canberra bird notes

ISSN 0314-8211

Volume 45
Number 3
December 2020

Registered by Australia Post 100001304

CANBERRA ORNITHOLOGISTS GROUP, INC.

PO Box 301 Civic Square ACT 2608

2020-21 Committee

President	Neil Hermes	0413 828 045
Vice-President	Steve Read	0408 170 915
Secretary	Bill Graham	0466 874 723
Treasurer	Prue Watters	
Member	Jenny Bounds	
Member	Brittany Brockett	
Member	Chris Davey	
Member	Kathy Eyles	
Member	Gabrielle Hunt	
Member	Alison Mackerras	
Member	A.O. (Nick) Nicholls	

Email Contacts

General inquiries	**cogoffice@canberrabirds.org.au**
President	president@canberrabirds.org.au
Canberra Bird Notes	CBN@canberrabirds.org.au/michael.lenz.birds@gmail.com
COG Database Inquiries	COG.database@iinet.au
COG Membership	membership@canberrabirds.org.au
COG Web Discussion List	canberrabirds-owner@canberrabirds.org.au
Conservation	conservation@canberrabirds.org.au
Gang-gang Newsletter	gang-gang@canberrabirds.org.au
Garden Bird Survey Coordinator	duncan.mccaskill@gmail.com
Publications for sale	sales@canberrabirds.org.au
Unusual bird reports	rarities@canberrabirds.org.au
Website	cogwebmaster@canberrabirds.org.au
Woodland Project	cogwoodland@canberrabirds.org.au

Other COG contacts

Conservation	Jenny Bounds	
Field Trips	Sue Lashko	6251 4485 (h)
COG Membership	Sandra Henderson	6231 0303 (h)
Canberra Bird Notes		
Editor	Michael Lenz	6249 1109 (h)
Assistant Editor	Kevin Windle	6286 8014 (h)
Editor for Annual Bird Report	Paul Fennell	6254 1804 (h)
Newsletter Editor	Sue Lashko, Gail Neumann	(SL) 6251 4485 (h)
Databases	Vacant	
Garden Bird Survey	Duncan McCaskill	6259 1843 (h)
Rarities Panel	Barbara Allan	6254 6520 (h)
Talks Program Organiser	Jack Holland	6288 7840 (h)
Records Officer	Nicki Taws	6251 0303 (h)
Website	Julian Robinson	6239 6226 (h)
Sales	Kathy Walter	6241 7639 (h)
Waterbird Survey	Michael Lenz	6249 1109 (h)
Distribution of COG publications	Dianne Davey	6254 6324 (h)
COG Library	Barbara Allan	6254 6520 (h)

Use the General Inquiries email to arrange access to library items or for general enquiries, or contact the Secretary on 0466 874 723. Current details of COG's Committee and other aspects of COG are available at: http://canberrabirds.org.au/

ARTICLES

Canberra Bird Notes 45(3) (2020): 220-223

SOUTHERN BOOBOOKS IN THE BLACK MOUNTAIN, ARANDA, COOK AREA 2019

JERRY OLSEN[A,C] AND SUSAN TROST[B]

[A]*Institute for Applied Ecology, University of Canberra, ACT 2601, Australia*

[B]*44 Wybalena Grove, Cook, ACT 2614, Australia*

[C]*For correspondence: Jerry.Olsen@canberra.edu.au*

Abstract. *Southern Boobooks are said to be declining. The number of territories we previously found on Black Mountain had declined, and a female banded there in 2014 was found dead in 2018. Toxicology analysis by the ACT Environment, Planning and Sustainable Development Directorate showed a heavy load of the second-generation rodenticide Brodifacoum, and other rodenticides. In 2019 we found two successful (fledged young) breeding pairs on Black Mountain, where the dead female had been replaced, and one pair in Wybalena Grove, Cook, more successful pairs than we found from 2014 to 2016. During the winter, before she left to breed, the successful Wybalena Grove female preyed on at least 28 Black rats, 28 small birds, and 17 insects.*

A recent BirdLife Australia *State of Australia's Birds* reported that Southern Boobooks (*Ninox boobook*) had declined throughout most of BirdLife's reporting period (BirdLife Australia 2015). Since 1993 we have been checking Southern Boobook territories in an area comprising Aranda Bushland, Black Mountain, Bruce Ridge and Cook. There were, on average, about 9 breeding pairs in this area each year. We have not been able to check these territories carefully in the past few years but we did search the area in the December 2014-January 2015 and December 2015-January 2016 breeding seasons, a good time of year to find adults with nestlings or fledged young. We found only one breeding pair in 2014-2015, and no breeding pairs in 2015-2016, so our results mirrored the BirdLife Australia claims.

On 29 Dec 2014, the one breeding female we found on the east side of Black Mountain appeared to be ill. At dusk she was attacked at her nest by Pied Currawongs (*Strepera graculina*), and we were able to capture her by hand, keep her safe for one night, then band and release her. She was feeding young after her release, and continued the following night, and finished the season without incident. But on 10 Sep 2018, a little over 44 months later, she was found dead in the Australian National Botanic Gardens, not far from her nest. She was sent to the ACT Environment, Planning and Sustainable Development Directorate for toxicology analysis and the results from Melissa Snape were:

Brodifacoum	886.7 $ng.g^{-1}$*
Bromadiolone	16.8 $ng.g^{-1}$
Coumatetralyl	<2.0 $ng.g^{-1}$
Difenacoum	<2.5 $ng.g^{-1}$
Difenathialone	<10.0 $ng.g^{-1}$
Flocoumafen	8.5 $ng.g^{-1}$
Pindone	<25.0 $ng.g^{-1}$
Warfarin	<2.0 $ng.g^{-1}$

(*$ng.g^{-1}$ = nanogram/gram = 0.001 milligram/kilogram)

Brodifacoum, the largest concentration found in this Boobook, is a second-generation rodenticide containing highly lethal 4-hydroxycoumarin vitamin K antagonist antico-agulant poison. In recent years, it has become one of the world's most widely used rodenticides, and is also used to kill larger animals such as Brushtail Possums (*Trichosurus vulpecula*) in New Zealand (Eason and Wickstrom 2001).

The December 2019-January 2020 breeding season was better. We found a pair on the west side of Black Mountain with two fledglings, and another pair on the east side with two more fledglings. So the dead female found in 2018 at the ANBG was replaced by another breeding female. We also found a pair in Cook feeding three nestlings, making at least three breeding pairs in the 2019-2020 season. The Cook adult female moved with her fledged young (Fig. 1) to her favourite winter roost in a Wybalena Grove backyard. She and her mate fed the fledglings there during the summer until they dispersed, and she settled into her winter roost.

Figure 1. Juvenile Southern Boobook in Wybalena Grove 2019 (*Jerry Olsen*).

During the 2019 winter, before she travelled to her nest in October and bred, we collected egested pellets and prey remains from under her roost (Table 1). She took at least 28 Black Rats (*Rattus rattus*) and other *Rattus* species (probably Bush Rats (*Rattus fuscipes*), two House Mice (*Mus musculus*), and a Common Ringtail Possum (*Pseudocheirus peregrinus*) (38.75% mammals), 32 small birds (40%), 17 invertebrates, all insects (21.25%). In a larger sample, Trost *et al*. (2008) found wintering Boobooks in Canberra took 33.6% mammals, 6.7% birds, and 59% invertebrates. The higher proportion of birds in the diet of this female, we think, reflects the high number of small birds wintering in Wybalena Grove. Nicki Taws (personal communication) said that:

Wybalena Grove is particularly rich for small birds in winter, probably due to the density of planted native vegetation. Mixed feeding flocks of fairy-wrens, thornbills, pardalotes, silvereyes, whistlers are encountered on a daily basis. In contrast, the adjacent nature parks (Aranda, Mt Painter) seem to have a lower density of small birds, particularly at this time of year.

The lower proportion of invertebrates in the Wybalena female's diet may be an artefact of the small sample, but could also represent a proportional decline in available invertebrate prey.

Table 1. Prey found at the winter roost of a female Southern Boobook at Wybalena Grove 17 Mar to 19 Sep 2019, before she bred in Cook in the spring of 2019.

Prey	Number found	%
Black Rat, and other *Rattus* species	28	35.00
House Mouse	2	2.50
Ringtail Possum	1	1.25
Small birds	32	40.00
Grasshoppers, beetles, and moths	17	21.25
Total	80	100.00

Three successful pairs in 2019-2020 is an improvement over the 2014-2015 and 2015-2016 breeding seasons, but still lower than the 9 breeding pairs found in the 1990s and early 2000s. Reasons for the decline of breeding pairs in the Black Mountain, Aranda Bushland, Bruce Ridge, Cook area are unclear, but we can float some possible hypotheses to explore: 1) the Gungahlin Drive Extension pushed through in 2004 reduced habitat and caused disturbance; 2) breeding Boobooks rely on woodland birds as prey (Olsen *et al*. 2006,), and some woodland birds are declining across Australia (BirdLife Australia 2015); 3) loss of nest hollows to increasing populations of species such as Sulphur-crested Cockatoos (*Cacatua galerita*) and Brushtail Possums (Olsen and Trost 2009) might reduce the number of successfully breeding pairs; 4) declining insect prey in Australia (Debus *et al*. in press) might reduce prey availability for breeding Boobooks; 5) second-generation anticoagulant rodenticides such as Brodifacoum, Flocoumafen, Difenacoum, Bromadiolone, Coumatetralyl, (sold as Racumin) have previously been implicated in owl deaths (Debus 2009, Olsen 2011, Mooney 2017, Lohr 2018). Closely related Tasman Moreporks (*Ninox novaeseelandiae*) have apparently died from Brodifacoum campaigns against rodents in New Zealand (Stephenson *et al*. 1999).

The Wybalena female appeared ill for a week in early January 2020 while she was still feeding her three young, and we thought she might have ingested something toxic. We kept an eye on her and she came good after a week and is roosting and foraging in the Grove on 15 Jul 2020 as we write.

So, it's not all bad news. We still have breeding Boobooks in Belconnen. And it's a positive step that the ACT Environment, Planning and Sustainable Development Directorate now tests dead raptors found in and outside of various ACT raptor field studies.

Acknowledgements

Thanks to Geoff Dabb and Nicki Taws from the Canberra Ornithologists Group, to Dalice Trost, Stephen Debus and Dick Roe for advice, and to Melissa Snape from the ACT Environment, Planning and Sustainable Development Directorate for toxicology analysis of the Black Mountain female Boobook. Thanks also to David Drynan and Naomi Clarke of the Australian Bird and Bat Banding Scheme, and Victor Hurley who generously supplied colour bands.

References

BirdLife Australia (2015) The State of Australia's Birds 2015: Headline Trends for Terrestrial Birds. BirdLife Australia, Melbourne.

Debus S (2009) *The Owls of Australia: A Guide to Australian Night Birds.* Envirobook, Sydney.

Debus, S. J. S., Olsen, J., Trost, S. and Judge, D. (in press). Diet of the Australian Hobby *Falco longipennis* breeding in Canberra, Australian Capital Territory, in 2002–04 and 2005–08. *Australian Field Ornithology.*

Eason, C.T. and Wickstrom, M. (2001) *Vertebrate pesticide toxicology manual (poisons)*. New Zealand Department of Conservation, Wellington.

Lohr, M. T. (2018) Anticoagulant rodenticide exposure in an Australian predatory bird increases with proximity to developed habitat. *Science of the Total Environment* 643**:** 134–144.

Mooney, N. (2017) Risk of anticoagulant rodenticides to raptors in Tasmania. *Tasmanian Bird Report* **38**: 17–25.

Olsen, J. (2011) *Australian High Country Owls*. CSIRO Publishing, Melbourne.

Olsen, J., E. Fuentes, A.B. Rose, and S. Trost (2006) Food and hunting of eight breeding raptors near Canberra, 1990-1994. *Australian Field Ornithology* 23: 77-95.

Olsen, J. and Trost, S. (2009) Common Brushtail Possum *Trichosurus vulpecula* evicts juvenile Southern Boobook *Ninox novaeseelandiae* from its nest-hollow. *Australian Field Ornithology* 26**:** 46–52.

Stephenson, B.M., Minot, E.O. and Armstrong, D.P. (1999) Fate of Moreporks (*Ninox novaeseelandiae*) during a pest control operation on Mokoia Island, Lake Rotorua, North Island, New Zealand. *New Zealand Journal of Ecology* 23, 233–240.

Trost, S., Olsen, J., Rose, A.B. & Debus, S.J.S. (2008) Winter diet of Southern Boobooks *Ninox novaeseelandiae* in Canberra 1993-2004. *Corella* 32: 66-70.

Accepted 27 July 2020

Canberra Bird Notes 45(3) (2020): 224-234

REPORT ON A SURVEY OF BREEDING ACTIVITY OF THE GANG-GANG COCKATOO WITHIN URBAN CANBERRA 2019-2020

CHRIS DAVEY[A] AND MICHAEL MULVANEY[B]

[A]*24 Bardsley Place, Holt, ACT 2615, Australia*
[B]*Environment Planning and Sustainable Development Directorate, ACT Government*

Correspondence to: chris_davey@aapt.net.au

Abstract. *We report on Gang-gang Cockatoo activity* (Callocephalon fimbriatum) *during the 2019-20 breeding season which follows on from a report on the two previous breeding seasons (Davey et al. 2019). A citizen-science led survey conducted through Canberra Nature Map provided information on 149 trees known to have been visited by Gang-gangs during the previous season. We report on young produced from 15 trees. Twenty-two chicks were produced. Of theses one died in the nest, and four fell from the nest site with two being successfully returned. Possible reasons for the fatalities are discussed in relation to weather conditions during the latter part of the season.*

The Gang-gang Cockatoo is a cool temperate species and may be particularly vulnerable to climate change. As all sites were located on the urban fringe additional observations are required from non-urban areas where water and food may not be so readily available.

1. Background

To celebrate the 50th anniversary of birding activity within the local region the Canberra Ornithologists Group (COG) conducted a citizen science led project on the Gang-gang Cockatoo (*Callocephalon fimbriatum*) from March 2014 to the end of the 2015-16 breeding season. The aim of the project was to find out more about the distribution and abundance of the little-studied cockatoo and in particular to determine whether the Gang-gang breeds within urban Canberra. Although a search of records collected between 1 July 1985 and 31 June 2013 from the COG database provided approximately 255 breeding records, the majority were of birds inspecting hollows or feeding young after they had fledged , none of which indicated that the birds actually breed within urban Canberra.

The 2014-16 survey produced an additional 258 records of birds showing an interest in potential nesting sites but there was only one record of birds nesting and producing young. For a copy of the COG report see http://canberrabirds.org.au/wp-content/uploads/2015/03/Gang-gang-survey-March-2014-to-February-2015-Final-report.pdf with a report on community participation at http://canberrabirds.org.au/wp-content/uploads/2015/03/GG-survey-Community-Engagement-Report-Final.pdf

In 2017 residents in the suburbs of Hughes and Garran were concerned about a proposed development at the base of Red Hill, since their observations suggested that the Gang-gang was nesting in the area. Subsequent observations in 2017-18 and again in 2018-19 confirmed successful breeding. Meanwhile the general public were encouraged to submit observations with photos to Canberra Nature Map (CNM) of Gang-gangs displaying any breeding behaviour, and over 400 records were submitted (Davey *et al.* 2019).

For the 2019-20 breeding season the reporting criteria to CNM were refined to capture observations from sites that previously had shown signs of breeding, but none been confirmed.

The aim of this report is to detail findings for the 2019-20 breeding season and to build on observations from previous seasons.

2. Methods

Records obtained from the 2014-16 COG survey and from the CNM survey were coded as follows:

- Breeding possible, one report only, bird/s near hollow (Category 1)
- Breeding possible, one report only, seen entering hollow (Category 2)
- Breeding possible, more than one report of birds at or near hollow (Category 3)
- Very likely breeding, seen on multiple occasions at or near hollow and entering hollow on at least one occasion (Category 4)
- Confirmed breeding, non-flying young seen at entrance (Category 5)

Although category 1 and 2 sites may just as likely have been successful breeding sites as categories 3, 4 or 5, we concentrated survey efforts on those trees with multiple records of Gang-gang interest. Sixty-seven sites categorised as 3 or greater were identified, and those individuals who had contributed observations from those sites were contacted and asked to contribute further sightings during the 2019-20 breeding season.

Instructions and a datasheet specially designated for the survey were posted on CNM. Although images could be posted to CNM, the aim of the datasheet was to record visits to possible nesting sites so that on occasions when there was no activity this could be recorded. From observations obtained the previous year it was realised that early morning or late evening were the most likely times to observe Gang-gangs at a potential nest site. Volunteers were asked to visit their designated site and to:

- Visit the tree at least twice a month from October to February (i.e. 10 visits)
- Spend 20 minutes each visit staking out the tree
- Visit at 7 - 9 am or 6 - 8 pm.

If no Gang-gang activity was observed at the site by the end of November, observations at the site were no longer required.

3. Results

Fifty-seven volunteers or family groups participated in the survey and, with additional information provided by the volunteers, 149 trees were watched, of which 127 were visited on at least two occasions. The field datasheets were returned by about 50% of the volunteers, the remainder providing comments directly via CNM or email. In total there were 864 separate observations.

Of the 149 trees, three had been cut down. Of the remaining 146, 27 had no activity reported. At 57 of the trees, Gang-gangs were seen at or near the site and entered the hollow

on at least one occasion. At 46 sites Gang-gangs were observed frequently entering the hollow, and chicks were reported from 15 sites.

Sixty-seven of the 149 sites had reported Gang-gangs visiting them on multiple occasions in previous years. As indicated previously, three of the trees had been cut down, six were not watched, 32 were not seen to be visited by Gang-gangs, two sites were visited by Gang-gangs on a single occasion and 24 were frequently visited, of which three produced young.

3.1. Breeding details

3.1.1. Comparison of sites between years

From records collected during the 2017-18, 2018-19 and 2019-20 breeding seasons we are aware of 22 sites that most likely (code 4) or had definitely (code 5) produced chicks, see Table 1.

Table 1. Breeding categories of 22 Gang-gang hollows during 2017-18, 2018-19 and 2019-20. See text for details of categories.

Site number	Site name	2017-18	2018-19	2019-20
25	Tree 66	5	5	5
28	Long hollow	4	4	NU
29	Small hollow	4	4	5
30	Duck down	5	5	5
133	Mistletoe	3	5	NU
134	Red Box	1	5	5
135	Norm's	NC	5	NU
136	Track hollow	4	4	NU
137	Gully hollow	NC	4	NU
138	Sandy's	4	2	NU
160	Roy's hollow	NC	NC	5
182	Davidson's	NC	NC	5
81	Sandy 2	NC	NC	5
6942	Birch	NC	NC	5
51	Tree 51	NC	NC	5
147	Mt. Ainslie	NC	NC	5
166	Federal Golf Course	NC	NC	5
163	Mugga 1	NC	NC	5
177	Mugga 2	NC	NC	5
183	Bass Gardens	NC	NC	5
Tree 4, ANBG	Tree 4, ANBG	NC	NC	5
Tree 10A, ANBG	Tree 10A, ANBG	NC	NC	4
Tree 2 ANBG	Tree 2 ANBG	NC	NC	4

ANBG: Australian National Botanic Gardens; NC- not checked, NU- Gang-gangs not seen using the site.

3.1.2. Breeding details for 2019-20

During the 2019-20 breeding season 22 chicks were observed from 15 nest sites, see Table 2. The 1.4 chicks per nest was below the average of 2.0 recorded during the 2018-19 breeding season. One of the chicks could not be sexed, leaving a sex ratio of 12 males and 9 females in 2019-20 compared with 8 males and 5 females the previous year.

Table 2 . Number of chicks and fledging dates for 15 category 5 nest sites, 2019-20.

Site number	Site name	Number chicks at hollow	Sex	When first observed	When fledged	Comments
25	Tree 66	2	♂, ♂	28/12/19	9-10/1/20	Male re-placed in hollow
29	Small hollow	1	♀	31/12/19	16/1/20	
30	Duck down	2	♂, ♂	29/12/19	4-5/1/20	
134	Red Box	2	♂, ♀	24/12/19	30-31/12/19	
160	Roy's hollow	2	♀	4/1/20	20/1/20	
			♂	4/1/20	24/1/20	
182	Davidson's	1	♂	15/1/20	16/1/20	
81	Sandy 2	1	♀	4/1/20	22/1/20	
6942	Birch	1	♀			Found dead 10/1/20
51	Tree 51	1	♀	7/1/20	ca 13/1/20	
147	Mt Ainslie	1	♂		ca 2/1/20	Replaced in hollow
166	Federal Golf Course	1	♂	4/1/20	6/1/20	
163	Mugga 1	2	♂, ♀	16/1/20	16/1/20	
177	Mugga 2	2	♂, ♀	9/1/20	24/1/20	
183	Bass Gardens	1		31/12/19		Dead in hollow
Tree 4, ANBG	Tree 4, ANBG	2	♂	8/12/19		
	Tree 4, ANBG		♀	9/1/19		Fell from nest

All of the category 5 sites provided indications of successful hatching and chick production. At all sites chicks were seen at the nest site but not all survived to fledging.

3.1.3. Chick mortality

At site 6942 (Birch) on 10 Jan 2020 a dead chick, near-ready to fledge, was found under the hollow, having presumably fallen from the nest entrance or been ejected by parents after dying in the nest. The state of decomposition suggested it had died about a week earlier.

At site Tree 4 ANBG a female chick was found on the ground near the nest site on 9 Jan. The tree was too difficult to climb so the chick could not be replaced. It survived in a nearby bush and continued to be fed by the adults but by the fourth day a pile of feathers indicated that the chick had been predated, possibly by a fox that had been seen in the area. From the development of the wing feathers we calculate that the chick was about a week from fledging. An interesting observation was the difference in the chick feeding behaviour between the male and female parents. Although the female was relatively gentle in feeding the chick, the male was not, and the feeding session usually ended with the chick falling off its perch. The chick then had to return to the perch with difficulty.

At site 147 (Mt Ainslie) on 2 Jan a nearly fledged nestling was found on the ground. It was replaced in the hollow and the entrance blocked with a jumper. When the parent birds returned and perched a short distance away, the jumper was removed by pulling the attached string. The parents then returned to the nest site.

At site 25 (Tree 66) breeding occurred in the same tree as last year but in a different hollow. On 9 Jan around mid-day a male chick was found by a member of the public on the ground near the nest site and taken to the Kent Street Veterinary Clinic in Deakin. The nearly fledged chick was returned to the nest site during the afternoon of the next day. For a detailed account of the rescue see Appendix I.

At site 183 (Bass Gardens) on 31 Dec 2019 a female adult was observed emerging at the hollow entrance and two photos were taken approximately one minute apart. When the images were displayed on a computer, it was realised that the second image showed the adult clutching a white/creamy-coloured object in its claws. This was not visible in the first image because the adult was still partly hidden. On looking at the images, we concluded that the object was a dead chick that was being removed from the nesting chamber. Subsequently no further breeding behaviour was seen at this site.

An interesting observation occurred during the evening of 31 Dec at Site 29 (Small hollow); the site identified by the small size of the hollow entrance (7 x 10 cm). The female chick was observed facing outwards and obviously stuck in the entrance. It remained stuck for a couple of hours. Eventually the male arrived, fed it, and managed to push it back into the hollow. Over the next few days the chick was seen to have great difficulty exiting and returning to the nest. It eventually fledged, presumably on 12 Jan.

3.1.4. Tree measurements

Tree species and hollow type (whether on the trunk or a primary or secondary limb) were noted. Measurements for hollow depth were taken from the base of the entrance to the floor of the chamber. There were two measurements for hollow diameter: the width and height of the entrance. In addition, the outside circumference of the spout or trunk at the level of the chamber floor and the maximum diameter of the chamber floor were measured. Finally, the height from the ground to the base of the entrance was measured and the hollow perch

length if present was measured (see Appendix II). For additional tree measurements and discussion see Davey *et al*. (2019).

3.2. Some general observations

No chicks were observed in trees in urban gardens, small urban parks or road reserves. We watched 27 hollow-bearing trees in these areas. The smallest park in which a hollow was observed to support a Gang-gang chick was the 3 ha Bass Gardens.

Nesting sites tended to be close to each other, and several observers recorded peaceful and what seemed to be helpful interactions between nearby nesting Gang-gang pairs, such as neighbouring Gang-gangs driving off another bird species from an unattended hollow, nesting pairs calling to each other and flying off together, or nesting pairs visiting each other's hollows. The nests were clustered at the urban interface in the Hughes-Red Hill area, the O'Malley – southern Red Hill area and the ANU-Botanic Gardens area.

Twenty-one chicks successfully fledged; 12 males and 9 females. One dead young female chick was discovered at the base of the ANU nest tree and one dead chick was observed being removed by a parent from the nest at Bass Gardens. The chicks did not seem to be hurt and we suspect heat exhaustion. Both deaths occurred in planted trees. The hollow formation in these trees is different from that in remnant trees. The hollows start as splits in limbs (or from surgery in the ANU tree), moisture collects in the splits and fungus softens the wood. Parrots then seem to chew out the wood to enlarge a hollow. One hypothesis is that hollows formed in this way are less well insulated than those formed from within by termites. Another "split branch" hollow in a tree in the Hughes area may have resulted in a drowned chick after a heavy spring downpour. A pair nested in a hollow in a 58-year-old planted Brittle Gum and successfully raised a chick, but the hollow in this instance seemed to have been formed by termites.

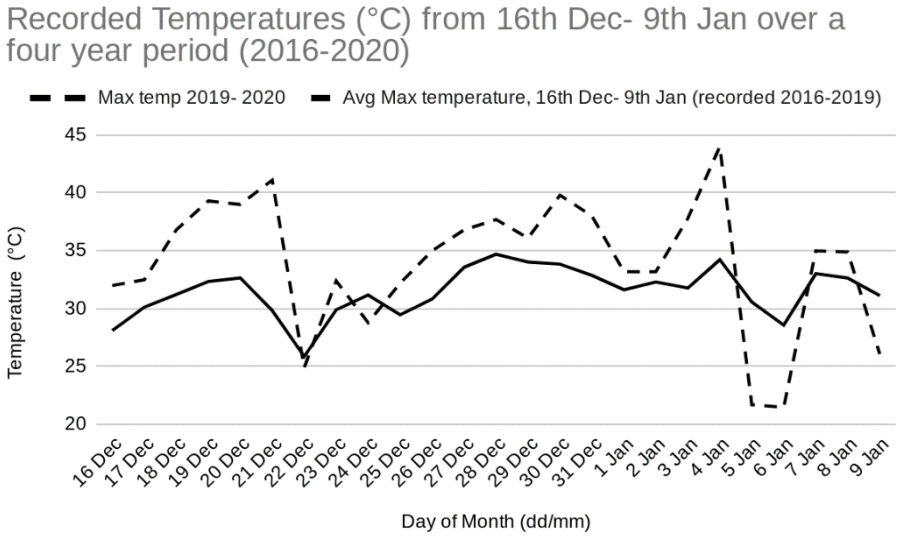


Figure 1. Average maximum temperature between 16 Dec and 9 Jan for years 2016-2019 compared with 2019-20.

We observed four chicks leaving or attempting to leave their hollow prematurely. One female chick was stuck halfway in and out of a small entrance and three chicks were found helpless on the ground. Apart from the very young chick at Bass Gardens, all other young were found between 2 and 10 Jan. From around 24 Dec to 9 Jan, apart from a hot spike on 4

Jan of just under 45°C, followed by the passage of a cold front on 5 Jan, the weather in 2019-20 was hotter than the average of the past three seasons (see Fig. 1).

Over the last 80 years the mean annual rainfall at Canberra Airport is 614 mm. The minimum yearly rainfall fell in 1982, with 262 mm, and the maximum was 1062 mm in 1950. The mean annual average over the last three-year period (2017-2019) is 439 mm, the lowest three-year average in the 80 years of recording.

Nevertheless, we cannot be sure whether chicks fell from nest sites due to the hot weather (or some other factor), or whether they were found on the ground because we were watching the trees. Our observations have been during a record dry period, and breeding success and behaviour is likely to be different in wetter years. The Gang-gang is a cool temperate species, unusual among cockatoos, and may well be a species likely to suffer from climate change.

Our observations confirm that when chicks are about to fledge they are fed at the hollow entrance, rather than by the adults entering it. It is possible that certain characteristics of the entrance and the more aggressive feeding behaviour of the adult male make the chicks more susceptible to falling out. This does not have to be fatal for the chick because, as demonstrated at site 4, parents will continue to feed the chick out of the nest.

During 2019-20, virtually all chicks were first seen appearing from the nest hollow between 24 Dec and 16 Jan and fledging occurred between 30 Dec and 24 Jan, that is, over a period of about one month from around the Christmas period. It is of interest that the exception was at ANBG, where one chick was recorded at site 4 on 8 Dec 2019 and young birds were seen at sites 10a and 2 on 19 Nov and 8 Dec respectively. It cannot be confirmed that the young birds were from these sites, but even so there are indications that Gang-gang emergence was earlier than at other sites.

From observations on Red Hill it appears that incubation takes 3-4 weeks and the time from laying to fledging varies from 61 to 79 days (Tom Tyrrell *pers. obs.*). Incubation was judged to have begun when the male or female were seen sitting on the edge of the hollow, looking out. During the incubation period, all was quiet and no birds or change-over were seen during the day. It appears that there are only two change-overs per day, one in the early morning and one at nightfall, with the female incubating during the night. The clutch is incubated continually, apart from the change-over. It was assumed that the eggs had hatched when the change-over started to occur during the day, rather than during the early morning or late evening and this visitation frequently seemed to increase as the chicks grew. As they grew, both parents were seen to leave the hollow together for short periods of time.

Taking the maximum time of 79 days or about 12 weeks from the start of incubation to fledging, these observations agree with those from captive birds (see Higgins 1999).

We acknowledge that it is difficult to assess whether hollows are being used as nesting sites, and most cases require many hours of patient observations or good luck to confirm successful breeding. As with other cockatoo species, Gang-gangs spend much of the year inspecting hollows. This activity is not confined to the breeding season. They will visit nests sites other than their own, and non-breeding birds will apparently also visit nesting sites, but to date we have not observed birds other than the nest owners entering nests, although others may spend much time peering in and head-bobbing. During incubation it would appear that

the nesting adults spend very little time around the nest site, with change-over only occurring early morning and late evening.

We obtained hollow measurements after the breeding season and at that time two of them were filled with water. These sites and another are known to be frequented by Gang-gangs coming in to drink, so some trees may be of value providing water during dry periods. Multiple entries into a hollow do not necessarily imply that it is a nesting site.

There is a need in the future to investigate trees visited by Gang-gangs some distance from the urban edge. In the survey reported here, none of the nests were further than 200m from the urban edge but we watched only five trees that were further than 300m: at Callum Brae (3), Mt Majura (1), and the Pinnacle (1). It is possible that the proximity of nests to the urban edge is related to a preference for sites close to food and water resources provided in the urban environment.

Acknowledgements

We wish to thank Tom Tyrrell for behavioural observations, assisted by Jenny and Cameron Tyrrell, Jacky Fogerty, Kim Lomax and Sam Nerrie. We thank Don Fletcher, Laura Rayner, McLean Cobden and Ben Le Dieu for tree climbing and Roy McDowall, Helen Cross, Clare de Castella, Larissa Dann, Sue Ross, Linda Beveridge and the Werner family for finding additional nest sites.

We also wish to thank Freja Cianchi for compiling the weather observations, the 57 individuals and family groups who contributed 835 observations and to 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.

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

Accepted 5 August 2020

APPENDIX I.

THE STORY OF A GANG-GANG CHICK BEING RETURNED TO ITS PARENTS

TOM TYRRELL

At 5:45pm on 8 Jan two male nestlings were seen in the hollow at Site 25 with both Mum and Dad close by. The male could be identified by having much more red on the head. After 20 minutes, both were fed. On returning at 7:00 pm, I thought that the two nestlings were still present

The next day there was no sign of nestlings at 8:30 am or again at 10:30 am. At 6:15 pm and again at 8:00 pm the nestling with less red on the head was seen at the hollow entrance. At about 8:00 pm my son Cameron mentioned that he had seen a picture of a Gang-gang chick on the Facebook site of the Kent Street Veterinary Clinic, Deakin. The chick was uninjured and had been handed over to the carers at ACT Wildlife.

Figure 1 Fallen male chick from nest site #25 (*Photo forwarded from Carla D'Andreti*)

On 10 Jan I rang the vet to enquire about the chick and was told that the bird had been picked up near Site 25 (at the back of the Kent St Defence building) around mid-day the previous day. It had since been picked up by ACT Wildlife, who sent me a photo of the chick, which looked very much like the chick from Site 25 (see Figure 1). I contacted Don Fletcher, who had rescued a chick from Site 147 (Mt Ainslie) a week earlier. (I had been involved in organising this rescue.) I then contacted the carer (ACT Wildlife had transferred it to a carer) and asked that the chick be given a big feed. My son and I then picked up the bird from its cage at Waramanga and met Don at around 3:15 pm near Site 25. Just after 4:00 pm Don climbed the tree and took measurements of the nesting site after checking that there was no other nestling present.

At around 5:00 pm, with the chick still in the box and becoming distressed, the parents flew in to a nearby tree. The chick called and they responded. The chick was taken out of the box and placed on a low branch near the hollow entrance, but after 30 minutes the parents had not made a move to contact son. Don then decided to place the nestling in the hollow. As this occurred both parents flew to the tree close to Don and after a few minutes flew away again.

When placed deep in the hollow the chick immediately turned around, came to the edge of the hollow and was starting to fall when Don, still up the tree, caught it. It was then placed on the top of the hollow, seemed disorientated and again fell, but Don managed to catch it a second time. When replaced in the hollow, it settled. At 6:51 pm the adult male flew in and fed and preened the chick and the female came in shortly after and did the same. Over the next 90 minutes there was further preening while the parents encouraged their son to fledge. This became quite forceful at one stage when Dad almost knocked his son off the perch. Dad could be seen a few times over this period demonstrating to his son how to get back into the hollow but the chick seemed very reluctant and scared to move from the perch.

After no success and with darkness drawing in, Mum came in at 8:20 pm and virtually pushed her son off his perch. Dad, Mum and son then all flew together to a small tree about 70m away where they spent some minutes. The fledgling, after his maiden flight, seemed very uncoordinated when trying to hold on to a very small branch at the top of the canopy but eventually settled. A happy ending for all.

Special thanks to Don Fletcher, without who's climbing skills the return of this chick to its parents would not have been possible. Thanks to all those who participated in this rescue, which ensured that the chick will have the best possibility of leading a normal Gang-gang life, to Cameron Tyrrell, the Kent Street Vet, Carla D'Andreti from ACT Wildlife, Erica who cared for the chick for 24 hours, and to Michael Mulvaney and Chris Davey for advice, to Michael for running the Gang-gang survey and finally to Jacky Fogerty for advice and monitoring the tree, and to Jenny Tyrrell for support and phone calls to Chris and Michael.

