (Hons.) thesis. Department of Zoology, ANU (unpublished).

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THE BIRD COMMUNITY OF THE GUNGADERRA CREEK WILDLIFE CORRIDOR IN SUBURBAN FRANKLIN, ACT, DURING THE 2020/2021 BREEDING SEASON

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Abstract: *Over the 2020/2021 breeding season the birds of the green belt (32 ha) in suburban Franklin, ACT, were surveyed. The site follows a creek line and includes 7 stormwater settling ponds, areas under exotic grass and many planted trees (mainly eucalypts and casuarinas) and dense native shrubbery near ponds. The suburb was established in 2012. The numbers of breeding birds were estimated using the 'territory mapping method'. Birds using the site for foraging were also counted. In total 247 territories (T) from 29 species were recognized, giving a density of 77.2 T/10 ha [19 species of land birds at 74.5 T/10 ha of the land area; 10 species of wetland birds at 83.2 T/ha of the wetland habitat]. Significant rain fell over the survey period, much of it in October and November, the main nesting time. Hollow-nesting birds were absent. Most land bird species also occur in the leafier Canberra suburbs and major eucalypt plantings across town. Nine of the land birds are species of south-eastern Australian woodlands, and a further 10 woodland species used the site during passage or nested nearby.*

The Australian Reed Warbler (Acrocephalus australis) *was the most common breeding bird (40 T). Only in 7 T were two broods raised, in all others the first brood failed, most likely due to heavy rainfall. But most Reed Warblers raised a second (replacement) brood. An influx of Little Grassbirds* (Poodytes gramineus) *occurred late in the breeding season. This local pattern reflected an ACT-wide pattern that differed from previous years. At one of the ponds a pair of Eurasian Coots* (Fulica atra) *raised three broods, another pair two broods, but one of those very late in the season - in both cases possibly in response to supplementary feeding of waterbirds by residents. The Red Wattlebird* (Antochaera carunculata) *was the most common land bird (24 T). Pairs raised one to three broods; overall 47% of possible nests produced fledglings. Eastern Koels* (Eudynamys orientalis) *fledged from late (third) Red Wattlebird nests,* i.e. *the Koel had access to only 28% of possible host nests. Rarer breeding species for the ACT included a pair of Singing Honeyeaters* (Gavicalis virescens), *which made four unsuccessful attempts to raise a brood, and four territories of the Lewin's Rail* (Lewinia pectoralis).

Species using the site only for foraging included the Latham's Snipe (Gallinago hardwickii). *For the most common species, Red-rumped Parrot* (Psephotus haematonatus), *Common Starling* (Sturnus vulgaris) *and Common Myna* (Acridotheres tristis), *details of their seasonal distribution are provided.*

Some recommendations are given for the management of the site.

1. Introduction

In recent years a new type of landscape has been developed in several parts of Canberra, combining water features in the form of stormwater control ponds along creek lines, with extensive plantings of mostly native trees and shrubs, and open grass-covered areas beside

them, thus creating green corridors of varied habitat for wildlife and human recreation. The ponds attract a range of waterbirds on passage and for breeding (*e.g.* Graham and Clark 2013; Wallace 2013; Clark 2016, 2021; Clark and Harris 2016); Henderson 2021a), a key reason that these sites have become very popular with birdwatchers.

Native trees and shrubs have been planted widely in other parts of urban Canberra, in suburbia, in industrial areas and along major roads. Monitoring of revegetation sites on open farmland in the wider Canberra region and in south-eastern Australia in general (and in other parts of Australia)[2] has shown that many woodland species will not only occupy such sites but will also breed in them (Bond and Taws 2006; Kavanagh *et al.* 2007; Bond *et al*. 2010). However, we have far less understanding of the extent to which birds use such plantings in urban settings.

In July 2020 a Singing Honeyeater[3] was recorded from the 'Franklin Pond' in the green belt, the Gungaderra Creek Wildlife Corridor [hereafter GCWC] in Franklin, Gungahlin (Darwood and Lenz 2021). While trying to locate this rare find I walked the full length of the corridor. This green space, 'designed as an ecological corridor for the movement of native wildlife' (Wiki 2 2021), looked interesting and I decided to return to the area during the 2020/2021 breeding season to determine which species breed there and in what numbers, and which species just visit the area. This article describes the results.

2. Site

The suburb of Franklin in Gungahlin was established in 2012. It comprises an area of approximately 256 hectares (Fig. 1). It is bounded by Flemington Road to the North and East, Well Station Drive to the South, and Gungahlin Drive to the West. Franklin is mainly a residential area with higher density, mixed-use development along Flemington Road. The suburb is surrounded on two sides by grassland nature reserves, the Mullangarri and Gungaderra Grasslands in the West and the North Mitchell Grasslands in the SE (Fig. 1).

Table 1. Size of the Franklin study area and its land and wetland components.

Site	Area* [ha]	% of total area
Survey area	32.00	
Land area (island)	22.15 (0.27)	69.2
Wetland area	9.85	30.8
Gungaderra Creek	2.21	6.9
Ponds (from E to W)	7.64	23.9
(1) Franklin Pond	1.37	
(2) at Tomasetti Cres.	0.23	
(3) Christina Stead Pond.	0.94	
(4) at Oodgeroo Ave. (a)	0.55	
(5) at Oodgeroo Ave. (b)	0.12	
(6) at Oodgeroo Ave. (c)	0.42	
(7) Patrick White Pond	4.01	

*Area values estimated with the polygon function available in Google Earth Pro.

[2] Numerous studies on this topic exist for many rural landscapes of Australia. In the context of this article only a very small selection is referenced.
[3] Scientific names of bird species are given in Tables 3, 7, 10 and 11.

Figure 1. Aerial view of Franklin, June 2012, from the SW with Patrick White Pond (with island) in the foreground [https://suburbanland.act.gov.au/em/franklin] (accessed 17 Jan 2021)**.** More housing was built along Flemington Road after 2012.

Figure 2. Survey area (outlined in orange), the Franklin part of the Gungaderra Creek Wildlife Corridor [Image from Google Earth Pro] (accessed 4 Aug 2019). Red circle: Stand of eucalypts, likely nest site for Australian Wood Duck and Pacific Black Duck.

Gungaderra Creek starts to the NE of Franklin and passes from NE to SW through the suburb. It is part of the wider Ginninderra Creek catchment. In the Franklin section (between Flemington Road and Gungahlin Drive) of the GCWC, seven ponds[4] are connected to it, ranging in size from 0.12 to 4.01 ha (Figs. 1 and 2; Table 1). A network of sealed pedestrian and cycle paths makes most parts of this green space very accessible. Two roads (Hoskins St and Nullarbor Ave.) and three pedestrian causeways cross over it. The largest pond, the Patrick White Pond in the southwestern part, also includes an island (0.26 ha), most likely created from excess soil from pond excavation. The island is covered by a dense stand of casuarinas and eucalypts. Mounds of excess soil were also formed on each side of Gungaderra Creek at the western end to Gungahlin Drive (Fig. 1). The mounds are mainly covered in grass and have some eucalypts and wattles planted along their edges. This part is not directly accessible but one can walk around its perimeter.

The survey area comprised 32 ha. It includes the GCWC and trees and gardens of adjoining roads and houses fronting it. The land component makes up 22.15 ha, the wetland area 9.85ha (creek and ponds) (Table 1).

At the ponds, along the creek and paths many River Sheoaks (*Casuarina cunninghamiana*), and several species of eucalypts, especially Red Box (*Eucalyptus polyanthemon*), Yellow Box (*E. mellidora*), Apple Box (*E. bridgesiana*), and Brittle Gum (*E. mannifera*), and some Blackwood (*Acacia melanoxylon*) have been planted, often in rows but also forming groves (Fig. 3). In recent years and in the ongoing planting program other species of eucalypts have been added (Isabel Chua, Urban Treescapes, ACT Government, personal communication; Nicki Taws, personal communication). Some of the main roads are also lined with some exotic tree species, including Chinese Elm (*Ulmus parvifolia*), Honey Locust Tree (*Gleditsia triacanthes*) and Pin Oak (*Quercus parvifolia*).

Around sections of the ponds, a range of native shrubs form dense thickets (Fig. 3D), including species of *Callistemon*, *Melaleuca*, *Banksia*, *Grevillea* and *Westringia.*

The areas under grass are regularly mown.

Among the dominant aquatic vegetation of the ponds and the creek are Narrow-leafed Cumbungi (*Typha domingensis*), Jointed Twig Rush (*Manchaerina* (formerly *Baumea*) *articulata*), Tall Sedge (*Carex appressa*), and Common Rush (*Juncus usitatus*) (for identifications: Dave Albrecht, CSIRO National Herbarium, personal communication (from supplied photos); Canberra Nature Map). The creek has only a few sections of open water, while much of it is covered by dense vegetation (see Fig. 3 A, B). However, in the course of summer several of those open stretches became overgrown by cumbungi and Water Plantain (*Alisma plantago*).

Over the 2020/2021 season, drought-breaking rain continued to fall (Fig. 4). Vegetation had a chance to recover, and on many visits Gungaderra Creek had good flows. In the context of the survey the heavier rainfalls during October and November were important (see below).

[4] An eighth pond on a tributary of Gungaderra Creek, separated from the survey area by a wide road, was not included.

Figure 3. Examples of landscapes at the GCWC: (A) Gungaderra Creek densely vegetated for most of its length; (B) One of the parts of Gungaderra Creek with areas of open water; (C) The pond at Tomasetti Cres. (No. 2 in Table 1) **with floating algal matts; (D) Dense shrubbery along pond; (E, F) Examples of groves of planted trees.**

3. Methods

The survey had two main objectives: first to establish how many species breed at the site and estimate their numbers, and secondly to establish how many species just visit the GCWC during the breeding season. Further, I was aiming to establish the length of the breeding season for some of the species.

During morning visits I walked the full network of available paths at a slow pace. All birds seen and heard were recorded. The totals for each species per visit were entered into the eBird database.

In order to estimate the breeding bird population at the GCWC, I followed the 'territory mapping method' (Oelke 1974; Lenz 1990a; Bibby *et al*. 1992; Fisher 2005). This method

was developed in the northern hemisphere with a seasonally restricted breeding season. It can also be applied to the Canberra region with its well-defined nesting season between (July) August to December (January) (Nix 1976, Lenz 1990a). However, one has to be aware that not all species can necessarily be assessed equally well with this method.

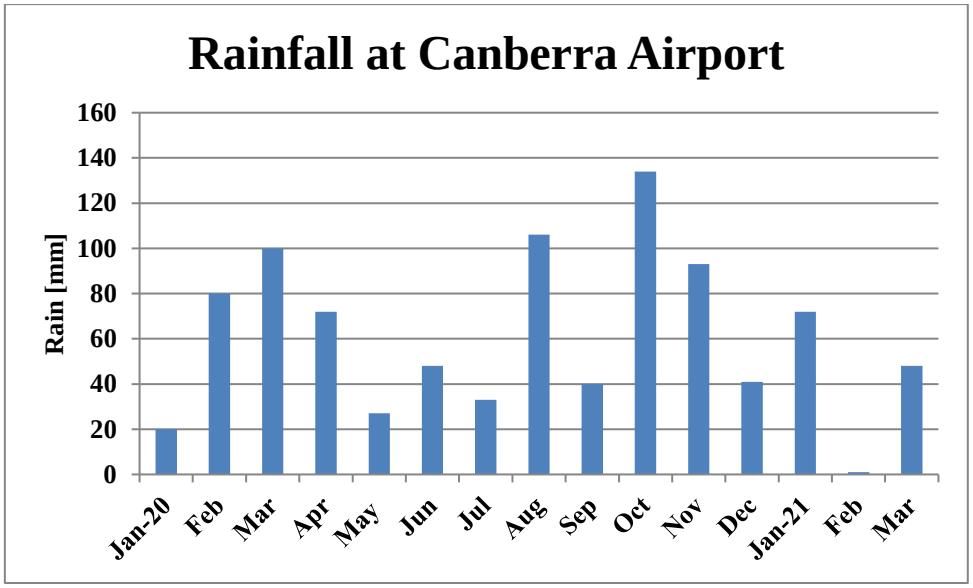


Figure 4. Monthly rainfall figures for Canberra Airport from January 2020 to March 2021 (Bureau of Meteorology, Australian Government: Product Code: IDCJAC0001, reference: 75771229).

All observations indicating that a bird might be breeding were plotted on a map. These observations included: singing and displaying, presence of a pair or group, fighting between neighbouring birds, birds carrying nest material, nest sites (I did not search for any nests; nest finds were incidental), warning adults, birds carrying food, begging young and fledglings (Fischer *et al.* 2005).

From these observations, species maps were prepared: a cluster of records for a given species over a period at a given site would indicate an occupied territory (thus excluding passage migrants staying only for short periods). Numbers of breeding birds are given as the number of territories (T), rather than the number of pairs. Some territories may be occupied only by one sex, in other cases by a group of birds (*e.g.* Australasian Swamphen, Superb Fairy-wren, Australian Magpie), and the presence of 'floaters' (individuals without a territory, but ready to fill any vacancies) may further complicate the picture. Hence, an estimate of the number of territories rather than of the total numbers of birds (pairs) may be more realistic and allow us to gain an understanding of the capacity of a given site to support 'potential reproductive units' (Mulsow 1980; Recher 1988).

From an image of the site on Google Earth Pro (see Fig. 2), four files were created, three of those covering approximately a third of the site each [East (Flemington Rd. to Nullarbor Ave.), Centre (Nullarbor Ave. to Hoskins St), West (Hoskins St. to path along W end of Patrick White Pond)], and the fourth covering only the very western end of Gungaderra Creek to Gungahlin Drive. These images were printed in b/w and enlarged to A3 format. This allowed plotting of observations with reasonable accuracy.

The site was visited thirty times between 11 Aug 2020 and 16 Mar 2021 (Table 2), at weekly intervals whenever possible. In addition several partial visits focussed on 'Franklin Pond' in the eastern part. Visits have to be spread out across the breeding season in order to capture the differing breeding regimes of the species at the site. The number of my visits well exceeded the basic requirements of the territory-mapping method (see references above). However, since I was also interested in determining the length of the breeding seasons for different species, a higher number of visits was needed.

Table 2. Number of full visits per month between August 2020 and March 2021.

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2	5	3	4	5	4	4	3

4. Results and Discussion

During the surveys, 82 species of bird were observed. Of those, 29 species were breeding, 27 species visited the area over periods for foraging, two species crossed the site on several occasions without stopping, and 27 species were recorded only occasionally. A couple of species fitted more than one category. For example, Little Corellas and Sulphur-crested Cockatoos often flew over the site, but occasionally they landed in trees along the creek to feed. Early in spring, small flocks of Pied Currawongs foraged in specific patches of grassland close to the creek, but later only breeding birds were noted.

4.1. Breeding birds

A total of 247 territories (T) from 29 species were recognised, giving an overall density of 77.2 T/10 ha (Tables 3 and 7). Results for breeding birds are presented separately for wetland and land birds.

Normally, the number of territories of a species at a given site or habitat is converted to the number of territories per 1 or 10 ha, *i.e.* expressed as the density (or carrying capacity) of a site. This figure allows for direct comparisons between sites. But at the GDWC two major habitats, wet and dry, are integrated. For a number of species the breeding territory is made up of land and wetland components, although they are mainly identified as water or land birds. For example, Australian Reed Warblers nest in reedy vegetation but forage widely in trees and shrubs and even visited gardens of neighbouring houses. Australasian Swamphens, Dusky Moorhens and Australian Wood Ducks often venture far from water to graze. Australian Wood Ducks and Pacific Black Ducks require tree cavities for nesting. Those were found only outside the study area. White-plumed Honeyeaters and Superb Fairy-wrens foraged frequently in reedy vegetation and Willie Wagtails caught insects over water. A variety of species come to the ponds for drinking and to bathe.

Hence densities in Tables 3 and 7 are given not just per area of habitat type (wetland/dry land) but for the entire area of the site as well.

4.1.1. Wetland species

The breeding birds of the wetland part of the GDWC comprised 10 species. 82 territories were identified, giving a density of 83.2 T/10 ha (Table 3). Four species were dominant, each having >5% of the total number of territories (Table 3). The Australian Reed Warbler stood out, having almost 50% of all recorded wetland territories. It was also the most common breeding species for the site.

Two species with potential to breed at the GDWC, Australasian Grebe and Hardhead, failed to do so. Australasian Grebes have been reported nesting on several ponds in the Gungahlin area (*e.g.* Lenz 2007). The species is present on ponds of the GCWC outside the breeding season, indicating that they provide food, but the ponds lack any significant stands of submerged aquatic plants for nest construction. A number of pairs of Hardheads nested in 2020/2021 on ponds in Gungahlin (Clark 2021). The species was also regularly present on several ponds of the GCWC, and pairs even spent time on some of the smaller and better-vegetated ponds early in the season, but the species almost disappeared over the course of summer and no breeding was recorded.

For several of the 10 breeding species (see Table 3) some observations and comments are given below.

Table 3. Composition and size of the breeding wetland bird community at the GCWC in the 2020/2021 season.

No.	Species	No. territories (T)			Dominance [% T of total]
		T	T/10 ha wetland[1]	T/10 ha entire site[2]	
1	Australian Reed Warbler *Acrocephalus australis*	40	40.6	12.5	48.7
2	Eurasian Coot *Fulica atra*	14	14.2	4.4	17.1
3	Purple Swamphen *Porphyrio porphyrio*	8	8.1	2.5	9.8
4	Little Grassbird *Poodytes gramineus*	5	5.1	1.6	6.1
5	Wood Duck *Chenonetta jubata*	4	4.1	1.3	4.9
6	Lewin's Rail *Lewinia pectoralis*	4	4.1	1.3	4.9
7	Pacific Black Duck *Anas superciliosa*	3	3.0	0.9	3.7
8	Dusky Moorhen *Gallinula tenebrosa*	2	2.0	0.6	2.4
9	Black Swan *Cygnus atratus*	1	1.0	0.3	1.2
10	Golden-headed Cisticola *Cisticola exilis*	1	1.0	0.3	1.2
Total		**82**	**83.2**	**25.7**	**100.0**

[1] Wetland area: 9.85 ha; [2] Area of entire site: 32 ha

4.1.1.1. Black Swan

On a pre-survey visit on 10 Jul 2020, a pair with 3 small cygnets was noted, and a nest was occupied by a second pair. However, by 11 Aug 2020 only the family was present. The other pair had vanished, although it or another pair was sighted on 8 and 15 Sep on the large Patrick White Pond, well away from the family.

Jon Coleman had colour-banded the swan family by 13 Oct 2020. I was able to read the letter code on the coloured bands on 27 Oct: adults: CDN and CZD; two of the young were CZN and CZA, the third had disappeared. By mid February 2021 the pair was chasing the young away, although one of them persisted for some time by 'hiding' on smaller ponds.

The family was seen over time on three ponds (at Tomasetti Crescent, Christina Stead Pond and Franklin Pond). The family moved on foot to the different sites, a maximum distance between ponds of about 550 m. The 2020 family was a favoured 'target' for people feeding waterbirds, especially when the birds were on shore at Franklin Pond (see also Sect. 4.1.1.7.).

On 25 May 2021 (after my surveys) the adult pair (with the bands as given above) was seen with their next brood of five small cygnets near the pond at Tomasetti Crescent.

4.1.1.2. Australian Wood Duck

The species frequented many of the ponds, but families were seen only at Franklin Pond and Christina Stead Pond (see Table 1). Since Wood Ducks require tree cavities for nesting and none are available at the site, they must have nested some distance away from the GDWC. The nearest group of eucalypts that could contain suitable hollows is located in the NW corner of the North Mitchell Grassland (see circled area in Fig. 1), a distance of about 540 and 470 m respectively from the ponds. Australian Wood Ducks can nest in trees up to 1500 m distant from water (Marchant and Higgins 1990).

Pairs with young appeared within a fairly narrow time frame from 8 Sep to 13 Oct 2020. The highest number of young seen was 12; the survival rate of young was low.

4.1.1.3. Pacific Black Duck

The species was found on all ponds, but the four females with young were seen only in the eastern part of the GDWC, mostly on Franklin Pond. One female with 14 young managed to raise 11 of them to independence. This family moved over an area of 2.6 ha. While the ducklings were very small the family spent most of its time in the shallow and at the time rather open water of Gungaderra Creek near Flemington Road. They also moved along the creek to the pond at Tomasetti Crescent and to Franklin Pond.

First sightings of small young were well separated, on 22 Sep, 10 Nov 2020, 22 Jan and 9 Feb 2021. This species also nests predominantly in tree hollows, and sometimes on the ground or in nests of larger birds (Marchant and Higgins 1990). It is again likely that the trees at North Mitchell Grasslands (see Fig. 1) were used for nesting. Suitable nests can be used over time by different females.

4.1.1.4. Australasian Swamphen

Of the eight groups/pairs identified, seven had young and three of them were double-brooded. Young from single broods were recorded over a long period, from 22 Sep 2020 to 4 Jan 2021 and second broods between 29 Dec 2020 and 27 Jan 2021, with 78 to 91 days between sightings of double broods. It is possible that late first broods were replacement ones. Families were often rather secretive and re-sightings of adults with small young from one visit to the next were not guaranteed. More time could pass before another sighting.

On two occasions at different ponds an adult Swamphen was found high up in a casuarina next to a pond. These birds were calling loudly and scanning the vegetation and ground

below, trying to locate an intruding Swamphen. When it was discovered, the spotter fluttered down and chased it.