APPENDIX II. Gang-gang breeding hollow measurements

Tree		**Hollow**						**Chamber**		**Branch trunk cir-cumf. (cm)**	**No-tes**
No.	Spe-cies	Lo-ca-tion	Ty-pe	Height above' ground (m)	Entrance		Perch length (cm) .	Depth (cm)	Floor diam (cm)		
					Height (cm)	Width (cm)					
25.2	Eb	S	S	8.7	12	--	--	90	--	--	
160	Er	P	H	5.8	30	9	114	44	29 est	178	
182	Er	P	H	5.7	17	14	50 & 200	83	19 est	176	
81	Em	T	H	7.4	26	13	84	46	15	100	P/F
6942	Ee	T	C	5.0	20	11	--	38	18	210	
51	Em	T	H	7.7	16	12	22	66	18	120	
147	Eb	S	H	9.0	24	17	110	78	18	176	
166	Eme	P	H	8.5	14	17	--	52	16	172	
163	Eb	S	H	8.5	35	17	--	22	20 est	80	WDe
177	Eb	P	C	6.9	20	15	100	52	21	166	
183	Ebi	T	H	7.5	42	20	--	35	23	135	P/F
4	Er	S	S	9.4	--	--	--	--	--	--	
10A	Ema c	T	C	--	--	--	--	--	--	--	
La-ris-sa*	Em	T	H	5.2	35	17	400	65	19	141	P, WDe
	Eb	P	H	6.0	34	26	--	84	28	129	Pos-sum

Tree species: Eb – *E(eucalyptus). blakelyi*; Er – *E. rossii*; Em – *E. mannifera*; Ee – *E. elata*; Eme – *E. melliodora*; Ebi – *E. bicostata*, Ema – *E. maculata*
Hollow location: T – Trunk; P – Primary Limb; S – Secondary limb
Hollow type: H – Hollow in trunk; S – Spout; C – Chimney
WDe – Wood Duck with eggs; P – Planted; F – Flooded; * Not used as a nest site

Canberra Bird Notes 45(3) (2020): 235-241

A GANG-GANG STORY FOR SEVERAL HOLLOWS IN RED HILL NATURE RESERVE AND SURROUNDS. HUGHES AND DEAKIN, 2019/20 SEASON

TOM TYRRELL

Hughes

For correspondence: Chris Davey: chris_davey@aapt.net.au

Background

The aim of this report is to document the activity of the Gang-gang (*Callocephalon fimbriatum*), known by the local Ngunnawal people as the *Wamburang,* at a number of nest sites during the 2019-20 breeding season. The objective was to develop a monitoring program of Gang-gang behaviour and provide a break-down of the various stages from looking into nest hollows to fledging. The sites were within a reasonable distance from each other and were covered at any time of the day, but usually early morning and evening. No fixed amount of time was set for each site; the duration of visits was determined by events at the site. Breeding at some of the sites had been documented in the previous two years, but other sites were newly discovered during this season.

Eleven sites were monitored and chicks fledged at five sites. Of these, three were known to have produced chicks over the past two seasons. Six sites did not produce chicks: four of those had been observed in previous years, and two were not known to have produced chicks previously.

From observations it was possible to separate the period from egg-laying to fledging into six stages. The dates against breeding sites for each stage are estimates based on observations. Some of the date allocations were obvious, while others were a best guess.

The Stages

Stage 1 – Gang-gangs show consistent interest in particular tree hollows. This is easy for some as they chose the same hollow as last year. Others need to fight other birds off and when successful must find new hollows. For some pairs such as those at Sandy 2 (possibly) it could be their first time nesting. At this stage the Gang-gangs are easy to see at any time during the day, are sometimes quite noisy and need to fight off other bird species for the hollows; these encounters can be very noisy. Some other birds which seem to challenge them for the hollows are Sulphur-crested Cockatoos (*Cacatua galerita*), Galahs (*Eolophus roseicapillus*) and Rainbow Lorikeets (*Trichoglossus haematodus*), which are very aggressive and not willing to share the tree at all.

Stage 2 - (3 to 4 weeks). The change-over stage. This is the stage where the Gang-gang pairs sit on the eggs (incubation). The Gang-gangs appear to incubate almost continuously, apart from a very short period at change-over. It appears that the female sits on the eggs all night from dusk to just after dawn, and then the male flies in and takes over. Change-over appears to happen only twice a day during this stage, which appears to last about 3 weeks. The incoming Gang-gang gives a very small call on the way in which gives the incubating bird

time to be prepared. The partner then comes in and change-over occurs. During this period the Gang-gangs are very quiet, change-over happens in a matter of minutes. Although it is difficult to find new hollows, this is a very good time to confirm eggs have been laid if you happen to be out within an hour or so after dawn. Seeing a change-over confirms that it is an active hollow. Overall, however, there is very little Gang-gang activity and noise during this period. If a suspected nesting hollow has become very quiet during this period, it is a likely that eggs have been laid.

Stage 3 – (2 weeks). Eggs have hatched and the nestlings are growing. The Gang-gangs appear to be happy to be off the eggs for longer periods at change-over and the frequency of change-over seems to increase to at least a few times a day. Feeding occurs during the change-over. While the chicks are very young there is always one adult in the hollow. Towards the end of this stage you can hear the chicks being fed.

Stage 4 – (3 weeks) Gang-gangs leave the hollow together for a while. Initially in this stage the parents bring other pairs with them, usually one pair, when they make the change-over. This may be to celebrate the young but it is probably more practical, as it provides a guard for the hollow while the parent Gang-gangs leave the hollow for periods of time. It appears that the parents are happy to leave the hollow together if they have a "friend" to watch the hollow. The young need more food and require that both parents feed them when they return. Feeding during this period becomes more frequent, every hour or two as the nestlings grow towards the next stage.

Stage 5 – (6 to 18 days). Nestlings can be seen at the entrance or on the rim of the hollow. During this period you can quite often see them when they are being fed, depending on the geometry of the hollow. Towards the end of this period the adults are talking to the young and getting them ready to fledge.

Stage 6 – Fledging. I have witnessed 5 clutches fledge (two last season and three this season). It is good to see this happen as it means that breeding has been successful. There have been a few unsuccessful fledgings this season, where the chick has been able to be returned to the hollow and then later successfully fledge.

Summary

From the data collected I am reasonably confident that the incubation period takes 3 to 4 weeks and stages 3 and 4 combined take about 5 weeks. The time from laying to fledging varied from 61 days to 79 days, the average being 69 days (just under 10 weeks).

In addition to the successful hollows, two new unsuccessful hollows were observed this season. Long Hollow, a site known to have been successful to stage 4 in previous years, reached stage 1, and two newly discovered sites, Pump Station and Larissa Hollow, reached stage 4 and stage 2 respectively.

The following Table summarises the observations for the successful sites.

Hollow	Red box 134	SECT 66 new 25	Downy 30	Small 29	Sandy 2 102	Av. no. (days)
Com-ments	The first chick, the ♂, fledged.	One fledged, think the other fledged also successfully.	I saw the first chick fledge.	1 ♀ nestling only. Assume successful fledging.	1 ♂ chick only. Successful fledging.	
No of chicks	**2**	**2**	**2**	**1**	**1**	
Sex	**1 ♂, 1 ♀**	♂	♂	♀	♂	
Estimated duration (days)						
Stage 2	**28**	**21**	**19**	**23**	**27**	**24**
Stage 3	**13**	**16**	**15**	**11**	**9**	**13**
Stage 4	**18**	**17**	**21**	**23**	**25**	**21**
Stage 5	**6**	**12**	**6**	**16**	**18**	**12**
Stage						
1	29-Sep-19	28-Sep-19		12-Sep-19	28-Oct-19	
	First seen at hollow	By 30 Sep Ggs. had probably selected this hollow.	No fight witnessed for this hollow. Ggs. checking out hollow 28 Sep.		♂ observed chewing bark at tree. This is a new tree for Ggs.	
2	26-Oct-19	4-Nov-19	4-Nov-19	4-Nov-19	4-Nov-19	
	Last time Ggs. seen 14 Oct, fresh bark chewings 7 Nov, change-over 9 Nov. Start time is guess.	At dark♀ peeping out of hollow. Change-over seen 9 Nov.	Seen looking out of hollow on 2 Nov and change-over on 7 Nov. Estimated stage 2 on 4 Nov.	Stage started between change-over seen 10 Nov and sighting on 30 Nov.	♂ seen on 2 Nov on the hollow but change-over witnessed on 6 Nov.	
3	23-Nov-19	25-Nov-19	23-Nov-19	27-Nov-19	1-Dec-19	
	17:00 h ♂ just visible, possibly eggs hatched. 26 Nov ♀ on rim, pretty sure eggs have hatched	♂ looking out of hollow (may indicate eggs hatched). when I arrived and when left	♂ seen looking out of hollow. Assumed the eggs had hatched at this point.	♀ spotted looking out of the hollow.	Changeovers a lot more frequent. Assume eggs have hatched.	
4	6-Dec-19	11-Dec-19	8-Dec-19	8-Dec-19	10-Dec-19	
	Pair leaving hollow together. So the chicks big enough to be left on own.	Estimate only based on sighting	Pair flying away from the hollow together. The chicks are large enough to leave on own	Pair seen leaving the hollow together	Stage 4 seems to be around the 10th. 2 flew in, 2 flew away, probably not the pair.	
5	24-Dec-19	28-Dec-19	29-Dec-19	31-Dec-19	4-Jan-20	
	10:03 h Chris and I witnessed first nestling of the season.	First sighting of two ♂♂ nestlings	Nestlings seen for the first time	Nestling seen for the first time. Appeared stuck outside hollow for a long while due to small entrance.	♂ nestling seen for the first time by Larissa	
6	30-Dec-19	9-Jan-20	4-Jan-20	16-Jan-20	22-Jan-20	
	♂ fledges 20:30 h almost dark. I think the ♀ fledged on the next day 31 Dec, not sure when.	One or both fledged. One unsuccessful, rescued, taken back to hollow next day, it fledged a couple of hours later on 10 Jan.	The first nestling fledged late in the evening. Assumed the second nestling fledged on 5 Jan because not there on 6 Jan.	Nestl. on rim of hollow 15 Jan am. still there at night. Late on 16 Jan no Ggs. noted. Assumed it fledged morning or late 16 Jan.	Nestl. fledged on this date, probably about 18:30 h. ♂ fledgl. seen with 2 other recent ♂ fledgl. on a tree 40 m away.	

Additional observations

For further information on the nest sites listed below see Davey and Mulvaney (2020). Unless otherwise credited, all photos by Tom Tyrrell. The images below highlight the different types of nesting sites and site competitors.

Figure 1. Red Box, site # 34. Thirty-five observations on 20 days.

Figure 2. Red Box, site # 34 (continued).

30-9-19 Acquiring a hollow

A problem with 10 Rainbow Lorikeets

8-1-20 Chicks about to fledge

Figure 3. Section 66, site # 25. Forty-three observations over 24 days.

28-9-19 Pair acquiring a hollow

29-12-19 Chicks about to fledge

Figure 4. Downy Hollow, site # 30. Forty-five observations on 22 days.

12-9-19 An unwelcome visitor

Eastern Rosella visiting hollow

10-11-19 A tight squeeze for exiting female

Figure 5. Small Hollow, site # 29. Thirty-five observations on 31 days.

23-11-19 An unwelcome visitor

Crimson Rosella visit during chick feeding phase

3-1-20 Female chick stuck in hollow entrance. Male pushed chick back into nest

Figure 6. Small Hollow, site # 29 (continued).

Sandy 2 nest site

22-1-20 Chick about to fledge

Figure 7. Sandy 2, site # 102. Thirty-nine observations on 32 days.

Pump Hollow, Site # 194

Larissa Hollow, Site # 81. Site possibly flooded

Long Hollow, Site #28

Figure 8. Unsuccessful sites.

Acknowledgements

Thanks for the support, company and observations of Jenny Tyrrell, Cameron Tyrrell, Jacky Fogerty, Sam Nerrie, Larissa Dan and Kim Lomax.

Reference

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: 224-234.

Accepted 7 August 2020

Canberra Bird Notes 45(3) (2020): 242-255

THE STATUS OF THE HORSFIELD'S BUSHLARK *(MIRAFRA JAVANICA)* IN THE CANBERRA REGION

MICHAEL LENZ

117/50 Ellenborough Street, Lyneham, ACT 2602, Australia

michael.lenz.birds@gmail.com

Abstract. *The review of the status of the Horsfield's Bushlark [Bushlark]* (Mirafra javanica) *in the Canberra Region is based on the records in COG's database, the literature and the author's observations. The distribution of the Bushlark is rather scattered. Most records come from a few areas: Lake George, Lake Bathurst and Parkwood Road (Wallaroo) in NSW, and Uriarra Rd. and Coppins Crossing in the ACT. The species is mainly recorded from agricultural grasslands (grazing paddocks with very low stocking rates or without livestock; grain fields [chiefly wheat, oats], lucerne and fallow fields). The species may be more widely distributed, but large areas of the region have not been adequately surveyed. Changes in land use, such as crop rotation, changes in stocking rates and the extent to which grain is sown greatly influence the distribution and abundance of Bushlarks. The breeding season extends from late September to February, but may start earlier in years of good rainfall. It is possible that birds can raise two broods per season, or at least attempt a second clutch after the loss of the first brood (observations of adults carrying food over a long period: 16 October to1 February). Estimates of the population density during the breeding season based on area searches or transect counts of grain fields have given values from 0.7 to 10.2 Territories/10 ha. Bushlarks are recorded in the Canberra Region throughout the year. Outside the breeding season reported numbers ranged from 1 to 20 birds per record (on average 3.3 birds/record). The overall paucity of records outside the breeding season is not due to birds migrating out of the Canberra Region, but largely due to the secretive behaviour of the species. The status of the Bushlark in the Canberra Region can therefore be described as 'rare to locally common, breeding resident'.*

1. Introduction

The current status of the Horsfield's Bushlark (*Mirafra javanica*[1]) [Bushlark hereafter], a bird of open natural and agricultural grasslands, is described for the Canberra Region [or the Canberra Ornithologists Group's Area of Interest (COG's AoI)] as 'rare, breeding summer migrant' (Frith 1984; Hermes 2017; Canberra Ornithologists Group 2020). However, Lepschi (1987) came to the conclusion, reviewing earlier records from the Canberra Region, that the species is 'present in our area throughout the year'. The view that the species is mostly sedentary, albeit with some nomadic movement possible in response to good rainfall or drought, is supported by several authors (Blakers *et al.*1984; Higgins *et al.* 2006; Alström 2020; Coopers *et al.* 2020). The impression that the species is migratory appears to be due largely to a notable behavioural change from the breeding to the non-breeding season. In the breeding season males can be readily located by their song and display flight, and birds may often be found sitting on fences and posts (Figs. 1 and 5). But once males stop singing at the end of the breeding season, Bushlarks become inconspicuous. Only occasionally will they

[1] Nine subspecies of the Horsfield's Bushlark are recognised in Australia (Schodde and Mason 1999). In SE Australia, including the Canberra Region, *M. javanica horsfieldii* occurs.

sit in the open. As a rule one has to almost step on the birds while walking through suitable habitat to see them. But even when flushed the birds remain largely silent, hardly rise above the ground vegetation and hide again very quickly (see also Hermes 2017).

Figure. 1. Pair of Horsfield's Bushlark shortly after copulating, Coppins Crossing, ACT, 17 Nov 2019 (*Shorty Westlin*).

Almost as a by-product of COG's waterbird surveys of Lake Bathurst and Lake George, Bushlarks have been recorded on many occasions, often by the author, over a number of years. Elsewhere in COG's AoI, most modern records come from a limited number of sites, although suitable habitat for the species is certainly more widespread than the records would indicate. This article comments on the distribution of Bushlarks, habitat choice, breeding records, population density and observations outside the breeding season. The aim is to provide a fuller account of the status of the Bushlark in our region.

2. Observations and Discussion

2.1. Distribution

A more detailed distribution map of the Bushlark in the Canberra Region, based on the records in COG's database, is given in Fig. 2 and a map using ebird data, in Fig. 3. A number of sites where the Bushlark was recorded prior to the review by Lepschi (1987) are now part of urban habitat and the species has vanished from those areas, such as Lyneham, Mitchell and parts of Tuggeranong (Fig. 2). In the past the latter area produced a number of sightings, including breeding records (Holland 1985; Jack Holland, *pers. commun.*).

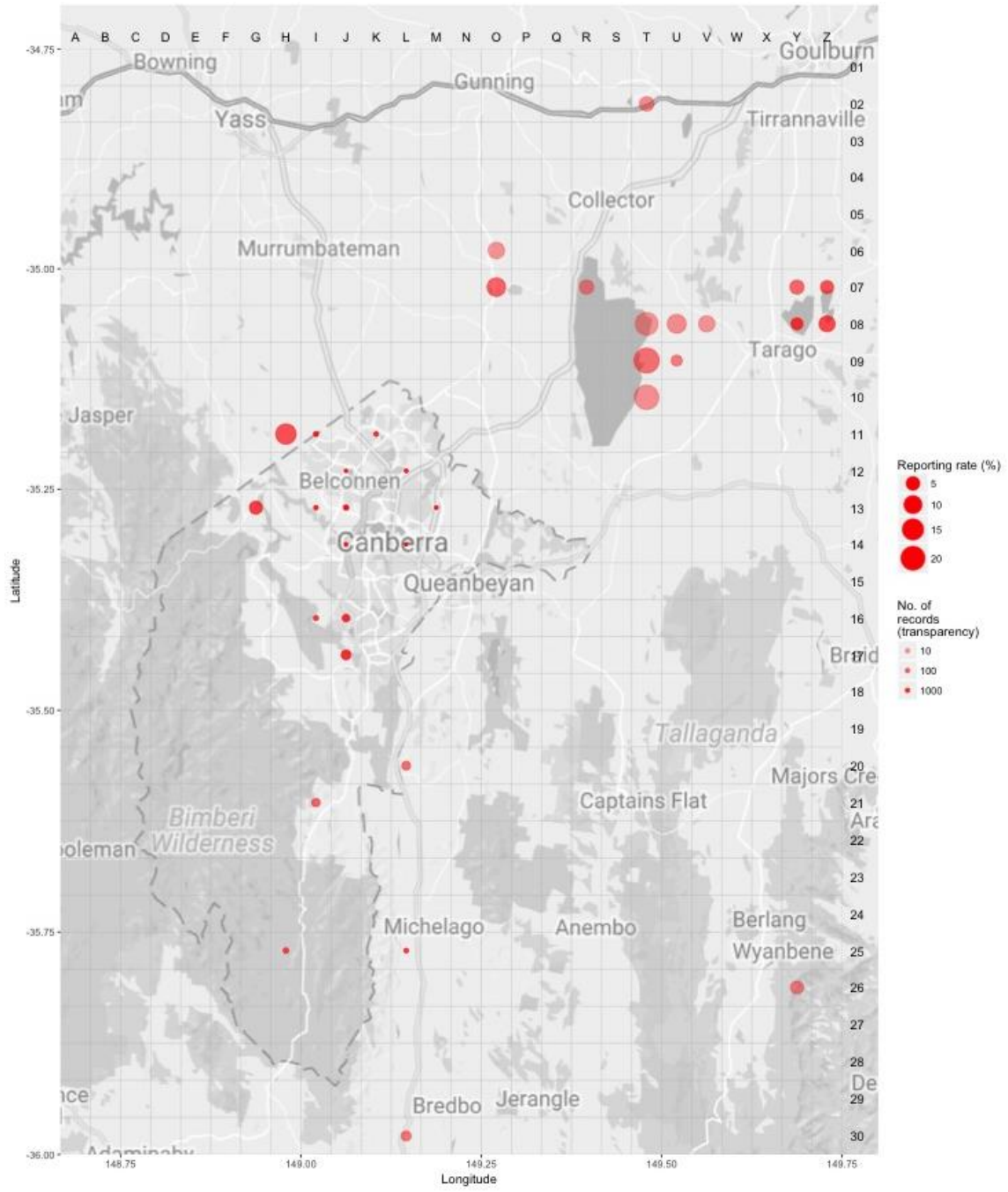


Figure 2. Distribution of the Horsfield's Bushlark in COG's AoI (based on the records held in COG's database, 1982-2017).

Apart from the paddocks around Lake Bathurst and the eastern side of Lake George, sites with more frequent modern records include grazing country along Parkwood Rd (Wallaroo), and sites near Gundaroo, all in NSW, and grasslands of West Belconnen (linking to the Parkwood area), Uriarra Rd and Coppins Crossing (Pipeline track) in the ACT.

The distribution is rather scattered. Many of the records come from agricultural grasslands, grazing paddocks with very low stocking rates, fallow land or from grain crops. These habitats are not necessarily favoured by bird watchers. One of the key reasons is the restricted accessibility of such sites (see Lenz and Kamprad 2019). There are large tracts of

farmland, especially in the northern third of COG's AoI that may also provide suitable habitat, and not only along certain roads travelled to reach specific survey areas (*e.g.* Gundaroo, Lake Bathurst and Lake George in the case of the author). The same may apply to country S and E of Canberra and Queanbeyan. Interestingly, the species appears to be sighted only occasionally from grasslands on the Hoskinstown plain to the S of Lake George, which produced only three records between 2011 and 2018 (Martin Butterfield, *pers. commun*.).

Figure 3. Distribution of the Horsfield's Bushlark (based on ebird data, visited 18 May 2020**) in the wider Canberra Region (*Map courtesy of Alastair Smith*).**

The other feature of Bushlark sightings, chiefly on agricultural grassland, is that birds may be recorded at a site in one year but not necessarily in the following one. For example, on a wheat field 2 km out of Gundaroo on the Gundaroo Rd. the author could record up to 5 singing males between 2011 and 2013 (see also Sec. 2.4, Table 2). However, from 2014 onwards the field has been used to grow lucerne and is harvested for hay more than once in a season. Since that time a singing bird has been noted only once (30 Dec 2016). Around Lake Bathurst and Lake George, the abundance and location of Bushlarks was largely linked to the extent to which grain (oats, wheat) had been sown (see also Lenz and Kamprad 2019).

Drought conditions can have a similar impact. In the 2018/2019 breeding season, grassland birds in general, including Bushlarks, were a common sight in the grazing paddocks along Parkwood Rd. (Wallaroo), and many observers visited and photographed the birds there (Dabb 2019). However, severe drought for most of 2019 and grazing by cattle left the paddocks rather bare, and Bushlark and Brown Songlark (*Cincloramphus cruralis*) were largely absent from the area in the 2019/2020 breeding season, while Eurasian Skylarks (*Alauda arvensis*) and Australasian Pipit (*Anthus novaeseelandiae*) managed to persist better.

2.2. Habitat

In general, Bushlarks occupy native and introduced grasslands, especially perennial tussock grasslands. They are frequently found in grain and lucerne crops and pastures with taller grass (Higgins *et al.* 2006; Cooper *et al.* 2020).

It is not clear to what extent the various reserves of natural grassland in Canberra are settled by Bushlarks. Some records exist for such grasslands in Gungahlin and NW Belconnen (notably Peter Christian for the latter area, *pers. commun.*), although to date some of these sites may not have been fully explored for this species.

The highest numbers of Bushlarks in the Canberra region have been found on grazing land with very low stocking rates (*e.g.* along Parkwood Rd. in the 2018/2019 breeding season) or pastures that have remained free of livestock for longer periods and turned into rank and weedy grasslands (Tuggeranong; Jack Holland, *pers. commun.*; Goulburn Maturation Ponds; Frank Antram, *pers. commun.*; some areas at Lake Bathurst, author), grain fields (several areas) and fields that have lain fallow. Around Lake Bathurst the dominant grain crop is oats; at Gundaroo and E of Lake George it is (was) wheat. Both crops are readily colonized by Bushlarks. Stands of Rye Grass (Lake George) have also been favoured (Fig. 4).

Interestingly, Bushlarks stayed in the rye grass stand shown in Fig. 4 after breeding, but left it when a few head of cattle were brought to the paddock.

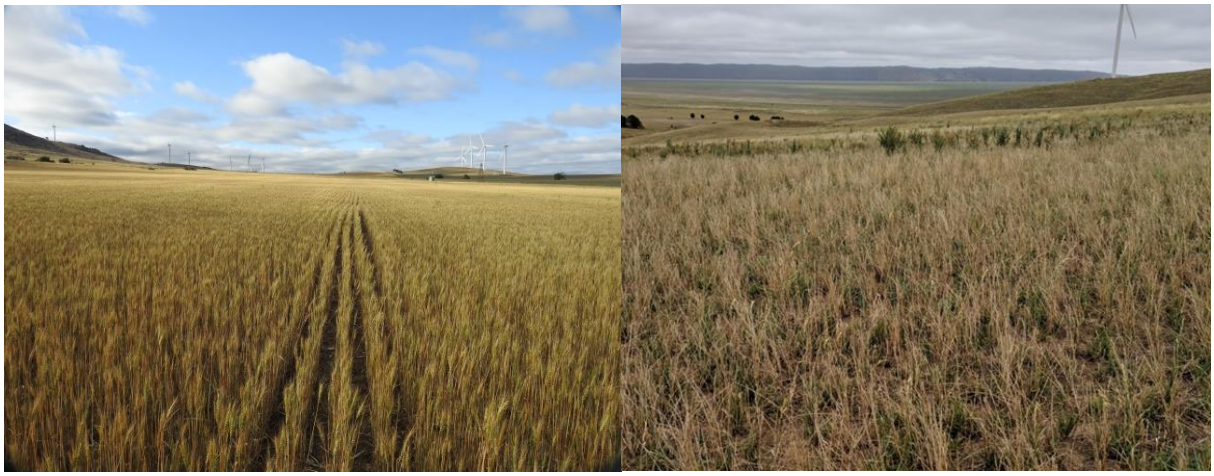


Figure 4. Wheat field (left) and a stand of rye grass in a grazing paddock (right) at Lake George. Bushlarks were breeding in both crops.

However, many grain paddocks are free of Bushlarks. We found that, where a choice of wheat fields was available, birds appeared to settle in those on level ground and with higher soil moisture and/or better soil quality, indicated by better growth of the crop (Lenz and Kamprad 2019). For example, Bushlarks were absent from wheat on the northern edge of Gundaroo, but in a field 2 km from the village, mentioned earlier, several birds were present. The latter field showed better growth, most likely due to higher soil moisture and better soil quality, the site being within the Yass River flood plain. The fact that Golden-headed Cisticolas (*Cisticola exilis*) also settled in the paddock, further indicated moister conditions (M. Lenz, *pers. obs.*).

Likewise, at 'Currandooley', just E of Lake George (CurLGeo hereafter), wheat grown on level ground was clearly preferred to wheat on slopes. Wheat growth was poorer on the slopes, and Bushlarks were absent from such a paddock if at the same time wheat fields on level ground were available (see Table 3 in Lenz and Kamprad 2019). Even within the preferred wheat paddocks, patches with poorer growth were avoided for nesting, but patches with more bare soil may still be visited for foraging (Jack Holland, *pers. commun*.).

Interestingly, on 18 Aug and 28 Oct 2020 one and three Bushlark respectively were singing at Lake Bathurst in an area with a dense cover of the weed Serrated Tussock. I have visited this particular area for many years and have never encountered Bushlarks there or in any other section s of the lake basin overgrown with this grass (Lenz 2014).

On the other hand if the grassland vegetation becomes too tall and dense, birds may become less abundant (Higgins *et al.* 2006). The latter can explain our preliminary observation that several Bushlarks were found singing over a young canola crop at CurLGeo, but appeared to abandon the site once the crop grew taller and leafier and the gaps between the plants closed up (Lenz and Kamprad 2019).

Lucerne paddocks are mentioned as habitat for Bushlarks (*e.g.* Higgins *et al*. 2006), but the observations from COG's AoI indicate a more complex picture. Over the four years when Bushlarks were monitored at CurLGeo, birds appeared in lucerne only after wheat was harvested, displacing the birds from their breeding sites. However, with one exception bushlarks did not seem to persist in those lucerne paddocks (Lenz and Kamprad 2019). The growth of the crop in those years did not seem to be very good. In early 2020, after good rains, the lucerne stood much higher than observed between 2015 and 2019. The relatively low height of the lucerne in the previous years may have been the limiting factor preventing settlement by the species. Also the example from Gundaroo, mentioned above, indicates that lucerne may not necessarily be attractive to bushlarks. However, a neglected lucerne paddock that had grown tall and turned weedy, a couple of kilometres distant from our site at CurLGeo, regularly held several singing Bushlarks over the breeding season in 2018/2019 (M. Lenz, *pers. obs.*).

Table 1. Breeding records of the Horsfield's Bushlark in COG's AoI, sorted by month.

Date	Breeding observation	Location	Observer	Reference[B]
16 Oct 2020	cf[A]	Throsby (Mulligans Flat)	C. Davey	Davey 2020
13 Nov 1988	2x cf	Tuggeranong Ponds	J. Holland	CBN 15(4) 105
22 Nov 2015	cf	Lake George, E side	M. Lenz	CBN 42(1) 82
10 Dec 2009	cf	Uriarra Rd. [G13]	S. Holliday	CBN 36(1)52
11 Dec 2009	cf	Uriarra Rd [G13]	M. Butterfield	CBN 36(1)52
14 Dec 1985	cf	Tuggeranong Creek	J. Holland	CBN 12(2) 66
16 Dec 2016	cf	Parkwood Rd, Wallaroo	C. Drake	CBN 43(1) 82
19 Jan 2019	cf	Parkwood Rd, Wallaroo	L. Battison	CBN 45(1) 75
22 Jan 1969	1 juv.	Lyneham	M. Clayton	CBN 1(7) 16
24 Jan 2019	cf; 1 juv.	Parkwood Rd, Wallaroo	M. Lenz	
1 Feb 2019	cf	Lake George, E side	M. Lenz	CBN 45(1) 75
14 Feb 2019	Pair, 4 juv.	Parkwood Rd, Wallaroo	M. Lenz	See Fig. 5

[A] cf = carrying food; [B] CBN: Canberra Bird Notes, volume, (issue), page number.

Another obstacle to breeding in lucerne is that this crop tends to be harvested twice or more over spring/summer, rather than once only as for grain crops. Hence the loss of broods may be more likely in lucerne (see also Sect. 2.3).

2.3. Breeding records

We can safely assume that Bushlarks observed in the period from late September to February, the breeding season, are birds holding a breeding territory, although not every territory with a singing male may be occupied by a pair (see Lenz and Kamprad 2019). Most of the limited number of actual breeding records (Table 1) come from past and current key areas for the species.

Very little is known about the breeding biology of the Bushlark in Australia. In NSW eggs have been recorded from late August to late February (Higgins *et al*. 2006). Cooper *et al*. (2020) report breeding for NSW from July to March and mostly from September to February. The limited number of records for the Canberra Region in Table 1 indicates the presence of dependent young (adults carrying food) over a notably long period, from 16 October until 1 February and young were noted at the end of January and mid-February.

The sketchy information on the timeline of breeding events taken from Higgins *et al*. (2006a) may indicate up to 40 (to 50?) days for a full breeding cycle:

? days courtship;
3 days nest-building;
3 to 5 days for a complete clutch (1 egg/day; clutch size 3 to 5 eggs)
12 days incubation [actually not known, probably not an unreasonable approximation][2]
10 days to fledging (result from a single nest) [Note: The young will leave the nest before they can fly (Higgins *et al.* 2006a)]
? days to independence

Birds on farmland at CurLGeo were quiet until the middle of September (although the species was present – we had encountered several birds) except once on 26 Aug 2018, when 2 birds gave a short partial song while briefly hovering low over the stubble field after we had flushed them. Bushlarks started singing and displaying from the end of September (2015, 2017) (Julienne Kamprad, M. Lenz, *pers. obs.*).

Good rainfall, as in 2020, may trigger an earlier start to the breeding season as indicated by a bird with full song flight already on 18 Aug at Lake Bathurst (M. Lenz) and a bird carrying food already on 12 Oct (Davey 2020).

Beruldsen (2003) states that the breeding frequency is 'once each year, more often when abundant seasons prevail in the drier interior.' In the Canberra region birds may also be able to at least attempt a replacement brood if their nests in grain crops or lucerne are mowed out. For example, song activity by Bushlarks at CurLGeo declined during November, when parents were feeding young in the nest, but birds were fully displaying again at the end of January (2018) over lucerne and fallow fields, after the wheat had been harvested, perhaps indicative of a second nesting attempt (see also above).

[2] Elphick (2014) states that among small passerines groups such as Old World Warblers and Larks may have incubation periods as short as 10 days. Incubation periods of some other grassland birds that share the same habitat with the Bushlark are: Eurasian Skylark 12 days; Australasian Pipit: 14-15 days; Brown Songlark: 11-13 days; Rufous Songlark (*Cincloramphus mathewsi*): 11-12 days; Golden-headed Cisticola: 11-15 days (Higgins *et al.* 2006a, b).

Interestingly, at Parkwood Road, Wallaroo, in grassland with low grazing pressure and no grass harvest, several Bushlarks were displaying and singing throughout January 2019 and young were recorded on 14 Feb 2019 (Table 1, Fig. 5). Unfortunately, no detailed observations from this area are available from earlier in the breeding season. However, if birds start displaying from the end of September and a full breeding cycle takes about 40 or even 50 days, then double-brooding is a distinct possibility, at least under favourable conditions, and pairs that have lost their brood due to harvesting of grassland may be able to produce a replacement clutch.

In this context an observation of a pair copulating on a wire fence on 17 Nov 2019 (see Fig. 1), well into the breeding season, at a natural grassland site near Coppins Crossing, is very interesting (Shorty Westlin, *pers. commun.*). This observation would support the view that, in our area at least, the species is able to initiate a replacement clutch or even a second brood.

We have other local species with long breeding seasons, such as the Australasian Reed Warbler (*Acrocephalus stentoreus*) (Lenz 1989) and Leaden Flycatcher (*Myiagra rubercula*) (M. Lenz, *pers. obs.*), which have been shown to be double-brooded. Other species are at least likely to be able to produce replacement clutches, if need be, within the period they are present in our area, such as the White-winged Triller (*Lalage tricolor*) and Rufous Songlark (Lenz and Nicholls 2017).

It is notable that over a period of 34 years only 11 breeding records have become available in the Canberra Region (Table 1). As mentioned earlier, grassland habitat is often not accessible, especially on farms. More important, though, may be the secretive behaviour of birds at and near the nest. For example, birds carrying food will not approach the nest if they feel observed (Higgins *et. al*. 2006a). It is no wonder that so little is known about the breeding biology of this species

Figure 5. (left) Family of Horsfield's Bushlark (pair with 4 young) at Parkwood Road, (Wallaroo), 14 Feb 2019; (right) close-up of one of the young birds; the remnant yellow gape is still visible (see arrow) (*Michael Lenz*).

2.4. Population density

Higgins *et al.* (2006a) indicate that for this species no data on the population density of breeding birds is available. However, for our region we have at least some estimates of the

number of territories for given areas. Searches of wheat paddocks at CurLGeo gave densities of Bushlark territories from 0.7 to 7.5 T/10 ha (Lenz and Kamprad 2019).

A number of counts, conducted while walking along the edge of grasslands, following roads, can be added. The relatively soft song of the Bushlark (compared to that of the Eurasian Skylark) can probably be heard from the edge of a field up to 70 m into it. This gives a strip of land with a width of 70 m and a length of xx m. Density values based on this detection distance ranged from 4.5-10.2 T/10 ha (Table 2).

These estimates can only form a base line against which to compare future counts at the same or other locations.

Table 2. Estimates of the population density of Horsfield's Bushlark (expressed as number of territories/km transect and number of territories/10 ha) **on agricultural land in the Canberra Region.** All transect counts by author.

Date	No. T[A]	Length of transect (km)	No. T/km	Area of transect strip (ha)[B]	Density T/10 ha (transect)
Pasture land with cattle (at low stocking rates) **Parkwood Rd, Wallaroo**					
24 Jan 2019	N: 9	1.6	5.6	11.2	8.0
	S: 5	1.6	3.1	11.2	4.5
31 Jan 2019	N:11	1.6	6.9	11.2	9.8
	S: 6	1.6	3.8	11.2	5.4
Wheat field, 2 km N of Gundaroo on Gunning Rd.					
5 Jan 2011	5	0.7	7.1	4.9	10.2
15 Dec 2011	5	0.7	7.1	4.9	10.2
Oat field, Glenoval Rd., Lake Bathurst					
17 Nov 2017	9	2.0	4.5	14	6.4

[A] T = Territories (chiefly number of singing ♂♂); N: paddocks on North side, S: paddocks on S side of road [B] Area of transect strip: length of transect (m) x distance (70 m) over which song could be heard from transect path.

2.5. Observations outside the breeding season

The seasonal distribution pattern of the Bushlark in the Canberra Region is illustrated in two ways, as the number of records held in the COG data base (Fig. 6) and as the reporting rate (Fig. 7). Both presentations give the same picture: very few reports before and after the breeding season (March to September), a build-up of records in October, the beginning of the breeding season; high numbers of records November to January, and a decline in records over February, the last month of the breeding season. Importantly, however, the species is recorded throughout the year. The higher figures for the reporting rate in the 2018/2019 season [yellow bars (light grey in b/w print) in Fig. 7] are largely a reflection of high observer activity at Parkwood Rd (Wallaroo) during the breeding season, when Bushlarks could be observed quite reliably, and the repeat visits to the wheat fields at CurLGeo during and outside the breeding season by Julienne Kamprad and the author.

In the context of this review of the status of the Bushlark in our region, the greatest interest is in the records outside the breeding season (Figs. 6 to 8). However, the number of records alone describes the situation inadequately. Records of Bushlarks in that period are not only of the odd single birds, but frequently of groups of birds. Single birds comprise just under half of the records (18 of 37), and remarkably the remainder (19 of 37) are of at least two birds; and 7 records are of 5 or more birds. The average number of birds per record is 3.3 (range 1.5 to 5.3 birds; Fig. 8).

The most outstanding record is that from John Leonard of 20 birds near a farm dam at Lake Bathurst on 13 Jun 2005. The other notable feature of this record is that several birds were sitting on fence wires and some birds were even displaying - behaviour rarely observed outside the breeding season (Leonard 2005).

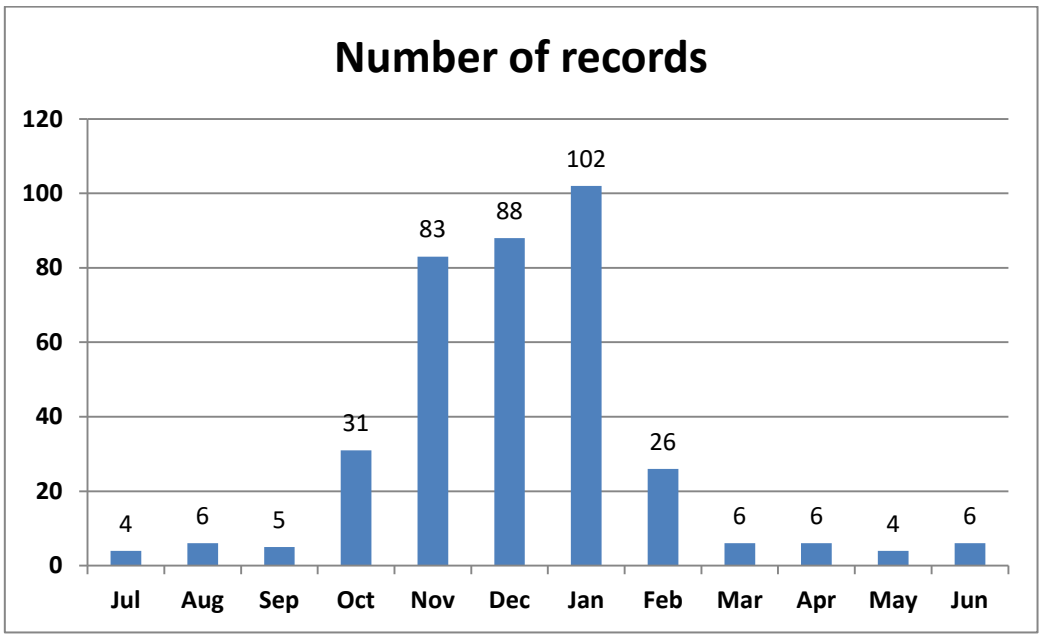


Figure 5. Seasonal distribution of the number of records of the Horsfield's Bushlark in the Canberra Region (source: COG database).

There is no evidence of large-scale movement for the Bushlark in Australia and the stability of the nine subspecies also implies movement only within the subspecies range (Higgins *et al*. 2006a, Griffioen and Clarke 2002, Cooper *et al.* 2020). The differences between the high reporting rates over the breeding season and the lower rates for the remainder of the year are similar across all regions of the species' range in Australia, and do not suggest large-scale seasonal movement (Blakers *et al.* 1984). The species is reported over the winter months throughout NSW (Cooper et al. 2020). The differences in reporting rates can be attributed to seasonal behavioural changes as discussed above.

Further, the fact that in our region we see not only single birds, but often groups of birds together is indicative of a species finding locally suitable conditions throughout the year, thus confirming Lepschi's (1987) conclusion that in the Canberra Region the Bushlark is a year-round resident.

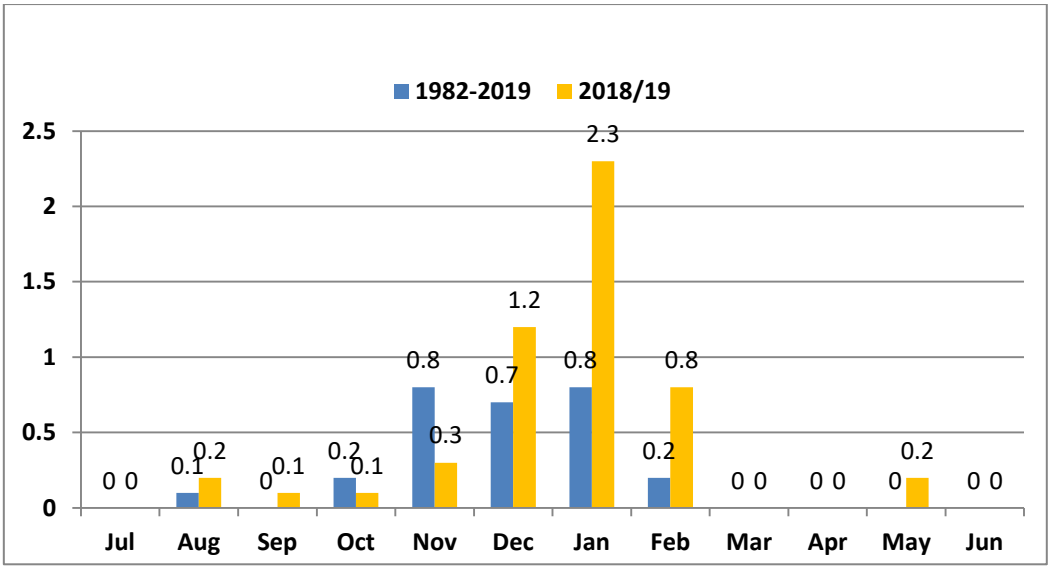


Figure 6. Seasonal changes in the reporting rate of the Horsfield's Bushlark in the Canberra Region for 1982-2019 and for July 2018 to June 2019 alone.

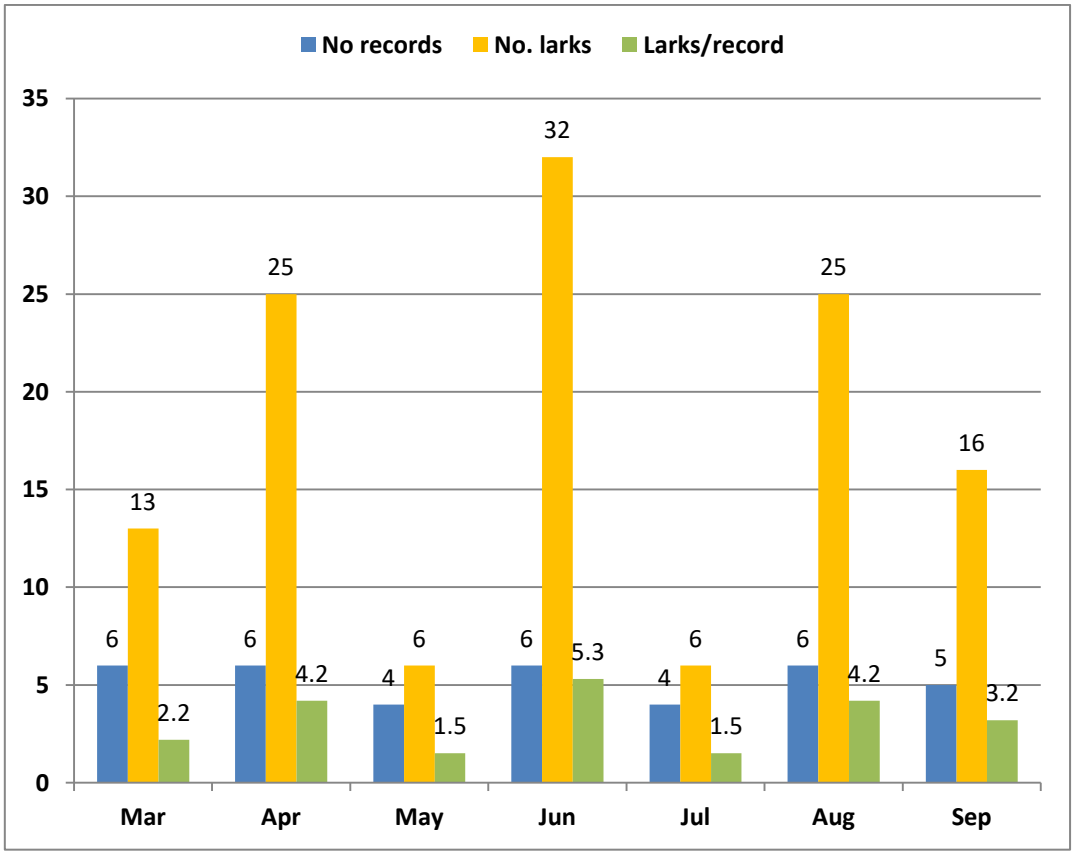


Figure 7. Number of records, total number of Horsfield's Bushlarks from those records and the average number of birds per record for the period March to September.

2.6. Comments on locating Bushlarks

The best guide to the presence of Bushlarks during the breeding season is their song. The song is much quieter and softer than that of the Eurasian Skylark. In our region both species often share the same habitat. It was notable that on many occasions several Bushlarks could

be heard singing in the early morning, and at the same sites several hours later there were few or none in song, while Skylarks were still in full song. As a consequence, we finished our surveys of breeding Bushlarks at CurLGeo well before 09:00 h, preferably even earlier. Hence, the early hours of the morning are the best for locating Bushlarks by song. Later in the day one may still encounter birds sitting on wires and posts.

Outside the breeding season the species can as a rule only be detected by walking through suitable habitat, *i.e.* rank grassland or stubble fields which have started to grow weedy. At CurLGeo birds were located mainly in parts of wheat stubble fields with taller grass and weeds, or in a stand of rye grass (Fig. 4) that had also served as a breeding site. At such sites we found Bushlarks reliably between April and September.

However, as Leonard's (2005) observation indicates, it is still possible in winter, albeit rarely, to see birds sitting in the open on fences. Birds may also venture into more open spaces to forage. For example, Jack Holland (*pers. commun.*) located Bushlarks more reliably at the edges of barer patches bordering dense and tall grassland in Tuggeranong. This corresponds with one of the author's winter observations of 5 birds at Lake Bathurst on 23 Apr 2017. They were found foraging in a patch of short vegetation in a paddock mostly covered by tall and dense weeds (mainly *Atriplex*).

3. Conclusions

- The Bushlark has a wide but scattered distribution in the Canberra Region. Much of the potentially suitable habitat is still under-explored for the presence of the species.

- Preferred habitats include natural grasslands with taller vegetation, paddocks lying fallow, grain fields (wheat, oats, rye grass), lucerne, and grazing paddocks without stock or with very low stocking rates. Changes in land use, such as switching from grains to lucerne, or reducing or increasing stocking rates of sheep or cattle, and the extent to which grain is sown influence greatly the distribution and abundance of Bushlarks.

- Most sites from which Bushlarks have been recorded in the Canberra Region are suitable for breeding. The breeding season extends from late September to February (but can start earlier in years with good rainfall). Its favoured habitats are only infrequently visited by bird watchers, coupled with the secretive behaviour of birds near the nest, may largely explain the paucity of local breeding records.

- It is possible that birds can raise two broods per season, or at least attempt a second clutch after the loss of the first brood (*i. e.* after nests have been destroyed by mowing).

- Estimates of the population density during the breeding season based on area searches or transect counts of grain fields have given values from 0.7 to 10.2 Territories/10 ha.

- Bushlarks are recorded in the Canberra Region throughout the year. Outside the breeding season, numbers reported range from 1 to 20 birds per record (on average 3.3 birds/record).

- There is no information that implies that the species is migratory in the Canberra Region. The secretive behaviour of the birds alone explains the overall paucity of records outside the breeding season.

- The status of the Bushlark in the Canberra Region can therefore be described as 'rare to locally common, breeding resident'.

Acknowledgements

My special thanks go to Julienne Kamprad for walking with me on many occasions across stubble and fallow fields at Lake George to locate Bushlarks. Paul Fennell and A.O. (Nick) Nicholls gave access to Bushlark statistics and the records from the COG data base. Peter Christian, Martin Butterfield, Jack Holland and Shorty Westlin shared details of Bushlark observations, and Shorty Westlin gave permission to include his photo of a pair of Bushlarks. Richard Cooper made the entry for the Horsfield's Bushlark from the 3rd Volume of 'An atlas of the birds of NSW and the ACT' (2020) available pre-publication. Jerry Olsen gave access to other references. I am grateful to Kevin Windle, Jack Holland, A.O. (Nick) Nicholls, Frank Antram and Geoffrey Dabb for providing comments on an earlier version of this article.

References

Alström, P. (2020). Australasian Bushlark (*Mirafra javanica*), version 1.0. In Birds of the World (S. M. Billerman, B. K. Keeney, P. G. Rodewald, and T. S. Schulenberg, Editors). Cornell Lab. of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.ausbus2.01 (visited 29 April 2020).

Beruldsen, G. (2003) *Australian birds their nests and eggs*. Author, Kenmore Hills, Queensland.

Blakers, M., Davies, S.J.J.E. and Reilly, P.N. (1984) *The Atlas of Australian Birds.* Melbourne University Press, Carlton.

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

Cooper, R.M., McAllan, I.A.W., Brandis C.C.P. and Curtis, B.R. (2020) *An atlas of the birds of NSW and the ACT.* Vol. 3. *Eastern Spinebill to Common Greenfinch.* New South Wales Birdatlassers Inc., Woolgoolga, NSW.

Dabb, G. (2019) *"Hail the Blithe Spirit" –an overview of our grassland birds*. Talk to Canberra Ornithologists Group, Canberra, meeting on 10 April 2019.

Davey, C. (2020) eBird Checklist: https://ebird.org/ebird/view/checklist/S74859996. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 17 October 2020).

Elphick, J. (2014) *The world of birds.* CSIRO Publishing, Collingwood.

Frith, H.J.F. (1984) Bushlark *Mirafra javanica*. In: Frith, H.J.F. (ed.) *Birds in the Australian High Country.* Angus & Robertson Publishers, Melbourne.

Griffioen, P.A. and Clarke, M.F. (2002) Large-scale bird-movement patterns evident in eastern Australia atlas data. *Emu* 102: 99-125.

Hermes, N. (2017) *A photographic field guide to the birds of the Australian High Country.* John Beaufoy Publ., Oxford.

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.

Holland, J. (1985) Birds of the proposed Lake Tuggeranong area. *Canberra Bird Notes* 10:114-131.

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

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

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.

Lenz, M. and Nicholls, A.O. (2017) The breeding season of White-winged Triller and Rufous Songlark in the high-rainfall year of 2016 at a site near Canberra. *Canberra Bird Notes* 42: 258-267.

Leonard, L. (2005) Overwintering Singing Bushlarks near Lake Bathurst. *Canberra Bird Notes* 30: 83.

Lepschi, B. (1987) Status of the Singing Bushlark in the Canberra District. *Canberra Bird Notes* 12: 95-98.

Schodde, R. and Mason, I.J. (1999) *The directory of Australian birds: Passerines.* CSIRO Publishing, Collingwood.

Accepted 15 June 2020, amendments accepted 10 November 2020

Canberra Bird Notes 45(3) (2020): 256-266

OBSERVATIONS OF BIRDS IN EASTERN NAMADGI NATIONAL PARK

JIM HONE

Institute for Applied Ecology, University of Canberra, Canberra 2601 ACT, Australia
jim.hone@canberra.edu.au

Abstract. *The bird community at seven sites within the eastern part of Namadgi National Park was surveyed each summer for 16 years (1993/4 to 2008/9) with the aim of assessing trends in the occupancy rates. The proportion of sites within a year at which a species was recorded was used as an occupancy rate. Trends in occupancy rates across years were evaluated by linear regression. A total of 92 bird species were recorded. Forty three species showed no evidence of trends, and two species, Common Bronzewing and Common Starling, had an increasing occupancy rate. Six species, Eastern Rosella, Superb Lyrebird, Welcome Swallow, Eastern Yellow Robin, Leaden Flycatcher and European Goldfinch had a declining occupancy rate. Five species of birds classified as Threatened in the ACT were recorded, namely Brown Treecreeper, Scarlet Robin, White-winged Triller, Hooded Robin and Varied Sittella, however too few data on each were recorded to assess their trends, except for Scarlet Robin which declined. Monitoring of the bird community of Namadgi National Park is recommended to assist park management.*

1. Introduction

Namadgi National Park was created in 1984 and is part of the Australian Alps, an Important Bird Area (Dutson *et al*. 2009). The bird fauna of the Australian High Country has been broadly described by Frith (1976) and Hermes (2017), and mapped during 1986 to 1989 in the ACT bird atlas (Taylor and COG 1992). The number of resident species declined in Namadgi National Park during a 16-year study, though there was no decline in the number of migrant species (Hone 2012). This was during a period of intensive feral pig control, though analysis showed no relationships between the birds and feral pigs (Hone 2012). There was a short-term decline in the number of bird species soon after the 2003 bushfire that burnt much of Namadgi (Hone 2012).

The Namadgi Plan of Management (Anon 2010) lists 178 bird species. Of these, four species which were classified as Vulnerable to extinction in the ACT at the time of this study occur in the eastern part of Namadgi and were recorded during this study. These are the Brown Treecreeper (*Climacteris picumnus*), the White-winged Triller (*Lalage sueurii*), the Hooded Robin (*Melanodryas cucullata*) and the Varied Sittella (*Daphoenositta chrysoptera*). The Scarlet Robin (*Petroica boodang*) has since also been classified as Vulnerable in the ACT.

Monitoring of biodiversity is essential in the assessment of whether areas such as national parks are achieving their objectives (Lindenmayer and Likens 2010). The Canberra Ornithologists Group (COG) has several bird-monitoring activities, such as the Garden Bird Survey and Woodlands Surveys, as described in COG's Annual Reports. Such surveys use sites in and around suburban Canberra, but do not include regular surveys in the eastern part

of Namadgi National Park. Hence this study reports results of monitoring birds in areas with little other monitoring.

This article reports observations of birds in the eastern part of Namadgi National Park. The emphasis is on a simple assessment of evidence of trends in occupancy rates over 16 years of study. More detailed analysis of trends in species richness (number of species), and relationships between birds and park activities, such as feral pig and fox control and bushfires, have been reported elsewhere (Hone 2012).

2. Methods

2.1. Study site

Seven sites were selected based on access and a range of elevations in the eastern part of Namadgi (Hone 2012), namely what was Gudgenby Nature Reserve. The seven sites, with their respective COG grid cells, were Honeysuckle Creek (H21), Nursery Swamp (H23), Prairie Dog Creek (towards Cotter Gap) (F21), Gudgenby Pines (H25), Brandy Flat (I24), Boboyan (Naas Creek: H27) and Shanahans Mountain (I27). The climate is cool temperate, with cool winters and warm to hot summers. Frosts and snowfalls are common in winter, especially at higher elevations. Rainfall occurs fairly evenly throughout the year. During the period of study (1993 to 2008), rainfall was slightly below average. The topography of the sites is dominated by mountain ranges and treeless valleys with elevation ranging from 700 m and 1200 m.

The vegetation in the area varies with elevation from evergreen woodland dominated by a range of *Eucalyptus* species at low elevation, to evergreen forest dominated by *Eucalyptus dalrympleana, E. viminalis, E. rubida, E. pauciflora* and *E. dives* at intermediate elevation, and sub-alpine woodland dominated by *E. pauciflora* and *E. stellulata* at the highest elevations. Grassland occurs in many valleys, being part native and partly the result of clearing for past livestock grazing activities. Detailed descriptions of the vegetation were reported by Anon (1984). High-elevation wetlands occur as swamps, bogs and fens, such as Nursery Swamp. At intermediate elevations, plantations of *Pinus radiata* were established, prior to national park status, such as at Gudgenby. The pines were planted during 1966 to 1969 and removed from 1997 to 2004. The high country vegetation is occasionally burnt in wildfires. Such large wildfires occurred in 1939, January 1983 (Anon 2010) and January 2003 (Carey *et al.* 2003; Anon 2010). Agricultural land use prior to the national park consisted mostly of cattle and sheep grazing (Corp 1989). Livestock grazing started during the early to mid-1800s and ended in about 1988. Further details of study sites, climate, vegetation and wildlife are given in Hone (2012).

2.2. Bird survey methods

The bird community in Namadgi National Park was studied during each summer (usually December) from 1993/4 to 2008/9 inclusive. Data were recorded at each of seven sites, each site being 1 km^2. Sites were selected for feral pig research, so were independent of the bird community. Each site was surveyed on foot on a set route by one observer, myself, thus avoiding differences between observers (Lindenmayer *et al.* 2009), for an average of 4 hours per site, usually 0800 to 1200 hours. Hence annual surveys totalled 28 hours (= 7 *4). The same set route was followed each survey as part of feral pig research. At the commencement of the study I had over 20 years of bird identification experience in south-east Australia. Bird surveys were conducted during fine weather and not during rain or high winds. The bird-survey method at each site was an area survey (Bibby *et al*. 2000), with a

larger area (1km^2) than that (2 ha) and longer time duration (4 hours) than that (20 minutes) used in the Birds Australia standard area survey (Barrett *et* al. 2003). Bird species were identified using sight and calls, noting that the calls could be differentiated from mimic calls by Superb Lyrebirds (*Menura novaehollandiae*). Mimic calls were not included in the data. Birds flying directly overhead were recorded. Presence/absence data of the type collected in Namadgi National Park have been used in other bird studies (Saunders 1989; Recher and Serventy 1991) and have been considered a useful form of data, depending on budgets and number of records obtained (Joseph *et al*. 2006). The taxonomy of the bird species followed that described by Christidis and Boles (2008), who list scientific names. Breeding data collected were too few to be useful, so there is no analysis of breeding activity.

The presence-absence data were converted to an occupancy rate (OCC), which was the proportion of sites at which a species was recorded in that year. This is equivalent to F in the COG Garden Bird Surveys, namely the percentage of sites with records for species (Canberra Ornithologists Group 2019). Evidence of a trend over years was assessed by linear least squares regression analysis. Significance was assessed at the P = 0.05 level. Departure from the linear trend assumption was assessed by inspection of residuals, with a random pattern of residuals expected. Inferences about trends in occupancy are restricted to proportions between 0.0 and 1.0. A preliminary analysis identified 41 species for which there was insufficient data for regression analysis, which was defined as 9 or more years with 0 records. The remaining 51 species were used in the analysis. The occupancy rate data are not interpreted as indices of abundance, though are expected to be positively correlated with abundance (Caughley 1980). The occupancy rate calculated here is a measure across study sites, so reflects habitat selection which varied across sites. The mean reporting rate is also calculated, as the proportion of years in which a species was recorded in at least one site.

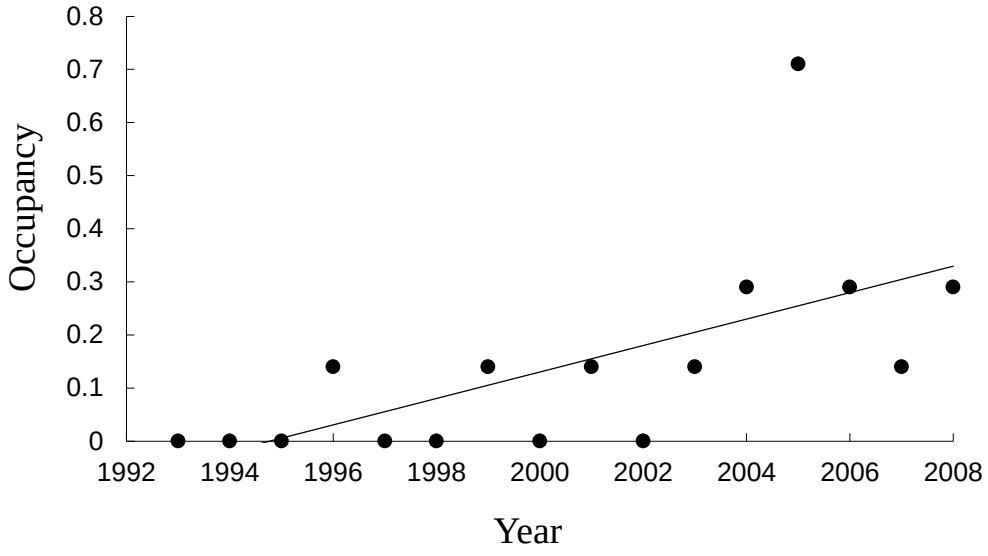
3. Results

A total of 92 bird species were recorded during the 16 years of study (Tables 1, 2, 3). The mean number of species recorded per year was 52. No species was recorded at every site in every year. The three species with a mean occupancy rate greater than 0.9 were Yellow-faced Honeyeater (*Caligavis chrysops*) (0.9732), Pied Currawong (*Strepera graculina*) (0.9554) and Striated Pardalote (*Pardalotus striatus*) (0.9018). Many species, such as Australian Magpie (*Gymnorhina tibicen*), Pied Currawong and Sulphur-crested Cockatoo (*Cacatua galerita*) had high (>0.50) occupancy rates throughout the study and showed no trend (Table 2). A total of 23 species, including Gang-gang Cockatoo (*Callocephalon fimbriatum*), Striated Pardalote, and Dusky Woodswallow (*Artamus cyanopterus*), were recorded in every year and hence each had a reporting rate of 1.00 (Table 2).

Two species, the Common Bronzewing (*Phaps chalcoptera*) (Fig. 1a) and Common Starling (*Sturnus vulgaris*) (Fig. 1b), showed significant evidence of an increase in occupancy rates (Table 1). A total of six species, namely Eastern Rosella (*Platycercus eximius*) (Fig. 2a), Superb Lyrebird, Welcome Swallow (*Hirundo neoxena*), Eastern Yellow Robin (*Eopsaltria australis*), Leaden Flycatcher (*Myiagra rubecula*) and European Goldfinch (*Carduelis carduelis*) (Fig. 2b) showed significant evidence of a linear decline in the occupancy rate over the study (Table 1). Two species, the Masked Lapwing (*Vanellus miles*), Sacred Kingfisher (*Todiramphus sanctus*), showed a pattern close to an increase (0.08>P>0.05) in occupancy, and three species, Nankeen Kestrel (*Falco cenchroides*), Wonga Pigeon (*Leucosarcia melanoleuca*) and Brown Thornbill (*Acanthiza ousilla*), showed a pattern close to a decline (0.08>P>0.05) in occupancy (Table 2). A total of 43 (84.3%) species

showed no linear trend in occupancy (Table 2). One species, the Noisy Miner (*Manorina melanocephala*), had a constant occupancy rate (OCC = 0.2900) as it was recorded each year at the same two sites. There were insufficient data for analysis of occupancy rates of 41 species (Table 3).

(a) Common Bronzewing



(b) Common Starling

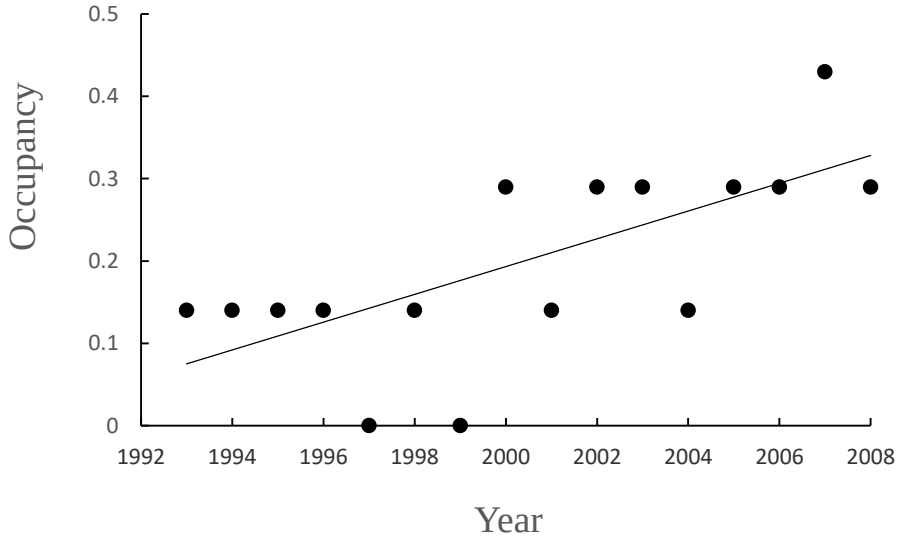
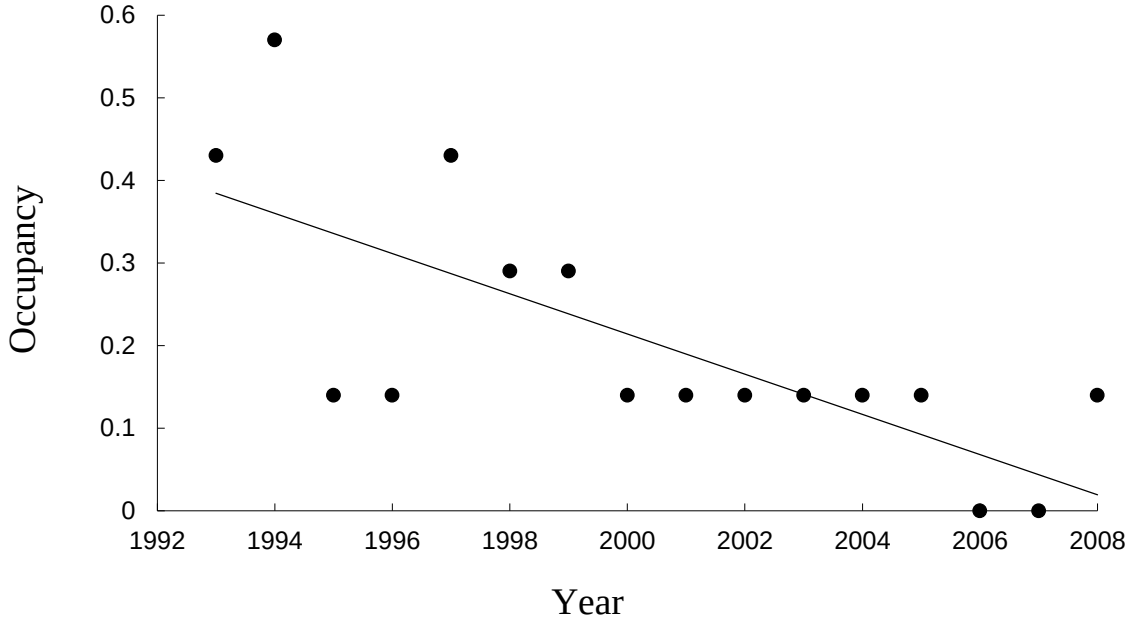


Figure 1. (a) Trends in occupancy of Common Bronzewing in Namadgi National Park. R^2 = 0.40, P<0.01. (b) Trends in occupancy of Common Starling in Namadgi National Park. R^2 = 0.47, P<0.01.

(a) Eastern Rosella



(b) European Goldfinch

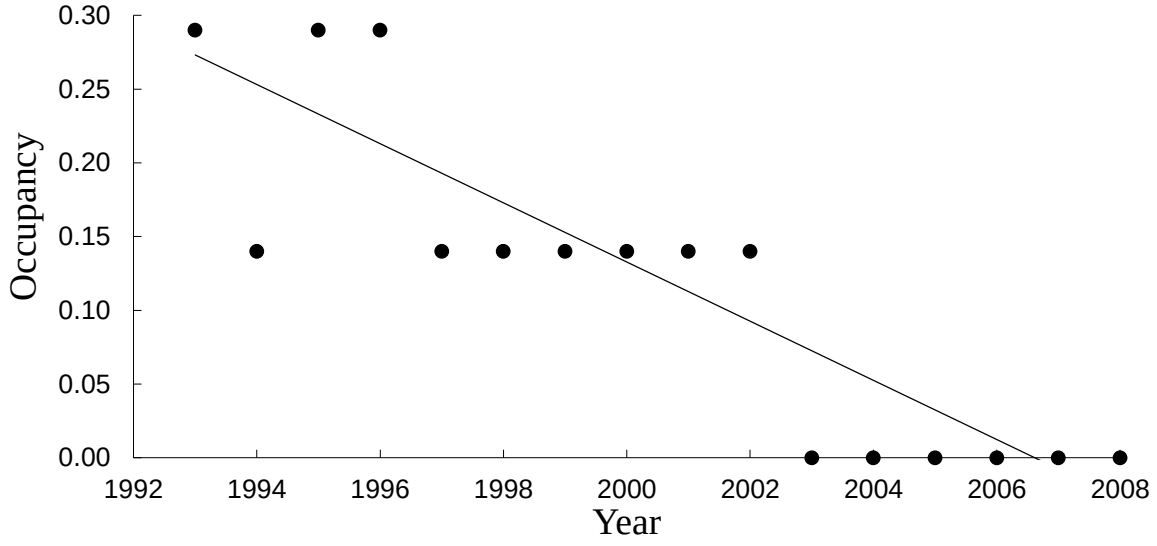


Figure 2. (a) Trends in occupancy of Eastern Rosella in Namadgi National Park. R^2 = 0.54, P<0.01. (b) Trends in occupancy of European Goldfinch in Namadgi National Park. R^2 = 0.78, P<0.01.