4.1.1.5. Lewin's Rail

Rails and crakes have greatly benefited from these new wetland landscapes, and breeding has been documented for a number of species in Gungahlin (Graham and Clark 2013; Wallace 2013; Clark 2016; Clark and Harris 2016). The Lewin's Rail has the status of 'rare, breeding visitor' in our area (Canberra Ornithologists Group 2020). Clark (2016) has documented breeding at Forde Creek.

Their frequent series of relatively soft territorial *jik-jik* calls (just as in the Pizzey and Knight Digital edition (2013)) were heard in four areas of Gungaderra Creek (see Table 4).

Table 4: First and last dates when Lewin's Rails were heard giving their territorial call at Gungaderra Creek.

Section/ territory	Date first heard	Date last heard
East 1	11 Aug 2020	15 Dec 2020
Centre 1	27 Oct 2020	04 Jan 2021
Centre 2	08 Sep 2020	29 Dec 2020
West 1	11 Aug 2020	15 Dec 2020

Christine D. (2021) observed an apparent immature bird on 21 Feb 2021 at Franklin Pond, about 30 m from the creek where 'East 1' had been residing.

The species was present for longer periods than indicated in Table 4; at two sites shorter series of *jik* calls were heard on 9 Mar 2021.

4.1.1.6. Dusky Moorhen

Single individuals of this species were seen at several ponds. However, breeding groups occupied only two sites, the pond at Tomasetti Crescent (Fig. 3C) and the area where the creek, Patrick White Pond and the western pond along Oodgeroo Ave. (No. 6, Table 1) meet. Both sites provided dense standing aquatic vegetation and easy access to open areas for grazing.

At the latter site 3 adults were first seen with 5 small young on 27 Oct. Three young survived to independence. At Tomasetti Crescent 4 adults produced two broods, on 7 Oct with 3 young, and on 8 Dec 2020 (62 days later) with 4 young. One of the young of the first brood helped feed the young of the second brood. Such helping behaviour is known in this species (*e.g.* Lenz 1990b).

4.1.1.7. Eurasian Coot

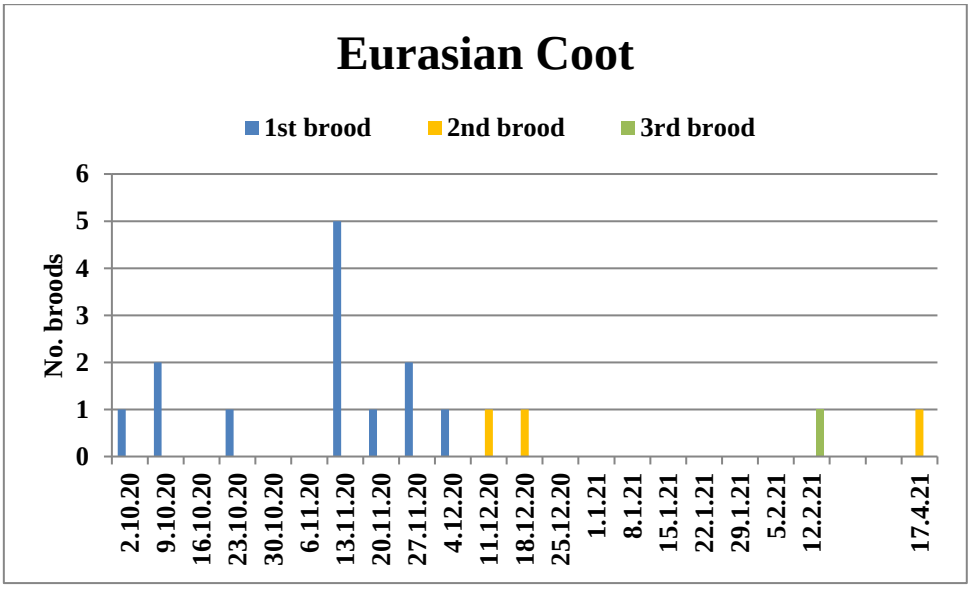
The Eurasian Coot was the second most common wetland species, with 14 territories. One pair failed to produce young, nine pairs raised one brood, three pairs two broods and one pair even three broods.

Young hatched from early October onwards, in most cases between mid November and early December (Fig. 5). A minimum of 42 chicks were recorded (the actual number was most likely higher); of those 23 either survived to independence or were still present when

the surveys finished in mid March. Brood size (*i.e*. young seen outside the nest) ranged from 1 to 4 (1 young: 2x; 2 young 7x; 3 young 6x; 4 young 2x).

Aspects of the breeding behaviour of the Coot at Franklin Pond were interesting. Two concrete boardwalks and associated vegetation divide the pond into three parts (see Fig. 6), although birds can still move between them. Each part is occupied and defended by one pair of Coots.

Figure 5. Seasonal distribution of first records of Eurasian Coot broods.



The pair in the W part failed to produce young. The pair occupying the large (C) part had a first brood out on 17 Nov and another notably late one (142 days later), probably hatched around 17 Apr. Two begging young were discovered on 15 May when Nicki Taws and I visited the pond for a different purpose (by 25 May only 1 young was left). The young were then estimated to be 4 weeks old, to judge by photos on the development of young Coots in Heinroth and Heinroth (1928). The pair in the E section raised 3 broods at about 60 day intervals.

Notably, on my first visit to the area on 10 Jul 2020, before the surveys, I recorded two and one young Coot still begging, albeit quite close to independence, at Franklin Pond. In other words, there may be a history of late/multiple broods at this site.

The reason for this may be that, with the two boardwalks and a stretch of grassed shore line (Fig. 6), people get close to waterbirds at this pond (Black Swan family, Pacific Black Ducks, Wood Ducks, Purple Swamphens and, of course, Coots), and it is favoured by young families and others for feeding them. (There are other sites along the GDWC, but none as popular as Franklin Pond for feeding waterbirds). Some people on their daily morning walk brought specially prepared food mixes, or rice and corn, in addition to the usual bread. It would seem that this frequent supplementary feeding enabled the Coots to raise extra and even late broods.[5]

[5] For the impact and discussion of supplementary feeding on birds, notably in urban environments, see Amrhein (2014) and Jones (2018).

The pair at (C) occupying more than two thirds of the pond seemed to be the birds most reliant on supplementary food, as indicated by their behaviour. The adults with young in tow would crisscross the large pond area whenever people appeared likely to provide food. The pond seemed to lack submerged waterweeds and had no floating algal mats. The latter appeared to be used as an important food source by adult Coots and Dusky Moorhens to feed their small young. The Coot pair in the E section was most often observed during monitoring of the Singing Honeyeater, and the small young received mainly small tufts of algae, for which the adults had to dive frequently.

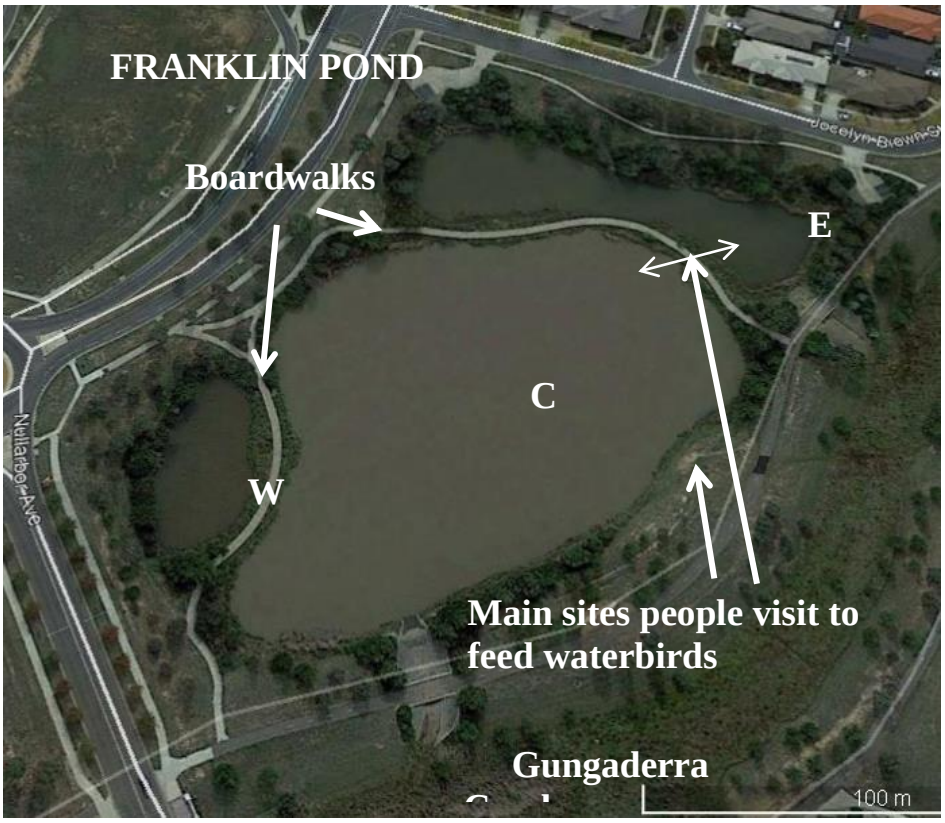


Figure 6. The three sections (W, C, E) of Franklin Pond and the main sites people visit to feed waterbirds.

Table 5. Breeding frequency of Eurasian Coots at the different sections of Franklin Pond (see also Fig. 6).

Pond section	Size [hectares (%)]	No. Coot pairs	No. broods and dates	Days between broods	No. young	No. young survived
East (E)	0.28 (20.4)	1	**3**: 7.10.; 15.12.; 16.2.	60; 62	3,1,4	5
Centre (C)	0.94 (68.6)	1	**2**: 17.11.; 17.4.	142	2, 2(+?)	3
West (W)	0.15 (11.0)	1	0	---	---	---
Total	1.37	3	5		12(+?)	8

Two other pairs had also raised two broods, 57 and 85 days apart respectively. These pairs were located on Ponds No. 2 (Fig. 3C) and No. 5 (see Table 1) with abundant wetland vegetation, including floating algae and receiving little (No. 2) or no food (No. 5) from people. These two ponds (and also Nos. 4 and 6) seemed to be shallower; they had sloping

banks and most likely received more local run-off when it rained, and with it more nutrients, as indicated by the formation of algal matts and taller and denser reedy vegetation than other ponds which were closer to the level of the surrounding ground.

4.1.1.8. Australian Reed Warbler

The Australian Reed Warbler has a notably long breeding season with clutches reported between early September to mid February (Higgins *et al.* 2006) and unspecified breeding in NSW between August and April (Cooper *et al*. 2020), allowing some pairs at least to be double-brooded (Brown and Brown 1985; Lenz 1989). At the GDWC the first singing birds were recorded on 1 Sep 2020, the last time new fledglings were noted was on 9 Mar 2021, and begging young were still present on 16 Mar 2021, the last day of the survey program. The bulk of birds had arrived by late October; numbers were stable until about mid February and then declined (Fig. 7). By then males had also become less vocal (apart from contact calls), although at least partial song could still be heard in mid March.

The 2020/21 breeding season of the Australian Reed Warbler at the GCWC had some unusual features. One would expect most fledglings to be reported in November to December in our region (Lenz 1989), given arrival of the first birds in early September (although females arrive with some delay), a period (not clear how long) for pairing, nest-building and laying, 13-15 days for incubation, and a nestling period of 10 to 14 days (Higgins *et al.* 2006). However, only in seven territories were fledglings noted at that time (Table 6, Fig. 8). Most pairs managed to raise fledglings only much later, between late December and early March (the bulk of them between late January and early February, see Fig. 8), *i.e.* the period when one would expect young to fledge from a second brood (Lenz 1989). The late brood was for most pairs a replacement brood, and only in seven cases did pairs raise a second brood after a successful first one. In nine territories no fledglings were recorded (Table 6).

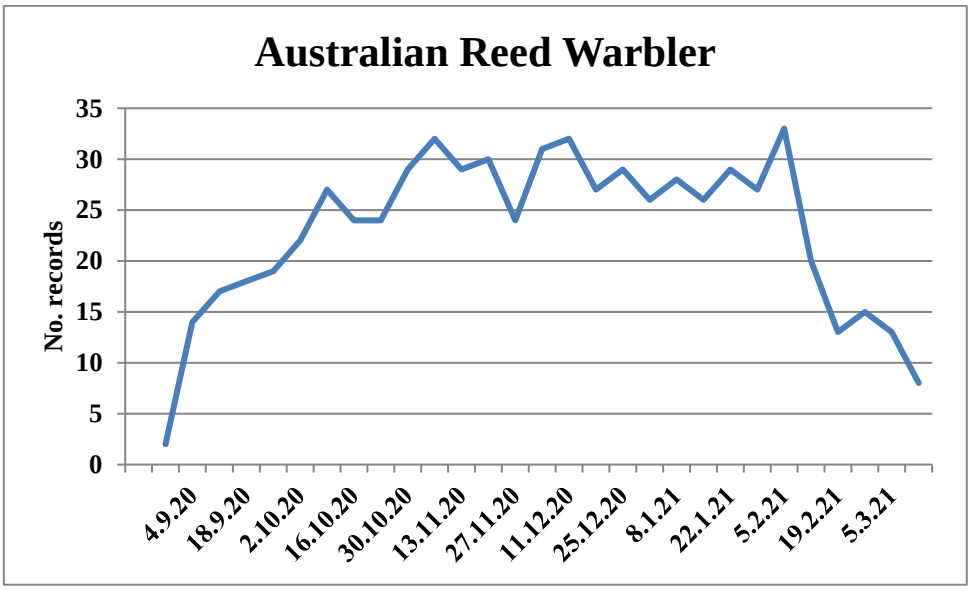


Figure 7: Number of times Australian Reed Warblers were recorded per visit (largely the number of singing males). However, the total number of birds seen and heard per visit was usually higher, especially once fledglings appeared.

Table 6. Breeding status (with or without fledglings, with first or/and second (replacement) brood of the 40 Australian Reed Warbler Territories.

Breeding status	No territories
Without fledglings	9
With fledglings	31
1st (early) brood	7
2nd (late) brood	31
1st and 2nd brood	7

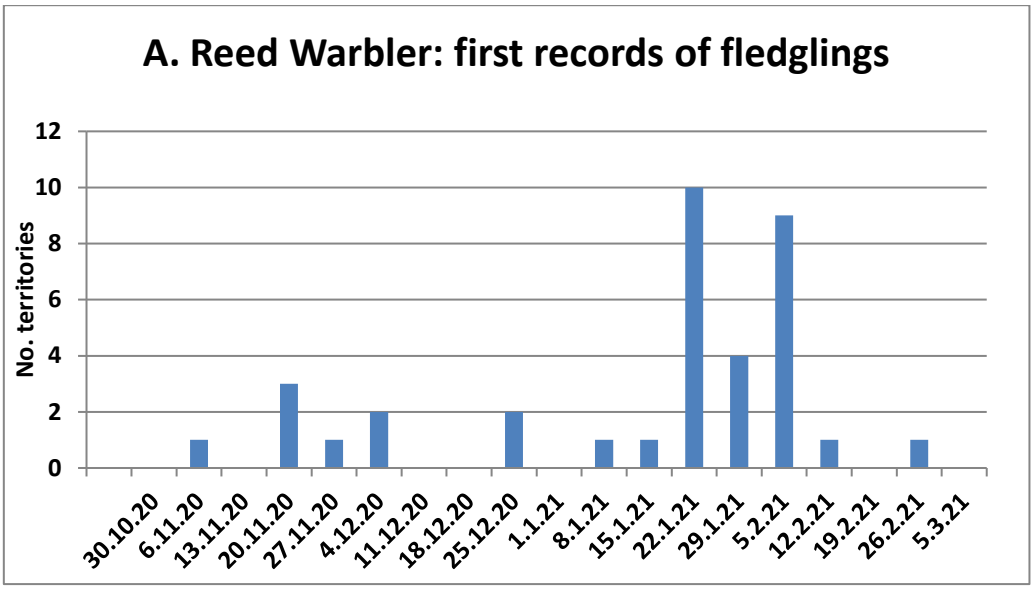


Figure 8. Seasonal distribution of first record of Australian Reed Warbler fledglings for each territory.

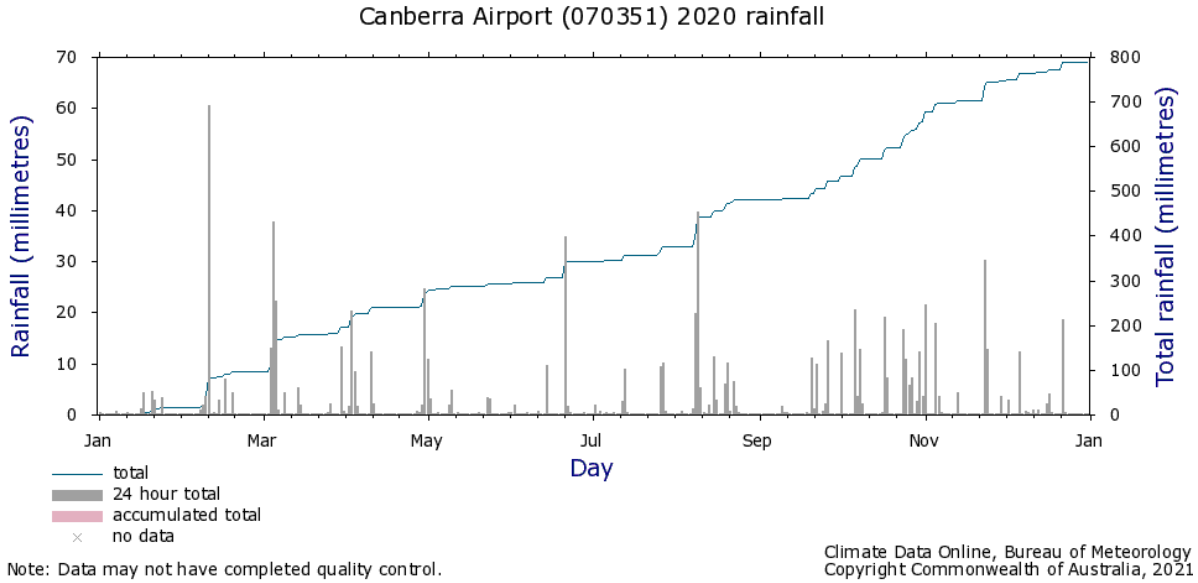


Figure 9. Daily rainfall in 2020 at Canberra Airport (Bureau of Meteorology, Australian Government, 2021).

The widespread failure of birds to raise a first brood is most likely due to the impact of high rainfall in October and November (see Figs. 4 and 9). Often rain fell on consecutive days

during the time of the first brood, as clearly shown in Fig. 9. This would have made it difficult for the female (which incubates alone, Higgins *et al.* 2006) to sit on eggs or keep any nestlings warm and dry, and for both adults to find and provide food. Prolonged heavy rainfall has also been implicated as a contributor to nest failures in other birds in Canberra at that time, such as the Little Eagle (Rae *et al.* 2021) and Singing Honeyeater (Darwood and Lenz 2021), and at other times in different species as well (Lenz 2016; Rae 2017).

4.1.1.9. Little Grassbird

The species is readily detected by its song, but when the birds fall silent the chances of noting them are greatly diminished. The biology of this secretive species is little known (McIntosh *et al.* 2003, Higgins *et al.* 2006).

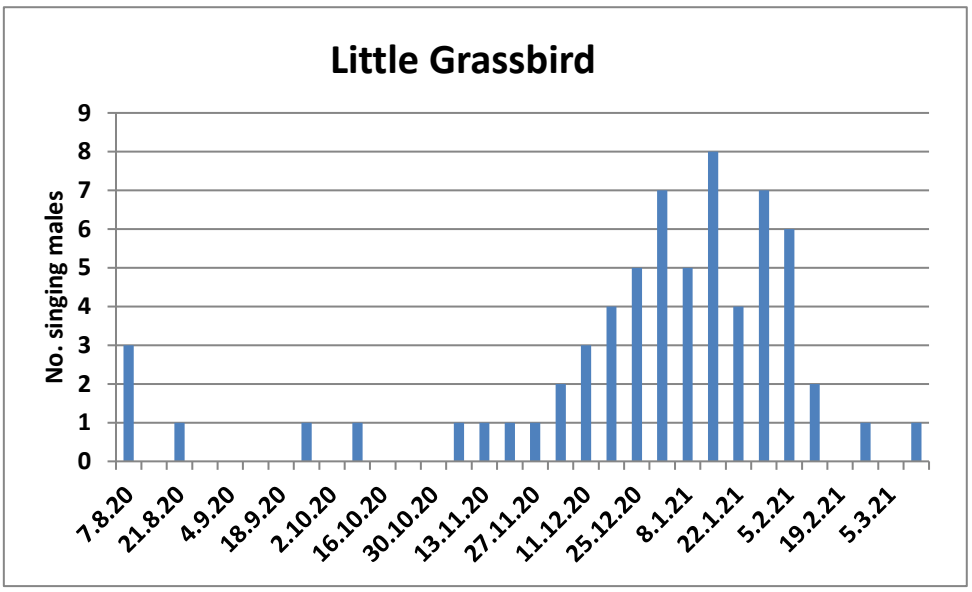


Figure 10. Seasonal distribution of calling Little Grassbirds.