Table 1: Bird species that had an increasing or decreasing occupancy trend in the eastern part of Namadgi National Park during the summers of 1993/4 to 2008/9 inclusive. The mean occupancy per site (OCC) across the 16 years is shown. If a species was recorded at every site in every year, then OCC = 1.0, and if it was recorded at only one site in only one year then OCC = 0.0089 (= 1/112 = 1/(7*16)). F = F statistic for linear regression, P = probability, R^2 = coefficient of determination, and the degrees of freedom of each linear regression analysis were 1, 14. The reporting rate (RR) is the proportion of years in which a species was recorded in at least one site and is cited to two decimal places. A species recorded only in one year has a reporting rate of 0.06 and if recorded in all 16 years it is 1.00.

Species	Mean OCC	F	P	R^2	Intercept	Slope	RR
Increasing trend							
Common Bronzewing	0.1429	9.28	<0.01	0.40	-49.6935	0.0249	0.56
Common Starling	0.1964	12.33	<0.01	0.47	-33.5469	0.0169	0.88
Decreasing trend							
Eastern Rosella	0.2054	16.54	<0.01	0.54	48.8342	-0.0243	0.88
Superb Lyrebird	0.1964	4.67	0.048	0.25	33.0868	-0.0164	0.81
Welcome Swallow	0.1518	5.33	0.04	0.28	14.4477	-0.0072	0.94
Eastern Yellow Robin	0.3214	6.24	0.03	0.31	46.6570	-0.0232	0.88
Leaden Flycatcher	0.3750	8.66	0.01	0.38	50.5941	-0.0251	0.94
European Goldfinch	0.1161	49.70	<0.01	0.78	40.2727	-0.0201	0.63

The four bird species classified as Vulnerable showed no clear pattern of trends in occupancy rates. This was likely caused by the low occupancy rate of each species. Brown Treecreeper was reported in 12 years, White-winged Triller in three years and Hooded Robin and Varied Sittella each in only one year. The Scarlet Robin was classified as Vulnerable after this field study. The occupancy rate of Scarlet Robin declined during the first 9 years of the study ($F_{1,7}$ = 8.00, P = 0.025, R^2 = 0.53), and was not recorded during the last 7 years.

Three bird species introduced to Australia since European settlement were recorded. The Common Starling showed an increase in occupancy over years (Fig. 1b, Table 1), the European Goldfinch showed a decrease in occupancy (Fig. 2b, Table 1), and the Common Blackbird (*Turdus merula*) was only recorded in one year.

4. Discussion

The occupancy rate of many bird species in Namadgi National Park showed no change over the 16-year duration of the study. Changes have been observed in other studies in Australian locations (Saunders 1989; Recher and Serventy 1991; Barrett *et al.* 2003). A small number of species had increasing or decreasing occupancy rates. The results complement those from COG surveys in and around the lower elevation urban and woodland areas of Canberra.

Table 2: The mean occupancy (OCC) and reporting rate (RR) of bird species that showed no statistically significant occupancy trends in the eastern part of Namadgi National Park during the summers of 1993/4 to 2008/9 inclusive. If a species was recorded at every site in every year, then OCC = 1.0, and if it was recorded at only one site in only one year then OCC = 0.0089 (= 1/112 = 1/(7*16)). F = F statistic for linear regression, P = probability, R^2 = coefficient of determination, and the degrees of freedom of each linear regression analysis were 1, 14.

Species	Mean OCC	F	P	R^2	Intercept	Slope	RR
Wedge-tailed Eagle	0.1339	0.71	0.41	0.05	7.7815	-0.0038	0.81
Nankeen Kestrel	0.1696	3.88	0.07	0.22	23.9119	-0.0119	0.75
Masked Lapwing	0.1696	4.04	0.06	0.22	-15.7764	0.0080	0.94
Wonga Pigeon	0.1429	4.18	0.06	0.23	24.0020	-0.0119	0.69
Gang-gang Cockatoo	0.4911	1.06	0.32	0.07	27.1750	-0.0133	1.00
Sulph.-cres. Cockatoo	0.7232	0.54	0.48	0.04	15.0202	-0.0072	1.00
Yellow-t. Bl.-cockatoo	0.3125	3.34	0.09	0.19	43.6475	-0.0217	0.88
King Parrot	0.1161	0.48	0.50	0.03	-8.1512	0.0041	0.63
Crimson Rosella	0.8214	0.05	0.83	<0.01	-2.8556	0.0018	1.00
Fan-tailed Cuckoo	0.4375	0.17	0.69	0.01	-12.5658	0.0065	0.94
Laughing Kookaburra	0.8571	1.32	0.27	0.09	13.9196	-0.0065	1.00
Sacred Kingfisher	0.1429	4.09	0.06	0.23	-34.5132	0.0173	0.56
Tree Martin	0.1786	0.01	0.94	<0.01	-0.4985	0.0003	0.94
Australian Pipit	0.2232	0.32	0.58	0.02	-4.6298	0.0024	1.00
Bl.-f. Cuckoo-shrike	0.5000	0.80	0.39	0.05	17.9449	-0.0087	1.00
Rufous Whistler	0.8839	0.03	0.86	<0.01	-1.7339	0.0013	1.00
Grey Shrike-thrush	0.8214	0.01	0.92	<0.01	2.5338	-0.0008	1.00
Grey Fantail	0.8750	1.07	0.32	0.07	-10.7449	0.0058	1.00
Willie Wagtail	0.3661	0.15	0.70	0.01	7.4281	-0.0035	1.00
Superb Fairy-wren	0.7857	0.04	0.85	<0.01	5.0100	-0.0021	1.00
White-br. Scrubwren	0.3036	2.77	0.12	0.17	41.8435	-0.0208	0.75
Brown Thornbill	0.2054	4.08	0.06	0.23	45.5104	-0.0227	0.38
Striated Thornbill	0.3036	1.38	0.26	0.09	28.0754	-0.0139	0.81
Yellow-r. Thornbill	0.2321	1.17	0.30	0.08	17.5309	-0.0087	0.88

Table 2 continued next page

Table 2 continued from previous page

Species	Mean OCC	F	P	R^2	Intercept	Slope	RR
Flame Robin	0.2143	0.74	0.40	0.05	18.0430	-0.0089	0.69
Spotted Quail-thrush	0.1518	0.37	0.55	0.03	-12.7932	0.0065	0.56
White-thr. Treecreeper	0.7679	0.01	0.95	<0.01	-0.4105	0.0005	1.00
Brown Treecreeper	0.1071	0.01	0.99	<0.01	0.1050	0.0000	0.75
White-eared Honey.	0.7321	0.10	0.75	0.01	-3.8581	0.0023	1.00
Yellow-faced Honey.	0.9732	0.53	0.48	0.04	-3.5568	0.0023	1.00
Fuscous Honeyeater	0.1429	0.32	0.58	0.02	7.5862	-0.0037	0.69
White-naped Honey.	0.5714	0.66	0.43	0.05	17.2525	-0.0083	1.00
Red Wattlebird	0.8750	0.36	0.56	0.03	-6.8917	0.0039	1.00
Striated Pardalote	0.9018	0.09	0.77	0.01	-3.8334	0.0024	1.00
Spotted Pardalote	0.8036	2.13	0.17	0.13	-38.5051	0.0196	0.94
Satin Bowerbird	0.1607	1.93	0.19	0.12	-21.4036	0.0108	0.69
Dusky Woodswallow	0.3036	0.84	0.38	0.06	-11.3450	0.0058	1.00
Pied Currawong	0.9554	0.02	0.89	<0.01	-0.0446	0.0007	1.00
Grey Currawong	0.2500	0.06	0.82	<0.01	4.5953	-0.0022	0.88
Grey Butcherbird	0.4554	0.78	0.39	0.05	19.3433	-0.0094	1.00
Australian Magpie	0.7232	0.01	0.93	<0.01	2.1058	-0.0007	1.00
Australian Raven	0.6071	0.02	0.90	<0.01	-1.7761	0.0012	1.00

The changes in birds in Namadgi National Park may have been associated with fire, and changes in vegetation, especially the pine forest. These are discussed in turn as hypotheses. The large bushfire in January 2003 was associated with a decrease in bird species richness, though it quickly recovered (Hone 2012). The European Goldfinch was not recorded during surveys after the January 2003 bushfire. Namadgi National Park was created in 1984, and then grazing and logging were excluded. The latter exclusions may have generated changes in vegetation that caused changes in the bird community. The removal of livestock grazing in parts of the Italian Alps, in Gran Paradiso National Park, was followed by increases in bird diversity in what was grassland, as shrubs and trees grew (Laiolo *et al*. 2004). Observed changes in bird occupancy are unlikely to be related to fragmentation as the park is large (1,060 km^2), and is adjacent to Kosciuszko National Park of approximately 6,900 km^2. At one site, the Gudgenby Pines, there was a significant change in vegetation with harvesting of the *Pinus radiata* plantation during the study (Hone 2012).

Table 3. The mean occupancy (OCC) and reporting rates (RR) of bird species for which there were insufficient data for regression analysis (9 or more years with 0 records), in the eastern part of Namadgi National Park during the summers of 1993/4 to 2008/9 inclusive. If a species was recorded at every site in every year, then OCC = 1.0, and if it was recorded at only one site in only one year then OCC = 0.0089 (= 1/112 = 1/(7*16)).

Species	Mean OCC	RR	Species	Mean OCC	RR
Pacific Black Duck	0.0446	0.25	Brown Songlark	0.0268	0.19
Australian Wood Duck	0.0536	0.38	Buff-rumped Thornbill	0.0982	0.38
Latham's Snipe	0.0089	0.06	Southern Whiteface	0.0089	0.06
Brown Falcon	0.0625	0.38	Speckled Warbler	0.0089	0.06
Peregrine Falcon	0.0089	0.06	Scarlet Robin	0.0804	0.38
Brown Goshawk	0.0804	0.44	Hooded Robin	0.0089	0.06
Swamp Harrier	0.0179	0.13	Satin Flycatcher	0.0089	0.06
Australian Owlet-nightjar	0.0089	0.06	Eastern Shrike-tit	0.0089	0.06
Stubble Quail	0.0089	0.06	Varied Sittella	0.0089	0.06
Painted Button-Quail	0.0268	0.13	Crescent Honeyeater	0.0089	0.06
Galah	0.0714	0.31	Eastern Spinebill	0.0089	0.06
Pallid Cuckoo	0.0179	0.13	Brown-headed Honey.	0.0089	0.06
Brush Cuckoo	0.0268	0.13	Noisy Friarbird	0.0089	0.06
Horsfield's Bronze-cuck.	0.1071	0.31	Noisy Miner	0.2900	1.00
Shining Bronze-cuckoo	0.1696	0.50	Silvereye	0.0357	0.19
White-winged Triller	0.0357	0.19	Diamond Firetail	0.0357	0.25
Golden Whistler	0.0089	0.06	Red-browed Finch	0.0268	0.13
Bassian Thrush	0.0089	0.06	Olive-backed Oriole	0.0714	0.19
Common Blackbird	0.0089	0.06	White-winged Chough	0.0536	0.31
Restless Flycatcher	0.0179	0.13	Magpie-lark	0.0625	0.44
Rufous Songlark	0.0089	0.06	Little Raven	0.1071	0.50

The significant trends shown by individual species can be compared cautiously with trends reported for each species by COG. Note that the trends described by COG use a reporting rate measured differently, namely as the proportion of times (surveys) at which a species was recorded, whereas I measured occupancy as the proportion of sites within a year. Common Bronzewing showed an increasing trend in the present study. COG reports that the species increased during 1993 to 2007 and then declined (Canberra Ornithologists Group 2018), and increased during 1998 to 2008 at woodland sites (Bounds *et al.* 2010). Common

Starling also increased during my study. In contrast, COG reported a long-term decline (Canberra Ornithologists Group 2009) then increase in Starlings (Canberra Ornithologists Group 2019). Of the species that declined during the present study, COG also reported trends over the same years and additional years since, which are now summarised. Eastern Rosella abundance was stable then declined (Canberra Ornithologists Group 2018). Superb Lyrebird showed increases and decreases over years, perhaps linked to the 2003 bushfire in Namadgi (Canberra Ornithologists Group 2016). Welcome Swallow showed an increase over years (Canberra Ornithologists Group 2018). Scarlet Robin, Eastern Yellow Robin, Leaden Flycatcher and European Goldfinch showed long-term declines (Canberra Ornithologists Group 2018). Scarlet Robins declined at woodland sites (Bounds *et al.* 2010). The main difference between the present study and the COG data is the Welcome Swallow, for which opposite trends emerged.

The bird data collected in the present study are in a form that could be used to monitor broad patterns in biodiversity in Namadgi National Park and other such parks. Bird abundance data would also be very useful and facilitate greater analysis and evaluation. Monitoring of Threatened species would be better with focussed surveys for those particular species, as the current method appears to have limited utility for them. Effective monitoring requires clear questions (Lindenmayer and Likens 2010) as well as a commitment to collect, store and analyse the data.

The data collected and analysed here have a few limitations. The occupancy data reflect habitat use, not abundance per se. The data are limited by the restricted survey duration each year, even though that totalled 28 hours in each summer. Multiple surveys within each summer would have strengthened the conclusions, but more surveys were impossible because of logistical constraints.

Acknowledgements

I thank the manager and staff of Namadgi National Park, the Institute for Applied Ecology at the University of Canberra, and A. Upitis for support. A.O. Nicholls suggested very useful edits to the manuscript.

References

Anon. (1984) *Ecological Resources of the ACT*. Technical Paper No. 42. National Capital Development Commission, Canberra.

Anon. (1986) *Namadgi National Park Management Plan*. ACT Parks and Conservation Service, Canberra.

Anon. (2010) *Namadgi National Park Plan of Management 2010*. Department of Territories and Municipal Services, Canberra.

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003) *The New Atlas of Australian Birds*. Birds Australia, Melbourne.

Bibby, C. J., Burgess, N. D., Hill, D. A. and Mustoe, S. (2000*) Bird Census Techniques*. 2nd edn. Academic Press, London.

Bounds, J., Taws, N. and Cunningham, R. (2010). A statistical analysis of trends in occupancy rates of woodland birds in the ACT, December 1998 to December 2008: the ten-year data analysis. *Canberra Bird Notes* 35: 158-191.

Canberra Ornithologists Group (Ed. P. Fennell) (2009) Annual Bird Report: 1 July 2007 to 30 June 2008. *Canberra Bird Notes* 34: 1-80.

Canberra Ornithologists Group (Ed. P. Fennell) (2016) Annual Bird Report: 1 July 2014 to 30 June 2015. *Canberra Bird Notes* 40: 1-112.

Canberra Ornithologists Group (Ed. P. Fennell) (2018) Annual Bird Report: 1 July 2016 to 30 June 2017. *Canberra Bird Notes* 43: 1-112.

Canberra Ornithologists Group (Ed. P. Fennell) (2019) Annual Bird Report: 1 July 2017 to 30 June 2018. *Canberra Bird Notes* 44: 1-108.

Carey, A., Evans, M., Hann, P. et al. (2003) *Wildfires in the ACT 2003: Report on Initial Impacts on Natural Ecosystems*. Technical Report No. 17, Environment ACT, Canberra.

Caughley, G. (1980) *Analysis of Vertebrate Populations.* Reprinted with corrections. John Wiley & Sons, New York.

Christidis, L. & Boles, W. E. (2008) *Systematics and Taxonomy of Australian Birds*. CSIRO Publishing, Melbourne.

Corp, T. (1989) Gudgenby: the last 150 years. *Canberra Historical Journal* 24: 21-30.

Dutson, G., Garnett, S. & Gole, C. (2009) *Australia's Important Bird Areas*. Birds Australia Conservation Statement No. 15, Melbourne.

Frith, H. J. (1976) *Birds in the Australian High Country*. Revised edn. A. H. & A. W. Reed, Sydney.

Hermes, N. (2017) *A Photographic Guide to the Birds of the Australian High Country*. John Beaufoy Publishers, London.

Hone, J. (2012) *Applied Population and Community Ecology*. *The Case of Feral Pigs in Australia.* Wiley Blackwell, Oxford.

Joseph, L. N., Field, S. A., Wilcox, C. and Possingham, H. P. (2006) Presence-absence versus abundance data for monitoring threatened species. *Conservation Biology* 20: 1679-1687.

Laiolo, P., Dondero, F., Ciliento, E. and Rolando, A. (2004) Consequences of pastoral abandonment for the structure and diversity of the alpine avifauna. *Journal of Applied Ecology* 41: 294-304.

Lindenmayer, D. B. and Likens, G. E. (2010) *Effective Ecological Monitoring*. CSIRO Publishing, Melbourne.

Lindenmayer, D. B., Wood, J. T. and MacGregor, C. (2009) Do observer differences in bird detection affect inferences from large-scale ecological studies? *Emu* 109: 100-106.

Recher, H. F. and Serventy, D. L. (1991) Long term changes in the relative abundance of birds in Kings Park, Perth, Western Australia. *Conservation Biology* 5: 90-102.

Saunders, D. A. (1989) Changes in the avifauna of a region, district and remnant as a result of fragmentation of native vegetation: the wheatbelt of Western Australia. A case study. *Biological Conservation* 50: 99-135.

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

Accepted 1 August 2020

Canberra Bird Notes 45(3) (2020): 267-272

WEDGE-TAILED EAGLES, LITTLE EAGLES AND DROUGHT IN THE ACT IN 2019

[A]JERRY OLSEN, [B]SUSAN TROST AND [A]BERND GRUBER

[A]Institute for Applied Ecology, University of Canberra, ACT 2601, Australia
[B]44 Wybalena Grove, Cook, ACT 2614, Australia

For correspondence: Jerry.Olsen@canberra.edu.au

Abstract. *In 2019 the nine ACT Wedge-tailed Eagle territories we check each year fledged 1.11 young per territory, with three nests fledging twins. ACT Little Eagle breeding success in 2019 was much lower, at 0.30 young per territory, and attributed to drought (Rae et al. 2019). We suggest that drought is not the only cause of low breeding success in ACT Little Eagles, and that Little Eagle productivity will remain low after the drought lifts. Wedge-tailed Eagle productivity remains high, and they continue to rely on a mix of native and exotic prey. A just-fledged juvenile ranged to the southeast of Canberra, then west into Namadgi and New South Wales, then north of the ACT near Wee Jasper.*

The nine Wedge-tailed Eagle *Aquila audax* territories close to Canberra we check each year fledged 1.11 young per territory in 2019. Breeding success for Wedge-tailed Eagles in the ACT region back in 1964 was 0.8 young per territory (Leopold and Wolfe 1970) and 1.1 in 2002-2003 (Fuentes *et al*. 2007). From 2016 to 2019 the 9 pairs of Wedge-tailed Eagle we checked averaged 1.17 young fledged per territory per year (Table 1).

Table 1. Reproductive success at nine Wedge-tailed Eagle territories near Canberra 2016 to 2019

Territory	2016	2017	2018	2019
1	1	1	1	2
2	1	1	1	1
3	1	1	1	1
4	1	1	1	2
5	1	1	1	0
6	1	1	1	1
7	2	2	1	0
8	2	2	2	2
9	1	1	1	1
Means	**11/9=1.22**	**11/9=1.22**	**10/9=1.11**	**10/9=1.11**
Grand mean	**1.17**			

Figure 1 – Twin nestling Wedge-tailed Eagles, ACT (*Jerry Olsen*).

Wedge-tailed Eagles are said to have lower productivity in low rainfall years compared to high rainfall years (Robertson 1987). Rainfall at the Canberra Airport in 2019 was 358.6 mm, which is only 58.2% of the long-term average of 615.6 mm (source - Australian Government: Bureau of Meteorology). However, Wedge-tailed Eagle productivity in the ACT remained high. In 2019 we recorded twins at three of nine nests (Table 1, Figure 1). Hence, the low breeding success during drought years found by Robertson (1987) may apply to eagles in arid regions but not in moderate, Mediterranean climates such as in the ACT.

We suspect that breeding Little Eagles (*Hieraaetus morphnoides*) in the ACT, as with Wedge-tailed Eagles, are not adversely affected by drought. Three successful territories of Little Eagles were found in the ACT in 2019 (Rae *et al*. 2020) (3 young from 10 occupied territories = 0.30 young per territory), lower than the 0.67 young per territory in each of two years for Little Eagles breeding during an increasingly dry period near Armidale found by Larkin *et al*. (2020) (10 young from 15 occupied territories in 2017, 12 young from 18 occupied territories in 2018) and a slightly lower number of successful pairs for the ACT than the four reported by Olsen *et al*. (2009) another dry year (530.4 mm, 86.1% of the long term average). Three successful Little Eagle nests were also found in the ACT in 2017 (Rae *et al*. 2018) an above average rainfall year with 761.0 mm, 123.6% of the long-term average (Table 2).

In contrast to the ACT, young fledged per occupied territory from nests near the ACT, but in NSW (also in drought), was 0.50 in 2017-2018 (one fledged from two territories), 0.75 in 2018 (three fledged from four territories), and 0.75 in 2019-2020 (three fledged from four territories), giving an overall mean of 0.70 young fledged per occupied territory for ten territories (Rae *et al*. 2018, 2019, 2020). This is similar to the 0.67 young fledged per territory found by Larkin *et al*. (2020) in NSW near Armidale. So, breeding success was similar in two separate studies in drought-affected NSW, and much higher than breeding success in the drought-affected ACT. Why is ACT Little Eagle productivity so poor?

Table 2 – Successful ACT Little Eagle nests, Young fledged/territory and Mean annual rainfall in the ACT 2017-2019.

Year	*Successful nests in the ACT	*Young fledged /territory	**Annual rainfall	% long term average rainfall
2017	3	4/9 (44%)	761.0	123.6
2018	5	5/9 (56%)	472.0	76.6
2019	3	3/10 (30%)	358.6	58.2

*****source Rae *et al*. (2018, 2019, 2020)
**source Australian Government: Bureau of Meteorology rainfall data

Olsen & Fuentes (2004, 2005) first signalled a decline in breeding Little Eagles in the ACT and linked this to increasing Wedge-tailed Eagles and habitat loss from property development. Rae *et al*. (2020) observed a Wedge-tailed Eagle pair displacing a Little Eagle pair from a NSW nest, and the Little Eagle nest at Strathnairn was abandoned (Olsen 2019) after some of its foraging territory was developed for housing, providing evidence for these claims.

Two hypotheses can be tested for low breeding success of Little Eagles in the ACT:

i) **drought**, so breeding success should improve when the drought lifts and rainfall increases (Rae *et al*. 2020); ii) **high-quality Little Eagles habitat has been lost to the combined effects of housing developments and an increase in breeding Wedge-tailed Eagles**, leaving degraded (marginal) habitat where Little Eagles cannot complete a breeding effort (Olsen 2018, 2019). It follows from this second hypothesis that *breeding success*, a key indicator of Little Eagle status according to the *Little Eagle Action Plan*, (ACT Government 2008) will remain low, even after the drought lifts, and the mean number of successfully breeding pairs will not increase significantly above the four successful pairs found in 2008. This does not rule out other factors impacting on breeding success such as declines in woodland birds used as prey (Olsen 2016).

Wedge-tailed Eagles are doing well in the ACT. In 2019 we satellite-tagged and colour-banded a just-fledged female Wedge-tailed Eagle and collected prey remains and egested pellets from the nest and roosts used by the juvenile, her sibling, and her parents. Prey included five species of mammal, including Red Fox and House Cat, 8 species of bird, and one species of reptile (Table 2). The prey remains of large mammals such as Grey Kangaroo and Sheep appeared to be from carrion, but we had previously observed Mia's mother chasing, attacking and eating foxes (Figure 3). The adult Grey Kangaroo were probably road kills, likely related to the eagle territory overlapping busy roads where the pair accessed carrion, but Wedge-tailed Eagles do attack and kill some kangaroos (Fuentes and Olsen 2015). A notable thing about Wedge-tailed Eagle diet in the ACT is that we have seen an increase in Euros *Macropus robustus* in the breeding habitat of these pairs, but eagles seldom take them, relying instead on Eastern Greys as prey. See, for example, the diet found at the nest of Emma, another Wedge-tailed Eagle we satellite-tagged (Olsen *et al*. 2019), which contained numerous remains of Sheep but no Euros. Mia's nest was not close to a Sheep property and had comparatively few Sheep remains compared to Emma's nest.

Table 3 – Prey found at Mia's nest and roosts.

Prey species	Number of times a prey species was found
European Rabbit (*Oryctolagus cuniculus*)	9
Eastern Grey Kangaroo (*Macropus giganteus*)	8
Sheep (*Ovis aries*)	2
Red Fox (*Vulpes vulpes*)	1
House Cat *Felis catus*)	2
Wood Duck (*Chenonetta jubata*)	2
Galah (*Eolophus roseicapillus*)	1
Sulphur-crested Cockatoo (*Cacatua galerita*)	1
Crimson Rosella (*Platycercus elegans*)	1
Australian Magpie (*Gymnorhina tibicen*)	6
Pied Currawong (*Strepera graculina*)	2
Australian Raven (*Corvus coronoides*)	1
Domestic Pigeon[band] (*Columba livia*)	1
Bearded Dragon (*Pogona barbata*)	1

Figure 2 – Breeding ACT female Wedge-tailed Eagle (Mia's mother) chasing a fox *(Jerry Olsen)*.

Post-fledging, Mia wandered to the southeast of Canberra, then west into Namadgi and New South Wales, then north of the ACT near Wee Jasper (Figure 3). We will continue to monitor Mia's nest and the nest of other ACT eagles in 2020, and report trends.

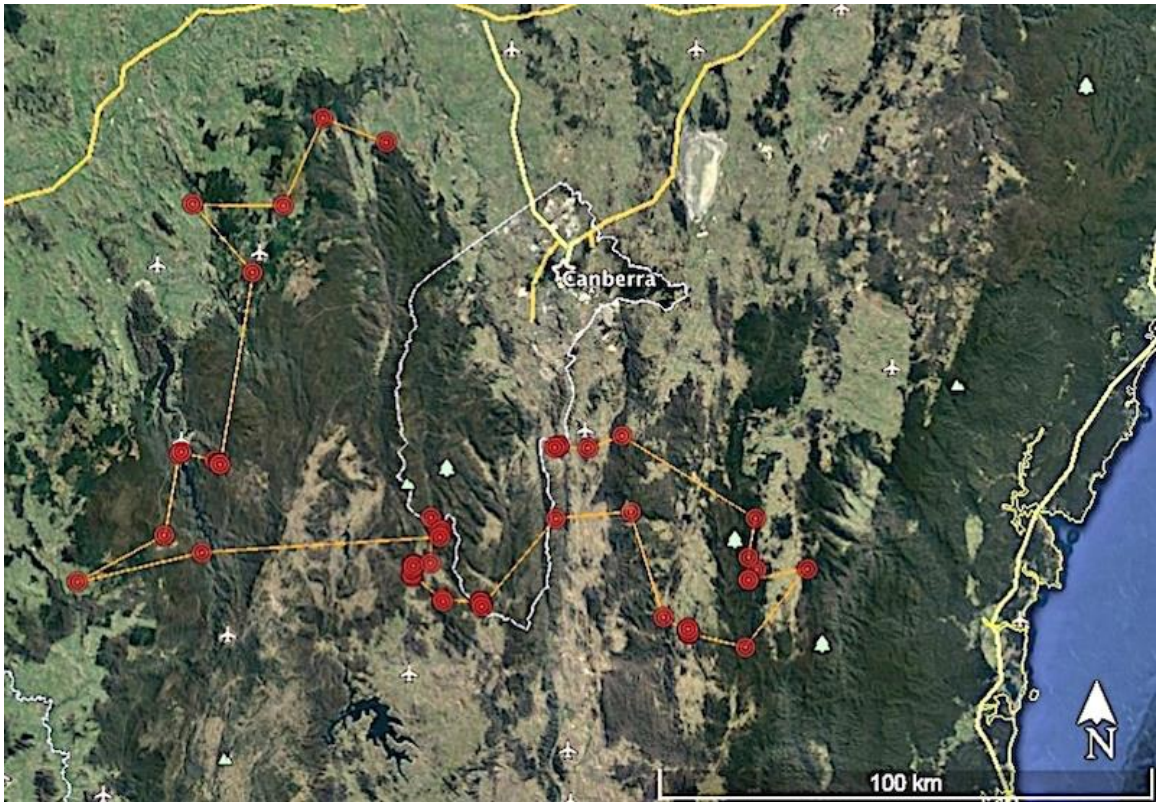


Figure 3 – Wanderings of Mia, a juvenile ACT Wedge-tailed Eagle satellite-tagged in 2019.

Acknowledgements

Particular thanks go to Roger Williams, Colin McLaren, Darren Roso, Michael,Maconachie, James Overall, Jeff van Aalst, Brian Summers, Alison Mungoven, Thomas Mungoven, Christie Gould, Lizabeth Collier, Joe Clifton, Geoffrey Dabb, Kym Bradley,Rosemary Blemings, Nic Mikhailavich, and to Naomi Clarke and Nathan Perring at theAustralian Bird and Bat Banding Scheme.

References

ACT Government (2008) Action Plan No. 35: Little Eagle *Hieraaetus morphnoides*. http://www.environment.act.gov.au/__data/assets/pdf_file/0004/576580/Little_Eagle_A P_Final.pdf.

Australian Government: Bureau of Meteorology rainfall data, 2008, 2016, 2017, 2018, 2019.

Fuentes, E. and Olsen, J. (2015) Observations of the killing of large macropods by Wedge-tailed Eagles *Aquila audax. Australian Field Ornithology* 32: 160-166.

Fuentes, E., Olsen, J. and Rose, A.B. (2007) Diet, occupancy, and breeding performance of Wedge-tailed Eagles *Aquila audax* near Canberra, Australia 2002-2003: Four Decades after Leopold and Wolf. *Corella* 31: 65-72.

Larkin, C., Jenkins, R., M^{c}Donald, P.G. and Debus, S.J.S. (2020) Breeding habitat, nest-site characteristics and productivity of the Little Eagle (*Hieraaetus morphnoides*) near Armidale, New South Wales. *Pacific Conservation Biology* 26, early online https://doi.org/10.1071/PC19033

Leopold, A.S. and Wolfe, T.O. (1970) Food habits of nesting Wedge-tailed Eagles, *Aquila audax*, in south-eastern Australia. *CSIRO Wildlife Research* 15: 1–17.

Olsen, J. (2016) ACT Representative's Report. *Boobook* 34*:* 8–10.

Olsen, J. (2018) Eleven historic breeding territories of ACT Little Eagles is an underestimate – A reply to Olsen and Rae (2017). *Canberra Bird Notes* 43: 120-131.

Olsen, J. (2019) Telemetry and colour-banding confirm predictions about Little Eagle migration and territory desertion. *Canberra Bird Notes* 44: 241-249.

Olsen, J. and Fuentes, E. (2004) *Preliminary Report on the Effect of the Development of the Molonglo Valley on the Community of Birds of Prey*. Report to ACT Planning & Land Authority, Canberra (36 pp.).

Olsen, J. and Fuentes, E. (2005) Collapse in numbers of breeding Little Eagles in the Australian Capital Territory. *Canberra Bird Notes* 30: 141–145.

Olsen, J., Osgood, M., Maconachie, M., Dabb, G. and Butterfield, M. (2009) Numbers of breeding Little Eagles *Hieraaetus morphnoides* in the Australian Capital Territory in 2008. *Canberra Bird Notes* 34: 81- 85.

Olsen, J. Trost, S. and Gruber, B. (2019) Emma and other Wedge-Tailed Eagles in the ACT in 2018. *Canberra Bird Notes* 44: 163- 168.

Rae, S., Fletcher, D., Mulvaney, M., Davies, M., Roberts, D. and Olsen, P. (2018). Notes on the breeding ecology of Little Eagles in the ACT in 2017/2018. *Canberra Bird Notes* 43: 186-193.

Rae, S., Wimpenny, C., Mulvaney, M., Davies, M., Fletcher, D., Roberts, D., and Olsen, P. (2019). Preliminary results from study of little eagles in the ACT and nearby NSW in 2018-2019. *Canberra Bird Notes* 44: 145-151.

Rae, S., Mulvaney, M., Fletcher, D., Wimpenny, C., Brawata, R., Kiggins, R., Stol, J., Davies, M, Roberts, D. and Olsen, P. (2020). The breeding success and diet of Little Eagles in the ACT and nearby NSW in a dry year, 2019. *Canberra Bird Notes* 45: 158-166.

Robertson, G. (1987) Effects of drought on a breeding population of Wedge-tailed Eagles *Aquila audax*. *Emu* 87: 220–223.

Accepted 29 July 2020

Canberra Bird Notes 45(3) (2020): 273-288

THE IMPACT OF THE JANUARY 2020 MALLACOOTA BUSHFIRE ON BIRDS – FIRST IMPRESSIONS

MARTIN BUTTERFIELD

martinflab@gmail.com

Abstract: *This report covers some aspects of the bushfires which affected the Mallacoota area in the period after 29 January 2020, extending to June 2020. Some anecdotal commentary is also given where observations between July and the completion of this report appear to offer valuable insight to the future. After outlining the fire event and its immediate aftermath there are two thrusts to the matters covered: (1) The efforts taken to monitor the presence of birds post fire in the area; and (2) Evaluating the impact of the fires on birds. It appears that recovery of diversity (i.e. number of species recorded) is progressing quite well but post-fire reporting rates and numbers are low for small bush birds. Some reference is also made to the impact of COVID 19 on the monitoring effort and the rising water level in Mallacoota Inlet. 2020 could be regarded as a "3F year": Fire, Fever and Flood.*

1. Main findings

The intention of this report is to provide some insights into the post-fire recovery of birds generally. Some comments will also be made about the processes that assisted or impeded this assessment. It is considered important to get an early benchmark. This report is just a very early effort to explore available information (mainly from eBird). There is a lot of detailed data in eBird for later analysts to assess, and possibly in other data sets.

- It appears that there is very little monitoring by official bodies: if work is being done there has been no public announcement of its nature and the results are in neither of the core citizen science applications.
- As with all analysis of citizen science activities, it is important to consider reporting rates and details of site locations, the number of observers and other aspects of data collection effort.
- It appears that looking at diversity (*i.e.* number of species recorded) recovery is progressing quite well. However, post-fire reporting rates and numbers are low for small bush birds.

2. The fire period

On 29 Dec 2019 a bushfire started in the Wingan area about 25 km East of the town of Mallacoota. By early on 30 Dec it had burnt towards the coast and then appeared to start burning East. Early on the morning of 31 Dec it reached the outskirts of the town: approximately 100 dwellings were burnt in the town and hinterland. This received extensive coverage in the media, due in part at least to the difficulty of evacuating 3,000 visitors from the area (many of whom had been camping in the Foreshore Caravan Park).

Over the next weeks the fire continued burning to the North and East. The eventual extent of the fire is shown in Fig. 1, extracted (I believe on 30 Mar 2020) from the Emergency Services Victoria (ESV) website.)

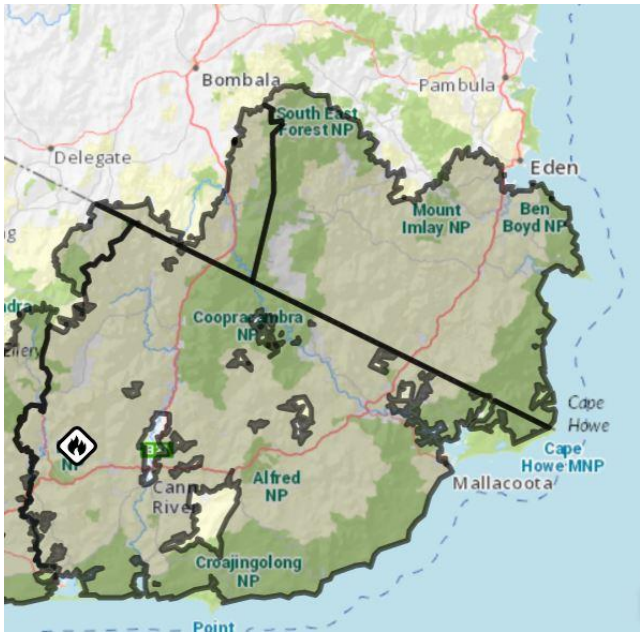


Figure 1. Overall Extent of fire.

Much of the built-up area of the town was saved by the actions of firefighters and residents who did not evacuate. (The author left early on 30 Dec.) Fig. 2 is a close up of the urban area from the ESV map showing where the fire went in relation to the town.

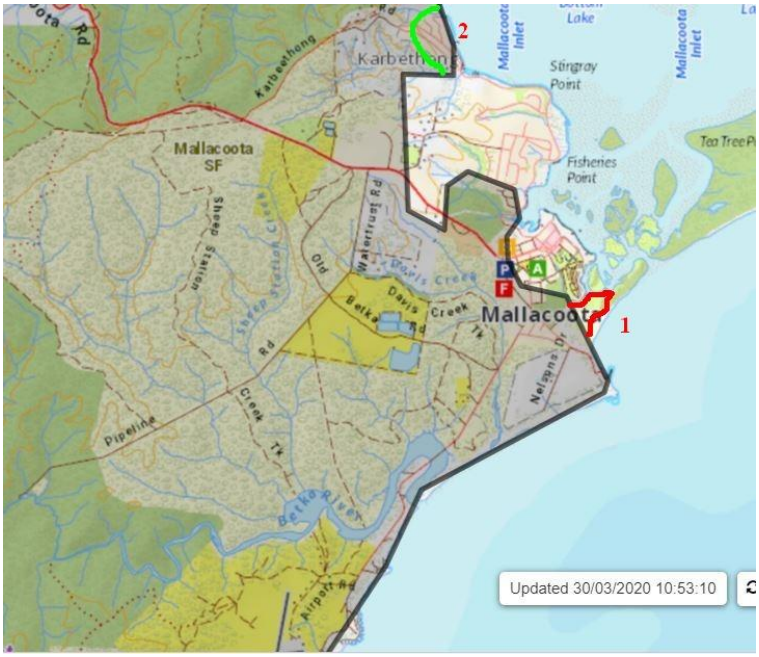


Figure 2. Extent of fire around Mallacoota town area.

As usual with disaster maps on-line, this map is an approximation. The firefighters have other priorities when on the fire ground. I have noted two areas worthy of specific comment and shown hand-drawn adjusted boundaries.

1. The fire burnt beyond the clifftop road and went out on to the sand dunes, burning in *Acacia longifolia* vegetation.

2. The boundary shown for the development of Karbeethong suggests the entire area was burnt, whereas most of this area escaped: this is significant as many of the houses in this area have extensive native gardens which provide excellent habitat for birds (and other wildlife, including Koalas (*Phascolarctos cinereus*)).

3. Aftermath

This is being written in July-October 2020 so only covers the immediate and short-term aftermath of the fires. There will be longer-term impacts on the people of the town and the surrounding environment for many years, but that is outside the scope of this report.

3.1. Immediate aftermath

It appears that most of the resident birders left the area before the fire struck. However long-term resident Bob Semmens remained and described his experiences in an interview with Australian Birdlife (Croft *et al.* 2020):

> A few days after the fire, Bob found his beloved Tip Beach covered in piles of blackened leaves. Among the ash, he noticed small bursts of colour too—the burnt bodies of birds littered the sand as far as the eye could see.

Residents who stayed have told me that the fire front hit the town about 08:00 hours on the 31st December 2019. People had gathered at points on the waterfront (many of those with boats taking them out into the centre of the Inlet). Most people at the wharf area were taken into the Community Centre for shelter at the height of the event. The fire had largely passed by noon.

The surrounding infrastructure was severely damaged. The road from Genoa to Mallacoota was blocked by fallen trees and damaged in other ways, meaning no land access for several days. Emergency workers (including teams from the Australian Defence Forces) commenced opening the road as soon as possible. Most supplies were arriving by air, when the dense smoke cleared enough to make it possible for flights to arrive, and as well documented in mass media, most of the people in the area were evacuated by sea to a naval base outside the fireground.

Many kilometres of powerline had been compromised, so there was no reticulated power in the town until generators could be installed approximately two weeks later. Even so it was considered that the number of people in the area should be kept to a minimum to avoid overloading the system as installed. Residents were officially allowed to return from 21 Jan 2020, at which point the author and his wife returned.

3.2. Subsequent period

After returning to our house we started to live normally as far as possible. Many areas in which I used to go birding were closed off for safety reasons (quite correctly at that time, as many standing trees were very fragile). Entry to the town was restricted to residents and emergency workers until mains power was reinstalled (our house was reconnected on 8 Feb.)

The closure of walking tracks and other bush access points has continued, although many residents are making their own assessments of whether areas are safe. It appears, from comments at an on-line forum, that as far as Parks Victoria are concerned many of these

closures are due to compromised tourism infrastructure rather than on-going hazards to the general public such as dangerous trees.

Visitors began to return in small numbers in late February to March, as will be detailed below. However, restrictions due to COVID 19 cut in from April onwards, greatly restricting the number of visitors, including birders.

Although beyond the time frame generally covered by this report, the chaos in the area was augmented when the level of water in the Inlet rose dramatically on 14 Jul 2020 as a consequence of heavy rainfall, especially in the upper catchments of the Genoa and Wallagaraugh Rivers, which feed the Inlet.

4. Birds and birding: Background

The author publishes, through the Mallacoota Birds Facebook Group (MBFG), a monthly summary of birds reported in the Mallacoota area. For that purpose I have defined the Mallacoota area as being the polygon shown in Fig. 3.

Figure 3: Mallacoota area used for monthly reports.

The boundaries are somewhat arbitrary but were selected to include the areas commonly visited by residents and birders visiting Mallacoota and an offshore area to include sites of possible pelagic outings and reports by fisherpersons on the ocean. The cut-off at the Victorian border reflects only the record-keeping practices imposed by eBird; as always, birds ignore such human conceits.

The main source of data for this article is records submitted to eBird. I also monitor reports to Birdata for a similar polygon, but the data publicly available is rather limited and I only record the presence of a species from this source which has not been reported to eBird during the period. Residents and members of the MBFG who do not use either of these major apps report sightings they find interesting to me, either in person or by posts to MBFG. I record these as incidental sightings in an ACCESS database and they usually provide a greater number of additional records than Birdata. I also monitor on an ad-hoc basis the Victorian Biodiversity Atlas (VBA), but that provides very few records, being mainly the repository of the results of specific projects by staff of, or contractors to, Victorian Government agencies (notably Parks Victoria (PV) or Agencies within the

Department of Environment, Land, Water and Planning (DELWP). I have been advised that the VBA is usually only updated once a project is completed, so there may be additional data to be included there.

4.1.1. Summary of reporting processes since fire

For the period since the fires the reporting has been rather difficult. I will attempt to quantify this below but in summary:

In January I commenced reporting to eBird after returning on the 21st. There are no eBird reports for 1 – 20 Jan. To broaden the take of birds, I encouraged residents to reports sightings to MBFBG which added significantly to the number of species observed for that month in particular.

That continued in February but the species recorded were boosted significantly by reports from a group of scientists which came (in an ADF helicopter) to capture, as insurance, some specimens of the Eastern Bristlebird (*Dasyornis brachypterus*) population on Howe Flat, where the habitat was seen as seriously threatened by the fire. Seventeen birds were captured and transferred to the Melbourne Zoo. The key participant (from Monash University) submitted two reports from the capture area and, following the team's evacuation to the town area due to the fire threatening the area in which they were working, a further report of birding around the town while awaiting the helicopter's return. The latter amounted to 88 species in a 4-hour period!

By March it appeared the town was open for business and the author and the co-administrator of MBFBG facilitated a Big Weekend which attracted 17 birders from out of town. Participants reported 138 species.

By the end of that month concerns were evident about limiting travel to the area due to the need to prevent the spread of COVID 19. Thus, for the period April to June reporting was largely by the author supported by ad-hoc reports by other residents. (That has largely continued to October.) A few visiting eBirders were around in June, one of whom provided some excellent sea-bird records from Gabo Island and a researcher has paid brief visits to the town area most months, submitting eBird reports of his observations.

4.1.1.1. Articles in 'Mallacoota Mouth'

A number of local observers do not use eBird but have presented their observations, some of which have been reported to Birdata, in articles in the local newsletter 'The Mallacoota Mouth'.

Semmens (2020) lists 25 species – mainly the species common in Mallacoota at this time of year) - found dead among the large number of dead birds washed up on the beach. He also summarises birds visiting his bird bath. He notes that

> When counted in the late summer, bird species in the 5 kilometre radius around Mallacoota remained similar to numbers pre-fire – around 100, helped by about a dozen species that migrate from northern Australia and were still here, no doubt confused!

Daws (2020) comments on the methods and results of the surveys of five areas by the group which are reported to Birdlife Australia. She comments:

> What we see here is that there are regularly around 75 to 90 species in the district and that more species are seen at Gipsy Point than at either Double Creek or in the Old Coast forest.

And subsequently

> The counts for 2020, although incomplete, have been included. What they show is that the number of species seen in Mallacoota immediately after the fire, and again in the autumn count are, if anything, up on recent years, while the numbers of species on the Heathland and in the Old Coast forest have fallen dramatically.

She also provides some qualitative commentary on changes in the avifauna since the fire.

The number of species reported by both authors is considerably lower than those recorded on eBird, in part reflecting the formal surveys apparently not including the Waste Water Treatment Plant, the sand flats and beaches of the area around Bastion Point; and Howe Flat. The number of participants in the surveys is also lower than the number of contributors to eBird (at least in a normal year), many of them visitors to the area for either recreation or professional environmental research.

4.1.2. Birding effort – Overview

As shown in Fig. 4 the number of lists submitted to eBird has grown fairly consistently since 2015, when the author believes eBird started to become the preferred means of recording sightings.

Figure 4. Number of eBird lists per year.

The pattern of reports is somewhat seasonal, with relatively few birders (or anyone else) visiting Mallacoota in winter and the author being the main resident eBirder. In the chart in Fig. 5, the peak in March reflects the impact of the Big Weekend in 2020.

4.1.3. Post-fire birding effort per month

As will be apparent from the preceding sections, much of the reporting for the post-fire period has been my personal observations. Using the number of species records as the counting unit, I have provided 43% of the number of records for the first half of 2020, including effectively all records for April and May.

Figure 5. Number of eBird lists per month.

Looking at the overall birding effort, taking the number of checklists as the counting unit, the chart in Fig. 6 compares the first six months of 2020 with 2019 and the rest of the period since eBird became widely adopted.

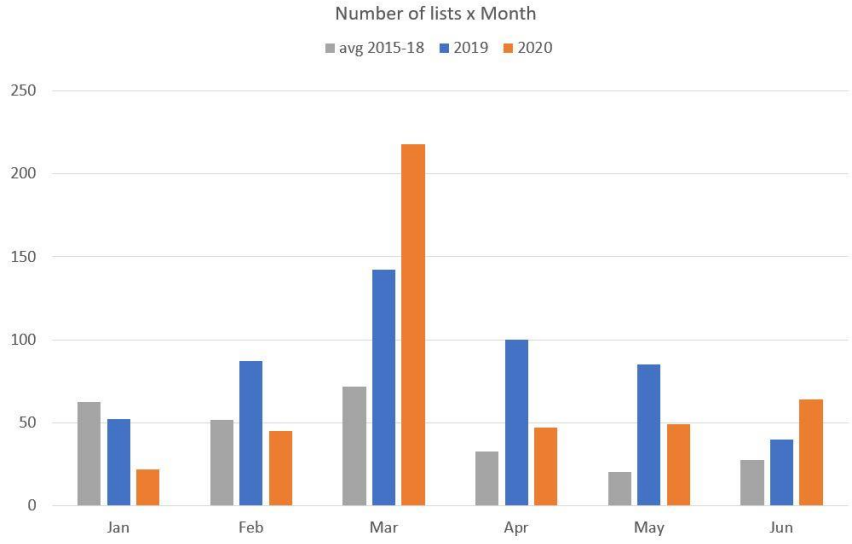


Figure 6. Number of lists per month and year.

The pattern is much as expected.

4.1.4. Impact of fire on, and accessibility to, sites

EBird includes at least one record for 424 locations in the Mallacoota area. In my analysis I have not distinguished between 'Hotspots' and 'Personal locations' as my intention is to present information about the presence or absence of birds in an overall sense.

Four eBird locations ("Mallacoota", "Mallacoota 10' Cell", "Mallacoota township" and "Croajingalong National Park") in particular are generic in nature and are mainly used by casual visitors (although the author does use "Mallacoota" for incidental records when traversing a wide area and not recording every bird). To make a rational workload, in compiling the following sections I classified the 61 localities with >100 species records

according to whether they were burnt, whether accessible by my standards in January – June; and whether a site had a significant water presence. I have not visited all sites since the fire so have used my knowledge of the area to apply some of the codes. Note that all those rated as 'partial' or 'unburnt' were accessible. This gave a classification as shown in Table 1.

Table 1. Post-fire status classification.

Post Fire status code	Post Fire status
100	<100 records
101	Generic
111	Burnt, accessible, water
112	Burnt, accessible
121	Burnt, inaccessible, water
122	Burnt, inaccessible
211	Partial, accessible, water
212	Partial, accessible
311	Unburnt, accessible, water
312	Unburnt, accessible

The number of localities classified to each code, and the number of species records ever submitted are shown in Table 2. Note that to minimise the amount of space taken by text I have omitted most "null" descriptors: thus a simple status of "accessible" (code 312) implies "unburnt" and that "water" is not significant at that locality.

Table 2. Attributes of post-fire status categories.

Post Fire status	Post-Fire status code	# localities	# records	% localities	% records
<100 records	100	425	7007	87.4	9.4
Generic	101	4	16214	0.8	21.7
Burnt, accessible, water	111	5	6462	1.0	8.7
Burnt, accessible	112	11	4166	2.3	5.6
Burnt, inaccessible, water	121	5	3880	1.0	5.2
Burnt, inaccessible	122	13	12469	2.7	16.7
Partially burnt, accessible, water	211	6	16001	1.2	21.4
Partially burnt, accessible	212	4	2257	0.8	3.0
Accessible, water	311	8	4781	1.6	6.4
Accessible	312	5	1438	1.0	1.9
Total		**486**	**74675**	**100.0**	**100.0**

For analytical purpose it is good to see that the proportion of records in the class "<100 records" is a relatively small proportion of the total (despite that class being 87.4% of localities). While disappointing that the two inaccessible codes amount to 21.9 % of total

records, it is pleasing that this proportion is not higher. Details of the species observed, classified to post-fire status are in a Google Sheet.[1]

4.2. Comparison by time of observations by fire status

As there are only records for the first six months of 2020, the analysis which follows will be restricted to the first half of years. It is possible that the view of the impact of the fire may change once the next breeding cycle has been completed.

Fig. 7 shows the total number of species recorded in localities of each status for the first six months of 2020, 2019 and all earlier years in aggregate.

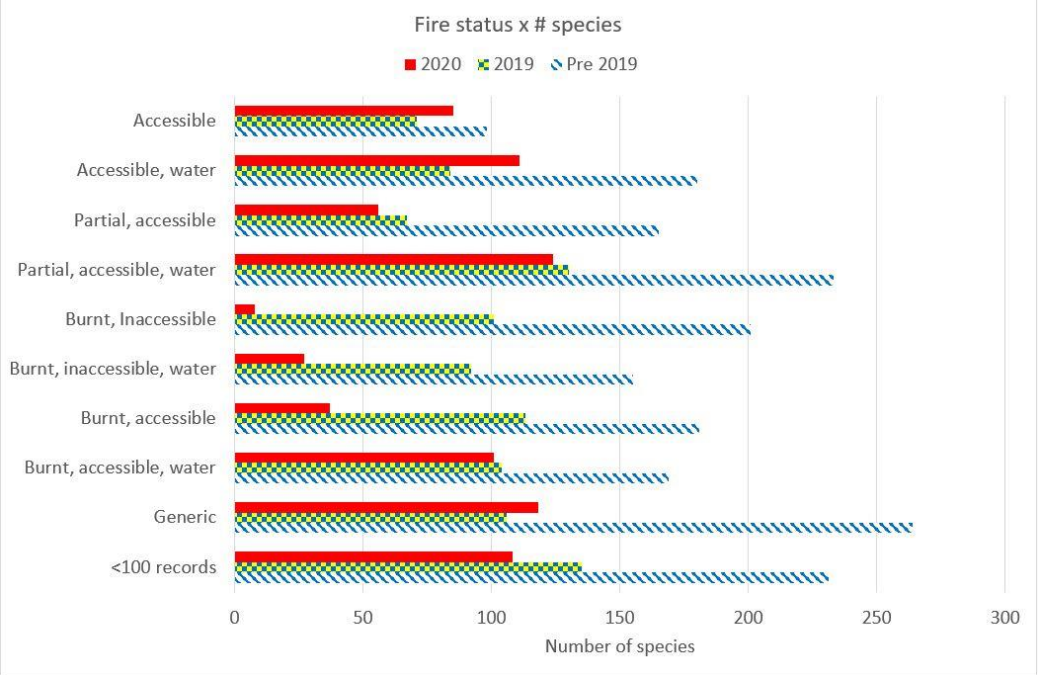


Figure 7. Number of species and post-fire status.

The observation of a small number of species from the inaccessible statuses reflects some of the locations becoming accessible (at least by community standards) in March – June 2020. In the case of the Casuarina Track to the West of the town, that reflects the track being officially removed from the closed status. In other cases it reflects the view of local residents that, with hazardous trees removed, the tracks are safely navigable once again (with, of course. the care always required when walking in the bush).

It might be hoped that the inaccessible areas would have been surveyed by officially sanctioned teams. This appears not to have happened to the date of writing. According to media reports, one survey team apparently entered the Howe Flat area, bogged their vehicle and became lost. They were evacuated by helicopter at 01:00 h after activating an EPIRB beacon. At an on-line meeting the author asked representatives of Parks Victoria about wildlife monitoring: the response was devoted to feral animal and weed control rather than progress on establishing a baseline for assessing recovery of valuable species. It is believed DELWP has engaged contractors to undertake some monitoring on Howe Flat at least.

[1] https://tinyurl.com/y6l9czgm (see the tab at bottom "Species by fire status"

It is noteworthy that the number of species reported in 2020 from the inaccessible areas is particularly low compared to the number of species reported in 2019. This is particularly the case for heath areas within these localities where the principal vegetation (dominant species of plants a dense mixture of *Allocasuarina paludosa, Hakea decurrens* and *Banksia marginata*) was incinerated. My inexpert view is that these areas went from a plant cover of ~90% to a cover of ~5% for the period immediately after the fire. (Other heaths with a high representation of *Xanthorrhoea resinosa* and *X. australis*, usually with a *Banksia serrata* and *Leptospermum sp.* upper storey were not so badly affected.) While many of the shrubs and ground cover are regenerating, it is likely to be several years before they are back to anything like the pre-2020 cover.

In each of the paired statuses the member noted with water as a significant feature has a higher species count than its partner without water. This is to be expected, as many of the local species are always associated with water (see general comment in following section).

4.3. Bird observations

My database of Mallacoota birds, including historical records, lists 325 taxa as being recorded in the area at least once on eBird. Of these, 19 are only listed to taxonomic levels above species (e.g. Shearwater sp.) and a further 10 combine two species (e.g. Australasian/Hoary-headed Grebe). For the first six months of calendar years 2019 and/or 2020 the taxon count is 233 of which 11 are multi-species taxa.

Comparing the information for the first six months of 2019 and 2020, a first comment is that of the 233 taxa:

- 162 were reported at least once in both years;
- 28 were only reported in 2020; and
- 43 were only reported in 2019.

Some of these species are dependent on water rather than land and are thus less likely to be directly affected by the fire. Using a set of categories employed by the author to summarise information for the local community (similar to those employed in tourist-oriented material), these are included in categories Waterbirds, Waders and Seabirds, and it has been decided to omit those species from the following discussion. For convenience the remaining species will be referred to as 'Land Birds'. A separate tab is in the linked Google Sheet.[2]

4.3.1. Land Birds seen only in 2020

It is unlikely that the addition of records of most, if not all, of the 11 species of Land Birds seen only in 2020 is related to the fire. It was reported anecdotally that many raptors were observed cleaning up carrion immediately post-fire, but no species details were included and there were no claims of for example Black Kite (*Milvus migrans*) being part of the process. However, for the sake of completeness, the following comments are offered on the other species, none of which are common in the area.

- 6 species are very uncommon birds in the area (<15 records) overall. Thus the records in 2020 are probably a combination of serendipity and the presence of expert birders in the area for the Eastern Bristlebird rescue project and the Big Weekend.
- The remaining 5 species are

[2] See the tab "Land Birds" at the bottom of https://tinyurl.com/y6l9czgm

- 3 migrant species not recorded in the first 6 months of 2019 (but recorded later in the year);
- Crested Shrike-tit (*Falcunculus frontatus*), which is not common here, but the number of reports varies greatly between years; and
- Peaceful Dove (*Geopelia placida*) rarely seen in the area in recent years although said to be "quite a few around the area" in 1979 (Pascoe 1979). A single bird – probably the same one - has been reported several times in 2020 from sites close to the town centre. Possibly it has been attracted back by the more open habitat.

4.3.2. Land Birds seen only in 2019

A notable feature of birds in this group of 25 taxa is that they are generally less common. Looking at the set of records for all years,

- 2 taxa not identified to species will not be considered further in this section.
- A further 7 species have been reported to eBird, for this area, less than 15 times in total and thus their absence in the first half of 2020 is not seen as remarkable.
- 4 species have been reported 40 or more times.
    - Scarlet Robin (*Petroica boodang*) (74 previous records). Of those records, 25 were from burnt and inaccessible areas; 14 from burnt accessible areas; 12 from partially burnt accessible areas; 14 from generic locations and 9 from unclassified localities (mainly accessible). In most years since 2014 there have been 5-9 records. My overall conclusion is that if the birds were present in early 2020 they would have been located. Possibly the fire has driven them away or killed them.
    - Brush Cuckoo (*Cacomantis variolosus*) (48 previous records). 22 of the previous records are from inaccessible areas. Possibly of more relevance is that 38 of the previous records were submitted for the period October to December: once the birds stop calling they are less likely to be reported. A status assessment has to await Spring 2020 (the species has returned – a little earlier than usual – in October 2020).
    - Pallid Cuckoo (*Cacomantis pallidus*) (48 previous records). Only 8 records from inaccessible areas and 12 from the generic sites. However, 35 records are from August to December, so again an assessment has to await Spring 2020.
        - As an aside, it is notable that the author has made several observations of Fan-tailed Cuckoo (*Cacomantis flabelliformis*) beginning in July and August 2020, which is quite early compared to previous years. Perhaps the preceding species will also return in Spring.
    - Striated Fieldwren (*Calamanthus fuliginosus*) (40 previous records). 15 previous records from inaccessible sites (mainly near Shipwreck Creek) and 6 from the badly burnt heath around the airport. 13 generic records. Possibly/probably a species that has been seriously impacted, but this will not be known until access is restored to Shipwreck Creek.
- The remaining 12 species not reported to eBird in the first 6 months of 2020 cover a wide range of situations and types of bird. They are summarised in Table 3 using an ad-hoc classification the author employs to summarise observations for the local community.

4.3.3. Overall reporting rate

I have created a reporting rate for the species seen in either or both half-years as the number of records of the species divided by the number of complete eBird lists submitted in each period (423 lists in Jan – June 2019 and 372 lists in Jan – June 2020). I decided to exclude "incidental" records as not reflecting a true amount of effort.

A full list of the species recorded (including Water Birds) and the reporting rates is included in a Google sheet. I have calculated the difference in reporting rate for each species and the average difference in rate for the broad groups I have developed. These are shown in Table 4.

Table 3. Species not reported in 2020 by broad category.

New Category	No.species
20 Birds of Prey	3
30 Parrots and Relatives	1
40 Kingfishers and other non-songbirds	1
41 Nightbirds	2
50 Honeyeaters	2
70 Thornbills, and similar species	1
80 Other, smaller birds	1
90 Other, larger birds	1

Table 4. Difference in reporting rate for each broad bird category.

Category	Avg diff. rep. rate
20 Birds of Prey	-0.00109
30 Parrots and Relatives	0.00846
40 Kingfishers and other non-songbirds	0.00559
41 Nightbirds	-0.00279
50 Honeyeaters	-0.01287
60 Flycatchers and similar species	-0.01358
70 Thornbills, and similar species	-0.01331
72 Finches	-0.01648
80 Other, smaller birds	-0.00581
90 Other, larger birds	0.01329

Obviously this outcome, with major drops for most small bird groups, is influenced by the closure of many localities previously rich in birdlife, including

- the more badly burnt forested areas such as Shady Gully and Double Creek; and
- the burnt heaths, particularly from Pebbly Beach to Seal Creek.

Where observers have been able to get to such areas to the West of the Inlet, as the actual danger level has become minimal, it has largely been a 'Silent Winter' supporting the finding shown above. (Again as an aside, in September – October the author and other local observers have noticed a marked increase in bird calls compared to earlier post-fire visits to these areas.)

In addition, the author has extracted data for some frequently visited unburnt sites close to the town. The pattern there is not so clear, with some categories showing increases and other categories, declines.

During the Eastern Bristlebird rescue operation and the Big Weekend, access to the unburnt heath on Howe Flat and the unburnt forest at Dowell Creek showed there seemed still to be good diversity in those sites. However, it is unclear to what extent those pockets of surviving habitats will provide a source from which the missing small birds can radiate out as the burnt areas recover. In July and August there have been some grounds for hope:

- Knowledgeable local observers have reported to the author sightings of Eastern Ground Parrot (*Pezoporus wallicus*) (1 from an island in the middle of the Inlet; another from incinerated, but regenerating, heath West of the town; and a third – photographed – from the heath near the airport);
    - On 13 August 2020 an eBirder photographed 2 Southern Emuwrens (*Stipiturus malchurus*) in vegetation at Bastion Point on the Western side of the Inlet. These birds were relocated by the author on 24 August 2020. This is not a usual area for sighting the species and may indicate they are moving over from the Howe Flats. The species has not been sighted in that area in September or October but has been reported from Howe Flat.

4.3.4. Land Bird Species of Conservation Concern

My use of the term "Conservation Concern" covers:

- the species listed in the Birdlife Working List of Australian Birds[3] as "Near-Threatened" to "Critically Endangered" levels of concern at the National level; and
- the additional species listed by the Victorian Government in the Flora and Fauna Guarantee Act Threatened List,[4] which includes (inter alia) taxa seen as at risk in Victoria while not at risk at the National level.

For the period 2015 – 2020, eBird recorded 34 species of birds listed to one of the levels of concern at least once in the study area. A full list of these species and the number of records per year is in the linked Google sheet.[5] Eleven of these species were Land Birds of which: 2 were listed Nationally; 2 were subspecies threatened in Victoria; and the remaining 7 seen as species threatened in Victoria while of Least Concern Nationally.

Of those 11 species, 6 have been recorded in the first 6 months of 2020. Of the remaining 5 species:

- 2 have been recorded since June
    - Square-tailed Kite (*Lophoictinia isura*) was seen once, by the author, in 2015; 4 times in 2018; and 5 times (3 by the author) in 2019. *The Australian Bird Guide* (Menkhorst *et al.* p. 228) notes that it hunts by "snatching prey from foliage": it is possible that the lack of foliage in the study area, and for a considerable distance around it, meant that the habitat was not suitable in 2020. Two birds of this species were seen, keeping close company, in the Genoa area in September 2020.

[3] http://www.birdlife.org.au/conservation/science/taxonomy
[4] https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list
[5] See the tab "Threatened species" in https://tinyurl.com/y6l9czgm

  - Powerful Owl (*Ninox strenua*) has subsequently been recorded through an audio recorder positioned in a burnt site.
- The remaining 3 species not recorded in the first 6 months of 2020 are all quite uncommon in the Mallacoota area. Chestnut-rumped Heathwren (*Calamanthus pyrrhopygia*) has been recorded once in this area on eBird in 2019; Flame Robin (*Petroica phoenicea*) recorded twice, most recently in 2017; and Diamond Firetail (*Stagonopleura guttata*) reported once in 2016.

4.3.5. A case study of heathland birds

One of the special habitats in the Mallacoota area is heathland. As noted in discussion of the impact of the fires this is generally of two forms, dominated by *Allocasuarina palludosa* or *Xanthorrhea sp*. (A special case could be made for an area adjacent to the airport where slashing, for airport safety and fire prevention, has generated a heath composed of other species. This is frequently searched by birders with reports usually lodged against the Gun Club Track hotspot.

These areas were in general very badly burned and it was thought that the species specialising in this habitat could be particularly at risk. The immediate question arises as to what those species might be? Rather than searching a field guide for comments about heathland habitat, I decided to identify the sites where three species known as heath specialists were found.

My three species were Southern Emuwren; Eastern Bristlebird and Eastern Ground Parrot. One or more of these species had been reported at least once from 58 sites, with 9 sites having more than 10 records. Two of these were the generic Mallacoota sites and thus excluded from further consideration. The remaining 7 sites with >10 records for the 3 species are taken as heathland sites.

Table 5: Species frequently reported at Heathland Sites.

COMMON NAME	% obs, at 9 sites	# records all sites	Comment
Eastern Bristlebird	84.62	91	Specialist
Ground Parrot	78.30	106	Specialist
Southern Emuwren	71.09	339	Specialist
Tawny-crowned Honeyeat.	55.17	174	Specialist
Stubble Quail	53.33	15	non-specialist
Horsfield's Bronze-Cuckoo	47.56	82	Lightly treed
Striated Fieldwren	47.50	40	Specialist
Brush Bronzewing	46.00	100	Dense vegetation
Brown-headed Honeyeater	45.28	53	non-specialist
Eurasian Skylark	43.48	23	Open grassland
Beautiful Firetail	42.31	104	Open grassy woodland
White-throated Nightjar	41.18	34	Woodland
Australian Owlet-nightjar	40.00	45	Woodland
Latham's Snipe	40.00	15	Wetlands

My final stage was to see which species were predominantly found at the heathland sites. For all species (with more than 10 total records) seen at the seven heathland sites, I calculated the % of sightings attributable to the seven sites. This gave 14 species in which more than 40% of sightings were at those sites. Examining the species notes in *The Australian Bird Guide* (Menkhorst *et al*.) enables comments to be offered in Table 5 as to whether the species are truly heath specialists or 'by catch' from the other habitats within the hotspots.

It should be noted that many eBird hotspots reflect outings rather than being limited to specific habitats. Notably in this context, the hotspots at Shipwreck Creek include areas of forest as well as the heaths and some densely vegetated creeklines with some temperate rainforest plant species. I have concluded that the specialist Heathland species are those shown in bold type in Table 5. The tabulated number of observations of each of these species in the first 6 months of the years 2015 – 2020 is shown in Table 6.

Table 6. Number of observations of heathland specialist species per year.

ORDER	COMMON NAME	2015	2016	2017	2018	2019	2020
2141	Brush Bronzewing	5	1	4	3	1	1
17406	Eastern Bristlebird	2		2	17	9	5
11794	Ground Parrot	6	5	13	17	1	2
16828	Southern Emuwren	17	18	20	38	16	7
17537	Striated Fieldwren	3	5	1		3	0
17243	Tawny-crowned Honeyeater	11	11	8	12	8	15

To assess the effort devoted to the core sites, I compiled a list of eBird localities in the Howe Flat, Shipwreck Creek and Gun Club areas for which at least one list was submitted for these years. This generated a list of 30 localities, the high number reflecting mainly different ways observers have listed a locality (failing to use the "standard name" offered by the eBird app). To that extent the records go beyond those for the nine key sites: but typically the additional sites are one-offs and will not significantly affect the outcome.

The number of checklists submitted for this set of localities in the first six months of years since 2015 is shown in Table 7.

Table 7: Number of checklists for Heathland localities.

YEAR	Number of lists
2015	15
2016	26
2017	23
2018	49
2019	41
2020	14

To some extent the drop in number of lists may explain the drop in number of records of most of the specialist species between 2018 and 2019. (The lack of rainfall in 2019 may be another factor.)

A positive outcome is that only one of the specialist species (Striated Fieldwren) has not been reported at least once in 2020: but there are low numbers of reports of this species (at best) in most years. Add to that the reports of Eastern Ground Parrot and Southern Emuwren since June and the picture looks less bleak than it might have done.

References

Croft, A., Harris, N. and Loos, T. (2020) Out of the Ashes. *Australian Birdlife* 9: 30-35.

Daws, L. (2020) *Birds and Bushfires*: Part 1. A Mallacoota U3A Webinar presented on Friday 31 July 2020; Mallacoota Mouth edition 1778, 21 August 2020.

Menkhorst, P., Rogers, D., Clarke, R., Davies, J., Marsack. P., and Franklin. K. (2017) *The Australian Bird Guide*. CSIRO Publishing, Clayton South Victoria.

Semmens, B. (2020) *Birds and Bushfires*: Part 2. A Mallacoota U3A Webinar presented on Friday 31 July 2020; Mallacoota Mouth edition 1777, 13 August 2020

Accepted 14 November 2020

Canberra Bird Notes 45(3) (2020): 289-292

INTERBREEDING BETWEEN RED-CAPPED AND SCARLET ROBINS

ALASTAIR SMITH[6]

berigora@gmail.com

I conduct weekly bird surveys at 'Bibaringa', a property to the west of Canberra where, in a single location, one can observe five of the more difficult to find woodland species [Red-capped Robin (*Petroica goodenovii*), Diamond Firetail (*Stagonopleura guttata)*, Double-barred Finch (*Taeniopygia bichenovii*), Southern Whiteface (*Aphelocephala leucopsis*) and Peaceful Dove (*Geopelia placida*)].

On 17 Sep 2020 when I visited the property I observed a male Red-capped Robin (Smith 2020a), which has kept a territory in more or less the same area since 2014 (Smith 2014). The last time that I saw a female of the species was on 11 September 2018 (Smith 2018). On my previous visit, a week earlier, however, I was convinced that I had observed the male feeding a female Scarlet Robin (*Petroica boodang*).

Figure 8. Nest with nestling and egg.

[6] All photos by the author.

On this latest visit I confirmed that the male did indeed feed a female Scarlet Robin and I also observed the male carrying food to a nest. The nest had at least one live young and one egg and from a distance I observed the male feeding the nestling (see Figs. 1 and 2).