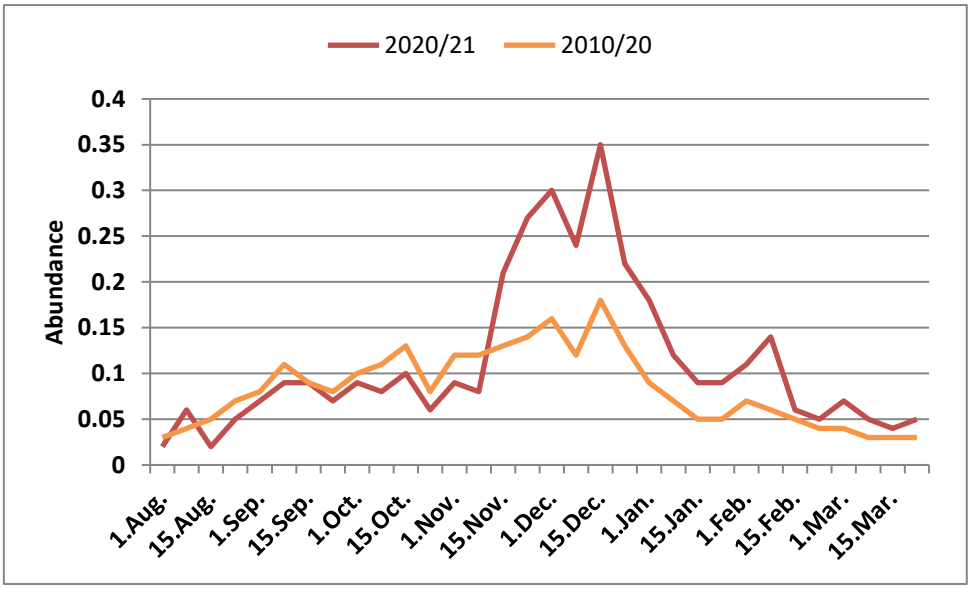


Figure 11. Abundance (see Footnote 6 for definition) **of Little Grassbirds for the whole of the ACT between August and March for 2020/2021 and 2010 to 2020 (data from ebird).**

Between late August and early December only a few singing birds were recorded, but from mid December onwards numbers increased and remained high, reaching a maximum of 8 singing birds until early February (Fig. 10). The same holds true for the whole of the ACT as the abundance values from ebird[6] indicate (Fig. 11). The pattern for this season differs notably from the abundance values for the same season (August to March) over the last 10 years (2011 to 2021) (Fig. 11). One could speculate that the late influx may also have been caused by the high rainfall, especially in October and November, resulting in nest failures, as reported for the Australian Reed Warble in Sect. 4.1.1.8., and triggering movement of birds to other sites, including the GDWC.

The number of 5 territories for the species at GDWC is an estimate, based on the length of the period a calling bird was located in an area, it could have been higher. Some of the late arrivals had enough time to raise a brood [29-37 days from incubation to fledgling independence (McIntosh *et al.* 2003)]. Observations include adults feeding a fledgling on 1 Feb 2021 in one of the territories (Henderson 2021b), a pair repeatedly chasing another Grassbird above cumbungi height, and males singing at each other less than 1 m apart at territory boundaries within the period of the influx. Interestingly, Wyllie (2021) reported a fledgling being fed at Moncrieff Pond in Gungahlin as late as 2 Mar 2021.

4.1.2. Land birds

The land bird breeding community was made up of 19 species with a total of 165 territories or 74.5 T/10 ha (Table 7). Key features of the community are:

- The new landscape was suitable for breeding of nine species (shaded in Table 7) found in south-eastern Australia's woodlands (Reid 2000; BirdLife Australia 2015), although most of them also occur commonly in the leafier suburbs of Canberra and in suburban plantings of eucalypts elsewhere.

  In this context it is worth mentioning that a further 10 woodland species were found either spending a week or a few weeks at the site during migration (*e.g.* Sacred Kingfisher, Olive-backed Oriole, Rufous Whistler). Others, such as White-winged Triller and Rufous Songlark were recorded displaying at particular patches without staying. Three other species were breeding in nearby areas and visited the site only for foraging (Red-rumped Parrot, Noisy Miner, Australian Raven).

- Five of the six dominant breeding species (each >5% of the population) were native species.

- Hollow-nesting birds were absent. The planted trees are still far too young and small to have developed cavities. Two pairs of Striated Pardalotes were the exception. They must have found cavity space in adjoining buildings. [The author has observed the species nesting in buildings (roof space, brick wall) from sites in Ainslie and the Australian National University, M. Lenz unpubl. observations].

  The lack of tree cavities prevented the establishment of breeding populations of the introduced Common Starlings, Common Mynas and House Sparrows, often dominant elements of the suburban avifauna in Canberra (Lenz 1990a). But other species such as Rosellas and Galahs also missed out, although all the cavity nesters mentioned use the site to varying degrees for foraging.

[6] Definition of **abundance in ebird**: The average number of birds reported on all checklists within a specified date range and region. This metric includes checklists that did not report the species and provides a measure of how commonly a species is reported relative to other species in the region (ebird).

- The three introduced breeding species (Spotted Dove, Common Blackbird, European Goldfinch) made up only 15.7% of the species and 16.3% of the territories; and only one, the Common Blackbird, ranked among the dominant species with 6.3% of the population.

Table 7. Composition and size of the breeding land bird community. The woodland species (BirdLife Australia 2015; Reid 2000) are shaded.

No.	Species	No. territories (T)			Dominance (% T of total)
		T	T/10 ha Land area[1]	T/10 ha Entire site[2]	
1	Red Wattlebird *Anthochaera carunculata*	24	10.8	7.5	14.5
2	Crested Pigeon *Ocyphaps lophotes*	22	9.9	6.9	13.3
3	White-plumed Honeyeater *Ptilotula penicillata*	21	9.5	6.6	12.7
4	Magpie-lark *Grallina cyanoleuca*	18	8.1	5.6	10.9
5	Superb Fairywren *Malurus cyaneus*	14	6.3	4.4	8.5
6	Common Blackbird *Turdus merula*	14	6.3	4.4	8.5
7	Australian Magpie *Gymnorhina tibicen*	8	3.6	2.5	4.8
8	European Goldfinch *Carduelis carduelis*	8	3.6	2.5	4.8
9	Willie Wagtail *Rhipidura leucophrys*	7	3.2	2.2	4.2
10	Weebill *Smicrornis brevirostris*	6	2.7	1.9	3.6
11	Spotted Dove *Streptopelia chinensis*	5	2.3	1.6	3.0
12	Pied Currawong *Strepera graculina*	5	2.3	1.6	3.0
13	Yellow-rumped Thornbill *Acanthiza chrysorhoa*	3	1.4	0.9	1.8
14	Silvereye *Zosterops lateralis*	3	1.4	0.9	1.8
15	Striated Pardalote *Pardalotus punctatus*	2	0.9	0.6	1.2
16	Welcome Swallow *Hirundo neoxena*	2	0.9	0.6	1.2
17	Eastern Koel *Eudynamys orientalis*	1	0.4	0.3	0.6
18	Singing Honeyeater Gavicalis virescens	1	0.5	0.3	0.6
19	Grey Fantail *Rhipidura fuliginosa*	1	0.5	0.3	0.6
Total	19 species	165	74.2	51.6	100.0

[1] Land area: 22.15 ha; [2] Area of entire site: 32 ha

- The other native species which are not dependent on woodlands, Crested Pigeon, Eastern Koel, Willie Wagtail, Magpie-lark and Pied Currawong, are well adapted to the urban landscape.
- The Singing Honeyeater is a rare visitor to the Canberra Region. This was the first time that a pair attempted to nest here (for details see Darwood and Lenz 2021).

Comments on some of the breeding land bird species are given below.

4.1.2.1. Crested Pigeon

This species was the second most common resident, with 22 territories (Table 7). However, it proved more difficult to estimate the number of breeding territories. Birds very often sat quietly on roofs, antennae or electric wires, or formed small groups under adverse weather conditions. As a result I had in many cases fewer records per assumed territory than I would have liked to see. But observations from Ainslie several years ago and more recently from Lyneham indicated that in such cases nest sites could be relatively close. The species can suffer a high rate of nest failures, especially if Pied Currawongs are nesting in the area. Re-nesting is most likely to occur at a different site. The number of territories of Crested Pigeons is a coarser estimate than those for the other species.

4.1.2.2. Red Wattlebird and Eastern Koel

The Red Wattlebird was the most common land bird with 24 territories (Table 7). The wide plantings of trees enabled it to breed across the site.

In total 36 broods (*i.e.* the presence of dependent fledglings) were recorded with first broods from late September to late November, second broods from early November to late December and third broods from early January to mid February (Fig. 12). In the latter period, 4 Eastern Koels fledged from Red Wattlebird nests. Only 2 pairs of Red Wattlebird managed to raise three broods; all others had either none, or one to two successful broods (Table 7).

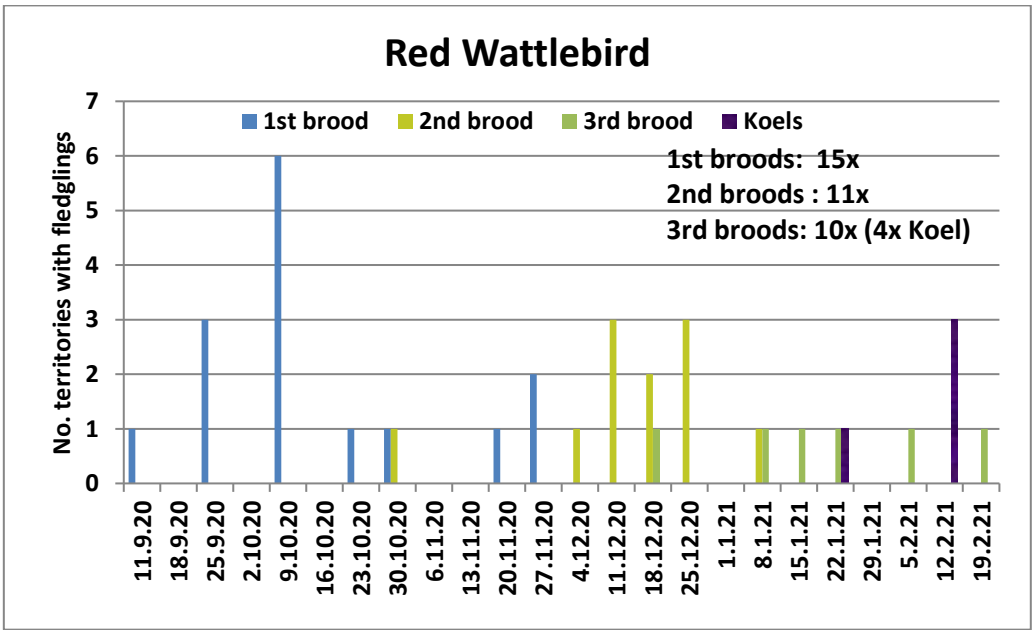


Figure 12. Seasonal distribution of first, second and third Red Wattlebird broods (*i.e.* presence of dependent fledglings).

This also means that the Eastern Koel pair that was present at the site and in the wider suburb had nests from only 42% of the population, at most, with a late (third) brood (or 27.7% of all successful nests) available in which to deposit an egg (Table 8). One to two male Koels were recorded from 30 Oct onwards. A female was first noted quite late on 29 Dec 2020; it was probably present earlier but overlooked (my previous visit on 22 Dec). Holland (2021) reported that in this season Koels, notably females, were often found just sitting quietly. The first Koel fledgling, just out of the nest, was recorded on 27 Jan 2021. The following time frame between first arrival of the female and the first fledgling is possible, since incubation and fledging times are similar for Red Wattlebird and Eastern Koel: 16 days incubation, 14 to 20 days nestling period for the Red Wattlebird (Higgins *et al.* 2001; Cooper *et al.* 2021), giving 30 to 36 days in total; the time from egg-laying to fledging amounts to 37 days (Albernathy 2017) for the Koel. Four Koel fledglings were produced within the site.

In his review of the 2020/2021 Eastern Koel season in the ACT Holland (2021) recorded 328 (and 37 possible) fledglings. A key feature was the prolonged season over which fledglings were found, from 31 Oct to 10 Apr. Fifty percent of them were recorded from 1 Feb onwards, *i.e.* around the time of the third Red Wattlebird brood. Alone in March 75 of the Koel fledglings were reported, and a further 4 in early April. The high number of late Koel fledglings clearly demonstrate that a number of Red Wattlebirds had a fourth brood. Good rainfalls, subsequent good vegetation growth and relatively cool weather provided good conditions for breeding (Holland 2021). It seems my surveys should have run even longer than to mid March in order to capture whether or not some pairs in the local Red Wattlebird population had initiated a fourth brood.

The number of started and failed Red Wattlebird broods is unknown since no nest searches were undertaken. Higgins *et al.* (2001) report a success rate of known nests fledging young between 22 and 33%, in various studies. If we assume that all 24 pairs raised three broods to fledging, that gives 72 sets of fledglings against 36 sets actually observed, *i.e*. a success rate of 50%. If we take account of 4 parasitised nests, reducing the potential number of sets of Red Wattlebird fledglings to 68 and actual numbers to 32, we have a success rate of 47%, still well above the values from the literature.

Table 8. Occurrence of first, second or third broods (*i.e.* presence of dependent fledglings) in the Red Wattlebird population.

Brood status	Territories		No. broods
	No.	%	
No successful broods	3	12.5	0
Only 1st brood	3	12.5	3
Only 2nd brood	2	8.3	2
Only 3rd brood	3 (2x Koel)	12.5	3
1st and 2nd broods	6	25.0	12
1st and 3rd broods	4 (1x Koel)	16.7	8
2nd and 3rd broods	1	4.2	2
1st, 2nd and 3rd broods	2 (1x Koel)	8.3	6
Total	**24**	**100.0**	**36**

4.1.2.3. White-plumed Honeyeater

The White-plumed Honeyeater ranked as the third most common species, with 21 territories (Table 7). It usually raises two broods in a season, sometimes three.

Table 9. Occurrence of one, two or three broods (*i.e.* presence of dependent fledglings) in the White-plumed Honeyeater population.

Brood status	Territories		No. broods
	No.	%	
No brood	1	4.8	0
One brood	10	47.6	10
Two broods	8	38.1	16
Three broods	2	9.5	6
Total	**21**	**100.0**	**32**

In the two territories with three broods, the first were recorded between early and late September, the second in the second half of November, and the third between mid January and mid February.

4.1.2.4. Other species

In the Magpie-lark, nest-building was observed from 24 Aug onwards and recently fledged young were recorded between late October and mid February.

Superb Fairy-wrens benefited from the many multi-species shrubs (*e.g.* Fig. 3D), especially planted around ponds, and also foraged frequently in the reedy vegetation along the creek.

Most Weebills were associated with plantings of Red Box. The variety at the site was characterised by dense foliage and extensive rough bark, possibly originating from a non-local subspecies (Nicky Taws, personal communication).

All Magpie (8) and Pied Currawong (5) territories fledged young.

In five of the eight Willie Wagtail territories one (3x) to two (2x) broods fledged; in three of them young were not recorded.

Silvereyes with fledglings were recorded between early November and mid February.

One of the two pairs of Welcome Swallows used the framework of a viewing platform above water for nesting, the other the roof space of a commercial building after damage to the fascia board gave access to it (the damage has since been repaired). Both pairs fledged young.

European Goldfinches were associated mainly with Chinese Elms and River She-oaks, both for feeding and nesting. Once the young had fledged the families spent time in stands of different species of thistles in weedy areas.

4.1.3. Species using the site for foraging

Some of the species listed in Table 10 were regularly present: Hardheads, and among the 3 cormorants especially the Little Pied Cormorant, Australian White Ibis, White-faced Heron (single bird), Royal Spoonbill (up to 4 birds) and all parrots (although Little Corella and Sulphur-crested Cockatoo were often just flying over).

Latham's Snipe were flushed from different sections of the creek on 7 visits between mid September and early February. The maximum number was 4 birds together.

Sacred Kingfisher, Rufous Whistler and Olive-backed Oriole spent periods of varying length at the site, but none of them settled. Noisy Miners were at first absent, but in the course of summer, they entered areas in the NW and SE and seemed to stay. Australian Ravens were recorded as single birds on several occasions, but later a family moved in, hanging mainly around the commercial area in the NE, but also foraging elsewhere on the site, sometimes stripping lerps off eucalypt leaves.

House Sparrows were surprisingly common at houses bordering the site (max. 22 times, as casually noted). However, they were recorded on site only later in the season, from about the end of October, when a few birds (mostly singles) were searching for insects in the vegetation. From about mid November small flocks, including young birds, visited mostly the more weedy soil mounds and surrounds at the western end of the site.

By number Red-rumped Parrot, Common Starling and Common Myna were the most common species using the site for collecting food.

Table 10. List of species observed using the site for foraging.

Hardhead *Aythya australis*	Eastern Rosella *Platycercus eximius*
Australasian Darter *Anhinga novaehollandiae*	Red-rumped Parrot *Psephotus haematonatus*
Little Pied Cormorant *Microcarbo melanoleucos*	Sacred Kingfisher *Todiramphus sanctus*
Great Cormorant *Phalacrocorax carbo*	Noisy Miner *Manorina melanocephala*
Little Black Cormorant *Phalacrocorax sulcirostris*	Noisy Friarbird *Philemon corniculatus*
White-faced Heron *Egretta novaehollandiae*	Rufous Whistler *Pachycephala rufiventris*
Australian White Ibis *Threskiornis moluccus*	Olive-backed Oriole *Oriolus sagittatus*
Royal Spoonbill *Platalia regia*	Black-faced Cuckooshrike *Coracina novaehollandiae*
Masked Lapwing *Vanellus miles*	Pied Currawong *Strepera graculina*
Latham's Snipe *Gallinago hardwickii*	Australian Raven *Corvus coronoides*
Galah *Eolophus roseicapilla*	Common Starling *Sturnus vulgaris*
Little Corella *Cacatua sanguinea*	Common Myna *Acridotheres tristis*
Sulphur-crested Cockatoo *Cacatua galerita*	House Sparrow *Passer domesticus*
Crimson Rosella *Platycercus elegans*	

4.1.3.1. Red-rumped Parrot

Seeds made the site attractive, and some pond margins free of vegetation allowed drinking, while casuarinas and some of the eucalypts with denser foliage provided safe cover, especially for the fledglings.

A few birds, almost exclusively males, were present until early November, except for a spike of 15 birds, on 13 Oct. On 10 Nov two pairs were seen, an indication that young were close to fledging. On the visit one week later, the first begging fledgling was accompanying its parents. Numbers built up to a peak of 30 parrots on 19 Jan (Fig. 13). From early March onwards only pairs were seen.

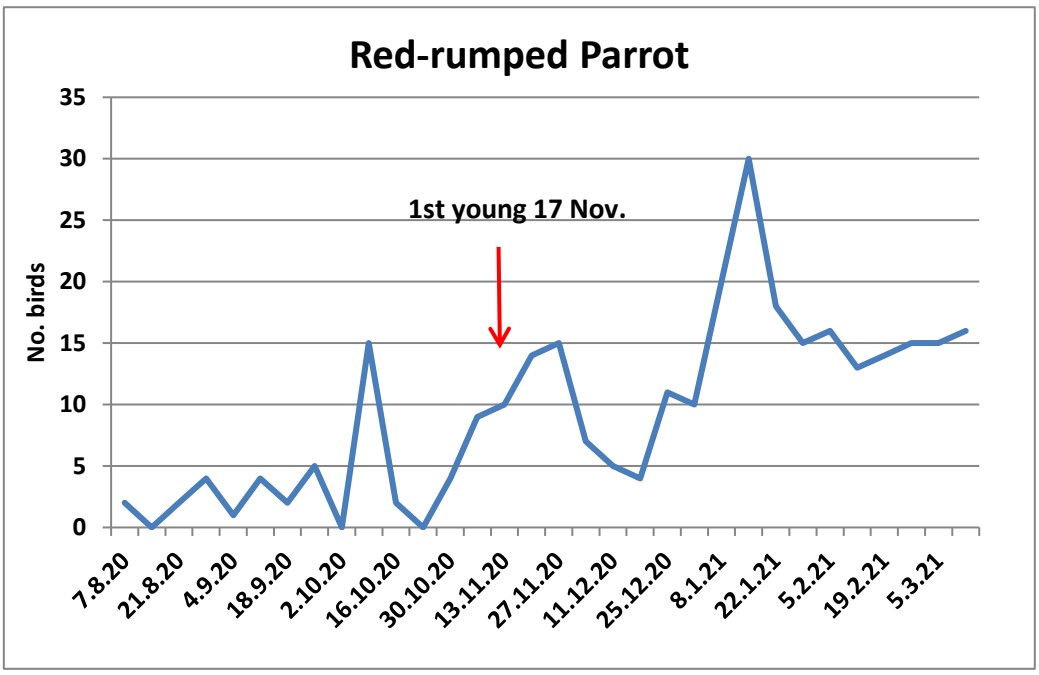


Figure 13. Number of Red-rumped Parrots observed over the survey period.

4.1.3.2. Common Starling

Until the second half of October only a few Starlings were present, although additional birds were singing from adjoining houses. By mid September birds were flying overhead towards the nearby grassland reserves and returning carrying food. In mid October small foraging parties of adults were also seen. Flocks of adults and begging fledglings of the first brood were common by the end of October (max. 60 birds, Fig. 14).

From late November the early pattern repeated itself: small numbers of adults flying over and returning with food in their bills. On 15 Dec flocks, including many still dependent young from the second brood, were foraging on the site. Eucalypts and casuarinas provided good cover for the young when the birds were disturbed.

After the second brood had fledged, Starling numbers varied widely, but all recorded birds were foraging.