Figure 9. Male Red-capped Robin feeding nestling (beak just visible).

On 23 September I returned to find the nest had been destroyed and no sign of the nestling. I photographed the nest and when I later reviewed the photos, I noticed that the nest still contained an egg (see Fig. 3). I again observed male Red-capped Robin foraging and carrying food to the female Scarlet Robin and feeding the female (Smith 2020b).

A subsequent visit on 1 October confirmed the egg was still in the nest (see Fig. 4), but there was no sign of either robin species (Smith 2020c).

Figure 10. Predated nest with egg.

The destruction of the nest and removal of the nestling would indicate that this breeding attempt was unsuccessful, but the fact the two birds were in the vicinity of the nest after this event may indicate the two species remain a pair and may attempt to breed again.

Higgins and Peter (2020) [HANZAB] make no mention of hybridisation between the two robin species. They do, however, state that the predation was probably caused by a Grey Shrike-thrush (*Colluricincla harmonica*), Grey Butcherbird (*Cracticus torquatus*) or Australian Raven (*Corvus coronoides*), all of which are common in the area.

Figure 11. Red-capped Robin/Scarlet Robin egg from predated nest.

In a 2000-02 study of the breeding biology of Red-capped Robin in Terrick Terrick National Park, Dowling (2003) found that clutch size ranged from one to three eggs, with clutches of three occurring relatively early in the season. For clutches of two, the period from laying of the first egg to hatching was 14 or 15 days, indicating that the egg in this case was probably laid early in the last week of August. The time from hatching to fledging was 13-15 days. In all, 34% of nesting attempts successfully fledged offspring.

References

Dowling, D. (2003) Breeding biology of the Red-capped Robin. *Australian Journal of Zoology* 51, doi: 10.1071/ZO03028.

Higgins, P.J. and J.M. Peter (eds) (2002) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 6*: Pardalotes to Shrike-thrushes.* Oxford University Press, Melbourne.

Smith, A. (2014) eBird Checklist: https://ebird.org/ebird/view/checklist/ S16188326. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 1 October 2020).

Smith, A. (2018) eBird Checklist: https://ebird.org/ebird/view/checklist/S45881292. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 1 October 2020).

Smith, A. (2020a) eBird Checklist: https://ebird.org/ebird/view/checklist/S73685698. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 17 September, 2020).

Smith, A. (2020b) eBird Checklist: https://ebird.org/ebird/view/checklist/S73981626. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 24 September 2020).

Smith, A. (2020c) eBird Checklist: https://ebird.org/ebird/view/checklist/S74261061. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 1 October 2020).

Please note that Bibaringa is private property and the owner does not welcome birders.

Accepted 10 October 2020

Editor's Note: On the suggestion of the editor, the nest and the remaining egg were collected by Alastair Smith on 8 Oct 2020 and lodged with the CSIRO Australian National Wildlife Collection (ANWC) on the following day.

Canberra Bird Notes 45(3) (2020): 293-310

SUMMARY OF THE 2019-2020 EASTERN KOEL SEASON IN THE ACT

JACK HOLLAND

8 Chauvel Circle, Chapman, ACT 2611

jandaholland@bigpond.com

Abstract: *This article summarises adult and fledgling Eastern Koel (Eudynamys orientalis) presence and behaviour throughout Canberra during the spring/summer of 2019-2020. Despite it being very dry to the end of January, compared with 2018-2019 the start to the season was a much more uniform one, with both sexes arriving early in most districts, and consequently earlier reports of noisy Koel aggregations/interactions, similar to the 2016-2017 and 2017-2018 seasons. However, the season finished earlier, probably due to the very hot, dry and smoky conditions until early February. New adult calls, including variations, particularly by females, have been reported. The latest evidence indicates that identification of females, and males for the first time, by call alone needs to be treated with some caution.*

The fledgling reporting season began in mid-December, but, except for two very late-staying birds, also finished early. This was the likely reason for just 69 reported fledglings, significantly lower than for the 2017-2018 and 2018-2019 seasons. Only one area supported multiple fledglings, and only one fledgling was reported from peri-urban areas. Four fledglings were able to be observed in gardens over a sustained period of between 23 and 77 days, the latter being well over double the time previously recorded. Further cases were reported of fledglings being fed mince at feeding tables by their RWB hosts, and then later taking it themselves, as well as another example of one being fed fruit (plums). The long-staying fledglings were quite bold and in the open, and also often on the ground. Drinking from a bird bath etc. was reported also for the first time. While there are further examples of adults associating/interacting with fledglings, there was only limited evidence that the adults were trying to imprint their calls, or possibly were waiting to escort them north.

1. Introduction

For the past six years I have published observations of fledglings and associated adult Koel activity and behaviour in Chapman/Rivett (Holland 2020a), and for the past three years summaries of these aspects for the wider Canberra area as well (Holland 2020b, and references therein). This paper summarises observations in the ACT area for the 2019-2020 season, and in particular highlights observations made for the first time.

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

The first report of a Koel for the 2019-2020 season brought to my attention was by Susan Wishart on 3 Oct. This was of a male heard calling from its usual tree in a back yard in Musgrove St, Chapman. The next was on 5 Oct from Tyrie Starrs of one calling in Wanniassa. Next, and the first bird actually seen, was a female heard loudly calling *kek kek kek* and then photographed in Narrabundah by Geoffrey Dabb on 11 Oct (see further in Section 3.2).

Further birds were then reported from 15 Oct, and by the end of October the eBird Australia map showed that Koels had been reported from at least 28 locations, including further females both seen and heard. So despite the similarly dry conditions to the start of the 2018-2019 season, the indications were that there would not be a delayed start to the breeding season due to the late arrival of the species, or specifically of females (see Holland, 2020b).

An interesting early observation was made on 21 Oct when Roger Williams photographed a male Koel at his bird bath. He noted that it sat in the next-door neighbour's tree watching a Magpie-lark (*Grallina cyanoleuca*) have a bath, and it was only when it had finished that it flew down and started drinking. Except for Rob Parnell's winter record on 17 Jun 2019 (see Holland, 2020b), I could not recall a Koel ever coming to a bird bath, certainly to none of the six or so different types I have in my garden. So, I posted a request on the COG chat line if anyone else had observed this. Only Shorty responded that he had seen both male and female Koels at his bird baths. However, as detailed below in Section 4.5, later in the season there were a number of examples of Koel fledglings drinking.

By the end of October, noisy Koel aggregations/interactions were also being reported. On 31 Oct Sandra Henderson posted that two evenings prior Koels had been incredibly noisy, with at least three birds close to Wanniassa Hills Primary, carrying on for about half an hour. On 3 Nov Geoffrey Dabb's investigation of mixed Koel calls in his back yard soon led him to the Chinese Pistachio-lined Hodgkinson Street. He found four Koels in a "frozen tableau" confrontation in one tree, 2 males and 2 dark-type females. All were in mature plumage. At the time another male Koel was calling near Caley Cres and a male and female down the hill towards Wells Gardens, so there were at least seven Koels in the vicinity, the highest number reported close together for the season.

My first noisy aggregation in Chapman was not until 8 Nov (see Section 3.2). Apart from Diana White's and Susan Robertson's posts on Koel calls (also in Section 3.2), there were few further posts during November on the COG chat line. However, as noted in Section 3.2 calling continued in Chapman/Rivett, and by the end of the month it was clear that, despite the very hot and dry conditions, the Koel was very widespread throughout the Canberra area, having been reported from over 70 locations on the eBird Australia map over the month.

On 11 and 22 Dec Steve Read posted that he had had Koel activity almost constantly around his house in Lyons for the past few weeks. He reckoned that they were more Koels than Red Wattlebirds (*Anthochaera carunculata*, hereafter RWBs). While the Koels had been there since they arrived in spring, recently their calls seemed to be as common as any other bird call. Very interesting was that mostly these were a repeated series of the normal '*ko-elle*'

call, at any time of day, but especially at night. However, it was also not unusual to hear the kind of agitated racket made when two or three birds were in the same tree.

The mostly *ko-elle* calling suggests males were still looking to pair with females. Steve noted two RWB nests in the garden appeared to have been deserted recently. While he was sitting on the verandah sometime after dusk around 19 Dec, a Koel flew rapidly into the brittle gum that contained one of these nests, making a *wirra-wirra* call as it flew, and appeared to land directly on the nest. It then flew off silently after a couple of seconds; but it was too dark for him to determine if it was a male or female. He thought the nest had already been deserted by that time. He did not report any Koel fledglings later, in fact there have not been any from Lyons that I am aware of for at least the past four seasons.

On 22 Dec John Layton heard loud *wurrow-wurrow* calls interspersed with brassy *keek-keek-keeking* about once every 30 seconds. He located a female perched in their large White Cedar, before a male burst from it. John noted this was only the third sighting he had had of Koels in their Holt garden in over 30 years, which supports Chris Davey's previous comments that there were very few Koels around in Holt (Holland 2018c).

On 27 Dec Diana White reported that morning her husband Ian had encountered a noisy skirmish between 3 adult Koels in the top of the very large Pin Oak in front of 40 Walker Cres, Narrabundah, about 400 m NW of their place. She noted this had previously been a key "lookout tree"[7], and that while it seemed that Koels may be quieter immediately near her house, they were certainly visiting old favoured spots (it was also the location of her fledgling D5 in January 2018 – see Holland 2018b).

From this time, likely due to the increasingly smoky, hot and dry conditions, there were no further posts involving noisy multiple Koel aggregations, though my observations of the Koels calling close to my first fledglings observed on 10-11 Jan (see Section 4.1) and those calling on 23-24 Feb below should be noted.

On 8 Jan Steve Wallace indicated that so far it had been a poor Koel season. While they were certainly around in similar numbers, the RWBs around Fraser were all feeding RWB young. He had not yet located any Koel fledglings, which did not seem to be the result of reduced RWB breeding. His impression was that there had been just as many RWB nests as usual, although he did not have any records to back this up. Had the smoke put the Koels off?

With the continuing very hot, dry and smoky conditions there were very few reports of adult Koel activity for the remainder of January, though I continued to hear them in Chapman/Rivett. On 9 Jan 2020 all three calls were heard, including a series of *ko-els* from deeper in Rivett. This call had been heard up to 18 Dec, but was then heard only 5 more times, last on 18 Feb. As noted in Section 4.2, Diana White's adult Koels were calling again from the second half of January to mid-February, with the male often *ko-eling*.

Conditions became cooler and wetter from early February, but there were few further posts of adult Koel activity. On 17 Feb John Leonard posted that after the recent rains the Hughes Koels had started calling again, and Ken Black noted the same in Fraser. In contrast

[7] Pin Oaks in Narrabundah have previously been noted by Diana as being used as "lookout trees" (Section 4.1 of Holland, 2020a).

Geoffrey Dabb noted mobile birds had been calling *wirra* or *kek* daily in Narrabundah. Pete Cranston also noted that adults continued to call throughout the dry and heat, and vigorously after the first rains, daily right up to that same morning.

On 23 Feb a male was *whoaing* in my GBS site before flying across Darwinia Tce to another giving the same call at on 23 Feb, while a presumed female remained behind *kek kekking*. Thus there were still three birds around. However, despite some frantic *whoaing/kek kekking* nearby from 06:16-06:19 h on 24 Feb, calling activity died right down, with calls heard only on four occasions (*whoaing* only once) in March, and the last brief but clear *kek keks* were heard from home at 09:42 h on 10 Mar.

The extreme weather conditions lasting into early February seemed to have encouraged many adult Koels to leave early. In support the eBird Australia map showed reports from still around 60 locations in January, dropping to 30 in February and 15 in March, the last four reports on eBird Australia being from Ngunnawal on 11 Mar, Amaroo on 14 Mar, Watson on 16 Mar and Kellys Swamp on 18 Mar. While this does not include the two late juveniles which stayed until early April (see Section 5.1 below), it is in marked contrast to the 2018-2019 season, when Koels were still reported from 10 suburbs on 14 March (Holland, 2020b).

3.2. Further observations on Koel calls

Following the descriptions detailed in Section 3.4 of Holland (2020b), further observations on Koel calls have been reported. From 20 Oct I had heard both "male and female" calls, the *kek kek* call first on 24 Oct, nearly a month earlier than in 2018-2019 (Holland 2020a). While calling increased from 1 Nov, birds were only occasionally seen until the evening of 8 Nov when at least 5 Koels were calling within a $>90^{o}$ arc inside my GBS site (this aggregation was about a fortnight earlier than the first in 2018-2019). There were two types of *kek kek* call, including a harsher quicker one, as well as variation within the call. While at least two birds were calling *whoa*, it was very difficult to see which sex was giving the call in the trees/bushes, though it appeared females were possibly giving the *whoas* as well.

Further evidence that females may give the "male" calls came from Susan Robertson's post on 30 Nov, saying that she had seen a pale-coloured female Koel fly into nearby trees in Campbell giving both '*ko-el*' and '*wirra wirra*' calls. It was being attacked by a RWB. While I had never confirmed or heard about a female giving male calls, my 8 Nov observation had made me wonder about this. As noted above, the problem is that often you cannot see the bird calling, especially when there are a number of birds around and all three of the main calls (and other more subtle variants, particularly of the *whoa* and *kek kek* calls) can be heard at about the same time.

A further possible example was Geoffrey Dabb's female in Narrabundah on 11 Oct. It responded to nearby RWB, making a "complaint call" before flying off. He tracked it to the top of a Pin Oak[8], where after a few *kek keks* it calmed down and over 10 minutes gave occasional soft "*oo-ers*", a sound that he thought might also be rendered as *wirra*, or perhaps even *koel*, but not repeated as a sequence. The bird was turning its head while calling as if it was sounding out the neighbourhood. Geoffrey had a clear view of the tree and nearby trees, and no other Koels were seen or heard.

[8] See footnote 1

The need to be very careful in determining numbers and sex of Koels by call alone was further demonstrated when I followed up close *kek kekking*, and then *whoaing*, within my GBS site at 17:53 h on 9 Nov. I could see a single male alternating these calls. He stayed there occasionally calling, despite the attention given by two RWBs, until at least 18:03 h.

As noted in Section 3.1 of Holland (2020b), Geoffrey Dabb and I have seen male Koels giving the *kek kek kek* call a number of times. Further examples of males giving the "female" call include the male I saw in the tree at the rear of 51 Darwinia Tce at 16:34 h on 7 Dec, it *whoaed*, then it *kek kekked* before flying out giving the latter call. On 17 Feb Geoffrey saw two males flying through the trees in Narrabundah giving an excited *'ek-ek-ek-ek-ek-ek*' call.

On 2 Nov from 04:31-04:34 h I heard *kek keks* in the middle distance, a call I had heard before dawn previously only definitely on 13 Jan 2019 (see Holland 2020a). Distant *whoas/kek keks* were heard at 04:52 h on 11 Nov, as well as a series of *kek keks* around 20:14 h, after dark that same day. The *kek kek* call was also heard at 04:05 h and 04:30 h on 21 Nov, as were brief *kek kek/whoas* at 05:00 h on 24 Nov, close *kek keks* at 04:14-04:16 h on 25 Nov, some *kek keks* from 04:42 h on 27 Nov, and finally brief *kek keks* at 05:03 h, followed by more sustained ones at 05:10-05:12 h on 29 Nov. The above is proof the "female" call can be given when it is dark. The *whoa* call being given before it is light has been well established (Holland, 2020a).

I have also heard further variations particularly within the "female" calls. On 5 Nov in my GBS site there was a different loud call, sounding like a hoarse female. Around 19:05 h on 12 Nov a female was seen to fly to a neighbour's tree where it occasionally made squeaky noises. On 14 Nov the Koels were heard to give some cackling noises in between their normal calls. On 15 Nov there were two close *kek keks* being given (including a faster *wuk wuk wuk*) at 18:04 and 18:27 h. On 4 Dec a growling noise was heard in a neighbour's tree, followed by *kek keks* and *whoas* separately for a couple of minutes.

On 12 Dec at 04:35 h there were very loud *kek keks* (sounding more like *wow wows*), an example of a variation of this call given before dawn. Mid that afternoon there were *kek keks* from a neighbour's tree. It then changed to a harsh *ko-aar* call, followed by more *kek keks*. Finally on 16 Dec there was a pair of Koels in our garden at 07:40 h. The female was seen making a growling sound before there were two different *whoa* and *kek kek* calls very close, culminating in one female giving a very fast *queck queck queck* call and the other the more normal call (a further example of the difficulty of telling the number and sex of the birds).

Diana White also recorded some further variations in the "female" call. About 18:00 h on 18 Nov, two very vocal females flew over their Narrabundah yard, one *kek-kekking* and the other giving a shriller whistling scream *qwik qwik qwik*, with 2 RWBs in hot pursuit. The chase ended in the large gum at 84 Walker Cres, and one female was heard to make a different quack-quacking/clucking sound, as also heard in the 2018-2019 season (see Holland 2020a).

On 21 Dec Diana noted that on several mornings at about 06.00 h she had heard a shrill *schwick schwicking* call very close by. That morning she surprised a dark morph female Koel in the Mulberry. It flew and called *kek* once, then gave a *Cluk Cluk Cluk Cluk Cluk* (or *Qwuk Qwuk Qwuk Qwuck*) as it flew up to the ACTEW wire. Diana had heard a bird

making this particular sound before this season in their back garden, but had not sighted it, and recalled she had heard this particular sound last year too (see Holland 2020a).

On 20 Jan Fiona Sweet Formiatti posted that at the crack of dawn she had heard a mature Koel interacting with what sounded like an immature one. The younger one's pitch was different and the sound "loop" less complete. The "conversation" woke her up and went on for a very long time! She wondered if adult Koels play a role in "acculturating/teaching" fledglings. Alison Milton also wondered whether adult Koels began interacting with more mature fledglings in order to "teach" them their true species, and to get them to leave with the adults when the time comes to migrate. This issue is further discussed in Section 5.4 below.

4. Eastern Koel fledglings reported for Canberra in the 2019-2020 season

On 15 Dec Geoffrey Dabb informed me of his first Koel fledgling for the season, at the corner of Brockman and La Perouse Sts, Narrabundah, the suburb of many fledglings in the past couple of years (see Holland 2020a). It was not mobile but had a longish tail, perhaps out of the nest for a few days. In response to my chat line post that provided a link to the YouTube video shot by Virginia Abernathy in 2014 of the Koel fledgling's begging call, very close (within 50 m) to where this fledgling had been found, Kym Bradley noted that she had heard that call down at Isabella Pond, Monash for the past couple of days. This was confirmed on 18 Dec by Sandra Henderson reporting on eBird (with photos) one large chick there being fed by a RWB. Pete Cranston also informed me that the morning of 14 Nov he had heard and had a fleeting glimpse of a young Koel in O'Connor.

Details of each individual fledgling have not been tabulated for this season[9], but the highlights of the 2019-2020 Koel fledgling season have been summarised below, starting with mine. Two of the four incidences of long-staying fledglings in observers' gardens that allowed some very interesting observations made follow (Diana White and the Lawsons in Section 4.2 and 4.3, respectively). The other two have been written up separately by Julie Clark (2020) and John Harris (2020), respectively.

4.1. At least ten fledglings in Rivett/Chapman

Despite the first ACT fledglings being reported on 15 Dec, none were observed in Rivett/Chapman by 24 Dec when we went away for nearly two weeks.

On our return my first two Koel fledglings (YK hereafter in this Section only) for the season were observed consecutively on the morning of 10 Jan – see Table 1. Interestingly male and/or female adult Koels were heard calling nearby when the first three YK were first observed, but only a female was seen on one occasion. These were the only times adult Koels were heard nearby for the long period of YK observations (10 Jan to 23 Feb).

A YK was then present in my GBS site until 1 Feb, including giving a raspy call around 17:00 h on 20 Jan. During this time adult calling was quite reduced in this site and in the local area as conditions continued to be very hot, dry and smoky. Only one female was seen in our garden on 19 Jan.

[9] A Table with details of each fledgling is available on request.

A feature of new YKs found after that was that it often took several times after first hearing them to actually find them. In particular the one not counted as a different YK in the laneway between Themeda and Mentha Pls/rear of 12 Themeda Pl, was seen on only one of seven occasions it was heard. Together with the adjacent N end of the small Rivett park, this area is where many fledgling observations have been made in the past, including J5/J6 in the 2017-2018 season (see Section 4.1 of Holland 2018a).

Table 1 Observations of the fledglings found in Chapman/Rivett in 2020

Dates	Time (h)	Comments
34 Woollum Cres Rivett		
10 Jan	06:28-06:31	Fledgling (YK hereafter) begging loudly in tree on verge before being fed by RWBs at 06:30 h, then flew >30 m to 3 Croton St, a male Koel was *whoaing* nearby.
Laneway between Themeda and Mentha Pls Rivett		
10 Jan	06:50 19:42-19:50	Located a second YK (softer call) at rear of 14 Mentha Pl (300 m away), again attended by RWBs. At least 3 RWB fledglings were fed by other RWBs at the N end of the Rivett park, and at least 3 adult Koels (2 lots of *kek keks*) called in nearby Pavonia St. Begging heard here at 06:43 h on 18 Dec (>3 weeks earlier) was from a RWB fledgling. YK seen rear 10 Mentha Pl before another found at the NW end of laneway (opposite 17 Pavonia St, 125 m away - both could be heard), also a long tail (so reasonably mature). Not fed before it flew 30 m to No 19. Assumed to be same as 34 Woollum Cres above.
Corner Woollum Cres/Eugenia St Rivett		
11-21 Jan	06:30	YK, begging very loudly, was moving around on the verge of 19 Woollum Cres (250 m from first YK observed on 10 Jan, and 200 m from Pavonia St one), attended/pursued by 2 RWBs. Two adult Koels were very close by, the male heard only but the female seen. YK was also near here at 17:16 h later that day, at 18:27 h on 14 Jan, at 16:44 h on 15 Jan, and at 6:29 h on 21 Jan, so assumed to be different.
GBS site, 8 Chauvel Circle Chapman		
11 Jan -1 Feb	Various times of day	A YK was seen/heard on 16 separate days over this period. Probably first observed pm on 11 Jan across Darwinia Tce on the edge of my GBS site, but I could not get a good view of it and could not rule out a very mature RWB fledgling. First seen mid-morning 16 Jan block at 52 Darwinia Tce, but was not seen fed by a RWB until there on 18 Jan. Often there or heard across the Tce in Rivett, it moved around more over time.
14 Titheridge Pl Chapman		
14-23 Jan	06:38	On 20 Jan YK finally located in medium pine tree in front yard, fed by one of two RWBs present. Also heard very close to here at similar time on 14, 16 and 23 Jan, and possibly the same YK at the rear of 31-33 Monkman St (250 m away) at 06:30 h on 17 Jan.
Goodenia St Rivett		
25 Jan	19:47	YK fed by 2 RWBs in large tree side of 2 Sollya Pl (opposite 14 Goodenia St). A YK had been seen near here at 18:00 h on 22 Jan, and at 20:06 h on 27 Jan, but not fed. Begging heard at 06:47 h on 24 Jan in 5 Melia Pl 175 m away was possibly this same YK. A YK at the rear 75 Darwinia Tce at 06:58 h on 2 Feb (175 m from here), was also not seen fed.
Laneway between Themeda and Mentha Pls/rear of 12 Themeda Pl		
28 Jan – 4 Feb	Am and pm	YK heard on 7 occasions between these dates, but only seen once (at 18:05 h at rear of 5 Themeda Pl). RWBs appeared to feed a hidden YK on 2 other occasions. Not counted as a separate YK as not sure if same as mobile Goodenia St one above, 200-250 m away.
Pavonia St Rivett		
11 Feb	17:00	Very dark slim begging YK found in tree at front of No 19, flew across road pursued but not seen fed by RWB (only slightly smaller). The above laneway YK had not been observed for 7 days, so it was assumed to be different. It was also seen at No 13 at 06:53 h on 12 Feb, and heard in nearby Themeda Pl pm on 14 and 17 Feb, and am 18 Feb.
39 Kanooka St Rivett		
21 Feb	16:48-16:55	Large, loudly begging, brownish, very long-tailed YK was watched moving around in an open bush at the front of house. No RWBs in vicinity so possibly independent. Also a YK was heard at rear next door (No 41) at 16:32 h on 23 Feb, and one was loudly begging in the silky oak at the rear of 42 Nelumbo St (150 m away) from 16:40-16:53 h on 20 Feb.

At 06:37 h on 25 Jan a begging YK was heard at the rear of 128 Perry Drive, Chapman, and at 06:47 h on 26 Jan one was heard going rapidly across Banvard Pl to the rear of No 9, about 150 m to the SE. This is less than 100 m from Susan Wishart's place in Musgrove St, where on 10 Jan she reported a YK with RWB parents. On 16 Jan Susan reported a RWB feeding a YK on the western side of the small reserve midway between Perry Drive and Sidaway St, around 250 m to the SSW. She thought it was younger than the one seen on 10 Jan, and it has been counted as different. The one I heard on 25-26 Jan could possibly have been the latter, so has not been counted as new, like some others only heard in Table 1.

In summary in the 2019-2020 season at least 10 YKs were observed in the area defined previously in footnote 1 in Holland (2020a), twice as many as in 2018-2019. Almost all were located in the area (most well within) in which YKs have been recorded in previous years, with Susan Wishart's YK in the small park across Perry Drive only a slight extension. Only for the last one was the RWB not confirmed or suspected as the host. It may have been independent already, though it was still begging loudly (see Table 1).

Figure 1. Diana White's fledgling at her bird bath (*Diana White*).

4.2. Diana White's observations of her Narrabundah fledgling

During the 2017-2018 and 2018-2019 seasons Diana White had multiple Koel fledglings in and around her garden at 65 Caley Cres, Narrabundah, which in the latter season was one of the few areas with much early adult Koel activity (see Holland 2018b and 2020a). On 15 Dec Diana noted that, compared with the previous season, their area had mainly been on the periphery of the Koel activity. Very little adult interaction was observed close by, with most of the mournful *ko-el* calls coming from further downhill, nearest in the gum in the front garden of 84 Walker Cres. Koels were calling only early morning and evening, and it was often quiet. She thought the severe pruning of the Pagoda tree over the back fence, favoured by Koels in the past (Holland 2020a), had made a difference.

Despite the low level of activity, on the evening of 28 Dec Diana confirmed a Koel fledgling in the Apricot and Manchurian Pear trees in their western side garden. She noted it was being fed by their usual "resident" RWB which had already raised two fledglings of its own some time before. She had heard the sound of this fledgling for several days, but was unable to locate it. The call was not typical of the fledglings previously noted, but a hoarse whistling sound, not the usual monotonous and persistent *bip bip bip*, hence she had not been certain that it was a Koel fledgling.

Diana heard it the next morning in the Hakea on their western side fence, but only located it after a RWB flew in to feed it. It was very well camouflaged when crouching right down. It looked quite well developed, alert and with a slightly longer tail than the smallest ones she had seen in the past seasons.

On 1 Jan 2020, in the smoke haze that morning, Diana noticed the Koel fledgling at the bird bath with other birds. It was drinking and begging, with the RWB feeding it (see Figure 1).

On 12 Jan the fledgling, still being fed by RWBs, had been present every day round the garden periphery. It was very evident at the times when the Australian Magpie (*Gymnorhina tibicen*) family with their three young turned up for mince. Recently a different RWB had arrived and ignored the begging Koel. It was feeding its own fledgling further down in the Mulberry (hardly any fruit now). Two days earlier, on one of the baking hot days, the fledgling spent a long time close by, calling persistently, and came down onto the deck near the back door, then up to the table on the side deck. This was a regular feeding spot and the Whites threw some mince out for one of the Australian Magpie young.

The whole Magpie family turned up and a noisy mêlée eventuated on the deck, with the Koel fledgling on the edge of the table adding to it. Diana's husband Ian kept up portioning out bits of mince, throwing pieces on to the table top near the fledgling. The RWB would dart in and out, catching small pieces in mid-air or picking up them up to feed it, and flying out of reach of any sideways lunge by one of the Magpies. The mince was right next to the fledgling and it eventually swallowed it in one big gulp, still calling for the RWB to come and feed it. Ian threw some more pieces and it turned and found these also and fed itself. Diana noted she had seen fledglings previously eating fruit and sitting in the sprinkler spray from under the Sour Cherries and the safety of foliage and distance, but she was amazed that one would venture out so openly and close by.

On 14 Jan the Koel fledgling was sticking round their garden periphery and had been seen drinking at the bird bath next to the deck and coming to the table on the side deck, periodically and when the Magpie family came for mince. It still kept begging for food from the RWBs, but would also hop across to gulp down large mouthfuls of mince on the table.

The fledgling was still there on 19 Jan, presenting itself regularly alongside the Magpie family when they came for mince, while at other times following the rather harassed RWBs still feeding it. It would hop down quite boldly on to the table on the side deck and even hopped onto the ground next to the door, where the Whites were distributing lumps of mince. They had been trying to keep conflict at bay by throwing mince on to the table for the Koel fledgling and making sure the Magpies were occupied with their pieces on the deck. Though gulping down large lumps, the fledgling still used begging postures whenever the RWBs ventured in, and sometimes received some from them too.

The Magpie siblings initially rushed at it to chase it away, but it reacted by lunging at them. The adult Magpies seemed baffled by this interloper and did nothing, but assiduously saw off any of the RWBs that come close. It was also notable that the adult female Koels were again calling nearby in the early morning, and that morning the male was calling regularly from the gum diagonally behind at 84 Walker Cres.

On 20 Jan Diana was surprised that there had been no pipping from the fledgling which had haunted them, or the attendant RWBs. She wondered whether the rain overnight had caused this change, or whether it had joined the adults which had been calling close by again (the male had been *ko-eling*), or was simply lured further away by the RWBs.

On 3 Feb Diana confirmed the fledgling had not returned, but that both adult male and female Koels were still noisy and active, the male still often *ko-eling* and the female *kek kekking*. This type of calling continued until about mid-month. No other fledglings were found this season, but Diana did not venture out too much in the heat and smoke.

4.3. The Lawsons' observations of their Holder fledgling

On 14 Jan 2020 Charmian and Tony Lawson found a very young Koel fledgling, attended by two RWBs, in their garden in Dixon Drive, Holder. In the heat and smoke they had been giving their Australian Magpies some mince, and at least one RWB had (to Charmian's amazement) been taking the mince to feed the fledgling. It was on the ground near their back porch, then flew up onto one of the water dishes and had a very long drink. They saw one of the RWBs give it something to eat, then it flew up into one of their trees. It started calling, initially a tiny little noise, which a day later had developed into a constant call.

Figure 2. The Lawson's fledgling at their bird bath (*Charmian Lawson*)

On the morning of 15 Jan it was up in the big tree very near their house, attracting the attention of a Pied Currawong (*Strepera graculina*). At first there was no sign of the RWBs and the Lawsons were concerned about the fledgling as it was not a strong flier, but later the RWBs were feeding it while it was well camouflaged. It was still there on 17 Jan, still being

fed mince by the RWBs and drinking occasionally from the various water sources (see Figure 2). That afternoon an adult Koel male was calling in the distance, and the fledgling stopped its chirping and looked in the direction of the call

On 21 Jan Charmian noted that the fledgling was growing up. It had been fed by two RWBs ever since they became aware of it, but that day it got at the mince they had put out on the ground for the RWBs, and was feeding itself. However, as soon as the RWB came back, the fledgling flew up into its usual tree and wanted to be fed again. It had been really interesting to watch its development from a "scrunched up little thing" to quite a confident young bird now. Charmian was surprised at how exposed it often was, both due to its continual chirping and because it did not hide in the branches at all. The Lawsons found it amazing that it could be seen and heard without any difficulty when it had taken so long for them to see an adult male, then even longer to see a female.

It went to sleep that afternoon and was quiet for a while, which was a relief, as the constant chirping became quite tiresome! Charmian also noted that it was nurse-maided by a Magpie-lark who usually sat on a branch nearby, but otherwise did not seem to interact.

The Koel fledgling was in the Lawson's garden from 14 Jan until the heavy rain on the morning of 10 Feb. By that stage it had become independent of the RWBs and was usually alone, or sometimes with the Magpies, including their young one, and would fly down for mince. It would sit on a flowerpot on the back porch wanting food, or on the evergreen Clematis vine. Charmian found the latter interesting as she believed it was a learned behaviour. The vine rests against a wind chime, and various birds had all found over time that if they landed on the vine and it hit the chime, it alerted the Lawsons to their presence, and the birds usually received some food. It was surprising that the Koel fledgling also landed on the vine and sat there waiting.

It had stopped the incessant chirping and its occasional call was changing to a less obvious one. It was still a clumsy flier and moved round the tree branches in short hops. Charmian thought at one stage that it had hurt its wing or foot or both.

After the heavy rain it was no longer present and was thought to have possibly died. However, a couple of days later it appeared in the big tree again, and came down for some mince. It was moving so much better that Charmian wondered if it was a different bird, but it may have had a chance to recover a little when the rain forced it to take shelter for a day or so. It seemed unlikely that another bird would come to the same spot for food. After that the fledgling was not seen again.

The fledgling was always quite timid and did not like humans to get too close – it would flick its tail up and chirp. For a while it chased off Pied Currawongs, with the hackles on the back of its head coming up and making it look quite a lot bigger and more fearsome. However, apart from some initial bullying by the Magpies, about halfway through the time when it was feeding independently, the young Koel, the young Magpie and a young Pied Currawong generally seemed to co-exist very equably, and would come very close together without showing any concern.

4.4. Koel chicks first found in nests

On 6 Jan Jerry Olsen informed me that there seemed to be a Koel nestling high up in a big eucalypt in a front yard in Cook. RWB adults were working hard in the smoke to feed

whatever was in the nest. On 13 Jan Jerry confirmed that the nestling had fledged 3 or 4 days ago. While it had left the nest tree, it had a soft voice and (maddeningly) stayed tucked up tight in non-native clumps of tree in people's yards, so he heard it but could never see it. He finally got a clear view and witnessed a feed. Its location was close to his 2018-2019 young Koel (Holland 2020b), but in the interim a second older fledgling had been found even closer.

On 7 Jan Julie Clark heard a Koel chick and spotted it in a street tree, lying on a branch next to the nest, in Amaroo. On her return some two hours later it was lying half in the nest (it was too big to fit), while being fed by two RWBs. This was a different fledgling from the one she has described separately (Clark, 2020), which possibly was also first being fed in the nest.

On 12 Jan Susan Robertson informed me there was a RWB nest in Campbell. There was baby calling in the nest, but it was too high to see it. Interestingly there was a Magpie-lark's nest (a potential Koel host) two trees down with a young bird in it. With Renée Ferster Levy's help, they were able to confirm a Koel fledgling in the RWB nest, as the chick's tail could be seen quite clearly and it had black bars. They also saw a bit of a gingery head pop up when it was fed. On 14 Jan Renée noted that it seemed to stay very low in the deep cup of the nest, and behave like a tiny begging nestling, then it suddenly reared up and stretched and started preening, and its head was huge. She saw the adult RWB feeding it, and then removing the faecal sac, which it ate.

On 19 Jan Susan noted that the young Koel was continuing to thrive and might soon leave the nest, which it did the next morning. While it only moved half a metre or so away from the nest, typically it was hiding and she could only see it when the RWB came into the tree with food. She had also heard a female Koel in the trees around the area in the previous few days. On 6 Feb it was still not far from the nest tree, moving around mostly quite near the ground, calling repeatedly (and ventriloquially), while still being fed by a RWB.

Another record of a chick still in the nest was that by "b" uploaded on Canberra Nature Map (CNM) on 16 Jan. It was stated that there were four or five RWBs in the area, but only three seemed to be feeding the fledgling (quite a recent one by the length of the tail). The nest where it was raised was a few trees away. This was the fourth confirmed Koel chick first found in the nest for the 2019-2020 season, which compares with only nine in total previously (see Section 5.5 in Holland 2020b). Susan Robertson's is particularly noteworthy, having been observed in the nest for a total of 8 days, and then it stayed close by and was still dependent for at least 18 days.

4.5. Fledglings feeding themselves independently, particularly on mince, as well as drinking

The four incidences of long-staying fledglings in observers' gardens that became very tame/bold as summarised above (Sections 4.2-4.3 as well as in Clark, 2020, and Harris, 2020), allowed some very interesting observations to be made. Three of these describe Koel fledglings coming to feeding tables and being fed mince, usually initially by the RWB host. Later they started taking mince themselves, while at first still preferring to be fed by their hosts. Diana White's was still being fed occasionally before it abruptly left after 23 days.

Julie Clark's fledgling was fed mince from very early in its 77-day stay[10], then took mince itself before it was fed a fruit-mince mash, and finally coarsely chopped fruit (Clark 2020).

These are further examples to those I noted in Section 5.3 of Holland (2020b). In particular the very interesting learned behaviour of the Lawsons' fledgling (Section 4.3) when it wanted food should be noted. Julie Clark's and Diana White's fledglings also often waited for food. This is the first time this behaviour has come to my attention.

John Harris noted his fledgling first being fed plums from his tree by the RWB hosts. This is the second observation of one being fed fruit (see Section 5.3 of Holland, 2020b). It then took plums itself quite early (from the ninth day after being first observed), and was not seen to be fed again. Barbara Allan's very mature fledgling was also feasting on her plums on 9 Jan.

Koel fledglings were also observed drinking (the first examples that I am aware of), possibly due to the very hot and dry January (see also the examples of adults drinking in Section 3.1). These include both Diana White's (Section 4.2) and the Lawson's fledglings (Section 4.3). Further examples follow.

On 20 Jan Margaret Robertson noted she had just seen her Giralang Koel fledgling drinking from her high bird bath. On 29 Jan Lindell Emerton posted that she was first alerted to her Koel fledgling in Mawson by her neighbour showing her a photo of "this bird" drinking from the pond in his back yard, and on 25 Feb Alison Mackerras alerted me to a photo she had just seen of a young Koel at a bird bath in Gordon, taken some time in the previous few weeks. On 1 Feb Lesley Malcolm noted that in Evatt the sprinkler was on the previous evening and the birds, including her Koel fledgling, were loving it. Diana White also noted she had seen fledglings previously sitting in the sprinkler spray (see Section 4.2).

Related to fledglings taking mince or drinking water, there are now further examples of them often being on the ground by Diana White (Section 4.2), the Lawsons (Section 4.3) and Julie Clark (2020), adding to Diana's first observation of this (see Section 5.2.3 of Holland, 2020a).

5. Discussion

5.1. Timing of Eastern Koel breeding for the past three seasons

The first fledglings were observed in mid-December, a little later than I had expected but nearly 3 weeks earlier than in 2018-2019 (Holland 2020b), though nearly 10 days later than the first two (one still a nestling) reported in the 2017-2018 season (Holland 2018c). However, numbers built up more quickly: 8 fledglings were reported by the end of December, and 29 by 15 Jan (cf 5 and 19, respectively for 2017-2018). By 31 Jan, 51 fledglings had been reported, 74% the total of 69 for the season, which seemed to finish earlier than usual, probably due to the extreme weather conditions lasting into early February.

[10] This is well over double that one has previously been observed constantly, ie 30 days for Diana White's fledgling D1 (see Section 5.7 of Holland, 2018c). The Lawsons' fledgling also stayed for about 30 days, as did John Harris', though the actual length is unclear due to likely presence of the fledgling released by Wildcare towards the end.

No new fledglings were reported in March, but on 1 Apr a friend of Terry Munro's sent him a photo taken that day of a juvenile Koel (identified by Geoffrey Dabb as a female) in his Campbell fig tree. It had been there for a few days and left on 3 Apr, about the same time as Julie Clark's long-staying fledgling in Amaroo (Clark, 2020). The previous latest recorded departures of fledglings were on 2 and 6 April 2011, respectively (Holland, 2011), though Rob Parnell's immature female was seen in Narrabundah on 17 June 2019 (Holland, 2020b).

Table 2. Location and number of Koel fledglings for the past four seasons.

District	Season			
	2019-2020	2018-2019	2017-2018	2016-2017
Belconnen	22: Aranda 1, Cook 2, Evatt 1, Florey 2, Fraser 1, Flynn 3, Giralang 2, Hawker 2, Higgins 2, Kaleen 2, Melba 1 and Page 3.	28 (31[11]): Cook 4 (6), Dunlop 1, Evatt 2, Fraser 8, Flynn 3 (4), Giralang 3, Hawker 1, Higgins 2, Page 3 and Spence 1.	30: Cook 1, Evatt 2, Florey 1, Flynn 1, Fraser 6, Giralang 4, Lake Ginninderra 1, Kaleen 4, MacGregor 1, Macquarie 1, Melba 3, Page 1 and Spence 4.	19-22: Cook/Macquarie 1, Evatt 1, Florey 1, Flynn 1, Fraser 3-5, Giralang 5, Lake Ginninderra 2-3, Macquarie 1, Kaleen 2, Melba 1 and Page 1.
South Canberra	5: Narrabundah 3 and Yarralumla 2.	20: Barton 1, Deakin 1, Griffith 3, Jerrabomberra Wetlands 1, Narrabundah 9, Red Hill 2 and Yarralumla 3.	20: Deakin 1, Jerrabomberra Wetlands 3, Kingston 1, Manuka 1, Narrabundah 9, Parkes 1, Symonston 1, The Causeway 2 and Yarralumla 1.	7-8: Deakin 2, Jerrabomberra Wetlands 1-2, Manuka 1, Telopea Park 1 and Yarralumla 2.
Weston Creek	13: Chapman 4, Duffy 1, Holder 1, Rivett 6 and Weston 1.	7: Chapman 3, Fisher 1, Holder 1 and Rivett 2.	12: Chapman 1, Duffy 2, Holder 2 and Rivett 7.	7-10: Chapman 1 and Rivett 6-9.
Woden	5: Curtin 1, Hughes 2, Farrer 1 and Mawson 1.	4: Hughes 1, Farrer 1, Garran 1 and Torrens 1.	3: Hughes 1 and Curtin 2.	4: Curtin 2, Hughes 1 and Mawson 1.
North Canberra	8: Campbell 2, North Lyneham 1, O'Connor 4 and Watson 1.	12: Ainslie 1, Braddon 2, Lyneham 1, O'Connor 6 and Turner 2.	11: Ainslie 2, Lyneham 3, O'Connor 3 and Turner 3.	12-14: Ainslie 1, Dickson 2, Lyneham 4-5. O'Connor 1, Turner 1 and Watson 3-4.
Tuggeranong	6: Kambah 3, Gordon 1, Monash 1 and Oxley 1.	10 (12): Wanniassa 1, Kambah 6 (8) and Fadden 3.	6: Kambah 2, Richardson 1 and Wanniassa 3.	2: Fadden 1 and Macarthur 1.
Gungahlin	4: Amaroo 2, Ngunnawal, 1 and Nicholls 1.	5: Amaroo/Yerrabi Pond 2, Ngunnawal 2 and Percival Hill 1.	3: Ngunnawal 1 and Yerrabi Pond 2.	5-6: Palmerston 4 and Yerrabi Pond 1-2.
Other	6: Queanbeyan 3, unknown 3.	-	-	-

[11] For the explanation of the numbers in brackets see Holland (2020b):

5.2. Fledgling locations and numbers

Table 2 provides a summary of the number of fledglings per district and the suburbs/locations within these for the 2019-2020 season, as well as the three previous seasons for comparison:

Adding the numbers from each of the districts gives a total of 69 fledglings in the ACT for the 2019-2020 season. Given the similar methodology for obtaining these numbers as outlined in Section 2 above, this is significantly lower than the total of 86[12] each for the 2017-2018 and 2018-2019 seasons, likely due the earlier finish to the season. The biggest drop was in South Canberra, where Diana White recorded only the single fledgling. Steve Wallace also found only a single fledgling in Fraser. The biggest rise was in Weston Creek where the ten fledglings (see Section 4.1 above) in Rivett and Chapman were a significant contributor. This was the only area where a large number of fledglings were found relatively close together.

Despite the lower numbers there are reports from 9 new locations (Table 2), including the three fledglings from Queanbeyan. Two of these were posted on the Australian Bird Identification (ABID) site on Facebook, a new source from which Mark Clayton alerted me to a total of 7 fledglings. However, he usually found it difficult to obtain information from ABID other than the photo and location. On one occasion not even the latter was possible, resulting in one of the unknown locations.

Very interestingly, except for the early Isabella Pond Monash record (see introduction to Section 4 above), there were no reports of fledglings from the creek corridors, urban lake reserves or peri-urban locations for the 2019-2020 season. In fact there appear to have been comparatively few reports of Koels in such areas. On 4 Nov Jean Casburn heard a Koel off the NW corner of the Narrabundah Hill reserve. On 7 Dec Jean also heard a Koel on the northern side of this reserve, and on 1 Dec Jenny Bounds reported a female Koel being chased by a RWB near the Mulligans Flat Woolshed.

The eBird Australia map also supports this. Except for multiple sightings at the Jerrabomberra Wetlands, West Belconnen Pond and Yerrabi Pond, it shows fewer peri-urban or rural records than in 2018-2019. This season single birds were reported once only from Kama NR, Coppins Crossing, Bibaringa, Casuarina Sands NR (all sites from which they were not reported in 2018-2019), the Tharwa Sandwash and the Gigerline NR.

5.3. Koel hosts

In about half of the cases, RWBs were again the confirmed host, and would have also been the case for more, since in other reports RWBs were often around but not seen to feed the young Koels. On two occasions (Mark Clayton in Kaleen on 11 Jan and Philip Veerman in Kambah on 10 Feb), the Magpie-lark was the only possible host present at the time when the Koel fledgling was observed, but in neither case could it be confirmed as the actual host (in the latter case the Magpie-lark was said to show "significant disapproval" of the fledgling).

A more interesting case was the young Koel around my daughter's place in Yarralumla. Her neighbour alerted her to it, saying it was a "cuckoo bird" chick being fed by Miners.

[12] One should be added to the 2018-2019 season as Julian Reid has indicated one successfully fledged (unknown hosts, perhaps by Noisy Miners) that spring-summer in Dickson.

Unfortunately, by the time I went round to check a couple of days later it had moved on and was neither heard nor seen again, so the Noisy Miner (Manorina melanocephala) remains an unconfirmed host. Interestingly, Julian Reid later told me a young Koel successfully fledged with unknown hosts, perhaps Noisy Miners (he could not be sure), in Dickson in the 2018-2019 season. HANZAB (Higgins, 1999) lists miners Manorina as hosts, but otherwise does not mention the Noisy Miner, so it does not appear to be a common host

5.4. Interactions of adults/fledglings, and fledglings with other species

There were a number of examples of adults Koels being very close to Koel fledglings, in particular the observations by Julie Clark of the male and female on 23 Feb, and the two occasions of the male on 4 and 14 Mar (Clark, 2020). Most remarkable was the adult male often seen very close to John Harris' fledgling throughout its stay of more than 30 days (Harris, 2020).

Other, less close, examples include mine (see Table 1 above), and the Lawsons' fledgling stopping chirping and looking in the direction of the calling adult male (Section 4.3). On 11 Jan Barbara Allan noted that her very advanced chick in Page was still begging (but not being fed) in a gum in the front garden while "mum" called to it from nearby. On 20 Jan, Susan Robertson noted that over the past couple of days she had heard a female Koel in the trees around the area of her fledgling (see Section 4.4 above). On 29 Jan, Lindell could hear an adult Koel calling in Mawson while watching her fledgling, and on 31 Jan, Alison Milton noted that a male Koel had hung around briefly while she was watching her fledgling being fed by RWBs.

The question of adult Koels being close to or associating with fledglings and/or calling late in the season was last discussed in Section 5.8 of my summary of the 2017-2018 season (Holland 2018c). However, as most of the above observations were made in January, even with the relatively early departure of adults and the earlier end to the fledgling season, none except for John Harris' would provide any support for the suggestion that adult Koels stay around to escort fledglings up North. Also Julie Clark's last observation of a quiet adult male close to her fledgling was on 14 Mar, about 3 weeks before her fledgling finally departed.

While John Harris' adult male was often nearby up to mid-February, except for very early in his observations it was not seen to interact with the fledgling, as it was usually hiding quietly nearby. However, towards the end it did give fairly constant wirra-wirra calls, which provides some support for the theory that it may have been trying to imprint the call.

In respect of Fiona Sweet Formiatti's observation (see Section 3.2 above), even with the relatively early finish to the Koel fledgling season it would seem too early for a juvenile to be making an adult-like call by 20 Jan. All possibly independent young Koels that I have ever observed have still been making the typical begging call. This is supported by observations this season, including those by Diana White (Section 4.2) and John Harris (2020), and especially Julie Clark's long-staying bird, whose call continued throughout, though becoming less frequent and much softer (Clark, 2020). Similarly, over the 30 days' observations the Lawsons' fledgling's begging call changed to an occasional and less obvious one (Section 4.3). So, Fiona's was probably a further example of the variation in the adult calls, for which there have been reports this season by Diana White and particularly by me (see Section 3.2).

The very interesting interactions described by Julie Clark (2020), Diana White (Section 4.2) and the Lawsons (Section 4.3) of fledglings at the feeding tables raising their hackles or lunging at other species to protect their food should be noted. However, at other times the latter two fledglings shared food without showing concern. Apart from these there were few reports of Koel fledglings interacting with other species, including the Noisy Miner[13]. The two main examples were the Magpie-larks observed harassing John Harris' (Harris, 2020) and Philip Veerman's fledglings (see Section 5.3 above). In contrast the Lawsons' appeared to be nurse-maided by a Magpie-lark (see Section 4.3).

5.5. Main features of the 2019-2020 Koel season

In summary the key features of the 2019-2020 season were:

- Despite it being very dry until early February, compared with dry only in October in 2018-2019, the start to the 2019-2020 season was a much more uniform one. Both sexes arrived early in most districts, and there were earlier reports of noisy aggregations/interactions, similar to the 2016-2017 and 2017-2018 seasons.
- Few cases of multiple birds calling/interacting were reported after the New Year, and from the evidence available adult Koels seemed to depart earlier than in previous seasons, probably due to the very dry, hot and smoky conditions to early February.
- There is further information on the variety of the calls made, particularly of the "female" one, and examples of the *kek kek* call being given both before daybreak and after it is dark.
- This includes further examples of the male giving the "female" *kek kek* call, and for the first time some evidence of females giving the "male" calls.
- While the mid-December start to the fledgling reporting season was the second earliest in the past four seasons (only 2017-2018 was earlier), the total of 69 was significantly lower than the 86 for the two previous seasons. It was the most rapid build-up in numbers to date, though also the earliest finish, probably due to the extreme conditions: only 18 (26%) reports in Feb, none in March, but a new one on 1 April.
- Only in Chapman/Rivett was a large number, at least 10 fledglings, found relatively close together, while previous areas such as Narrabundah and Fraser reported only three and one, respectively. There was also only one report of a fledgling from the creek corridors, urban lake reserves or peri-urban locations, in line with the reduced reporting of adults from these areas.
- Four chicks were first observed in the nest, one for over 8 days, compared with a total of nine previously, but the only possible new host, though not confirmed, was the Noisy Miner.
- There were four separate instances of fledglings observed in gardens over a sustained period of between 23 to 77 days, the latter being well over double the time a fledgling has previously been observed constantly.
- This allowed for a considerable number of close observations, including three further instances of fledglings being fed mince by their RWB hosts, then taking mince themselves, as well as an instance of apparent learned behaviour as one waited to be fed.

[13] Interestingly both Geoffrey Dabb's fledglings were in or on the edge of the red-shaded area defended by Noisy Miners in 2018-2019 (see Map 3 of Holland 2020a). The only other comment this season on this species was Steve Read's that the attendant Noisy Miners were not impressed with the noisy male/female interaction near his place in Lyons on 4 Nov.

- There was a second example of a fledgling being fed fruit (plums) by its RWB hosts, as well as for the first time five examples of fledglings drinking at a bird bath, and two cases of bathing under a sprinkler.
- Fledglings taking mince or drinking water were often quite bold and in the open, on feeding tables or on the ground; there were three further examples for the latter.
- There have been further instances of adult Koels calling near or associating with fledglings, but in only one case was there limited evidence that a male may have been trying to imprint its call, or waiting to escort it north.
- There have been further cases of Koel fledglings associating/interacting with other species, including some very interesting reactions such as raising their hackles when protecting their food at feeding tables.

Acknowledgments

My sincere thanks go to Diana White and to Charmian and Tony Lawson for collecting and providing me with the fledgling observations near their houses in Narrabundah and Holder, respectively, and for allowing me to use this information in this article. My sincere thanks also go to Julie Clark and John Harris for agreeing to publish their observations separately, and for discussing these with me, including during the drafting of their articles. My sincere thanks also go to everyone (including those named in this article) who has contributed to my two main data sources, postings on the COG chat line and direct correspondence with me. Without this it would not have been possible to put this 2019-2020 Koel season summary together.

References

Clark, J. (2020) A juvenile Pacific Koel (*Eudynamys orientalis*) in our Amaroo garden – 2020. *Canberra Bird Notes* 45: 311-315.

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

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.

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

Holland, J. (2018a) The 2017-2018 Eastern Koel season. I. Adult and fledgling behaviour in Chapman/Rivett. *Canberra Bird Notes* 43: 252-262.

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. (2018c) The 2017-2018 Eastern Koel season. III. Observations of adult and fledgling behaviour in wider Canberra. *Canberra Bird Notes* 43: 274-289.

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.

Accepted 18 September 2020

Canberra Bird Notes 45(3) (2020): 311-315

A JUVENILE EASTERN KOEL (*EUDYNAMYS ORIENTALIS*) IN OUR AMAROO GARDEN – 2020

JULIE CLARK[1]

julie.clark8387@gmail.com

A pair of Red Wattlebirds (*Anthochaera carunculata*), regularly visiting our garden, had raised a brood of two chicks in October 2019. We were unsure where they actually nested but it was in close proximity to our garden. From as early as 7 Jan 2020 we were confident that the Wattlebirds were nesting again as they were calling in when we were feeding Australian Magpies (*Gymnorhina tibicen*) and carrying mince away in significant quantities. Around 17 Jan my husband, Len, thought he heard a bird begging for food. On 19 Jan 2020 a juvenile Pacific Koel (*Eudynamys orientalis*) first appeared in our garden and remained perched in dense foliage for most of the day (Fig.2 C8A7304). The bird was being fed by a Red Wattlebird. Over the next several days we were able to sight the Koel on numerous occasions without disturbing it. During the early weeks of its stay in our garden it seemed to be perched in a *Photini*a or *Hakea*, well-hidden.

The Wattlebirds continued collecting mince from us and we observed them feeding the juvenile Koel. We are unclear as to whether one or both Wattlebirds were involved in the feeding process. During this time the juvenile seemed to be fairly stationary, well hidden by the quite dense foliage of the chosen tree. The Wattlebirds continued feeding the Koel for up to three weeks, after which time they no longer carried mince away. They could have been feeding it other food but we did not see this occurring.

Feeding

During the early weeks the juvenile could be heard begging to be fed, with the Wattlebirds responding. When the Wattlebirds ceased feeding the juvenile, its begging continued but was far less frequent, much softer and continued for the duration of the stay. Initially we placed meat on low *Hakea* branches and it moved to the food as soon as we left. Gradually, as its agility improved, it began to appear from the foliage, flying down to the lawn, shed roof or outdoor table to pick up mince when the Magpies were being fed (Fig.3 P1020438). At this stage the Koel was only taking mince even though we had offered a variety of food.

At about five weeks we began mixing a small amount of mince with mashed banana and other diced fruits, a very soft, sloppy mix. Gradually the juvenile grew used to this and we slowly removed the mince and offered more coarsely chopped fruits. Banana was definitely its favourite. As we modified the diet, we placed the food in a dish on our outdoor table, the shed roof or the lawn, only when the juvenile appeared.

At that stage the juvenile Koel was only visiting about once a day, but then, for a couple of weeks, it was visiting more frequently, sometimes four or more times a day, but only eating small amounts of fruit each time. It would land on the table or on the ground near the sliding door and wait for us. In the late afternoon it often came down with the other visiting species.

[1] All photos by the author.

From about mid-March its visits became less frequent again, sometimes coming in the morning and always appearing in the early evening, usually after the other birds had departed. It was consuming relatively small quantities of banana and other fruits during each visit and flew up into the tree as soon as it had finished eating. Rarely was all offered food consumed. It was relatively aggressive when defending its food, almost hissing at other birds, beak open, and hackles raised (Fig. 1 P1036875). Magpies in particular seemed unsure about it and allowed it to take food that they would normally consider theirs.

Figure 1. P1036875 Raised hackles to deter the magpie – 26 Mar.

Physical appearance

The physical appearance of the juvenile began changing very early and Geoffrey Dabb confirmed his identification as a male on 5 Mar. The most dramatic change was in plumage. Initially he was buff-coloured underneath with fine dark brown barring on the throat, breast and body (Fig.2 C8A7304). His head was mainly buff-caramel coloured with a dark brown patch on the crown and a wide dark brown stripe through the eye. His tail feathers were buff with fine brown striping while his wings were browner with buff patterning and upper wing coverts buff with brown patterning.

The following is a summary of physical changes observed and confirmed in the relevant photos. The photos appear in chronological order. The photo number appears when hovering over it and the date is visible when you select the photo. Photos can be accessed at: https://www.flickr.com/photos/140414659@N08/albums/72157713627541912

Date	Comments	Photo
19 Jan	First sighting of juvenile.	C8A7304
25 Jan	Rear view of plumage.	P1020356
25 Jan	View of back of head, mantle and back, showing patchy dark feathering.	P1020417
4 Feb	Caramel-coloured feathers appearing on breast and some dark brown feathers appearing on the upper-wing coverts.	P1021763
15 Feb	More dark brown patches and caramel on the upper breast and edges of belly. More dark brown feathers in the upper-wing coverts.	P1023140

Summary continued on next page

Summary continued from previous page

Date	Comments	Photo
22 Feb	Darkening to the throat and neck is extending, while changes to the underside also continuing, now extending down to the flanks. More dark feathers on the upper wing coverts.	P1024006 P1024015
3,4 Mar	Head and throat predominantly very dark brown with a few remaining buff-coloured feathers. Darkening of plumage on the belly extending to the flanks and thighs.	P1035503 P1035509
12 Mar	Good views of very dark rump, upper tail feathers, nape, mantle and back. (Dark rump seen 28 Feb but not photographed).	P1035726
13 Mar	Breast mostly darker brown. Belly darker brown feathers with caramel tips. A paler band of feathers extends down the centre of the body.	P1035847
18 Mar	Most of the upper body plumage is now very dark brown (appearing almost black in poor light), as is the back and rump.	P1036369
26 Mar	Feathers over tarsi now dark brown with caramel tips as for the belly and flanks.	P1036874
26, 27 Mar	Examples of raised hackles and open beak when hissing and reacting to a magpie.	P1036875 P1036880
31 Mar	Good views of the bird and plumage changes.	P1037487
31 Mar	Eye now a red/brown colour when seen in good light.	P1037495
1 Apr	Band of pale feathers running down the centre of the body more prominent as the surrounding plumage has darkened. Pale shoulder patches clearly seen.	P1037525
2 Apr	Bill clearly paler. Upper tail coverts are now dark brown as are some of the flight feathers.	P1037533

Interaction with other birds

During the early weeks a Wattlebird was always close by and even after feeding ended always seemed to be in the vicinity. As time progressed, we suspect the Koel was probably following the hosts to other gardens to feed. It was interesting that, on several occasions, and as early as Day 7, it followed the Wattlebird down to our outdoor table in order to be fed, and picked up the mince itself. The Wattlebirds only fed it when it was perched in the trees. The Koel was observed in the early weeks in our tan bark, possibly copying the Wattlebird which was actually feeding in a low *Grevillea*. The Koel picked up tan bark but quickly discarded it. The Wattlebird remained in the vicinity of the Koel but there was no apparent interaction and it probably had more to do with both coming to the same area for food. Other birds, including Magpies, Pied Currawongs (*Strepera grtaculina*), Sulphur-crested Cockatoos (*Cacatua galerita*), and Crested Pigeons (*Ocyphaps lophotes*) seemed wary and avoided approaching it. It behaved aggressively toward the Currawongs and Magpies in particular, raising its hackles, beak open, making a hissing sound and sometimes chasing them, but only if they approached it too closely (Figs. 1 and 4).

During the first month or more we regularly heard an adult male Koel calling and also saw it on many occasions. The female was a less frequent visitor. On 23 Feb, around 19:30 h, two adult Koels, one male and one female, flew into trees near the juvenile, both calling. After several minutes all three birds flew out of the trees, one after the other, in the same direction, landing in a tree further up the street. We did not see them again that night.

The adult male was seen on 4 Mar during heavy rain. Both it and the juvenile were perched in the same tree, within a metre of one another, for a number of hours. On 14 Mar an adult male was seen perched in the juvenile's favourite *Hakea*. The juvenile was present as well. Coincidentally it was a rainy day. The male flew into a neighbouring tree when I walked nearby, then minutes later the juvenile flew down for a feed.

Figure 2. C8A7304 – 19 Jan
Juvenile – first sighting.

Figure 3. P1020438 - 25 Jan
Juvenile perched on outdoor table.

Figure 4. P1036880 – 27 Mar
Hissing to deter the magpie.

Figure 5. P1037533 - 2 Apr
Juvenile two days before departure.

Over time the juvenile became tamer and allowed us to walk up to the table when it was perched there. It used to fly at me as I walked through the external sliding door and would probably have landed on me if given the chance. It also took food from our hands as we were putting it in the feeding container, but we discouraged this. We were pleased, but also a little sad when it apparently departed, hopefully to head north, on 4 Apr, coincidentally another rainy day, three weeks after our last sighting of any other Koels in our local area and 77 days since our first sighting.

Conclusions

1. From first sighting to departure, the juvenile was seen on every one of the 76 days.
2. Its departure was three weeks after our last sighting of other Koels in our immediate area.

3. Its initial diet was beef mince, fed to it by the Red Wattlebirds, and then directly by us.
4. Its diet was gradually modified to include fruit, and eventually it was only receiving fruit, particularly banana, from us.
5. It continued begging for food after the Wattlebirds ceased feeding it. The begging was far less frequent, much softer and continued for the duration of its stay.
6. It flew to the ground on many occasions, mostly for food and, on occasions, particularly in the early weeks, where it appeared to be foraging for food.
7. There appeared to be interaction between the juvenile and the adult male and female Koels on two occasions in particular. The first involved all three birds flying off one after the other and landing in the same tree. The second was when the adult male and juvenile remained perched in the same tree, within a metre of one another, for several hours on a rainy day.
8. Interaction with other birds was limited to forms of aggression when other birds approached it or its food too closely. This resulted in raised hackles, open beak, a hissing sound and chasing the birds on occasions.
9. Plumage changes were dramatic. As a newly fledged juvenile, its plumage was pale underneath and above with the exception of a dark brown crown and eye-stripe and some darker patterning on the wings. By the end of March the head, throat, upper-tail coverts, mantle, back, rump and some flight feathers were almost entirely dark brown/black. The breast, belly, flanks and feathers over the tarsi were dark brown with caramel tips. The paler band of feathers still extended down the centre of the body and a pale patch remained on each shoulder.
10. Other physical changes included the bill becoming much paler and the eye colour becoming red-brown.

A more extensive album of photos, including those of the Red Wattlebirds and the adult male and female Pacific Koels can be accessed through the following link: https://www.flickr.com/photos/140414659@N08/albums/72157713548103011

Acknowledgments

Jack Holland was very interested in my sightings and encouraged me to write up my observations. He gave generously of his time and expertise throughout the process. I was very grateful for his valuable input. Thanks also to Geoffrey Dabb for his identification of the juvenile as a male and his encouraging feedback.

Accepted 10 April 2020

NOTES

Canberra Bird Notes 45(3) (2020): 316-317

OBSERVATIONS ON AN EASTERN KOEL ADULT MALE AND FLEDGLING INTERACTION

JOHN HARRIS

jwharris@grapevine.com.au

Interactions between adult Eastern Koels (*Eudynamys orientalis*) and fledgling Koels are being reported more frequently in the ACT. In the past, brief interactions, or perhaps briefly-observed interactions, have been dismissed by some respondents on the COG chatline as accidental or, at best, momentary curiosity, the received wisdom being that cuckoos take no interest in their young. There is increasing evidence, however, that these interactions are purposeful and persist over a number of weeks (see Holland 2018).

On 12 Jan 2020, I began observing an interaction between an adult male Koel and a Koel fledgling. I was initially drawn to the commotion in my backyard and a neighbouring backyard. It took me some time to interpret what I was hearing and seeing. A Koel fledgling was in my neighbour's tree. At first I could only identify it by its constant 'cheep, cheep, cheep' but soon located it when I saw Red Wattlebirds (*Anthochaera carunculata*) taking pieces of ripe plum and flying to feed the Koel fledgling. The commotion was caused mostly by Magpie-larks (*Grallina cyanoleuca*) trying to evict the Koel fledgling and the Red Wattlebirds screeching back at them. Other birds, including Pied Currawongs (*Strepera graculina*), were also interested in the proceedings. For this reason I presume that the fledgling had only just arrived here.

To my surprise, I eventually noticed an adult male Koel lurking in the foliage a metre or so from the fledgling. It was not being attacked and took no obvious part in the proceedings. Sometimes the fledgling would be harassed enough to fly to another more distant tree. The adult male would follow it and make its wirra-wirra call. The fledgling always came back soon to the tree next door and the wattlebirds continued to feed it. The adult male also came back to hide again near the fledgling.

All this went on for several days until the fledgling flew into my yard and settled in my plum tree. The Wattlebirds continued to feed it and soon the adult male turned up, hiding in the leafiest foliage of the plum tree. The magpie-larks eventually lost interest. The Wattlebirds fed the fledgling for a few more days but on 23 Jan I saw it taking its own plums. The Wattlebirds hung around but I did not see them feed it after that. The fledgling would keep up its hopeful cheeping but the Wattlebirds did not respond. I presume I had observed the transition from dependency to independent feeder. The adult Koel stayed hidden where it always was and I did not see it move or interact with the fledgling, but it was constantly present and would occasionally fly to another tree if the fledgling flew there.

When the fledgling finished the nearest plums, it would move to another branch. It sometimes moved to the elderberry tree to eat elderberries where the branches intertwined with the plum tree. On one occasion it moved to a branch below my verandah so that I could

see it from above. I could see the darkening feathers on its nape and upper wing coverts and this confirmed my earlier hunch that it was a male. By early February it took up residence in a eucalypt tree over my back fence in the reserve, and I was able to locate the male high up in the foliage. The fledgling began to take plums and return to the eucalypt to eat them. Gradually I began to see the Koels less, probably because the fledgling was now foraging further afield. There are plenty of fruit trees around this area. They seemed, however, to return to my tree to forage every few days.

Early in February, I was contacted by Wildcare. They had raised a rescued Koel chick and needed to release it. People had read my posts and, wanting to release their fledgling where there were other Koels, asked if they could release it in my yard. Of course I agreed. When they came, I could not locate my Koels. They released their fledgling, which flew off rapidly and noisily.

For some time after that I continued to see and hear a fledgling and the adult nearby but not in my tree, or at least not when I happened to be watching, although there was daily evidence of plums being taken. I also heard fairly constant wirra-wirra calls. Regrettably, I did not ever see two fledglings at once. I did not see them at all after mid-February, by which time the northern migration had begun. The whole adult/fledgling interaction had lasted for a month.

The questions raised by this in my mind are many! Was the male trying to bond in some way with the fledgling? Given that there were Koels calling nearby long before all this, is it possible that this was the male parent of a fledgling which hatched near here in a one of the Red Wattlebird nests? Had it waited in the vicinity for the fledgling to leave the nest? Would it have therefore been interested or disinterested in the released fledgling? Could the adult have a protective role? Was it trying, for example, to imprint its call on the fledgling? Could this be so that the adult could guide the fledgling on its first northern flight? Is it therefore possible that not all Koel behaviour is instinctive but that some behaviours are learned?

One day we will know…-When there are more observations. I don't imagine I will be so fortunate next year!

Reference

Holland, J. (2018) The 2017-2018 Eastern Koel season. III. Observations of adult and fledgling behaviour in wider Canberra. *Canberra Bird Notes* 43: 274-289.

Accepted 21 July 2020

Canberra Bird Notes 45(3) (2020): 318-319

SWIMMING MR FOX

ALASTAIR SMITH

berigora@gmail.com

At 0925 on 12 May 2020 while I was sitting in Fulica hide I observed an irruption of about sixty Pacific Black Duck *Anas superciliosa*, Grey Teal *Anas gracilis* and Hardhead *Aythya australis* from the northern side of Jerrabomberra Creek. The ducks flew out of heavy cover on the north side of the creek and landed nearby in the water. While my first reaction was to look for a raptor, the cause of the ruckus soon became apparent - a canine. My first thoughts were that someone was swimming their golden retriever in the creek, but on closer inspection with my binoculars I saw that the canine was in fact a Red Fox *Vulpes vulpes*. It is probably not well known that foxes and dogs are closely related and like dogs, foxes can swim.

I am sure that most Canberra birders regularly observe foxes when out birding. Despite ongoing control programs, foxes are almost a daily occurrence around places I frequent such as Jerrabomberra Wetlands.

Most of my observations of this introduced species are out in the paddocks or around the water's edge of Kellys Swamp. Often it is the observation of waterfowl flushing that indicates the presence of a fox. Until May 2020, though, I had never observed a fox getting more than its paws wet; I certainly had never observed a fox swimming.

That May morning the fox swam across the creek from the northern bank to the southern shore and while the ducks were initially flushed by its presence on land, as the attached photographs attest (see Figs. 1 and 2), they appeared totally unconcerned by the fox's presence in the water. Indeed, the ducks swam with the fox and appeared to escort it across the creek.

The fox made it across to the southern bank and was lost to view. Foxes are a serious pest species and I have witnessed first-hand the devastation caused by them and so I have no

compassion for the species. However, I was left feeling I had witnessed something very unusual; indeed something special.

In researching this article, I found a number of videos and photographs of foxes and media of foxes swimming but almost always accompanied by the words 'unusual', 'not often witnessed' etc.

It would appear then, that the effort of conservationists in putting roosts for birds in the middle of dams, be they islands or logs, is wasted. So too is the apparent comfort and safety felt by those species that roost and nest on them.