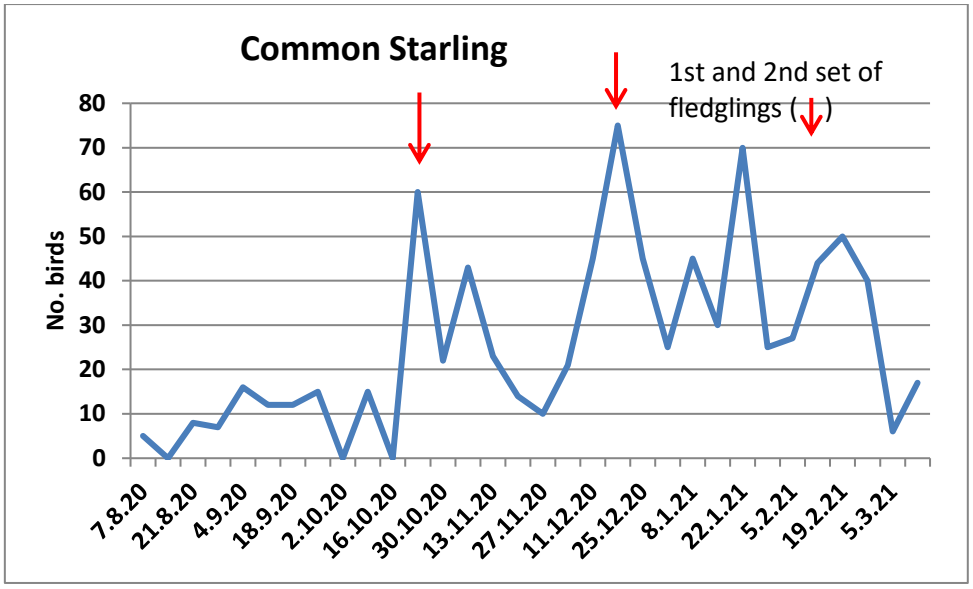


Figure 14. Numbers of Common Starlings and times when fledglings of the first and second brood appeared (arrows).

4.1.3.3. Common Myna

The Common Myna had a regular presence at the site (Fig. 15) and on roofs of adjoining buildings (and within the suburb). Fortunately, overall numbers were much lower than those of Common Starlings (Fig. 14).

The species raised only a single brood: the first dependent fledgling was recorded on 1 Dec 2020. Begging fledglings were present over a period of 50 days (bar above graph in Fig. 15). Myna breeding appeared less synchronised than that of Starlings.

Numbers thereafter varied widely (Fig. 15).

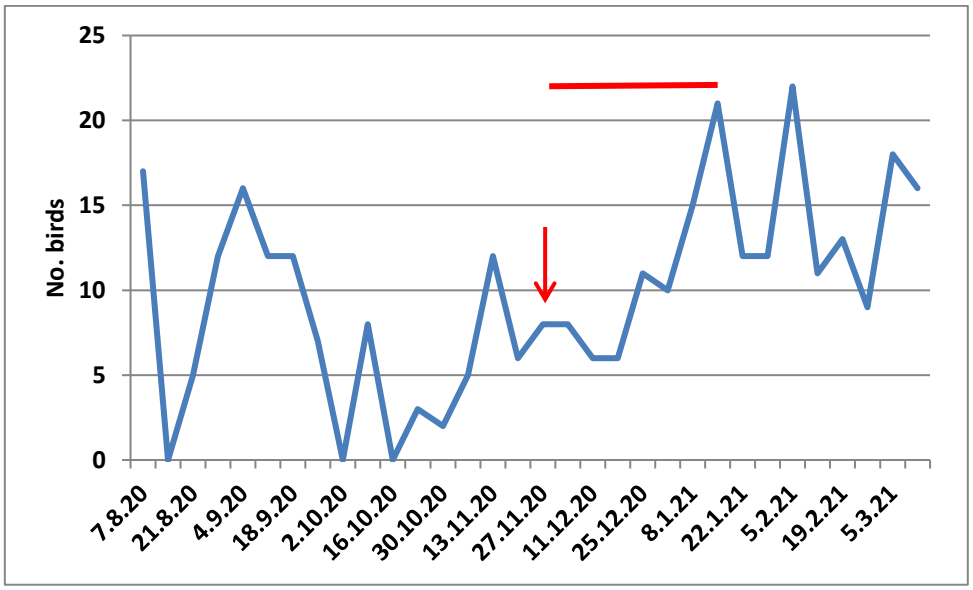


Figure 15. Numbers of Common Mynas and date when the first fledgling was noted (arrow). The bar above the graphs indicates the period when dependent young were present.

4.1.4. Occasional visitors

Table 11 provides a list of species that were seen once or on a few occasions. Several of those were just flying over the site; others spent only brief periods there. Other observers will no doubt have noted additional species.

5. Recommendations for site management

Ongoing plantings of trees are designed to enhance the value and attractiveness of the area for wildlife (Isabel Chua, Urban Treescapes, ACT Government, personal communication). These efforts are very much appreciated and those responsible are to be highly commended for their efforts.

Table 11. Species recorded on only a few occasions or flying over (Figure in brackets: number of times the species was noted; shaded species: only flying over).

Stubble Quail (1) *Coturnix pectoralis*	Australian King Parrot (4) *Alisterus scapularis*
Musk Duck (1) *Biziura lobata*	Superb Parrot (14) *Polytelis swainsonii*
Grey Teal (3) *Anas gracilis*	Horsfield's Bronze Cuckoo (1) *Chalcites basalis*
Pink-eared Duck (1) *Malacorhynchus membranaceus*	Rainbow Bee-eater (2) *Merops ornatus*
Australasian Grebe (1) *Tachybaptus novaehollandiae*	Dollarbird (1) *Eurystomus orientalis*
Rock Dove (2) *Columba livia*	White-browed Scrubwren (2) *Sericornis frontalis*
Great Egret (1) *Ardea alba*	Western Gerygone (1) *Gerygone fusca*
Straw-necked Ibis (2) *Threskiornis spinicollis*	Eastern Spinebill (2) *Acanthorhynchus tenuirostris*
Collared Sparrowhawk (2) *Accipiter cirrocephalus*	Yellow-faced Honeyeater (4) *Caligavis chrysops*
Peregrine (1) *Falco peregrinus*	White-winged Triller (3) *Lalage tricolor*
Spotless Crake (1) *Zapornia tabuensis*	Grey Butcherbird (2) *Cracticus torquatus*
Pied Stilt (1) *Himantopus leucocephalus*	Little Raven (3) *Corvus mellori*
Yellow-tailed Black Cockatoo (3) *Zanda funereus*	Rufous Songlark (1) *Cincloramphus mathewsi*
Rainbow Lorikeet (3) *Trichoglossus moluccanus*	

In this context, it is important to consider and implement several other aspects of landscape care at the site and in other similar landscapes (although this may well be happening already to varying degrees):

(1) Where possible plant trees in clusters rather than simple rows;

(2) By designed plantings of trees and shrubs, create areas that are less accessible to pedestrian traffic, and hence reduce human disturbances to bird life, especially to breeding

birds (the GDWC has some examples). This would also increase the chances that further species may settle at the site.

(3) Native shrubs are important sources of food, shelter and nesting sites for birds. The turnover time for shrubs is, of course, much shorter than for trees. The renewal, *i.e.* replanting, of native shrubs where they have become too old and are dying back is considered an important measure in enhancing the bird population, as the case of the Singing Honeyeater illustrates.

(5) Removal of invasive tree species in existing plantings, notably in areas with shrubs. Species noted are Chinese Elm, Honey Locust Tree, and oaks (*Quercus* sp.).

(6) Place (educational) signs throughout the site asking people NOT to feed waterbirds. The artificial food is of limited health benefit to waterbirds and left-over food can attract vermin. Such signs have already been erected at ponds in other areas of Gungahlin, for example at the Lyell Gillespie Corridor in Ford.

6. Concluding remarks

The GCWC is one example of a recent form of Canberra Landscape shaped by the need to better deal with urban run-off, the greatest source of pollution to our rivers and lakes. The settlement ponds come in various shapes and sizes and differ in their attractiveness to birds of wetlands. Associated abundant plantings of native trees and shrubs make these sites very valuable for many species of land birds, notably woodland species. Birdwatchers now regularly visit these sites, as the many entries in ebird show.

The survey of the GDWC is the first for this type of landscape to try and establish the composition and size of the breeding bird community and the extent to which other species use the site for foraging or as stop-over site during migration. It provides a baseline for future comparisons of the same site and with other sites. This aspect represents the greatest value of the survey.

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References

Abernathy, V.E. and Langmore, N.E. (2017): The first stages of coevolution between a brood parasite and its new host: are naïve hosts defenceless? *Emu Austral Ornithology* 117: 114-129.

ACT Government (2012) https://suburbanland.act.gov.au/en/franklin (visited 17 Jan 2021).

Amrhein, V. (2018) Wild bird feeding (probably) affects avian urban ecology. pp. 29-37. In: Gil, D. and Brumm, H. (eds.) *Avian urban ecology*. Oxford University Press, Oxford.

Bibby, C.J., Burgess, N.D. and Hill, D.A. (1992) *Bird census techniques.* Academic Press, London.

BirdLife Australia (2015) *Woodland birds of south-east Australia. Identification booklet.* https://birdlife.org.au/documents/WL_-_Woodland_ID_booklet_v7_web_1.pdf (visited 4 July 2021).

Bond, S. and Taws, N. (2006) Bringing breeding birds back: Woodland birds breeding in revegetation patches. *Canberra Bird Notes* 31: 136-141.

Bond, S., Reid, J. and Taws, N. (2010) Woodland bird breeding in revegetation sites in the greater ACT region. In: *The state of Australia's birds 2009*. Supplement to *Wingspan* 20, p. 8.

Brown, R. and Brown, M. (1985) Reports of the Middlesex Field Study Centre 183-1985. RAOU Report 23, Melbourne.

Bureau of Meteorology (2021) Monthly and daily rainfall for Canberra Airport 2020 and 2021. http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=070351 (visited 5 June 2021).

Canberra Nature Map https://canberra.naturemapr.org/categories/guide/431 (visited 19 May 2021).

Canberra Ornithologists Group (ed. P. Fennell) (2020) Annual Bird Report: 1 July 2018 to 30 June 2019. *Canberra Bird Notes* 45: 1-106.

Christine. D. (2021) Checklist: https://ebird.org/ebird/view/checklist/S82136208. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (accessed 13 June 2021).

Clark, J. (2016) Breeding of Rails, Gallinules and Coots in Gungahlin in the 2015/2016 season. *Canberra Bird Notes* 41: 225-232.

Clark, J. (2021) Unprecedented Hardhead breeding during the 2020 – 2021 season. *Canberra Bird Notes* 46: 82-84.

Clark, J. and Harris, J. (2016) Growth and development of Buff-breasted Rail chicks. *Australian Field Ornithology* 33: 90-96.

Cooper, R.M., McAllan, A.W. Brandis, C.P. and Curtis, B.R. (2020) *An Atlas of the Birds of New South Wales and the Australian Capital Territory.* Vol. 3 *Eastern Spinebill to Common Greenfinch.* New South Wales Bird Atlassers Inc., Wolgoolga, NSW, Australia.

Darwood, C. and Lenz. M. (2021) First breeding attempt by Singing Honeyeater in Canberra. *Canberra Bird Notes* 46: 51-56.

Fischer, S., Flade, M. und Schwarz,J. (2005) Revierkartierung [Territory mapping]. pp. 47-58. In: Südbeck, P., Andretzke, H., Fischer, S., Gedeon, K., Schikore, T., Schröder, K, und Sudfeldt, C. (Hrsg.) (2005). *Methodenstandards zur Erfassung der Brutvögel Deutschlands*. [Standard methods for surveying Germany's breeding birds.], Radolfzell.

Graham, B. and Clark, J. (2013) Australian Spotted Crakes breeding in Forde, Gungahlin. *Canberra Bird Notes* 40: 113-121.

Heinroth, O. and Heinroth, M. (1928, reprint 1968) *Die Vögel Mitteleuropas.* Vol. 3. *Die Nestflüchter*. Urania Verlag, Leipzig.

Henderson, S. (2021a) Three unusual breeding events for the ACT: Silver Gull, Great Crested Grebe and Blue-billed Duck – Personal observations (mostly). *Canberra Bird Notes* 46: 36-44.

Henderson, S. (2021b) Checklist: https://ebird.org/ebird/view/checklist/ S80234615. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed 5 March 2021).

Higgins, P.J., Peter, J.M. and Cowling, S.J. (Senior Eds.) (2006) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 7, Part B *Boatbill to Starlings*. Oxford University Press, Melbourne.

Higgins, P.J., Peter, J.M. and Steele, W.K. (2001) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 5, *Tyrant-flycatchers to Chats*. Oxford University Press, Melbourne.

Holland, J. (2021) Summary of the 2020-2021 Eastern Koel season in the ACT, with record numbers of fledglings. *Canberra Bird Notes* 46: 119-144.

Jones, D. (2018) *The birds at my table.* NewSouth Publishing, Sydney.

Kavanagh, R.P., Stanton, M.A., and Herring, M.W. (2007) Eucalypt plantings on farms benefit woodland birds in south-eastern Australia. *Austral Ecology* 32: 635-650.

Lenz, M. (1989) Regular double-brooding by Clamorous Reed-Warblers *Acrocephalus stentoreus* in the Canberra Region. *Australian Bird Watcher* 13: 73-77.

Lenz, M. (1990a) The breeding bird community of three Canberra suburbs. *Emu* 90: 145-153.

Lenz, M. (1990b) Multiple brood family unit of the Dusky Moorhen in Canberra. *Corella* 14: 94-95.

Lenz, M. (2007) Late breeding records for the Australasian Grebe from the Canberra Region. *Canberra Bird Notes* 32: 102-105.

Lenz, M. (2016) Effects of widespread rainfall in 2016 on birds in the Canberra region – some observations and comments. *Canberra Bird Notes* 41: 241-252.

Marchant, S. and Higgins, P.J. (Co-ords.) *Handbook of Australian, New Zealand and Antarctic birds.* Vol. 1B. *Australian Pelican to Ducks.* Oxford University Press, Melbourne.

McIntosh, R.R., Kats, R., Berg, M., Komdeur, J. and Elgar, M.A. (2003) Breeding ecology and bias in offspring sex ratio in little grassbirds (*Megalurus gramineus*). *Australian Journal of Zoology* 51: 505-514.

Mulsow, R. (1980) Untersuchungen zur Rolle der Vögel als Bioindikatoren – am Beispiel ausgewählter Vogelgemeinschaften im Raum Hamburg […function of birds as bioindicators…] *Hamburger avifaunistische Beiträge* 17: 1-270.

Nix, H.A. (1976) Environmental control of breeding, post-breeding dispersal and migration of birds in the Australian region. *Proceedings of the International Congress of Ornithology* 16: 272-305.

Oelke, H. (1974) Siedlungsdichte. In: *Praktische Vogelkunde.* In: Berthold, P. und Thielcke, G. (eds.), pp. 33-44. Kilda-Verlag, Greven.

Pizzey, G. and Knight, F. (2013) *Birds of Australia.* 1st Digital edition. Gibbon Multimedia Australia.

Rae, S. (2017) Breeding success of Tawny Frogmouths in relation to rainfall. *Canberra Bird Notes* 42: 140-145

Rae, S., Mulvaney, M., Wimpenny, C., Brawata, R., Stol, J., Davies, M., Roberts, D. and Olsen, P. (2021) Breeding success and diet of Little Eagles in the ACT and nearby NSW in 2020. *Canberra Bird Notes* 46:57-63

Recher, H. (1988) Counting terrestrial birds: Use and application of census procedures in Australia. *Australian zoological reviews* 1: 25-45.

Reid, J. (2000) *Threatened and declining birds in the New South Wales sheep-wheat belt: II. Landscape relationships – modelling bird atlas data against vegetation cover.* CSIRO Wildlife and Ecology, Canberra.

Wallace, S. (2013) Observations on the development of the Australian Spotted Crake. *Canberra Bird Notes* 40: 122-131.

Wiki 2 (Wikipedia republished) (2021) https://wiki2.org/en/Franklin,_Australian_Capital_Territory (visited 18 May 2021).

Wyllie, P. (2021) Checklist: https://ebird.org/ebird/view/checklist/ S82761872. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (accessed 5 March 2021).

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BIRDS OF MULANGGARI GRASSLANDS NATURE RESERVE JANUARY 2012 – NOVEMBER 2020

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Background

This article is based on 72 visits, documented in eBird Australia, between January 2012 and November 2020, at the Mulanggari Grasslands Nature Reserve (MGNR), located due south of the Gungahlin Town Centre (see Fig 1). The reserve (140) hectares, was established in 1995 and extended in 2014 to include an environmental offset of 22 hectares (ACT Government 2019).

The area has a long history of stock grazing; approximately one third of the reserve is exotic pasture, one third is native pasture lacking in forb diversity, and one third is Natural Temperate Grassland. On ridge tops in the west and north the grasslands grade into partially cleared Yellow Box–Blakely's Red Gum Grassy Woodland. Management of MGNR aims to improve the ecological condition and connectivity of the Natural Temperate Grassland and the habitat quality for declining woodland birds. It protects trees that have been a roosting site of the vulnerable Superb Parrot (*Polytelis swainsonii*). Grazing by cattle is conducted by ACT Parks and Conservation to reduce plant material and improve habitat for threatened species such as the Golden Sun Moth (ACT Government 2019).

Methods

I made 55 visits to the site over 8 years. The species lists were submitted to eBird Australia (eBA) and evaluated together with those of 18 other contributors. Incidental records were not included except for a few observations of raptors. A record was kept of the number of lists for each season, the reporting rate (%) and indications of breeding (b) (see Table 1). The total number of visits each year was also recorded (see Table 2). There was no plan at the outset to include all breeding records.

Most of my records were from the northern and central sections of the reserve. The aim was to identify those species that were present, which were the most common and some that did not occur. The ten most common species at MGNR were compared to the ten most common species from the Canberra Bird Blitz (Allan, 2018). In addition, field notes from eBA records were utilized to describe aspects of bird behaviour.

Results

Comments on Individual species:

Grassland Birds

Stubble Quail (*Coturnix pectoralis*). Recorded in 2 seasons from 5 checklists. They were flushed or heard only when it was a good season with sufficient grass cover.

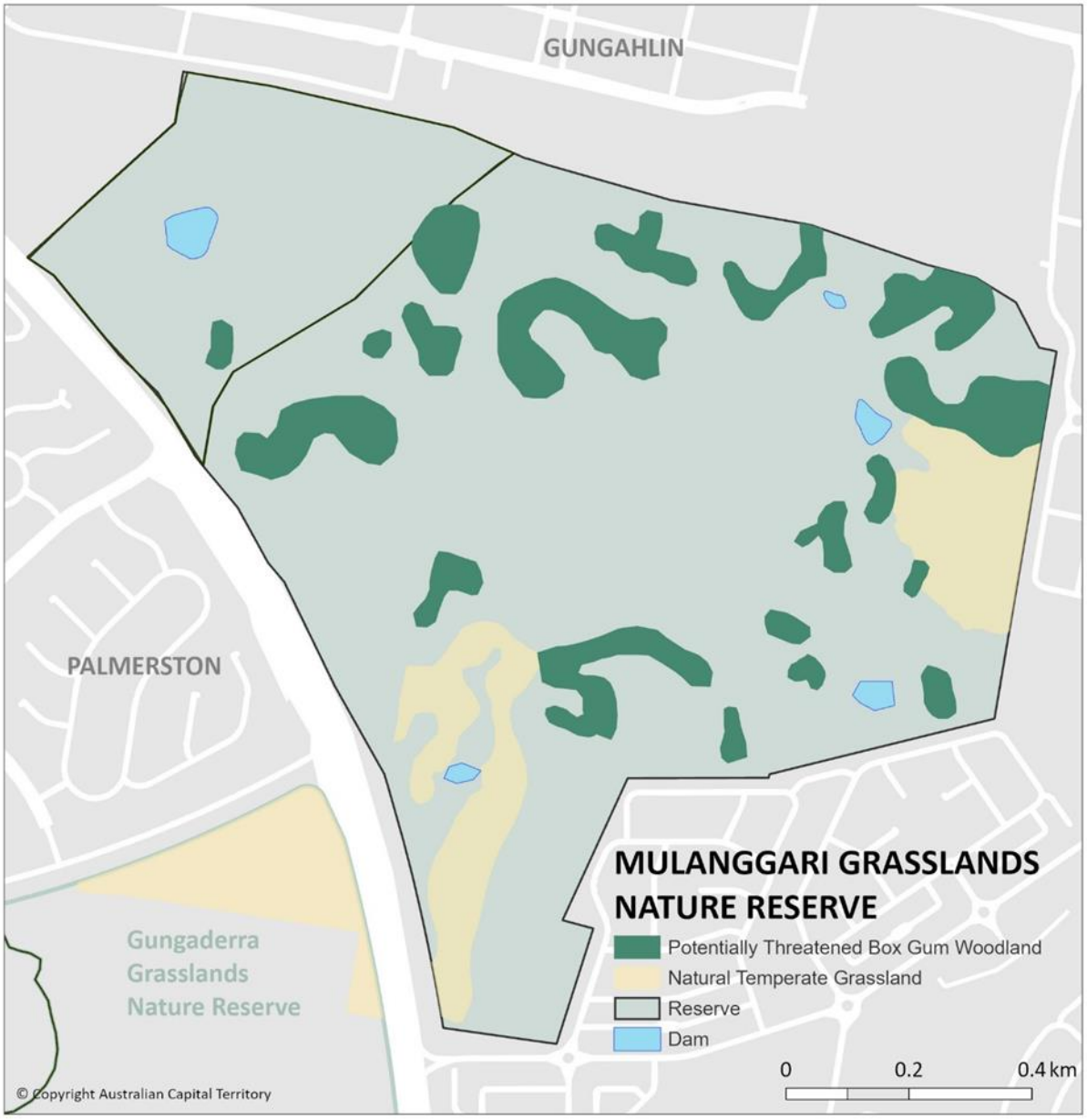

Figure 1 Map of Mulanggari Grasslands Nature Reserve *(courtesy of Jen Smits, Spatial Ecologist, Environment, Planning and Sustainable Development Directorate ACT Government).*

Eurasian Skylark (*Alauda arvensis*). Recorded over all seasons from 17 checklists. On 18 Nov 2020 two pairs were flying and singing and finally there were 5 flying together. They occupy two sites: in the environmental offset and at the southern end near the rocky knoll. They appear to be sedentary (Higgins *et al.* 2016a). The species is found in various grasslands, even in regularly grazed paddocks (Lenz and Kamprad 2019).

Rufous Songlark (*Megalurus mathewsi*). A single record on 5 Nov 2013. A common, breeding resident, found in many grasslands around the ACT (Canberra Ornithologists Group 2017). They are less likely to be found in heavily grazed areas (Taylor and COG 1992).

Table 1. Total number of lists for each season, reporting rate (%) and indications of breeding (b) January 2012-November 2020.

Species	Spring (Sep-Nov)	Summer (Dec-Feb)	Autumn (Mar-May)	Winter (Jun-Aug)
Number of lists	*33*	*13*	*10*	*16*
Stubble Quail	6.1	23.1	0.0	0.0
Black Swan	3.0	0.0	0.0	6.3 (b)
Australian Wood Duck	21.2 (b)	30.8 (b)	30.0	43.8
Grey Teal	15.2	15.4	30.0	18.8
Pacific Black Duck	15.2	38.5	0.0	18.8
Hardhead	3.0	7.7	0.0	12.5
Australasian Grebe	15.2 (b)	23.1	40.0	18.8
Rock Dove	6.1	7.7	20.0	6.3
Crested Pigeon	15.2	23.1	10.0	25.0
Great Cormorant	0.0	0.0	0.0	6.3
Little Black Cormorant	3.0	7.7	10.0	0.0
Little Pied Cormorant	12.1	7.7	0.0	6.3
White-faced Heron	3.0	7.7	0.0	6.3
White-necked Heron	0.0	7.7	0.0	0.0
Australian White Ibis	18.2	23.1	0.0	31.3
Straw-necked Ibis	39.1	23.2	10.0	6.3
Black-shouldered Kite	0.0	7.7	20.0 (b)	18.8 (b)
Wedge-tailed Eagle	3.1	0.0	0.0	6.3
Nankeen Kestrel	24.2	46.2	30.0	12.5
Australasian Hobby	0.0	0.0	0.0	18.8
Australasian Swamphen	9.1	0.0	10.0	6.3
Dusky Moorhen	3.0	0.0	0.0	12.5
Eurasian Coot	9.1 (b)	0.0	20.0	18.8
Masked Lapwing	18.2	7.7	10.0 (b)	31.3
Latham's Snipe	3.0	15.4	10.0	0.0
Yellow-t. Black Cockatoo	0.0	0.0	0.0	6.3
Galah	21.2 (b)	46.2	40.0	37.5 (b)
Little Corella	12.1	23.1	10.0	6.3
Sulphur-crested Cockatoo	24.2	46.2	40.0	43.8 (b)
Superb Parrot	15.2	23.1	10.0	12.5
Crimson Rosella	21.2	30.8	40.0	37.5
Eastern Rosella	21.2	30.8	30.0	37.5
Red-rumped Parrot	21.2	46.2	40.0	31.3
Horsfield's Bronze-cuckoo	3.0	0.0	0.0	0.0
Laughing Kookaburra	3.0	0.0	10.0	6.3
Superb Fairywren	0.0	0.0	0.0	6.3
Weebill	12.1	30.8	10.0	12.5
White-throated Gerygone	3.0	0.0	0.0	0.0
Yellow Thornbill	0.0	7.7	0.0	0.0
Yellow-rumped Thornbill	18.2 (b)	38.5	10.0	37.5 (b)
Southern Whiteface	3.0	0.0	0.0	12.5 (b)

Table 1 continued next page

Table 1 continued from previous page

Species	Spring (Sep-Nov)	Summer (Dec-Feb)	Autumn (Mar-May)	Winter (Jun-Aug)
Number of lists	*33*	*13*	*10*	*16*
Spotted Pardalote	0.0	0.0	0.0	6.3
Striated Pardalote	24.2	46.2	40.0	37.5
Yellow-faced Honeyeater	3.0	0.0	10.0	0.0
Noisy Miner	21.2	38.5	40.0 (b)	37.5
Red Wattlebird	21.2	38.5	40.0	37.2
Noisy Friarbird	12.1	0.0	0.0	0.0
Black-f. Cuckoo-shrike	24.2	30.8	30.0	12.5
White-winged Triller	9.1	0.0	0.0	0.0
Rufous Whistler	3.0	0.0	0.0	0.0
Dusky Woodswallow	3.0	0.0	0.0	0.0
Grey Butcherbird	3.0	15.4	20.0	6.3
Australian Magpie	24.2 (b)	46.2	40.0	37.5
Pied Currawong	18.2	7.7	20.0	18.8
Grey Fantail	3.0	7.7	0.0	0.0
Willie Wagtail	12.1	23.1	30.0	25.0
Australian Raven	24.2 (b)	46.2	50.0	43.8 (b)
Little Raven	6.1	0.0	10.0	0.0
Magpie-lark	21.2 (b)	46.2	40.0	18.8
Scarlet Robin	0.0	0.0	0.0	6.3
Flame Robin	0.0	0.0	0.0	12.5
Mistletoebird	3.0	0.0	0.0	0.0
Eurasian Skylark	24.2	15.4	10.0	37.5
Golden-headed Cisticola	12.1	7.7	20.0	12.5
Australian Reed Warbler	9.1	7.7	10.0	0.0
Little Grassbird	6.1	7.7	0.0	0.0
Rufous Songlark	3.0	0.0	0.0	0.0
Brown Songlark	3.0 (b)	7.7	0.0	0.0
Welcome Swallow	21.2	30.8	40.0	37.5
Tree Martin	15.2	23.1	0.0	12.5
Fairy Martin	3.0	0.0	0.0	0.0
Common Blackbird	3.0	0.0	0.0	6.3
Common Starling	24.2	30.8	30.0	43.8
Common Myna	24.2	46.2	30.0	37.5
House Sparrow	9.1	7.7	0.0	6.3
Australasian Pipit	21.2 (b)	30.8	30.0	31.3
European Goldfinch	12.1	7.7	20.0	12.5

Brown Songlark (*Cincloramphus cruralis*). Recorded in 2 seasons from 2 checklists. A single record of an immature male near Gungahlin Drive on 1 Jan 2012 (P.J. Milburn *pers. obs.*). On 19 Nov 2020 I observed one singing and a displaying male. The species is never common and prefers lightly grazed paddocks with long grass (Taylor and COG 1992). Timing of movements and numbers present can be irregular and often appear to be affected by climatic factors (Higgins *et al.* 2016b).

Grassland Birds *(Photos and Collage by Geoffrey Dabb)*

1 Stubble Quail, 2 Brown Songlark male, 3 Brown Songlark female and immature, 4 Rufous Songlark male, 5 Australasian Pipit, 6 Golden-headed Cisticola, 7 Eurasian Skylark, 8 Horsfield's Bushlark.

Australasian Pipit (*Anthus novaeseelandiae*). Recorded in all seasons from 19 checklists. It is very likely breeding, based on territorial song and distracting display. On 30 Sep 2020, one was disturbed and flew away close to the ground, fanning its tail, landing and darting into cover. At MGNR they occur at two sites: in the offset paddock beside Burgmann Anglican School and along the north/south ridge closer to Franklin. Below 1000 m, Pipits are common at all times of the year (Taylor and COG 1992).

Wetland birds

Breeding has been recorded at two of the five dams; one in the environmental offset and the other in the north-east corner. Species recorded include Black Swan (*Cygnus atratus*), Australian Wood Duck (*Chenonetta jubata*), Eurasian Coot (*Fulica atra*), Australasian Grebe (*Tachybaptus novaehollandiae*), Masked Lapwing (*Vanellus miles*), Little Grassbird (*Megalurus gramineus*), and Australian Reed- Warbler (*Acrocephalus australis*).

Latham's Snipe (*Gallinago hardwickii*). Recorded in 3 seasons from 4 checklists. The hotspot for snipe in Gungahlin is the Forde Pond-Horse Park Drive Wetland, where a

maximum of 25 was recorded on 15 Oct 2016 (Snipe Survey eBird Australia). In recent years I have recorded them at one or two wetland sites in Gungahlin. This seems to indicate a pattern of dispersal, while Forde appears to be the main roosting site.

Golden-headed Cisticola (*Cisticola exilis*). Recorded in all seasons from 9 checklists. It has been observed in dense stands of *Phalaris aquatica* and *Typha domingensis* (Southern Cattail). Territories are near the dam in the environmental offset and below the dam at the southern end.

Woodland birds

Black-shouldered Kite (*Elanus axillaris*). Recorded in 3 seasons from 6 checklists. It has been seen mainly in the eastern half and has exhibited behaviour indicating breeding. On 20 Mar 2016 a pair together were making territorial calls and chasing Australian Magpies away. On 24 Apr 2016 two were flying together, then one landed in the top of a eucalypt and continued calling, while the other swooped me twice giving alarm calls.

Wedge-tailed Eagle (*Aquila audax*). Recorded in 2 seasons from 2 checklists. On 22 Aug 2018 I observed a pair trying to catch a European Hare (*Lupus europaeus*). One eagle was on a fallen log, the other on the ground nearby, unable to catch the hare which kept close to the log. It was a stalemate. The trio stayed still as if exhausted. Other birds, including Australian Magpies, Australian Ravens and a Pied Currawong, harassed them. After 10 minutes the Wedge-tailed Eagles flew off and the hare escaped. Three incidental records: I observed 2 on 11 Apr 2016 at 10.15 h circling low over the rocky knoll. At 11.15 h on the same day 2 were observed by Patrick Wylie. On 25 Dec 2017, 3 were seen circling and mobbed by a Nankeen Kestrel (Archer Callaway *pers. commun*.).

Nankeen Kestrel (*Falco cenchroides*). Recorded in all seasons from 19 checklists and is the most common raptor. A pair have been seen flying together.

Australian Hobby (*Falco longipennis*). The three records were of a single bird on 30 Jun, 25 Jul and 14 Aug 2020.

Little Corella (*Cacatua sanguinea*). Recorded since 2015, maximum 12 on 15 Feb 2020.

Superb Parrot (*Polytelus swainsonii*). Status vulnerable. Recorded over all seasons from 15 checklists. They tend to stick to the band of trees at the northern end of the reserve. When making local foraging movements, usually move along wooded corridors, rarely crossing areas of open ground; clearance of corridors used for local and longer movements is considered a threat to the species (Higgins et al. 1999).

The following members of the cockatoo and parrot families were doing well; Galah (*Eolophus roseicapilla*), Sulphur-crested Cockatoo (*Cacatua galerita*), Crimson Rosella (*Platycercus elegans*), Eastern Rosella (*Platycercus eximius*) and Red-rumped Parrot (*Psephotus haematonotus*). In good seasons, when there was long grass, I observed Eastern Rosellas and Red-rumped Grassparrots perching on fencing wire to reach tall seed heads.

Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) Recorded over all seasons from 18 checklists, numbers range between 2 and 10, with a maximum of 24 on 28 Jun 2017. They tend to follow the tree line from the south east to the north west.

Southern Whiteface (*Aphelocephala leucopsis*) Recorded over 3 seasons. They have occurred in association with the Yellow-rumped Thornbills. Possible breeding on 17 Aug 2016, when one took a white feather into a tiny hollow in a fallen branch on the ground.

Noisy Miner (*Manorina melanocephala*). Occupy and breed in woodland areas. The heaviest concentration is in the woodlands of the north-east corner.

Australian Magpie (*Cracticus tibicen*). Permanent resident with territories occupying most of the reserve.

Pied Currawong (*Strepera graculina*). Infrequent visitors, tending to keep to the boundaries. They are more often heard from nearby suburbs.

Australian Raven (*Corvus coronoides*). The most commonly recorded species. They are present throughout the year and nest at sites where suitable tall trees occur.

Scarlet Robin (*Petroica boodang*). A single record of a male on 30 Jul 2015.

Flame Robin (*Petroica phoenicea*). Recorded twice; a female on 24 Jun 2018 and a male on 27 Jul 2019, both in the same location, on the valley floor near a thicket of trees towards the southern end.

Tree Martin (*Petrochelidon nigricans*). It is a spring migrant that has used two eucalypts with multiple hollows. The maximum number recorded was 11 on 9 Sep 2016.

Common Starling (*Sturnus vulgaris*). Occur in flocks throughout the reserve.

Common Myna (*Sturnus tristis*). Occur and breed throughout the reserve. No breeding was recorded in eBA although I have observed them entering and leaving suitable breeding holes in trees.

Some species which do not occur

All cuckoos, except one Horsefield's Bronze-cuckoo (*Chalcites basalis*) on 2 Oct 2019. I have heard the Eastern Koel (*Eudynamys orientalis*) nearby in Palmerston on a number of occasions and Pallid Cuckoo (*Cocomantis pallidus*) once in Gungahlin, but not recorded them.

White-throated Treecreeper (*Cormobates leucophaea*), Eastern Spinebill (*Acanthorhynchus tenuirostris*), White-plumed Honeyeater (*Lichenostomus pencillatus*), Striated Thornbill (*Acanthiza lineata*), Buff-rumped Thornbill (*Acanthiza reguloides*), Brown Thornbill (*Acanthiza pusilla*), and Grey Shrike-thrush (*Colluricinla harmonica*).

Summary and Discussion

Although MGNR is described as a grassland, there have been less than ten grassland species recorded while over 70 woodland and wetland species have. It is not surprising that the 10 "most commonly recorded" species in MGNR are woodland birds. When these 10 are compared with the ten most common species in the Canberra Bird Blitz of 2018, five occurred in both lists; Australian Magpie, Red Wattlebird, Sulphur-crested Cockatoo, Australian Raven and Galah. The other five in the blitz; Pied Currawong, Crimson Rosella, Grey Fantail, Magpie Lark, and Yellow -faced Honeyeater were replaced in the MGNR list by Red-rumped Parrot, Noisy Miner, Striated Pardalote, Common Starling and Common Myna. The predominance of grasslands and the scattered distribution of woodlands with sparse understorey has resulted in fewer woodland species being present. Pest species like Noisy Miner, Common Starling and Common Myna have thrived.

Of the grassland species, only two, Australasian Pipit and Eurasian Skylark, appeared to be sedentary. This is consistent with results from the breeding grassland bird community on farmland at Lake George (NSW) (Lenz and Kamprad 2019.)

There were 72 lists submitted for the survey period. There were variations in the number of lists for each season and the number of visits each year (see Tables 1 and 2). Visits varied in time spent on site, the distance covered and methods of recording. Some incidental records of raptors were mentioned in the text. Of the 36 possible seasons for records, 12 had none because there were fewer visits in autumn and summer. The number of spring visits was more than double that for the other seasons. The number of visits each year ranged from lows of 2 in 2012 and 1 in 2014 to highs of 10 in 2016 and 14 in 2020 excluding December.

One weakness in the data was that no breeding was recorded for species which probably did, including Common Starling, Common Myna and Striated Pardalote even though they were among the ten most common species. The quality of the data is therefore affected by the skewed nature of seasonal reporting and numbers of visits each year, the experience of the contributors and the differences in length of time for each survey. MGNR differs from other ACT grassland reserves in that it has suburbs on four sides. The data did not show what was happening in the areas outside the reserve; Gungaderra Grasslands Nature Reserve, Palmerston, Gungahlin and Franklin. These suburbs have been established for about 20 years and have gardens with trees, shrubs and understory that support species like Superb Fairywrens, honeyeaters and thornbills, House Sparrows and Common Blackbirds.

Table 2. Total Number of visits each year

2012	2013	2014	2015	2016	2017	2018	2019	2020
2	7	1	8	19	7	7	7	14

The management aim of MGNR, to improve the ecological condition and connectivity of the Natural Temperate Grassland and the habitat quality for declining woodland birds, is being fulfilled. Ecological grazing, controlled burns, weed spraying and the management of kangaroo numbers has made the reserve more bird friendly. In recent years there has been a good regrowth of acacia and eucalyptus spreading out from mature trees. Although there are not so many woodland species as on Mulligans Flat Nature Reserve nearby, MGNR does provide connectivity for seasonal or altitudinal migrants like Lathams Snipe, Flame and Scarlet Robins, White-winged Trillers, Dusky Woodswallows, Brown Songlarks and Tree Martins. Although eBA has its limitations, it has been able to yield data which otherwise may not have become available. It encourages birders to survey in new areas. It is a convenient system for storing and accessing data. It gives an idea of what is happening at MGNR and how important the reserve is for birds.

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References

ACT Government (2019) *Canberra Nature Parks and Conservation Draft Management Plan* 2019, p. 144.

Allan, B. (2019) The Canberra Bird Blitz 2018. *Canberra Bird Notes* 44: 169-187.

Canberra Ornithologists Group (2016) (ed. P. Fennell) Annual Bird Report: 1 July 2015 to 30 June 2016. *Canberra Bird Notes* 42: p. 84.

eBird Australia, a branch of Cornell Lab of Ornithology, Cornell University 159 Sapsucker Woods Rd, Ithaca, New York.

Higgins, P.J., Peter, J.M. and Cowling, S.J. (1999) *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 4: *Parrots to Dollarbird*. Oxford University Press, Melbourne.

Higgins, P.J., Peter, J.M. and Cowling, S.J. (2006a) *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 7, Part A: *Boatbill to Larks*. Oxford University Press, Melbourne.

Higgins, P.J., Peter, J.M. and Cowling, S.J. (2006b) *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 7, Part B: *Dunnock to Starlings*. Oxford University Press, Melbourne.

Lenz, M and Kamprad. J (2019) Composition and estimate of the size of the breeding grassland bird community on farmland at Lake George (NSW). *Canberra Bird Notes* 44: 271-285.

Taylor, M. and Canberra Ornithologists Group (1992) *Birds of the Australian Capital Territory- An Atlas.* Canberra Ornithologists Group and National Capital Planning Authority, Canberra. p. 150.

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THE MAULBROOKS ROAD BIRD STUDY SITE, MORUYA NSW: AFTER 18 YEARS OF COLLECTING DATA, WHAT HAVE WE LEARNED?

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Stephen Marchant (Sarah's and Richard's father) studied the breeding ecology of the bird community on this 10ha site from 1975-1984 inclusive (Fig. 1). He set up the original 50m grid. He was out on the site most days during the breeding season, colour-banded the birds he found and monitored their nests, and recorded everything in terms of co-ordinates on the grid. He left the property in 1998.

Figure 1. Aerial photograph of the site. The boundaries of the picture are much the same as the 10ha site. The dirt road to the east is Maulbrooks Road. Sarah's and Michael's house is in the SE corner.

Sarah and I arrived in Moruya in 2004, and eventually found all the reinforcing rod markers that marked the intersections of the tracks on the site (Fig. 2). We re-established the grid, which was completely overgrown, and set about teaching ourselves how to repeat Stephen's study of 30 years earlier. By the breeding season of 2007, we considered ourselves suitably accomplished, and proceeded to collect data (and ticks!) for the next eight years.

Much of Stephen's data was available in Occasional Publication No.1, which was published under the auspices of the Eurobodalla Natural History Society (ENHS) in 1992. However, many of his observations were written on Nest Record Cards. These included the colour bands of the pair at each nest, nest co-ordinates on the grid, and the progress of the nests. At the end of each season these cards were sent to the Nest Records Scheme, run by what was then called the Royal Australasian Ornithological Union, which has since become BirdLife Australia. Stephen started the Nest Record Scheme in 1964, soon after he arrived in Australia, basing it on a similar scheme (highly successful to this day) in the UK. We managed to get hold of all of his Nest Record cards from BirdLife Australia, which gave us access to a lot more of Stephen's observations, as well as much more detail. His Occasional Publication and his Nest Record cards were crucial in enabling us to add his data to ours, producing a comprehensive set of data that comprised up to 18 years of observations, over a period of 39 years.

Figure 2. Intersection of two tracks, marked by a 50-year-old reinforcing rod (right foreground), looking East.

Before we summarise the conclusions that can be drawn from these studies, it is important to draw attention to several aspects of the studies which render them reliable, significant and informative. First, separately, and especially when combined, the two studies can be considered long-term. Long-term studies are often the only way of uncovering links between the environment and the biology, as many environmental changes either happen very slowly, in small increments, or occur in cycles which can have long periods. Long-term studies are rare, as they require a commitment which is usually not practical, or even feasible. Second, the study was focussed on the breeding biology of the birds, which necessarily requires a lot of time and effort; again, luxuries which are often not available. But despite the problems involved, it is important to study breeding stages. It is the most important part of a bird's life cycle, the *raison d'être* of their existence, as it is for all species on the planet. Hence the ecology of breeding, and the place and habitat in which breeding occurs, are of unique significance, and every other activity is directed at increasing the success of breeding. Third, the study is unusual not only because it covers a long period. It is also unusual in that daily observations were made which produced a level of detail seldom seen in published work. There are certainly no comparable studies which have been done in Australia, and few, if any, world-wide.

What can we conclude from the data accumulated during these studies? In summary, the two studies have identified a variable that predicts when the birds will start breeding, and how many of them will breed. The data have also shown what determines the success rates of the nests when they do breed. We therefore understand what influences three processes (there are others) which are fundamental in determining how many fledglings are produced on the site each season. We will look at each of these processes in turn.

First, the timing of breeding. One factor that has a significant effect on when the various species lay their first egg is the average Southern Oscillation Index (SOI; see Footnote ENSO) over the four months before the beginning of the season, from April to July inclusive. The SOI varied from -13.4 to 14.3 over the course of the two periods of study, and the timing of breeding changed by about one day for each change in the SOI by one unit. Second, the same is true for the numbers of pairs that breed on the site. 70% of the change in the numbers of breeding pairs from one season to the next was explained by changes in the SOI. Third, when nesting did occur, success (to fledged young) was almost entirely determined by nest predation; 90% of nest failures were the result of predation.

The combined study however, offers more than insights into the breeding ecology of the community on Maulbrooks Road. Due to the long-term nature of this study, the data can also offer an insight into the vexed question of the effect of climate change on biological systems. During both studies, temperature (in a Stevenson Screen) and rainfall were measured, under conditions that approximated those required for an official BOM meteorological site. Stephen's measurements ceased in 1997, and ours did not start until 2004, so there was about a 7-year gap in the records from our site. But serendipitously, the Moruya Pilot Station meteorological site (about 9km to the SE of the site) is one of the oldest in Australia, with measurements going back over 100 years. Since global surface temperature change is one of the most obvious results of climate change, we used the long-term data from the Pilot Station, which contains no gaps, to investigate the effects of long-term temperature change on two of the aspects of breeding ecology on the site discussed above, *i.e.* the timing of breeding and the numbers of breeding pairs.

Mean monthly maximum and minimum temperatures at the Pilot Station, calculated over a year, increased between 1975 and 2014 by about 1 °C. Neither the timing of breeding, nor the numbers of breeding pairs was related to the increases in temperatures, maximum or minimum. Similarly, they were also not related to time, which itself is related to temperature. The lack of correlation with time or temperature is predictable, as the data on both the timing of breeding and the numbers breeding are strongly related to the SOI, which itself is not related to time.

So on this site, neither the timing of breeding, nor the numbers that breed each season, were affected by the temperature component of climate change, between 1975 and 2014. There may be some other aspect of climate change that is affecting the breeding ecology of the birds on this site, but it is not related to temperature or time. El Niño Southern Oscillation (ENSO)[1] itself might be in the process of being affected by climate change, but it is difficult

[1] ENSO. The rainfall of southern and eastern Australia is associated with oscillations in the wind patterns in the tropical and subtropical Pacific Ocean. This is called the El Niño Southern Oscillation (ENSO). The state of this oscillation is quantified using the Southern Oscillation Index or SOI. ENSO cycles recur every 5-7 years, and in general more rainfall occurs when the index is positive and less when it is negative. The average April-July SOI was not related to linear time over the period of the two studies.

to imagine such a process that is not related to time. There are almost certainly other factors, not related to either SOI or climate change, that affect breeding on our site, but they are unknown at this time.

We think our conclusions are important when considering conservation strategies for the bird community of the NSW Spotted Gum forests. The numbers of breeding birds, the timing of breeding, and the numbers of fledglings produced will fluctuate over time. But if one is to determine acceptable limits to any of these changes, fluctuations due to ENSO must be taken into account, just as tidal fluctuations must be taken into account when trying to estimate changes in mean sea levels.

We are left with two questions, the answers to which are essential for a complete understanding of the breeding ecology of the bird community on the site. First, what is it that the birds are sensing, in the four months before the breeding season starts, which determines how many of them will initiate breeding, and when they will start? Second, we know the nesting success rate, to the fledgling stage, and we know what determines it, but we have no information on how many of these fledglings survive to become breeding birds. These two questions expose a gap in our understanding of this community which urgently needs filling.

References

Marchant, S. (1992). A Bird Observatory at Moruya, NSW 1975-84. *Eurobodalla Natural History Society* Occasional Publication No.1.

Marchant, R., Guppy, S. and Guppy, M. (2016) The influence of ENSO and rainfall on the numbers of breeding pairs in a woodland bird community from south-eastern Australia. *Emu* 116: 254-261.

Guppy, M., Guppy, S., Marchant, R., Priddel, D., Carlile, N., and Fullagar, P. 2017. A study of nest predators in a woodland bird community in south-east Australia reveals unexpected predators and marked changes with each breeding season. *Emu* **117**, 92-96.

Marchant, R., Guppy, M., Guppy, S. (2021) The influence of the Southern Oscillation Index on the timing of breeding in a forest bird community in south-eastern Australia. *Wildlife Research* 48 (in press). DOI: https://doi.org/10.1071/WR21004

Guppy, M., Overs, A., Guppy, S. (2021) A detailed description of the breeding season of a community of birds on the south-east coast of Australia. *Australian Zoologist* 21 (in press). DOI: https://doi.org/10.7882/AZ.2021.014.

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WATERBIRD BREEDING AT LAKE BATHURST, NSW, AFTER PARTIAL REFILLING IN 2020

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Abstract. *Lake Bathurst and The Morass, a lake system within the Canberra Ornithologists Group's Area of Interest, dried up in 2017. It refilled partially after good rain in 2020/2021. In response, seven species of waterbirds started to breed once islands had formed in the lakes. Most Black Swans* (Cygnus atratus) *nested between October and December, although a low level of breeding was recorded for eleven months. Cygnets suffered high mortality, most likely due to frequent rain. The highest number of nests at one time for Hoary-headed Grebes* (Poliocephalus poliocephalus) *was 51. Fluctuations in water levels resulted in nest failures. Some birds made two further attempts until mid February, but no young were produced. At the Southern Morass, Pied Stilts* (Himantopus leucocephalus) *commenced breeding. However, all 77 nests, a record number, became flooded; 11 pairs attempted to re-nest, but also failed. A further 200 or more birds showed territorial behaviour at Lake Bathurst, but except for a few pairs, no nesting was observed. The other species breeding were Australian Shelduck* (Tadorna tadornoides) *[2x], Australasian Shoveler* (Spatula rhynchotis) *[1x], Grey Teal* (Anas gracilis) *[9x] and Silver Gull* (Chroicocephalus novaehollandiae) *[one colony with dependent young until mid February]. Very high numbers of Banded Lapwing were also recorded in October 2020.*

1. Introduction

The Lake Bathurst system, within COG's Area of Interest, consists of the main lake (Lake Bathurst) and two smaller lakes, the Southern and Northern Morass (collectively The Morass), which are separated from the main lake by a 500 m wide ridge. When full, Lake Bathurst extends to about 1350 ha and its depth can reach 7 m, and the two parts of the Morass can reach 125 and 300 ha respectively (Braithwaite 1982; Abel 1995).

From April 1980 onwards, the author has organized monthly COG waterbird surveys (WBS) at these lakes when holding water (except for the Northern Morass, which was accessible only for a limited period), with several other COG members and observers or on his own (Lenz 2014). During the survey period, Lake Bathurst has never reached its full capacity. Between 1989 and 1993 it had a maximum depth of 3.3 m (Abel 1995). For periods the lake and The Morass have been dry, at other times only partially filled. At lower water levels, Lake Bathurst is separated into a larger East and a smaller West Basin with smaller pools of varying sizes or none in between (Fig. 1; Lenz 2014, 2019). Waterbirds move between the different parts of the lake system.

Lake Bathurst and The Morass had dried out again by May 2017. From February 2020 onwards drought-breaking rains began to fall (Fig. 2). The lakes started to refill partially and again attracted waterbirds. Some species started to breed. This article summarises breeding observations over the period June 2020 - June 2021.

2. Observations

2.1. Chronology of the refilling of the lakes

The rainfall in the area (measured at Bundong Station at the Northern Morass) for 2020 totalled 1108 mm, and another 592 mm for the first half of 2021 (Fig. 2). The corresponding figures for Canberra Airport were 790 mm and 406 mm (Bureau of Meteorology 2021), *i.e.* the Lake Bathurst area received 42% more rain than Canberra.

2.1.1. Lake Bathurst

Lake Bathurst is sustained by groundwater discharge (Abel 1995). The nearly 200 mm of rain in February 2020 and around 100 mm each in the two following months (Fig. 2) did not result in any surface water on the lake (East and West Basin), except for a few temporary puddles. The lake was still dry in mid July, a clear indication of how much the groundwater level had fallen during the previous severe drought. During the first half of August rainfall reached again close to 200 mm. At the visit on 18 Aug 2020, a large area of both basins was under water, indicated schematically for the East Basin by the inner (red) ellipsoid in Fig. 1, and waterbirds had returned to the lake. The extent of area under water fluctuated over the following months (Table 1) and reached its maximum in March 2021 (Fig. 1, outer (yellow) ellipsoid), when for the first time in many years the East Basin was connected with a smaller pool of water just to the West of it (Fig. 1).

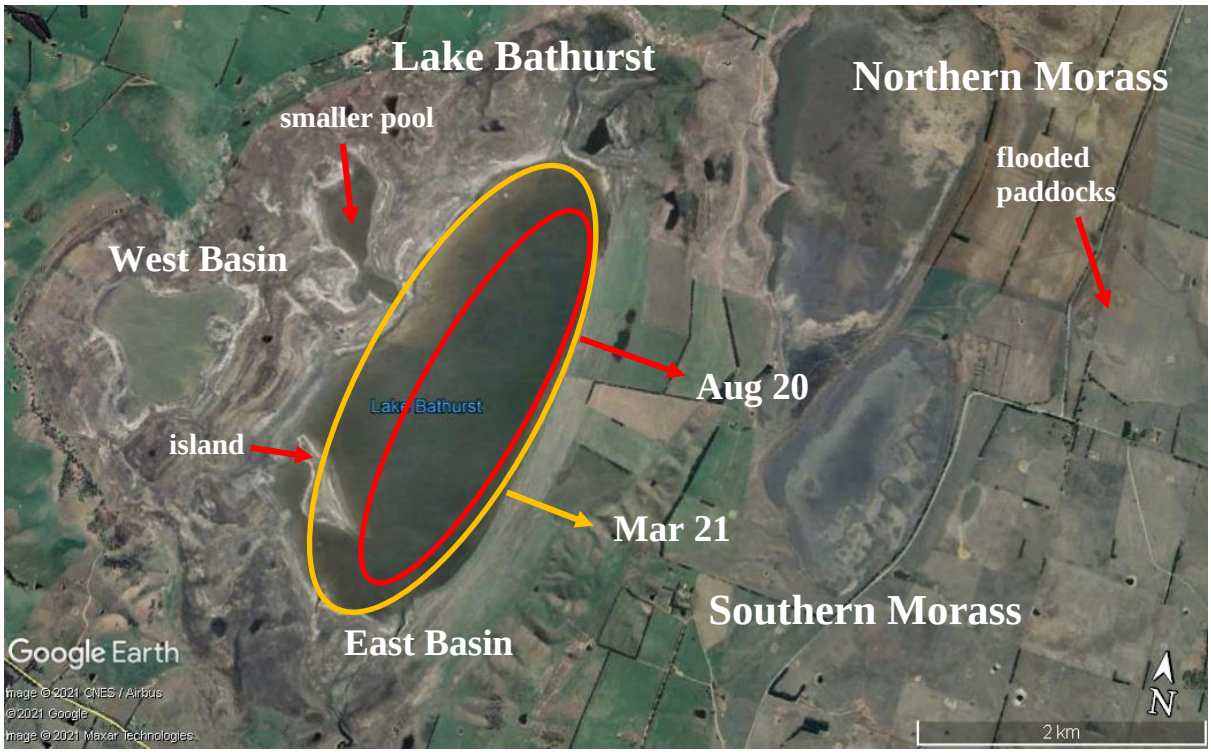

Figure 1. Image of Lake Bathurst and the Morass from Google Earth Pro, taken on 9 May 2020 (accessed 23 August 2021). Schematic representation of the extent of water in the East Basin: Inner (red) ellipsoid: August 2020; outer (yellow) ellipsoid: March 2021 [see text for details]**.**

2.1.2. Southern Morass

The Morass is fed by creeks (Abel 1995). In contrast to the main lake, the Southern Morass filled much earlier. It already had surface water in mid February. Paddocks 1.5 km to the

NE were flooded with water which normally drains along a creek into the Southern Morass. For some reason the culvert underneath Lumley Road in the creek line must have been blocked. However, during the visit on 12 March water from the paddocks was rushing through the culvert and along the creek down to the Morass. The scenario was similar on 18 Aug 2020: a build-up of water in the paddocks after heavy rainfall; the water had drained again by 1 Oct 2020. As Table 1 indicates, water levels fluctuated over following months, with a peak in late October. The number of islands varied from 2 to 7 and they shrank or increased with rising or falling water levels (Table 1).

Table 1. Observations on the status of the Lake Bathurst system during visits between February 2020 and June 2021. The figures for areas under water are only rough estimates.

Date of visit	Rain between visits [mm][1]	Status of the lakes (area under water)		
		Lake Bathurst		Southern Morass[4]
		East Basin[3]	West Basin[3]	
17 Feb 20	186[2]	few pools of water	few pools of water	35 ha; flooded paddock to NE
12 Mar 20	102	dry	dry	60 ha under water, 7 islands (water from paddock had drained into S. Morass)
06 Jun 20	166	dry	dry	50 ha, 7 islands
18 Jul 20	43	dry	dry	as before
18 Aug 20	216	240 ha	55 ha	80 ha; 2 islands; (flooded paddock to NE)
01 Oct 20	70	180 ha	50 ha	60 ha; 7 islands (water from paddock had drained into S Morass)
28 Oct 20	94	240 ha	55 ha	70 ha; 4 islands left
11 Nov 20	117	------	------	70 ha
25 Nov 20	42	290 ha	65 ha more water in pool between E and W Basin	------
02 Dec 20	2	------	------	60 ha; 7 islands
21 Dec 20	48	240 ha	55 ha	60 ha
20 Jan 21	44	220 ha	50 ha	60 ha
17 Feb 21	116	190 ha	40 ha	50 ha
18 Mar 21	90	------	------	60 ha; 7 islands
25 Mar 21	171	480 ha	80 ha	------
21 Apr 21	0	400 ha	65 ha	50 ha
26 May 21	83	400 ha	65 ha	50 ha
16 Jun 21	65	400 ha	50 ha	50 ha

[1] Amount of rainfall between visits based on daily records at Bundong Stn. *(courtesy of Mark Quinlan)* from 1 Jan 2020;[2] Only 23 mm of rain fell in January 2020;

[3] On 21 Mar 2021 the East and West Basin were filled to the greatest extent in the observation period (480 ha and 80 ha respectively; area estimated with polygon function in Google Earth Pro), when the East Basin was connected with the pool of water on its western edge; values for other dates are estimates based on the March 21 value;[4] Similar approach for Southern Morass: maximum area under water: 80 ha on 18 Aug 2020.

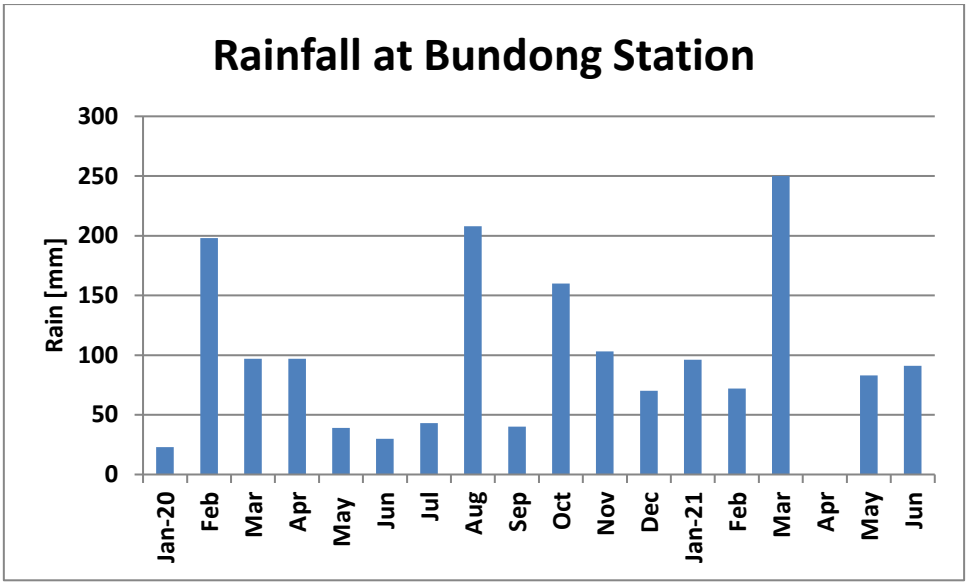

Figure 2. Rainfall record from January 2020 to June 2021 from Bundong Station, located 800m from the NW corner of the Northern Morass *(Courtesy of Mark Quinlan)*.

2.2. Waterbird breeding

Seven species of waterbirds were recorded breeding. A further species, the Masked Lapwing (*Vanellus miles*), certainly bred as well, but it was not possible within the constraints of these surveys to detect and monitor potential breeding of the species, which was present throughout the wetlands.

Most breeding of the waterbirds occurred on islands. Only in a few cases was it possible to get a full view of these islands, hence numbers of nests could have been higher than reported.

BLACK SWAN (*Cygnus atratus*)

Breeding activity was recorded between June 2020 and May 2021 (Table 2). The first bird on a nest was seen on 6 Jun 2020. In June/July very little nesting material was available on islands at the Southern Morass. Swans could only build very flat modest structures, which extended little beyond the incubating birds, using stalks of thistles and other weeds, and some grass. At the East Basin of Lake Bathurst the large island in the southern part (Fig. 1) was the nest site for swans. Fluctuations in water level may have allowed foxes access to the island at times.

From the Southern Morass and the East Basin a total of 77 recently hatched cygnets (22 families) were counted on 28 Oct 2020. Two weeks later only 26 cygnets remained (Table 2). High rainfall at that time (Fig. 2) may have contributed to the early death of many cygnets. Small numbers of pairs were found on nests until the end of May 2021.

AUSTRALIAN SHELDUCK (*Tadorna tadornoides*)

Two broods were recorded: 28 Oct 2020 a pair with 6 small ducklings on the Western Basin of Lake Bathurst. On 2 Dec 2020 a pair with 4 older young was seen on the Southern Morass.

AUSTRALASIAN SHOVELER (*Spatula rhynchotis*)

One brood was raised on a pond at a gravel pit at the western edge of Lake Bathurst: 21 Dec 2020 a female with 3 ducklings; 20 Jan 2021 the 3 young were close to independence. There exist only a couple of breeding records for this species from Lake Bathurst/Morass over the 41 years of the WBS.

Between February and December 2020 only 30 to 45 birds were present. On the East Basin of Lake Bathurst, notable numbers were 325 birds on 20 Jan 2021 and a maximum of 660 on 17 Feb 2021.

Table 2. Records of Black Swan breeding and number of swans present at the Southern Morass and the East Basin of Lake Bathurst.

Date	Southern Morass		East Basin Lake Bathurst[1]	
	No. birds	Breeding activity	No. birds	Breeding activity
06 Jun 20	119	1 on[2]	dry	
18 Jul 20	174	10 on; 3+4 small cygnets; only thistle stalks + little grass for nest material	dry	
18 Aug 20	75	2+5 cygnets	10	
01 Oct 20	46	22 on; 3 cygnets.	11	6 (?) nests on south. island (see Fig. 1)
28 Oct 20	82	55 cygnets (16 families)	117	22 small cygnets, max. 7 (6 families)
11 Nov 20	50	5 on; 17 cygnets left, likely that many died in heavy rains (see Table 1)	22	only 9 cygnets left
02 Dec 20	45	7 on, 4x cygnets	---	------
21 Dec 20	58	2 on, 3x cygnets	144	2x cygnets
20 Jan 21	32	1 on	233	no cygnets
17 Feb 20	64	2 pairs with small cygnets	340	1 on; 3 started nests built of aquatic plants, in shallower water, but given up as water level falling
18 Mar 21	79	2x cygnets, size ½ of ad.	---	------
25 Mar 21	---	-----	184	
21 Apr 21	55	1 cygnet, size ⅓ of ad.	228	
26 May 21	51	1 on, 3 cygnets	98	1 on
16 June 21	64	2 cygnets, size ⅓ of ad.	172	

[1] Swans also present at West Basin, but no breeding (no islands); [2] Occupied nest.

GREY TEAL (*Anas gracilis*)

Between 28 Oct 2020 and 21 Apr 2021, 9 broods were recorded: 8 on the Southern Morass and one on the East Basin of Lake Bathurst. (Table 3). Among the islands on the Morass was only one that provided denser vegetation for nests. At the East Basin of Lake Bathurst, it was only during March 2021 that the lake filled enough (Table 1) to enclose an outcrop of granite boulders which provided a safe nesting site for the ducks.

The numbers of young per brood ranged from 6 to 12, with a median of 6. In all cases a pair of adults accompanied the ducklings.

Table 3. Records of Grey Teal broods and number of birds at the East Basin of Lake Bathurst and the Southern Morass.

Date	No. broods (ducklings)	Lake	Grey Teal numbers	
			S Morass	EB L Bath.
28 Oct 20	1 (3)	S Morass	43	90
02 Dec 20	3 (4, 7, 10)	S Morass	505	680 (21 Dec)
18 Mar 21	4 (4, 5, 6, 12)	S Morass	58	17 (25 Mar)
21 Apr 21	1 (6)	EB L Bath	19	152

Table 4. Records of Hoary-headed Grebes breeding and number of grebes present at the Southern Morass and Lake Bathurst.

Date	S Morass			EB L Bath	WB L Bath	
	No. birds	No. nests	Comments	No. birds	No. birds	No. nests
18 Aug 20	180			16		
01 Oct 20	---	---	------	186	16	
28 Oct 20	150	49		623	224	
11 Nov 20	240	51	most nests flooded; being repaired or new ones being built	----	----	
25 Nov 20	---	---	------	305	155	1 in emerging shore vegetation
02 Dec 20	480	48	with lower water level, some nests on dry land of the islands	---	---	
21 Dec 20	620	7	most nests flooded earlier in month, possibly due to a 'fetch' (see text), no rise in water level	260	18	no sign of nest
20 Jan 21	---	---	------	145	29	
17 Feb 21	400	25	7 existing nests, 18 new ones at early stage in area with emerging island	278		
18 Mar 21	430	no nests		---	---	---
25 Mar 21	400			680	2	
21 Apr 21	10			106	15	
26 May 21	0			4	1	
16 Jun 21	6			600		

HOARY-HEADED GREBE (*Poliocephalus poliocephalus*)

Hoary-headed Grebes tend to prefer larger bodies of water with submerged vegetation. In response to rainfall, the species can gather in large numbers at inland lakes after they fill (Marchant and Higgins 1990). They breed as single pairs or in colonies. Lake Bathurst is one of the few lakes in Australia for which good documentation of mass nesting events exits (Lenz 2019). Whenever islands are available on the main lake and The Morass during the breeding season, Hoary-headed Grebes may nest. They build their nests in lines or clusters close to the shores of islands (Lenz 2019).

By the end of October 2020 49 nests were either occupied or still under construction on a few islands on the Southern Morass (Table 4). Two weeks later, after good rainfall (Table1), most nests had become flooded. Some of these were either being repaired or replaced with new ones. The total number of nests remained almost the same (51), indicating that the number of breeding pairs had not changed. On 2 Dec 2020 48 nests were still present (Table 4), although some were now on dry land on the islands (but close to the shore) and still occupied.

By the end of December, most nests were flooded again although the water level had not risen and rainfall was not exceptional (Table 1). With prevailing westerly winds, water can temporarily be pushed up by wind action (a 'fetch'; Abel 1995), sufficiently high to flood the nests, as has happened in the past at these lakes (Lenz 2019). In mid February another 18 nests were under construction in the area of an emerging island. More rain terminated those breeding efforts as well.

Another feature of the season was the wide fluctuations in the numbers of Hoary-headed Grebes across the lakes (Table 4). On two occasions (December 2020, March 2021) about a thousand grebes were recorded, not the highest numbers for the site, but still notable (Lenz 2019).

PIED STILT (*Himantopus leucocephalus*)

This species has bred several times at Lake Bathurst and the Southern Morass in the past. Successful breeding was last recorded in February 2011 at the East Basin of Lake Bathurst (Lenz 2018) and at the Southern Morass in December 2016 (Lenz 2016).

Numbers of stilts built up in October 2020, and by the end of the month there were 77 occupied nests on islands in the Southern Morass and one at Lake Bathurst (Table 5), certainly a far greater number than in the past. However, by 11 Nov 2020, after significant rainfall, all nests were flooded. The birds stayed on; numbers even increased slightly. On 2 Dec 2020 11 pairs had re-nested at the Southern Morass. But by 21 Dec all nest sites were under water, most likely, as for the Hoary-headed Grebes (see above), due to a 'fetch'.

On 25 Nov 2020 at Lake Bathurst, a single nest and a young, not yet fully grown stilt was observed. At the same time, 285 adult stilts were gathered. Interestingly, many of them responded differently to my approach: instead of flying off, many would hover in the air or fly towards me while loudly calling, endlessly yelping (see Marchant and Higgins 1993) as I moved forward. They displayed territorial behaviour, as if preparing for nesting. I had encountered such behaviour in the past near actual nests. However, with few exceptions no nesting was recorded at the East Basin of Lake Bathurst for the 2020/2021 season (Table 5).

In October 2020 Pied Stilts also nested for the first time in the ACT (Westlin 2021).

Numbers of Pied Stilts had peaked by the end of December 2020, with close to 850 birds across all lakes and 500 birds still present on 20 Jan 2021. During the February 2021 visits no stilts were recorded. In May 2021 only 8 birds were seen (Table 5).

Table 5. Records of Pied Stilts breeding and number of stilts present at the Southern Morass and the East Basin of Lake Bathurst.

Date	S Morass			EB L Bathurst		
	No. birds	No. nests	Comments	No. birds	No. nests	Comments
17 Feb 20	1			dry		
12 Mar 20	6			dry		
06 Jun 20	18			dry		
18 Jul 20	35			dry		
18 Aug 20	36			0		
01 Oct 20	60			190		
28 Oct 20	150	77	on islands	65	1	
11 Nov 20	165	0	all nests flooded	---		
25 Nov 20	---	---	------	285	1; 1 young	territorial beha-viour by many birds
02 Dec 20	307	11	on islands	---	---	------
21 Dec 20	226	0	nests flooded, due to 'fetch' see text, Table 4	620		territorial beha-viour by many birds
20 Jan 21	15	5	1 young	490	3 young	
17 Feb 21	0			0		
18 Mar 21	2			8		
25 Mar 21	0			0		
26 May 21				8		

SILVER GULL (*Chroicocephalus novaehollandiae*).

For many years a colony of Silver Gulls bred on the large island in the southern part of the East Basin of Lake Bathurst (Fig. 1). But with low water levels in more recent years the site was no longer safe for nesting. In 2015 a small number of pairs nested for the first time at the Southern Morass, using a couple of islands. In 2016 gulls used only one of those islands ('gull island'), which was more elevated over its central part and had better grass cover than all the other rather flat islands, which rose only slightly above the water (Lenz 2016). It can be viewed only from its eastern side, hence numbers of birds will always be underestimates.

Birds spent time on the island from June onwards. However, in July, early nests became flooded. By 21 Aug 2016 many birds appeared to be sitting (nesting). On 6 Nov 2016, 20 young not yet able to fly were seen, and 95 sitting adults. A similar number of adults was still sitting on 14 Dec 2016, and several downy young were visible. On 22 Jan 2017, 8 young had not yet left the island.

In 2020 Silver Gulls nested again on 'gull island' (Table 6). An estimated 270 birds were present on 18 Jul 2020. A month later, 80 birds were spread out over the island and sitting

(nesting). By the end of October many runners were visible. The heavy rain in November (Table 1, Fig. 2) led to partial flooding of the island, and some of the nests were probably lost. On 2 Dec 2020 most birds had left, but some were still sitting, probably re-nesting birds. By 20 Jan 2021 and also 17 Feb 2021, several chicks not yet able to fly were seen. By March 2021 the island was deserted, but gulls started to gather again at the island in mid June 2021 (Table 6).

The breeding season at the Southern Morass tends to last longer than for the well-studied colony at Lake Burley Griffin in Canberra (Davey and Fullagar 2016). The latter uses an island that is not prone to flooding, while at least some nests at the Southern Morass closer to the edges of the island can be submerged after rainfall (and/or a 'fetch), triggering re-nesting in some pairs.

Table 6. Observations from a Silver Gull colony at the Southern Morass in 202/2021.

Date	No. Birds	Comments
06 Jun 20	45	
18 Jul 20	270	
18 Aug 20	100	80 visible on island, spread out, sitting (nesting?)
01 Oct 20	140	70 birds sitting
28 Oct 20	220	many runners
11 Nov 20	260	many young birds, island has shrunk (rain); some nests probably flooded
02 Dec 20	125	30 sitting (some of them re-nesting?)
21 Dec 20	60	most birds had left the island, some still sitting
20 Jan 21	80	10 young visible
17 Feb 21	30	5 young still visible
18 Mar 21	5	
16 June 21	80	at breeding island

2.3. Other notable observations

Overall waterbird numbers at the lakes, especially of ducks, were not exceptional. Widespread rainfall over many areas of eastern Australia will have created much suitable wetland habitat, and birds will have dispersed.

However, a concentration of one species was notable: on 1 Oct 2020, 139 Banded Lapwings had gathered at the western side of the East Basin of Lake Bathurst. The flock had increased to 160 birds by 28 Oct 2020. Thereafter fewer than 10 birds were recorded. The last sighting for the season comprised 16 Banded Lapwings at the Western Basin of the lake.

3. Concluding remarks

The partial refilling of Lake Bathurst and The Morass triggered breeding in 7 species of waterbirds, when safe nesting sites in the form of islands had formed. The area received considerably more rain than Canberra. Especially heavy rain over October and November affected many nesting birds by flooding some or most of their nests (Hoary-headed Grebe, Pied Stilt, Silver Gull). Some pairs re-nested, but except for Silver Gulls, these second nesting attempts were also unsuccessful. Black Swans started to breed very soon after water levels had risen, and produced many cygnets, although it is likely that heavy rainfall was also the cause of high cygnet mortality.

The fact that Lake Bathurst is a ground water lake has important implications for breeding waterbirds. Breeding can occur at apparently unusual seasons and the generally low water levels lead to the continual problems of fluctuations in water level (rain or wind action or a combination of both and drying of the lakes) which can easily impair breeding, despite otherwise ideal conditions at Lake Bathurst and The Morass (Lenz and Kamprad 2012; Lenz 2019).

Acknowledgements

My thanks go to all landholders and managers of properties around the lakes for giving access to conduct the surveys. I am especially grateful to Mark Quinlan for providing daily rain fall records for 2020/2021 from Bundong Station. These figures were essential for understanding the dynamics of waterbird breeding events. The manuscript has benefitted from comments by Kevin Windle and Chris Davey. Kevin Windle and Archer Callaway participated each in one of the surveys.

References

Abell, R.S. (1995) *Geology, Geomorphology and Hydrology of the Lake Bathurst Drainage Basin, New South Wales.* Record 1995/23, Australian Geological Survey Organisation. Canberra.

Braithwaite, L.W. (1982) Ecological studies of the Black Swan IV. The timing and success of breeding on two nearby lakes on the Southern Tablelands of New South Wales. *Australian Wildlife Research* 9: 261-275.

Bureau of Meteorology (2021) Monthly and daily rainfall for Canberra Airport 2020 and 2021. http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=070351 (visited 5 June 2021).

Davey, C. and Fullagar, P. (2016) Silver Gull breeding on Spinnaker Island, Lake Burley Griffin, spring 2013 and 2015. *Canberra Bird Notes* 41: 199-205.

Lenz, M. (2014) The history of COG's waterbird surveys – Lake George and Lake Bathurst. *Canberra Bird Notes* 39 (COG 50th Anniversary Issue): 104-115.

Lenz, M. (2016) Effects of widespread rainfall in 2016 on birds in the Canberra region – some observations and comments. *Canberra Bird Notes* 41: 241-252.

Lenz, M. (2018) Mass emergence of dragonflies attracts large numbers of White-faced Herons. *Canberra Bird Notes* 43: 290-293.

Lenz, M. (2019) Mass-breeding by Hoary-headed Grebes *Poliocephalus poliocephalus* at Lake Bathurst, New South Wales. *Australian Field Ornithology* 36: 158-162.

Lenz, M. and Kamprad, J. (2012) Late breeding attempt by Hoary-headed Grebes. *Canberra Bird Notes* 37: 140-141.

Marchant, S.M. and Higgins, P.J. (eds.) (1993) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 2, *Raptors to Lapwings.* Oxford University Press, Melbourne.

Westlin, S. (2021) First breeding record for Pied Stilts in the ACT. *Canberra Bird Notes* 46: 80-81.

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NOTES

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MALE-MALE INTERACTIONS AT A SATIN BOWERBIRD BOWER

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On 25 April 2021 at around 14.30 h on a warm autumn afternoon I observed a male Satin Bowerbird (*Ptilonorhynchus violaceus*) at a partially constructed bower near the end of Downes Place, Hughes, on the edge of the Federal Golf Course. The bower was located underneath thick *Cotoneaster* understorey beneath a Tasmanian Blue Gum plantation. It was partially constructed in that a platform had been built and about 8cm of the avenue had been erected on both sides (the avenue is usually about 30–40cm long) but this section was not fully woven or as tightly meshed as finished avenues are; there was also little evidence of gathered blue, or other objects scattered about.

What was interesting was that, as well as the bower-owner, another fully blue male Bowerbird was present. It approached the avenue with a yellow leaf in its beak, which it deposited, and then it hopped slowly around the bower as a female might do (though the manipulation of objects is part of the male's display). For its part, the owner, whilst not hostile, was not highly engaged but kept an eye on the other male and hopped around slowly after it (*i.e.* it did not perform any of the body posturing usually observed in courtship rituals). It was also vocalising ('loud, harsh churring' and 'an odd mechanical buzzing sound' (Frith *et al.* 2004; p. 368)), but with nowhere near the intensity that males normally vocalise in the presence of a female.

I understand that young, green males sometimes pretend to be females around a bower in order to hear and experience the male courtship behaviour and learn some tricks (Frith *et al.* 2004, pp. Frith 374–75). At the time I thought the situation was perhaps a male recently moulted into fully blue plumage, not realising that he was no longer disguised, trying to experience an older male's courtship ritual. I also thought that perhaps the owner of the bower was not advanced enough in its construction to be worried about the younger male damaging it, but was just keeping an eye on him.

However, subsequent to this I have heard from a birdwatcher who keeps an eye on the bowers in this area that these two males have associated together for several years, and are perhaps siblings. Whatever the case, subsequent to the initial sighting I have examined the bower site and a bower has not been proceeded with in this location. The platform remains in place, but the twigs making up the beginning of the avenue have been removed. Perhaps it was only a 'rudimentary bower' (Frith *et al.* 2004; p.372), typically made by younger males; the fact that the activity I observed happened very early in the displaying season might also suggest this.

Reference

Frith, Clifford B and Dawn W Frith. *Bird Families of the World: The Bowerbirds* Ptilonorhynchidae. Oxford: Oxford University Press, 2004.

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SUMMER OF THE 18TH KOEL

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Over the months of January and early February 2021, I recorded four fledgling Eastern Koels (*Eudynamys orientalis*) hosted by Red Wattlebirds (*Anthochaera carunculata*), in or in the vicinity of my Garden Bird Survey (GBS) site, 11 Chevalier Street, Weston. Two of these fledglings with very similar plumage patterns had overlapping ranges and visited my garden regularly, including to drink from bird baths. Eventually I was able to individually identify these two birds. I did not see them bathing in my bird baths, but they drank from them regularly, and on hot days visited several times to drink. I do not know the locations of the nest sites.

A third Eastern Koel (Koel) fledgling was located on 5 Jan, two streets away from my house, off Gray Place/Wakelin Street in Weston. This fledgling was very difficult to see from the street, often in large, dense eucalypt trees and tall shrubs in rear gardens. There was (at least) a fourth fledgling based further along Chevalier Street (within 5/6 houses). I did not regularly track these two birds (the third and fourth fledglings), or get good enough views to identify them individually.

There were several pairs of Red Wattlebirds (RWBs) which frequented my garden over the 2020/21 spring/summer, especially in a large ironbark (*Eucalyptus sideroxylon*) in the rear garden, and they often chased each other and other birds away. The RWBs had already reared two young around my garden in the first two weeks of November 2020.

The story began on Sunday 3 Jan 2021, when I confirmed the first Koel fledgling in my GBS site, being fed by RWBs. It was a rainy morning. I had stepped onto my back porch early, and was alerted by a repeated begging call in a large oak tree (*Quercus sp.*) across the street, on the corner of Chevalier Street and Sturgess Place, about 40 metres from my front verge. I kept watch over the morning, with the RWBs coming and going, and finally when the showers stopped I went closer and saw the fledgling Koel's head amongst thick leaves. What struck me was the large golden patch on the head, shining in the sun, which initially alerted me to the location in the tree. I wondered if this was a visual cue early on, to assist the host parent birds in locating the young. This was the 18th fledgling Koel for the season, reported to Jack Holland, who was coordinating the Canberra reports.

Jack Holland advised that if relatively recently fledged, young Koels can hang around the same spot for quite a while, but will come out more into the open as they grow older and bolder. That proved to be the case as the days passed. I heard calls from fledgling 1 frequently throughout the day and could see from my house which tree it was in, until the last week of January when it was moving further away at times. I do not know where the nest site was, or the date when the bird fledged, but think it was probably a day or two before 3 Jan, the date of my first sighting. The large trees in the immediate area of my house are a mix of eucalypts and several non-native deciduous species.

Early the next day, 4 Jan, the fledgling Koel was still in the same oak tree in the street, but then moved (about 80 metres) to the ironbark in the middle of my back garden, almost at the top and well concealed by bunches of hanging leaves. I did not see it fly in, but after hearing it in the garden, I sat outside and watched for quite a while; there was the same pattern of begging call I had heard earlier, but also a rapid, faint squealing call when the RWBs came in to feed it. The fledgling stayed in the ironbark during the whole morning, then moved back to the same oak tree in the street, where it had been the day before. On 4 Jan, also very early, I had seen five adult male Koels calling and posturing in a deciduous tree in my rear neighbour's yard; until that point, I had not realised there were so many Koels in the area.

Also that morning, while I was outside observing, two Pied Currawongs (*Strepera graculina*), one a juvenile, came into the ironbark to search for cicadas and there was a scuffle, with the RWBs bombing them. The juvenile currawong then sat quietly in the middle of the tree for some time, with RWBs sitting nearby, rather like a stand-off. After a while the RWBs flew off to forage. What I found interesting is that during this encounter with the currawongs, the fledgling Koel went almost completely silent, ceasing its constant begging calls until well after the currawongs moved on. During this time, the only sounds the fledgling Koel made were very quiet squealing calls when the RWBs came to feed it occasionally at the top of the tree canopy.

Over the second week of January, the fledgling moved around a number of trees in near neighbours' blocks (within two houses), and spent a lot of time in my ironbark, coming and going several times a day. The weather was warm to hot, and I observed fledgling 1 coming to drink from a pedestal bird bath in the rear yard. I have several bird baths, including one in the open, under the ironbark on a pole five feet high. However, fledgling 1 seemed to prefer the lower pedestal water source, which had some cover from tall shrubs. I also observed the host RWBs feeding the fledgling when it was sitting on the bird bath's edge. The fledgling took its time to drink, sometimes several minutes, and would then move from shrub to shrub nearby before it flew, usually up into the ironbark. I wondered if it remained on the bird bath for a time because it was cooler there; I had noticed Crimson Rosellas (*Platycercus elegans*) doing this on hot days. Most mornings very early, as I lay in bed, I could hear fledgling 1 in the garden, and usually it went for an early drink at the pedestal bird bath.

One day, a shrieking Sulphur-crested Cockatoo (*Cacatua galerita*) came into the ironbark when fledgling 1 was there, and the fledgling gave a shrieking call in response, not unlike an adult Koel. A couple of times, adult Koels were in the large deciduous tree in the rear neighbour's back yard (adult Koels commonly use this tree), but I did not see the fledgling interact with them or call in response.

By 18 Jan, fledgling 1 was flying strongly and moving to various trees nearby, not always following the host parents. Sometimes no host parents could be seen when it flew off. From my house, I could not always hear the begging calls, and wondered how the RWBs could track and find the fledgling. One night I came home late and the begging calls continued until around 21 h, when there was only half light.

By the third week of January, I suspected there might be two fledglings coming into my garden for water in a period of very warm to hot weather, although I had not actually seen or heard two birds at the same time. On 21 Jan, I confirmed there were indeed two different fledgling Koels coming into my garden. While fledgling 1 was in my ironbark, I heard another series of begging calls in a back yard two houses away in Chevalier Street, in a very

large claret ash (*Fraxinus sp.*). From my rear garden, I had a good view of that tree and could see where fledgling 2 was, fed by RWBs.

In the previous week, I had taken some distant photos of the Koel fledglings with my phone, on their visits to the garden water sources. After applying a zoom, (despite the photos being a little blurred), I recognised slightly different black patterns around the face and neck areas. These were very subtle differences, not easy to discern from a distance. The two fledglings were very similar, the same size, with the same overall pattern/tones of black and brown on the body, wings etc., and it was very difficult to distinguish fine differences in the colour pattern. Both birds were very black on the nape/upper back. However, one photo showed a bird (fledgling 2) with a roundish black patch on the throat, compared to a slightly mottled black area on the throat of fledgling 1. I called fledgling 2 'Black Spot'.

After discussing the plumage colour/patterns with Jack Holland, we thought fledglings 1 and 2 were probably males, based on the amount of black around the head and nape, and Jack suggested they may have been from eggs laid by the same female Eastern Koel around the same time, something which is not well documented. Jack pointed out a reference in HANZAB Vol 4, which said a female may lay in many nests in a season (Higgins 1999).

On Saturday 24 Jan, Black Spot came into the garden and hopped to a deep-water bowl on the ground, only a couple of metres from the pedestal bird bath I usually saw fledgling 1 drink from. I saw Black Spot come to that bowl on several occasions, never to the pedestal bird bath. (It is possible that it also used the pedestal bird bath for drinking when I was not present.) Use of both these kinds of bird baths (on the ground and pedestal) as drinking sources was documented in the 2019/20 breeding season (Holland 2020).

I saw something interesting one day when fledgling 1 had come for a drink. Afterwards it sat in a small tree, *Angophora sp*., nearby, which had just finished flowering and was forming its hard fruits. After drinking, the fledgling went into it and pecked at the forming fruits. They were pink in colour and looked rather like very small plums, but not soft or edible! The fledgling clambered around for quite a while, pecking at many pink buds. It seemed to have an instinct to do this. On another occasion, I saw it pecking at hard eucalypt buds in another small tree. There was a small apricot tree with some fruit in my rear neighbour's yard, hanging over the fence very close to the water sources used by the Koel fledglings, but I did not see a fledgling go to the apricot tree in the weeks I was observing.

On Saturday 30 Jan, I heard a fledgling Koel in the garden very early in the morning, and I got up and watched fledgling 1 for around half an hour. It had been raining. There were no RWBs around, and the begging calling was very intermittent, slow and low in volume. Over the morning, fledgling 1 came and went a few times, not attended by RWBs, still doing the occasional begging call before flying off again. The 30 Jan was the last time I saw fledgling 1, and it was day 28 since I first discovered it on 3 Jan. I last saw fledgling 2 (Black Spot), in my garden in the early morning on Tuesday 9 Feb, sitting on the rear powerline for a few minutes (no begging calls and no RWBs around), before it flew off.

The dependency period of fledgling 1 appears to be consistent with the periods generally documented in the literature for the host species: 19 to 28 days (Strahan 1994); 19-21 days from nests of Magpie-larks (*Grallina cyanoleuca*) (Higgins 1999); at least 28 days from nests of Australasian Figbirds (*Specotheres vieilloti*) (Higgins 1999). It seems that the

dependency period from Red Wattlebird nests is not well documented, but the Figbird seems a reasonable species for comparison.

Over January and early February, I confirmed that there were at least four fledgling Koels raised by RWBs in the general vicinity of my Weston house. Over a couple of days, 7/8 Feb, I did several car crawls along Chevalier Street (to about seven houses away) to listen and locate begging calls, and then immediately drove over to Gray Place/Wakelin Street. This confirmed to me that there were probably three fledged, dependent Koels still in the area at the end of the first week of February (fledgling 1 had not been sighted since 30 January, and an independent fledgling 2 was last seen briefly on 9 Feb). I was not able to get close views to individually identify any other Chevalier Street fledgling/s or the fledgling based around Gray Place/Wakelin Street (first discovered on 5 Jan).

References

Higgins, P.J. (1999) *Handbook of Australian, New Zealand and Antarctic Birds*. Vol. 4: *Parrots to Dollarbird*. Oxford University Press, p. 767.

Holland, J. (2020) Summary of the 2019-2020 Eastern Koel Season in the ACT. *Canberra Bird Notes* 45: 293-310.

Strahan, R. (ed.) (1994), *Cuckoos, Nightbirds & Kingfishers of Australia*. The National Photographic Index of Australian Wildlife, Angus & Robertson, p. 37.

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OBSERVATION OF PREDATION OF AUSTRALIAN SHELDUCK DUCKLINGS BY AUSTRALIAN PELICANS

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Australian Pelicans (*Pelecanus conspicillatus*) are relatively common throughout most of Australia and are frequently observed in the Canberra region. Having grown up with the movie 'Storm Boy' and observed Pelicans around the lakes and rivers of South Australia, I thought I knew a lot about them. That changed a few years ago when I observed some interesting behaviour.

I had visited Alfred Cove on the Swan River in Perth, Western Australia, a few days in a row in August 2016 to photograph four Ospreys (*Pandion cristatus*) which had taken up residence in the park adjacent to the river. I had noted a number of Pacific Black Ducks (*Anas superciliosa*) with their young feeding in close proximity to the Ospreys, who, having a diet consisting mainly of fish, showed no interest in them.

Fig. 1

Soon after arriving one morning, I noticed a pair of Australian Shelducks (*Tadorna tadornoides*) with two ducklings in close proximity. They were swimming close to the edge of the river in shallow water. What took place over the next few minutes came as a surprise to me. A group of nine Pelicans flew low along the river and landed within 20 metres of the shelducks. They settled in a group and did not seem to be heading in any particular direction. One of the pelicans then split from the group and began to swim slowly towards the ducks, between them and the shore. In response to this approach the shelducks swam out into deeper water with the ducklings close by them.

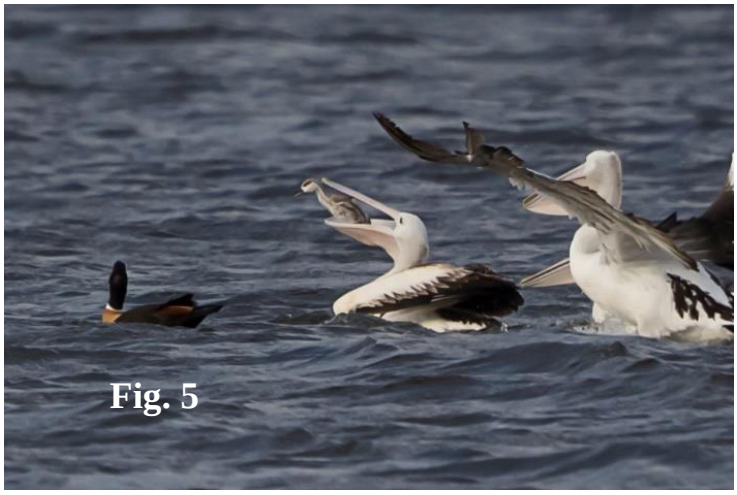
It was not long before the other pelicans joined in and began to pursue the ducks out into the river. The ducklings, sensing danger, swam at speed in front of the adults (Fig. 1). At this point three pelicans broke from the group and flew low over the water, landing in front of

the ducks to cut off their escape route. By now the adult ducks were attempting to turn back on the pursuing pelicans and the ducklings began diving. Some of the pelicans began to snap at the adults, who were trying to protect their young (Fig. 2). The other pelicans then started to dive in an attempt to catch the young ducks (Fig. 3). Over the next ten minutes this action was repeated, with pelicans herding the ducks and pursuing the ducklings. Eventually the ducklings grew tired and were scooped up and eaten by the pelicans (Figs. 4 and 5 [close-up of main part of Fig. 4]).

Fig.

Fig. 3

Fig. 4



Pelicans have been reported eating other birds and even pet dogs in apparently random opportunistic attacks. However, the sustained coordinated attack described above displays a co-operation between individuals of the group that has rarely been observed in such predation.

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AUSTRALIAN LITTLE BITTERN AT A SUBURBAN GARDEN POND IN COOK, ACT, IN 2014

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On 16 Oct 2014 an Australian Little Bittern (*Ixobrychus dubius*) was found foraging along the edge of our back garden pond in Cook. It remained in our back garden for just over 27 hours. It was reported at the time in eBird and to the COG Rarities Committee. Photos were taken and there was much general surprise at this unexpected event. So unusual was it that it rated a short note in the December 2014 issue (4 of Vol. 3) of *Australian Birdlife*. This current note adds further detail to the 2014 observation.

The only other records of Little Bittern in 2014 were a single bird seen by multiple observers in June and July at Mackellar Pond and another (or the same) bird at the nearby Mackellar Wetland (eBird 2014). Most Little Bittern records in the last decade in the ACT have been from Jerrabomberra Wetlands, though this likely reflects the activity of birders rather than abundance of Little Bitterns.

About the pond

The pond was small, about 2.5 x 2 metres and about 50 cm deep at its deepest and 20 cm at its shallow end. It was edged with flat rocks that were only a few centimetres above the surface of the water. There was a dense grassy and shrubby surround on two sides of the pond and contiguous shrubby trees nearby. The pond had very clean clear water that supported Spotted Marsh Frogs (*Limnodynastes tasmaniensus*) and their tadpoles, damsel-flies (*Austrolestes leda*) and their nymphs, water beetles and water boatmen (unknown species).

The water was well vegetated with local ACT native plant species under the water, on the surface and emergent from the water. In all, a third of the water surface was covered in plants. No goldfish were present to foul the water. Small White Cloud Mountain Minnow fish (*Tanichthys micagemmae*) were used to control mosquito larvae.

Description of the bird

Our first view was of a small skulking bird with relatively long greenish-yellow legs and a relatively long bill. When flushed into flight the contrast between the dark back and dark primaries and the pale wing coverts was very obvious. The nape and back of the neck was a reddish brown. Later we observed that the bill was yellowish and very pointed, and the iris a bright clear yellow. The dark streak down the throat from chin to breast was very apparent. The lack of further streaking on the breast or belly indicated that the bird was an adult rather than a juvenile. Later, in the full sunshine of the afternoon, we were able to see that the crown was black, as was the back. This contrasted strongly with the pale buff wing coverts. It was therefore considered that the bird was an adult male. There was no red breeding flush at the lores or bill. No calls were heard.

Figure 1. Australian Little Bittern at garden pond. Cook, ACT, 16 Oct 2014 *(Kim Farley).*

Figure 2. Australian Little Bittern in apple tree. Cook, ACT, 16 Oct 2014 *(Kim Farley).*

Behaviour of the bird

The Bittern was first seen at about 12.30 h when it was accidentally flushed from the edge of the pond. It flew with trailing legs to an apple tree behind the pond. It clambered through the small branches and foliage of the tree as I approached. It was briefly photographed in the apple tree where it stayed for about 30 minutes. In the tree it stood on a branch and assumed the typical vertical Bittern stance with neck extended and bill pointing skyward. I was close enough to make eye contact, which is not something that I ever expected to have with a Bittern! Personal experience indicates that it is unusual for this species to use trees for perching but given that its preferred habitat of dense reedbeds was unavailable, the apple tree probably provided the best available retreat.

Later in the day we saw it in full sunlight, standing in the open on a rock at the pond edge. During the afternoon and the next morning, it was seen stalking along the flat rock edges of the pond and retreating at times to the dense shrubby shelter at the rear. The bird was seen taking prey several times. The prey appeared to be smaller than the *Limnodynastes* frogs in the pond, though smaller individuals of this species cannot be definitely excluded. Possibly it was taking damselfly nymphs or even Mountain Minnow fish.

Why our pond?

Menkhorst *et al*. (2017) note that Little Bitterns can occur in surprisingly small wetlands, and during migration may take cover in cereal crops or gardens. It is very likely therefore that our bird was *en route* to more suitable habitat for the summer. We like to think that the dense vegetation around the pond and the density of native water plants, frogs and invertebrates provided an attractive overnight stay for a Little Bittern on a big journey.

References

Australian Birdlife (2014) 3(4), p. 83. Available to subscribers at

"australian-birdlife" http://www.birdlife.org.au/australian-birdlife

eBird (2021) Australian Little Bittern records for the Australian Capital Territory to 2021, *eBird*. *An online database of bird distribution and abundance* [web application]. eBird, Ithaca, New York. Available: https://www.ebird.org/map/ (Accessed: 8 September 2021).

Farley, K. (2014) eBird Checklist: https://ebird.org/australia/checklist/S20260828. *eBird: An online database of bird distribution and abundance* [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 1 September 2021).

Menkhorst, P., Rogers, D., Clarke, R., Davies, J., Marsack, P. and Franklin, K. (2017) *The Australian Bird Guide*. CSIRO Publishing, Clayton South.

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COLUMNIST'S CORNER

Canberra Bird Notes 46(2) (2021): 233-234

Birding in Cyberspace, Canberra Style

The magpies, in whose territory I live (I have been here only 14 years, so it is quite likely that they were occupying the territory before I arrived), and I have a good relationship. The male does not swoop me. Part of this, I am sure, is that every morning I feed them with a food mixture recipe provided by Wildcare as I walk to my front gate to pick up my copy of the *Canberra Times*. It takes me straight past their nest. As we all know, however, not everyone has such a good relationship with the *quardle oodle ardle wardle doodles*, which probably underlies **Jon Clark's Magpie Alert** https://www.magpiealert.com/. Jon explains that the aim of the website is: 'simply by recording our magpie swoops on a map we can all help others to avoid the dangerous birds. The website also gathers information on the attack: the position (lat/long), a description, date/time, what activity was taking place and whether an injury resulted… [T]he idea of www.magpiealert.com/ was born as a place where anyone across Australia can come and register their swoops to pre-warn others, you can then avoid the more nuisance and aggressive swoopers.'

On the home page, under the heading 'Recent attack details for Australia', we find 3,605 reports. For today's date alone (and I am writing at just 3.30 pm) there are already 17 reports of swooping, the most recent being 'Magpie attack on Cyclist - 8A Rolph Pl, Gilmore ACT 2905'; no injury. Members of the public are encouraged to sign up for the website and submit records of swooping, and of related injuries.

The site also contains a comprehensive section presenting 'Swooping Magpie Safety Tips', and another replete with summary statistics presented by calendar year. Interestingly, as at 24 September 2021, 18% of the reports were from the ACT, whereas the ACT has only 2% of the nation's population. Nationally, 12% of the swooping attacks up to 24 September resulted in injuries to the people being swooped. Heaps of other fascinating statistics are to be found at the website.

In the past, this column has drawn attention to some fascinating podcasts. Your columnist is currently listening to, and greatly enjoying, **'The music of Australia's birds'** on the ABC Listen app https://abclisten.page.link/XFYxLQgBBGZn74wi9/. It is an episode in the ABC's New Waves series which features new music by Australian composers. In this case, 'Immerse yourself in the sounds of some of Australia's great songbirds. And the human music they inspire.' There are 19 tracks, varying in length from just a few minutes up to 21 minutes.

Another podcast that I found fascinating comes from the BBC World Service's brilliant series,
BBC Witness https://www.bbc.co.uk/programmes/w3ct1x31/. Titled **'Saving the world's wetlands',** it is described thus: 'Migratory birds and wildlife depend on wetlands but in the 1960s governments were draining them for industry and agriculture. The first protections were put in place in 1971.' It focusses on the origins of the Ramsar Convention on Wetlands of International Importance.
The Macaulay Library at Cornell University has recently featured an article, published in the journal *Biology Letters*. We are advised that **'Photos Reveal Purpose of Black Facial**

Markings in Peregrine Falcons' https://www.macaulaylibrary.org/2021/08/23/photos-reveal-purpose-of-black-facial-markings-in-peregrine-falcons/. I draw attention to this as it links to the excellent work of many Canberra region birders who submit their bird photographs to the Macaulay Library as media included in their eBird Australia checklists. Researchers '… sought to better understand why falcons have black markings under their eyes. They turned to photos in the Macaulay Library and in iNaturalist to test this long-standing hypothesis about plumage markings for the first time on a global scale … To test these hypotheses, researchers examined over 2000 photos of Peregrine Falcons, 1843 of which came from 1200 eBirders who archived their photos in the Macaulay Library. I will not be a spoiler and tell you what the researchers discovered through analysing the falcons' facial markings, but my point is that the study could not have been conducted, and valuable new things learned about avian biology, were it not for the contributions of photographs submitted by eBirders.

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.
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Vale Alan Normington Cowan (13 June 1929 - 24 July 2021)

One of COGs longest members, Alan Cowan passed away in July aged 92. He had been a COG member for over 50 years. He joined COG in 1968.

I first met Alan when we both were members of the 16th International Ornithological Congress in Canberra in 1974. We shared a birthday and city of birth. In the early years he was a regular attender at COG outings and in later years was an active contributor to the chatline.

Alan Cowan was born in London in 1929. In 1946, he entered Medical School at London University, qualified in 1951 and, that same year, married Anne Gammon. They had four children. In 1966, he and his family moved to Canberra, where Alan worked for the rest of his medical career, both as a specialist surgeon and a general practitioner.
Dr David Hollands recalls that he met Alan in 1969 on a Bird Observer's Club members three-week camp on Cape York Peninsula. They formed a friendship and often birded together. In later years they travelled together to photograph Snowy Owls inside the Artic Circle and Blakiston's Fish Owl in Japan.

One of Alan's great loves was seabirds. He went on several oceanic expeditions and it was seabirds behind his decision to go to the Antarctic, where he over-wintered as Medical Officer to Casey Station, returning to be awarded the Queen's Polar Medal.
The Antarctic is not for the faint-hearted and there were many hazardous situations there in inflatable boats but nothing to compare with the voyage of the *Totorore.* This was a tiny 11-metre yacht, being sailed by its owner around Cape Horn, and then up the western side of South America's tip, all in search of seabirds. He needed a crew to make the venture possible and Alan put his hand up, flying to the southerly tip of the continent to join the boat.
By all accounts, it was a successful but highly testing journey through some of the wildest seas in the world. Sometime later, I am not sure just how long, the *Totorore* and its master disappeared at sea without trace. Alan had been very fortunate. This voyage in 1984-5 resulted in a co-authored paper titled "*Notes on the seabirds of Cape Horn Islands*" Notornis 39 (1992) 133-144.

Alan's role in relation to Antarctic birds is recognised in the introduction to the first HANZAB volume: "*Then, largely on the representations of Dr A. N. Cowan it was decided to include the whole Antarctic continent ".* He is acknowledged as having made a substantial contribution as a reviewer for that volume.
Not just interested in seabirds and Antarctica, Alan was interested in the birds in his long term home in Canberra. In particular, he took a particular interest in the issue of preserving the native habitats on Stirling Ridge.

I thank Alan's friend Dr David Hollands, well known bird photographer and author and sometime presenter to COG meetings, who gave me permission to lift sections of his obituary for Alan published in the Canberra Times on 27 August 2021 under the heading "*A generous doctor, classical music enthusiast and keen bird watcher*". I also thank Geoffrey Dabb for his input.

Neil Hermes
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Canberra

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RARITIES PANEL NEWS

2021 has been an interesting period for unusual birds in the ACT and surrounds, COVID notwithstanding. Perhaps most noteworthy were the Swift Parrots which apparently overwintered in Kambah. Surprisingly, though they are classed as an endangered species, they do not figure on COG's unusual bird list as they occur here in small numbers fairly regularly on their migratory path.

The most-observed of the unusuals has been the Red-backed Kingfisher at Campbell Park, which appears to be still around and has been widely recorded by COG members and others. It even featured on the ABC TV news on 21 September, photographed by Robin Eckermann. These inland kingfishers, mostly single birds, have been recorded here fairly regularly since 2008.

The Common Sandpiper – presumably the same bird as last year - has returned to Isabella Pond and has been observed doing its characteristic bobbing by many. It seems that when this species finds a spot which suits it, it will return – as did the one to Uriarra Crossing for several years in the early 2000s.

The Spiny-cheeked Honeyeater, another common inland species, is less predictable in its movements, but is an infrequent visitor to the ACT. Its relatively large size for a honeyeater, pink bill, apricot throat and chest, white tips to the tail feathers and distinctive call make it fairly readily identifiable. As is the tiny Scarlet Honeyeater, this time a coastal species which has drifted inland. Another coastal species, the drongo, is recorded here from time to time and 2021 saw many autumn records of the species south of Sydney.

It is hard to know what to make of the Diamond Dove record – and those which have preceded it over the years . Aviary escapes, or birds from the inland? This bird was recorded by many in subsequent days, even attempting to mate with a Crested Pigeon.

ENDORSED LIST 99, OCTOBER 2021

Diamond Dove *Geopelia cuneate*
1; 31 Jul 21; Patrick Cox; Glendale Depot: ebird S9253 3415

Common Sandpiper *Actitis hypoleucos*
1; 20 Aug 21; Richard Allen; Isabella Pond: ebird S93474705

Red-backed Kingfisher *Todiramphus pyrrhopygius*
1; 12 Sep 21; T Putter; Campbell Park: ebird S94538118

Scarlet Honeyeater *Myzomela sanguinolenta*
1 female; 13 Jul 21; Richard Allen; Curtin Horse paddocks: ebird S91683471
1 male; 21 Jul 21; Richard Allen: Curtin Horse paddocks: ebird S92070874

Spiny-cheeked Honeyeater *Acanthagenys rufogularis*
1; 26 Sep; Michael Braby; North Lyneham

Spangled Drongo *Dicrurus bracteatus*
1; 19 May 21; Luke Downey; Stirling ebird S885077263

Barbara Allan *allanbm@bigpond.net.au*

Canberra Bird Notes

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CBN@canberrabirds.org.au or michael.lenz.birds@gmail.com

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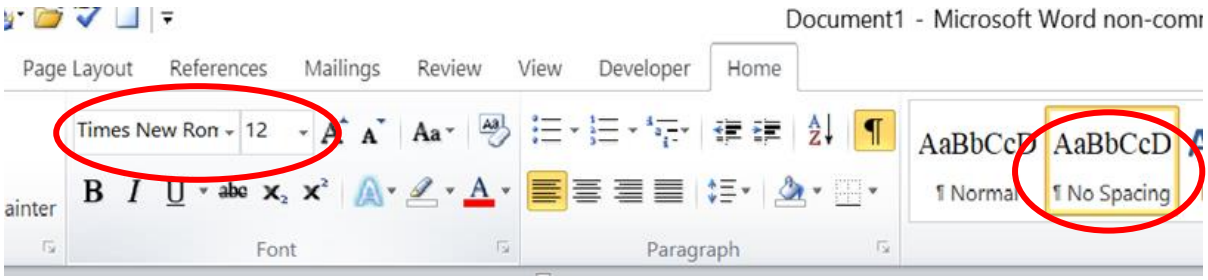

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