Accepted 10 October 2020

Canberra Bird Notes XX(X) (2020): 320-322

BREEDING RECORD FOR HARDHEAD AT ACACIA INLET AND FYSHWICK SEWAGE PONDS

ALASTAIR SMITH

berigora@gmail.com

Abstract: *In early October 2020 I made my first ever observation of a Hardhead* (Aythya australis) *breeding event in the ACT. This was followed by a second observation of juveniles at another location in mid-October. In reviewing breeding records of Hardhead in eBird, I realised my own observations and judgements of the rarity of this event were matched by the paucity of breeding records in eBird and the Annual Bird Report.*

Observation

On 17 Oct 2020 Peter Milburn and I observed five juvenile ducks swimming on pond 4 at Fyshwick Sewage Ponds (Smith 2020a). They ducklings looked unusual with thick bills and a creamy buff-coloured face. They also lacked the usual dark line through the eye found in Pacific Black Duck (*Anas superciliosa*) juveniles and a second dark line under the eye found in Grey Teal (*Anas gracilis*). Our identification was not helped by the lack of adult ducks in the vicinity to ascertain the parentage. Eventually a Grey Teal approached the ducklings, which caused a Hardhead to swim over and display agonistic behaviour towards that duck. The ducklings then swam off with this Hardhead adult. This appeared to establish the provenance of the ducklings, and a later review of the photographs I took established this beyond doubt (see Fig. 1).

Figure 1: Three ducklings showing the characteristic facial features of Hardhead juveniles swimming on FSP pond 4. (*Alastair Smith*)

This was my second observation of the species with young in 2020. The first was on 5 October, when I observed an adult Hardhead with seven juveniles swimming on the

foreshore of Lake Burley Griffin, in the vicinity of Acacia Inlet (Smith 2020b). These two are my only ever breeding records of Hardhead in the ACT.

Comment

In my assessment, the above-average rainfall in the ACT in spring 2020 and the subsequent availability of excellent habitat for waterfowl, has led to a marked increase in the breeding of all duck species within the ACT. Pacific Black Duck, Grey Teal and Australian Wood Duck (*Chenonetta jubata*) are breeding prolifically. Not only is this my first record of Hardhead breeding, but this spring I also witnessed my first ever breeding record of Australasian Shoveler (*Spatula rhynchotis*) (Smith 2020c). The first observation in eBird reported six juveniles, but by the time of my first and subsequent observations this had been reduced to three ducklings.

In 1999, Wilson described Hardhead as 'uncommon' breeding visitors, though the Annual Bird Report (ABR) now reports its presence as 'common'. Breeding, however, appears to be extremely uncommon. There was only one other record of breeding Hardhead in eBird, six juveniles reported at Gungahlin Pond in January 2020 (Bear 2020). In recent years the Annual Bird Report reported two breeding records in 2017/2018 and none in 2018/2019 (COG 2020).

I will continue to monitor this breeding event both by personal observation and also records from other observers in eBird. It is of interest that seven juvenile Hardhead were observed with an adult bird at Kellys Swamp on 12 October (Brooks 2020).

References

Bear, C. (2020) eBird Checklist: https://ebird.org/ebird/view/checklist/ S63215457. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 21 October 2020).

Brooks, A. (2020) eBird Checklist: https://ebird.org/ebird/view/checklist/ S74726108. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 22 October 2020).

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

Hill, Y. (2020) eBird Checklist: https://ebird.org/ebird/view/checklist/S74387597 eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 23 October 2020).

Marchant, S. and. Higgins, P.J (eds) (1990) *Handbook of Australian, New Zealand and Antarctic Birds.* Vol. 1 Part B*: Pelican to Ducks.* Oxford University Press, Melbourne.

Smith, A. (2020a) eBird Checklist: https://ebird.org/ebird/view/checklist/ S74992920. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 21 October 2020).

Smith, A. (2020b) eBird Checklist: https://ebird.org/ebird/view/checklist/ S74443004. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 21 October 2020).

Smith, A. (2020c) eBird Checklist: https://ebird.org/ebird/view/checklist/ S74796196. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 21 October 2020).

Wilson S. (1999) *Birds of the ACT: Two centuries of change.* Canberra Ornithologists Group, Canberra.

Accepted 5 November 2020

COLUMNIST'S CORNER

Canberra Bird Notes 45(3) (2020): 323-327

The new (but somewhat tangled) world of subspecies: a further dimension for recreational birding?

1999 seems a long time ago. That year saw the publication of *The Directory of Australian Birds* (Dick Schodde and Ian Mason). Their aim had been to provide "an inventory of Australian bird ultrataxa that, however crude an approximation of Australia's avian biodiversity, gets information out to biologists, environmental planners and managers, and the public now".

In the introduction, the significance of bird subspecies was discussed. 'Subspecies', we were told, "are viewed pejoratively by much of the biological community". "In Australia, for example, many fauna managers and birdwatchers … do not value them at the same level as species, and some … do not take them seriously at all". An exception is mentioned, being the work of Stephen Garnett in producing the *Action Plan for Australian Birds* (1992).

Subsequently, and with the help of the *Directory*, Australian field guides began to take subspecies more seriously, providing descriptions, illustrations and, within (and sometimes beyond) the limits of available information, small maps showing the ranges of subspecies.

In 1980 the *Complete Checklist* of Richard Howard and Alick Moore, had improved on five global bird lists of the late 1970s by including "generally recognized subspecies". The authors grappled with the question "what is a valid or recognized subspecies?", accepting that "clinal variations of size or plumage colour make the arbitrary selection of subspecies very difficult". Unsurprisingly, they claimed to place reliance on the "best available authorities". Internationally, debate continues today among scientists about the criteria to be used to define subspecies, although, it must be said, species criteria are not universally agreed either.

Nonetheless, later global lists followed Howard and Moore in including subspecies.

In 2012 Birdlife Australia adopted its *Working List of Australian Birds* (WLAB) for its own purposes which included the updating of the *Action Plan for Australian Birds*, a new version of which had been published in 2010. WLAB included names of all recognised subspecies, those for passerine species being based on the *Directory*. Moreover, as an ambitious but controversial step, these were assigned English names. That policy was explained in a 2017 article in *Bird Conservation International*, the journal of Cambridge-based Birdlife International. "Over the last 25 years subspecies have become an important unit in bird conservation in Australia. … Here we present the arguments for creating a standardized list of English names for Australian bird subspecies … with the aim of building the general public's attachment to subspecies, increasing interest in their conservation and as subjects of research." The COG bird list uses the species' scientific and English names from WLAB but does not give the subspecies.

The debate about criteria for subspecies-level classification complicates decisions on conservation status. Conservation legislation in Australia makes provision for protection of both species and subspecies: a particular subspecies might be classified as threatened while the species as a whole is not. Under the Commonwealth Act (the 'EPBC Act') threatened birds have been classified nationally as follows: critically endangered - 11 species (including Swift Parrot and Regent Honeyeater), 6 subspecies (including 'Helmeted Honeyeater', the Victorian faunal emblem); endangered - 29 species, 26 subspecies; vulnerable - 28 species, 35 subspecies. That list reflects the 'ultrataxon' approach put forward in the Directory and followed by Birdlife Australia. This means that the relevant unit for conservation purposes (the 'ultrataxon') is either a subspecies or, where no subspecies are recognised, the species itself. Ultrataxa are a useful concept, being the endmost twigs of the figurative tree of evolution.

In a recent demonstration of the link between careful attention to subspecies and conservation priorities, a tiny population of the Striated Grasswren in and near Yathong Nature Reserve has been found to need urgent protection as the last remnant of a separate subspecies. This is the nominate subspecies, now existing precariously within a greatly reduced range. (A. Black, *et al.* 'A taxonomic revision of the Striated Grasswren *Amytornis striatus* complex (Aves: Maluridae) after analysis of phylogenetic and phenotypic data'. Emu, online 19 July 2020).

Given the small areas involved, in the ACT or even in the wider COG area of interest few species are represented by more than one subspecies. For COG purposes, birds are referred to and recorded as species. However, the ACT's official list of threatened birds now refers to subspecies. There is some untidiness in the list due to changes in the legislation. Of the 14 'birds' on the list, 5 raise ultrataxon issues. What is referred to as the 'Glossy Black-cockatoo' (sic) is the subspecies *Calyptorhynchus lathami lathami*. The Conservation Advice refers to 'Glossy Black-cockatoo (south-eastern subspecies)'. Similarly, the 'Hooded Robin' is now 'the south-eastern sub-species *M. c. cucullata'*. However, confusingly, the statement that that subspecies is recognised as threatened in the 'following jurisdictions' goes on to cite the national status of 'critically endangered' of an irrelevant northern subspecies. By contrast, the current listings of the Scarlet Robin and Varied Sittella appear to relate, having regard to the listing histories, to a species rather than a subspecies.

The listing of the Brown Treecreeper illustrates how confusion might arise without appropriate names. This, like other ACT threatened species, was originally listed as a species, so the 'Brown Tree-creeper' was a threatened species in the ACT. The listing of the 'Brown Tree-creeper' now refers to the subspecies *C. p. victoriae*, appropriately because the subspecies *picumnus* that occurs just to the west of the ACT is not threatened. However, there is no English name for the ACT's ultrataxon unless the WLAB name 'South-eastern Brown Treecreeper' is used. It is something of an obstacle to their common use that the WLAB names sacrifice convenience in the interests of clarifying subspecies status.

Under current taxonomic opinion here are four species represented within the COG area of interest by more than one subspecies: Australian Magpie (with various intergradient forms), Silvereye, Striated Pardalote and Yellow Thornbill. However, with respect to the last two, as with many subspecies, the differences are difficult to detect in the field.

An interesting question concerns the Pilotbird. The published range maps for the two Pilotbird subspecies do not cover reported populations to the east of Canberra within the

Tallaganda section of the COG area and Monga National Park. It is not known whether those belong to subspecies *floccosus* (the so-called 'Upland Pilotbird', found to the west, in the Brindabellas) or *sandlandi* (the more widespread 'Lowland Pilotbird').

What do subspecies mean to the average birdwatcher who takes to the field with binoculars and field guide and the intention of recording the different birds that he or she comes across? Your field guide might be *The Australian Bird Guide* (Peter Menkhorst *et al*., rev. ed. 2019 – 'ABG'). If so, you will find considerable attention is paid to subspecies. After noting their 'great conservation significance', the ABG goes on:

> Consequently, we have emphasized subspecific variation in this guide including depiction of those that can be recognized in the field and, as far as practicable, showing their distributions in the distribution maps. The recognition of morphologically distinctive subspecies also adds a further dimension to recreational birding that is increasingly being taken up by keen birders and we have a strong commitment to accommodate that interest.

A popular system of personal record-keeping is based on the eBird/Clements Checklist. This makes provision for recording selected 'identifiable sub-specific forms or ISSF'. Curiously, these are known as 'groups' even if containing only a single subspecies.

> The group is not a formal taxonomic unit, but often represents a potential future split (and so groups are a valuable taxonomic tool for the savvy birder). Birders that faithfully enter groups in eBird will be rewarded by automatic updates to their lists if and when splits occur.

Here are two examples of available groups for an Australian birdwatcher. For the Varied Sittella you have the option of entering the species or the relevant one of 5 subspecies, each of which is a monotypic bird 'group'. For the White-browed Scrubwren you have the option of entering that species or, where relevant, the subspecies *laevigaster* or the '*maculatus* Group' or the '*frontalis* Group' each of the 3 being a group, with the respective English labels 'Buff-breasted', 'Spotted' and 'White-browed'. Some choice is also offered within the Golden Whistler complex. See also the Australian Magpie.

Birdlife Australia is also aiming to capture subspecies information with the Birdata recording system. The present system enables identification of subspecies according to reported location, with an improvement intended to allow selection of a particular subspecies by an observer in an area where more than one subspecies occurs.

Whatever the criteria applied, it is the scientists who determine, usually on the basis of specimens on a table, what qualifies as a subspecies and what range should be attributed to it. The reported places of origin of a set of specimens determine the specified subspecies range limits, and any zone of intergradation. On the other hand, it is observations in the field that lead to decisions about conservation status. The enlisting of the help of recreational birdwatchers to report on occurrence of subspecies is a relatively recent development. Initially, and probably for some time, most such reports will be based simply on location. If you see species X in area Y, it must be subspecies X(Y).

And the future? Will invisible genetic information become determinative so that features that can be seen in the field have less relevance to identification? The *Directory* had acknowledged the need for molecular data, but could not wait 'at least several decades' for it. Invisible properties will be a challenge for illustrators of field guides.

Stentoreus

(See following pages for illustrations and legends.)

PHOTOS

Some notable subspecies

1. Width of the white wing-stripe and the tone of the orange-red covert spot are said to distinguish two subspecies of Striated Pardalote found in and near Canberra.
2. A breeding Silvereye subspecies is found in the ACT, as well as this rusty-flanked *lateralis* which occurs as a migrant from Tasmania.
3. This Pilotbird was banded in Monga State Forest. The species is also recorded in Tallaganda State Forest within the COG AoI. Is this the same subspecies as the one found in the Brindabellas?
4. The critically endangered subspecies of the Striated Grasswren *Amytornis striatus striatus*, photographed near Ivanhoe NSW by Mick Todd in 2003.
5. The colourful female of the Red-tailed Black-Cockatoo, subspecies *graptogyne*, near Casterton, Vic. Recognised only in 1989, this subspecies has a population of about 1000 individuals.
6. Australian Magpies. This familiar species shows a range of plumages reflecting the mixing of different subspecies in the Canberra area.

Canberra Bird Notes 45(3) (2020): 328-329

Birding in Cyberspace, Canberra Style

It seems that the bulk of Canberra region birders use eBird: the mobile app, the web browser version, or both. In recent months significant upgrades and enhancements have been made to both; very welcome initiatives. In November, the eBird Australia managers presented a feature article at their home page by Margaret Alcorn, entitled '**Identifying Australian Raven and Little Raven in South-East Australia'** https://ebird.org/australia/news/identifying-australian-raven-and-little-raven-in-south-east-australia. It is straightforward advice, particularly useful for the Canberra region, where the species' ranges overlap and they are found together, particularly in summer and autumn. The identification information that Margaret has provided is enhanced by the multimedia uploaded to the Macauley Library at Cornell University by eBirders over the years. In this case, reflecting the fact that the calls of these ravens are especially important for identification purposes, she has provided audio calls and sonograms for side-by-side comparisons. In addition, eBirders' photographs of the two species clearly demonstrate the different throat hackles, and videos of both species calling are provided to demonstrate the wing-flicking of Little Ravens when calling while perched or on the ground. When I saw the still that links to the Little Raven video wing-flicking, I thought the setting looked familiar. And it is: the video was taken at Trucking Yard Lane at Bungendore, a birding hotspot visited by many of us when travelling between Canberra and the coast. What is more, the photographer was Steve Wallace, a highly accomplished local video bird photographer.

For completeness, I should add that Margaret Alcorn also includes notes, in her eBird Australia piece, about the bare skin patch on the face of the Australian Raven, flocking behaviour, and size differences between the species. The birding community should be really grateful, in my view, to the many eBirders in COG and the broader community who make the effort to produce excellent still photographs, audio calls, and video photography of our wild birds, and upload them to eBird for our use.

On 15 November, on the eBird Australia Facebook page Nancy Auerbach referenced the raven identification resource. Someone commented, 'We need all the Little Crow records in NSW reviewed,' implying that mis-identification of corvid species is not restricted to the Little and Australian Ravens. There was one response: 'Good luck', with a screenshot of the huge number of NSW Little Crow records. It would be quite a task to review them all!

March this year saw the release of the Cornell Lab of Ornithology's **Birds of the World**, a wonderful online resource for us all. In September, the Birds of the World team published a feature **'Common names available in 43 languages plus 35 regional dialects'** https://birdsoftheworld.org/bow/news/new-feature-common-names-available-in-43-languages-plus-35-regional-dialects. They wrote:

> Obviously, multilingualism is important for a global resource like Birds of the World. The Cornell Lab now offers common names in 43 languages plus 35 regional dialects – that's 78 variations in all, including 15 versions for English, 15 for Spanish, and 6 for French!
>
> We most recently installed nine new languages (**Arabic, Asturian, Azerbaijani, Catalan, Gallegan, Slovak)** plus two additional **regional versions of Spanish** (for

> Peru and Paraguay) and **one additional version of French**, customized for French Guiana. We also have expanded variations of many other languages, and now have complete global namesets for **German**, **French, Japanese, Norwegian, Slovak, Spanish (Spain),** and **Turkish**.
>
> The namesets apply to several other Lab projects, as well, including eBird, the Merlin Bird ID app, the Macaulay Library, among others.

This shows, in fascinating detail, the way in which a skilfully designed, strategically thought through online resource, can be built upon over time to serve ever wider audiences and functions.

The May 2020 issue of *Gang-gang* (p. 13) contained a valuable article by local eBird reviewer Smith. Titled simply 'eBird', it provides **tips for using the eBird internet-based resource**, under three headings: 'Some notes about comments in eBird', 'Filter changes', and 'eBird tools'. While all the advice is useful, two things stood out for me which may also be of particular interest to readers. The first is that the eBird filter for the Pied Butcherbird has been reset to 0 for the ACT (but not for the area of NSW that surrounds the ACT), meaning that we are required to provide comments or other evidence to support the identification. This was done, Alastair explains, because of the high frequency of mis-identifications. I find this surprising, as the Pied Butcherbird does not really look or sound much like any other species. Are people confusing it with the Grey Butcherbird? Or with currawongs, magpies or Magpie Larks? One would not think so.

Another topic that Alastair covers, in which you may be interested, is the list of **Kent Fiala's seven eBird tools** https://www.faintlake.com/eBird/. The tools are Nearby notable eBird reports; Nearby eBird hotspots; Import eBird checklists into AviSys; Compile multiple eBird checklists into one spreadsheet; Share multiple eBird checklists at once; Set up a needs alert for a hotspot; and Display a life, year, or month list for a location. They appear to be especially useful utilities.

I conclude this column by drawing attention to **The Facebook Bird Misidentification Page** https://www.facebook.com/groups/birdmisid/. I am conscious that some readers of *Canberra Bird Notes* suffer from the debilitating condition known as facebookphobia. (Defined there as 'Feeling of disgust or contempt toward facebook'. Yes, it is one word, commencing with a lower case 'f', in the Urban Dictionary https://www.urbandictionary.com/define.php?term=facebookphobia.) The group had 25,000 members in November 2020. Nothing on the Facebook page describes what it is about, and your columnist is at a loss to describe it. The best I can say is that its title mis-identifies its contents!

T. alba

This column is available online at http://canberrabirds.org.au/publications/canberra-bird-notes/. There you can access the web sites mentioned here by clicking on the hyperlinks.
To join (subscribe to) the *CanberraBirds* email discussion list, send an empty email message to canberrabirds-subscribe@lists.canberrabirds.org.au. To unsubscribe, either permanently or temporarily, send an email message to canberrabirds-unsubscribe@lists.canberrabirds.org.au. If you wish to re-subscribe after being unsubscribed temporarily, simply follow the 'subscribe' instructions above.

BOOK REVIEW

Canberra Bird Notes 45(3) (2020): 330-332

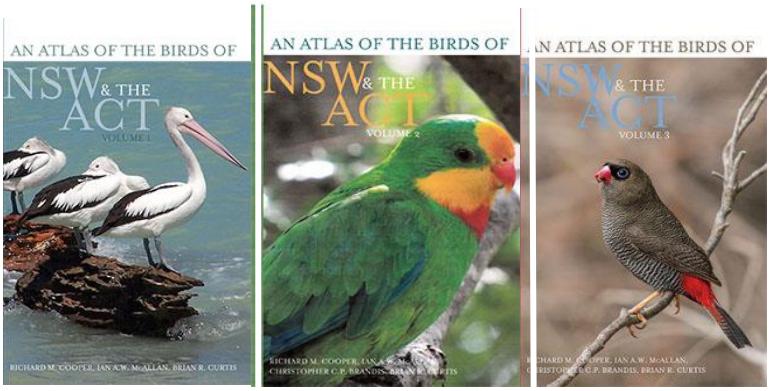
***An Atlas of the Birds of New South Wales and the Australian Capital Territory. Vol. 1 Emu to Plains-wanderer.* By Richard M. Cooper, Ian A.W. McAllan and Brian R. Curtis.** 2014, New South Wales Bird Atlassers Inc., Wolgoolga, NSW, Australia. ISBN: 9780957704732, Hardback, 720 pp.

***An Atlas of the Birds of New South Wales and the Australian Capital Territory. Vol. 2 Comb-crested Jacana to Striated Pardalote.* By Richard M. Cooper, Ian A.W. McAllan, Christopher C.P. Brandis and Brian R. Curtis.** 2016**,** New South Wales Bird Atlassers Inc., Wolgoolga, NSW, Australia. ISBN: 9780957704749, Hardback, 673 pp.,

***An Atlas of the Birds of New South Wales and the Australian Capital Territory. Vol. 3 Eastern Spinebill to Common Greenfinch.* By Richard M. Cooper, Ian A.W. McAllan, Christopher C.P. Brandis and Brian R. Curtis.** 2020**,** New South Wales Bird Atlassers Inc., Wolgoolga, NSW, Australia. ISBN: 9780957704756, Hardback, 673 pp.,

Price for all three volumes: $390 + $70 postage ($310 + $70 postage for members of NSW Bird Atlassers Inc.), volumes can also be purchased individually: for details and ordering contact: treasurer@nswbirdatlassers.org.au

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



Three comprehensive volumes (2066 pages in all) on the birds of New South Wales, and even with the ACT in the title, have to be of great interest and significance to the Canberra birding community. And if one considers that many of us regularly go bird-watching across the border into NSW, and from the coast to the west of this State, and that COG's Area of Interest extends well into NSW, then these three volumes are most relevant and deserve close attention.

One may expect, as the title "An Atlas" suggests, that the volumes will be filled with distribution maps. We are used to such productions from the *The Atlas of Australian Birds* (Blakers *et al.* 1984) and *The New Atlas of Australian Birds* (Barrett *et al.* 2003). *Birds of the Australian Capital Territory - an atlas* (Taylor and COG, 1992) provided not only maps but also interpretative text with basic information on the status, distribution, breeding and seasonal changes for each species.

However, this new atlas for NSW and the ACT [*Atlas* thereafter] presents a major extension to any similar works in Australia. Of course, distribution maps form the backbone. But many other results and details from the survey work and other sources are included, and combined with information from the literature, these voumes give a comprehensive picture of many aspects of the biology of each species. To quote from the Preface, the *Atlas* "will provide an inventory of the birds of the region and a foundation for the management and future directions for specific species studies as well as for environmental planning and conservation efforts within the region."

The New South Wales Bird Atlassers group was formed in late 1981. Among its main objectives were the determination of the breeding and non-breeding distribution of birds in NSW and the ACT, and the monitoring of these on a continuing basis.

Over 1500 volunteers, including some COG members, conducted many thousands of surveys, providing 56% of all data used. This data was combined with a similar volume of records from other sources (for example, the RAOU Field Atlas, RAOU Historical Atlas and data sets from COG) and those extracted from the literature, including historical records. (In this context 'historical' means before 1971.)

The results in the three volumes are based on records from 1971 to 2006.

The area of coverage totals about 1.6 million km^2, of which 50.5% comprise mainland NSW, and 49.5% the Tasman Sea from the NSW coast to about 160°E, including Lord Howe Island. The basic area unit is a 10-minute block (about 290 km^2).

What information do we find for a species?

- A box next to the species name gives the number of total records, incidental records, 10-minute blocks, breeding records and breeding blocks;
- Introductory paragraphs describe habitat requirements and give a general description of the distribution in Australia and more specifically in NSW;
- A distribution map for NSW;
- Text on breeding biology;
- Tabulated seasonal reporting rates for all main geographic regions of NSW at 2-monthly intervals;
- A map of reporting rates;
- A map of the breeding distribution;
- A graph with the seasonal distribution of breeding records and seasonal reporting rates;
- Description of seasonal movements (with maps for some species);
- Early records and changes in distribution, supplemented for some species by historical distribution map(s);
- Status;
- Graph of annual reporting rates and an associated box that gives the number of reporting rate records, the trend *(e.g.* increasing, decreasing etc.), the type of graph (*e.*g. simple linear; curvilinear etc.) and the level of significance for the trend.

The number of topics covered varies with species and is most complete for more common breeding birds.

In addition to the species accounts, each volume contains other chapters.

Volume 1 includes an introduction that details the methods of data collection and issues of analysis, coverage and summary statistics, the geography of the area, threatening processes for birds, and appendices giving the literature and manuscript sources for historical data and a biogeographic analysis of the NSW Bird Atlas data set (Julian R.W. Reid).

Volume 2 has a brief introduction and an appendix on the history of ornithology in New South Wales and the Australian Capital Territory (Ian A.W. McAllan).

Volume 3 includes a brief introduction, supplementary species (10 species not covered in Vols. 1 and 2 because there were too few records at the time, but with more recent observations the distribution could be mapped), endemic Lord Howe Island birds (Ian A.W. McAllan and Ian Hutton), vagrant species (Ian A.W. McAllan and David J. James), *i.e.* species with fewer than 20 records and non-breeding species in the area (cut-off date 31 December 2019; 80 species), list of unconfirmed species (52 species), list of introduced species, populations now extinct (20 species), and an index of scientific and common names of birds for all three volumes.

Each volume includes a list of references and a gazetteer. The references are also a valuable resource.

I have only a small quibble. I felt that information from the *Canberra Bird Notes* is inadequately referred to.

Volume 2 received an award as the *2016 Best Zoological Resourc*e published on any Australian fauna or flora by the Whitley Awards Committee of the Royal Zoological Society of NSW. Volume 3 has been awarded the prestigious Royal Zoological Society's Whitley Award for Highly Commended publication**,** 2020.

While the data available up to 2006 has been used to compile these volumes, the survey work has continued and is ongoing. The NSW Atlassers are currently working on a 50-year review of their complete dataset to 31 December 2020 to re-assess the trends reported in the 3 Volumes (Richard Cooper, *pers. comm.*). This will be very important in the light of declining annual trends for many species.

For the reviewer the most important aspect of these three volumes is that they enable us to see the birds of COG's Area of Interest in a wider context, including their distribution, and more importantly their biology.

This unique and fundamental work is highly recommended.

References

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003) *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Hawthorn East.

Blakers, M., Davies, S.J.J.E. and Reilly, P.N. (1984) *The Atlas of Australian Birds.* Melbourne University Press, Carlton.

Taylor, M. and Canberra Ornithologists Group (1992) *Birds of the Australian Capital Territory – an atlas.* Canberra Ornithologists Group and National Capital Planning Authority, Canberra.

Accepted 21 September 2020

Canberra Bird Notes 45(3): 333-335

How Birds Behave. Interpreting What They Do and Why. **By Wenfei Tong.** CSIRO publishing. 2020. ISBN: 9781486313280, Hardcover, 224 pp with bibliography and index. RRP: AU$ 39.99. Also released with slightly different titles in the USA and UK in 2020.

Reviewed by *PETER. FULLAGAR, Belconnen, ACT 2617 (peter.fullagar@gmail.com)*

This is an attractively produced hardcover with a good selection of excellent colour photographs from various sources and lively watercolour illustrations by Kate Osborne.

The publisher's blurb accurately indicates the range of subjects covered: 'how birds find food … their courtship rituals … familial conflicts … stresses and strains of nesting … how birds respond to threats and danger … how birds change certain behaviours' and cope with climate change. A bibliography and index are included.

The bird behaviour information is structured in six sections. The book also explores the increasing focus on how individual birds differ in personality and how big data and citizen scientists are helping to add to what we know about birds.

How Birds Behave has a strong bias towards northern hemisphere examples. Not that that is in itself a problem, because research on bird behaviour has a long history from this part of the world. But anyone expecting to find much mention of Australian birds will be disappointed. Fairywrens are mentioned in several chapters, as are Zebra Finches, while a few others get a passing nod, such as Australian Magpies, Silvereyes and Satin Bowerbirds along with Weka and Hihi (p135) from New Zealand. If you are unfamiliar with Hihi, the Maori name for the Stitchbird, you will not get any help from the index.

To be more inclusive, examples from Africa and South America along with more examples from our region, including Southeast Asia, could have been considered. Birds of the southern hemisphere provide a lot of examples of behaviour that differs from the norm found north of the equator. And, after all, it is in this part of the world where the evolution of songbirds, in particular, had its origin.

There is plenty to digest, maybe too much, with many statements following in quick succession as vignettes without much explanation. For example, on p15, 'Giant Petrel males bully females and exclude them from carrion, forcing the females to forage farther out to sea.' Again, on p57, 'American Crows and Australian Magpies in the same group learn to sound more similar to each other than to members of other groups.' Another statement describing mutualism in the relationship between Elk and Black-billed Magpies was fascinating but there is little detail.

The problem with these and other examples in the book is that no citation is provided for the source of these interesting observations. The bibliography is not helpful. Chapter notes at the end of the book with a better reference list would have made all the difference, even at the expense of a few more pages.

Occasionally, inaccuracies lead to confusion. For example (p71) we read that 'New Zealand bellbirds and fairywrens also have territorial females that sing both solo and in duets with their mates, to defend their turf'. Fairywrens don't occur in New Zealand. On the same page, possible confusion could have been avoided by clarifying that the Rufous-and-white Wren is a member of the predominantly New World family of wrens.

Omissions also occur. Under the heading 'All's less fair when love is war' (pp116-7) the author does not explain forced copulations in ducks generally, instead concentrating on the frequently observed large groups of males chasing a solitary female in semi-wild Mallards. The description of the exceptionally elongated and twisted pseudopenis of stifftail ducks deserves a fuller explanation. All ducks, geese and swans have a distinct pseudopenis along with the ratites, screamers and cracids.

I was pleased to see mention of the tangerine scent present in Crested Auklets at the start of their breeding season, but was disappointed not to find more said about the reliance of birds on their sense of smell generally. Long overlooked as non-existent, this sense is now known to be important in many species for locating sources of food and for individual identification.

Nevertheless, many aspects of bird behaviour are well described. The evolutionary tree of eggs and nests from dinosaurs to modern-day passerines is neatly shown in a diagram (p131); the process of 'kidnapping' in Southern Pied Babblers is well illustrated in another diagram, and a map illustrates the spread of Silvereyes from Australia to New Zealand and Norfolk island since the 1830s (pp. 66-67). Using this map, the author tells us that song becomes degraded during colony foundation, followed by an increasing level of complexity as the population becomes established. Bird vocalisation, however, is not well covered, despite this being an exciting and rapidly expanding field of avian behavioural research.

Destroying the nests of potential hosts is not exclusively found in cowbirds, as the author implies (p167); farming is an important strategy found widely among cuckoos. Similarly, Kirtland's Warbler was certainly near to extinction because of habitat loss. Although removing the threat of Brown-headed Cowbird parasitism remains important, it is the strict management of a particular condition in Jack Pine forest regeneration that is the key to breeding success, and efforts are now also directed towards protecting the species in The Bahamas and nearby islands where it overwinters.

I have a few other quibbles. I should have thought the bizarre 'Michael Jackson moonwalk' performance of displaying Red-capped Manakin deserved a mention on p96, as well as the uncanny performance of the Club-winged Manakin involving a complex sound-making mechanism in the wings. But neither were. Cisticolas also occur in Australia (p. 170); the Black Robin was confined to one island when rescued from imminent extinction (p184); the Vampire Finch mentioned on p27 is the Vampire Ground Finch of the Galapagos, where it is restricted to two islands and, occasionally, in extremely dry conditions, resorts to feeding on blood from Nazca and Blue-footed Boobies. We might reasonably expect that the Australian Apostle-bird and the White-winged Chough would rate a mention among cooperative breeders. Furthermore, it's a pity that the unique brood parasitism of Black-headed Ducks (p162) is not further discussed to open the subject of dump nesting by other waterfowl.

The sections on geolocators and data-loggers (p206) are superficial with no clear explanation of how these remarkable devices actually work. Some inaccuracies: in a good season, Red Knot (p212) greatly exceed, not 'regain half', their initial weight during their migration refuelling stopover in Delaware Bay. What exactly does 'Doppler radar data allows scientists to reconstruct past migration' (p212) mean? It's good to see a section on Big Bird Data which importantly includes recognition of citizen science and how it is spectacularly contributing to a better understanding of the world of birds.

This book will appeal mainly to the non-specialist reader. It's an easy read. However, the keen bird-watcher wanting to learn more about bird behaviour would benefit from references to explore further the large number of interesting ideas and interpretations scattered throughout this book. The more inquisitive will be frustrated. It's a Christmas stocking filler.

Canberra Bird Notes 45(3) (2020): 336

RARITIES PANEL NEWS

A modest list again. A Northern Shoveler was observed again at Kellys Swamp by several birders and was seen to attempt to mate with a local species. If it is the same bird as was recorded last September, one can but speculate where it has been in the interim.

The Sooty Owl was noted during survey work in Tallaganda, a likely location for the species, and the Red-chested Button-quail in suitable rural habitat.

No sooner than the Panel has instated the Little Lorikeet and Brush Bronzewing on the "unusuals" list, both are observed – hopefully a positive sign for the future.

The Panel has updated its list of "unusuals" for which an endorsed report is required before the record is published in a COG publication.

ENDORSED LIST 97, NOVEMBER 2020

Northern Shoveler *Spatula clypeata*
1; 19 Jul 20; Alastair Smith; Kellys Swamp

Brush Bronzewing *Phaps elegans*
1; 8 Sep 20; Greg Wood; Warks Rd

Red-chested Button-quail *Turnix pyrrhothorax*
1; 5 0ct 20; Michael Lenz; Nelanglo (TSR 48)

Sooty Owl *Tyto tenebricosa*
1; 6 Oct 20; Mark Allen; Sharewater, Tallaganda

Little Lorikeet *Glossopsitta pusilla*
1; 4 Nov 20; Liam Manderson; Jackie Howe Cres, Macarthur

Singing Honeyeater *Gavicalis virescens*
1; 22 Sep 20; Michael Lenz; Franklin Pond

Spiny-cheeked Honeyeater *Acanthagenys rufogularis*
1; 27 Sep 20; Luke Downey; Palerang

Black-faced Monarch *Monarcha melanopsis*
1; 20 Sep 20; COG outing; Molonglo Gorge

Canberra Bird Notes 45(3): 337-338

CANBERRA ORNITHOLOGISTS GROUP

UNUSUAL BIRDS IN THE ACT – 2020 update

The following is the list of 'unusual birds' in the ACT compiled by the COG Rarities Panel.

Common name	**Scientific name**	**Notes**
Northern Shoveler	*Anas clypeata*	
Brush Bronzewing	*Phaps elegans*	
Diamond Dove	*Geopelia cuneata*	Reporting not required for "Bibaringa"
Bar-shouldered Dove	*Geopelia humeralis*	
Brown-capped Emerald Dove	*Chalcophaps longirostris*	
White-throated Nightjar	*Eurostopodus mystacalis*	
Spotted Nightjar	*Eurostopodus argus*	
Black-eared Cuckoo	*Chalcites osculans*	
Black Bittern	*Ixobrychus flavicollis*	
Bush Stone-curlew	*Burhinus grallarius*	Reporting not required for Mulligans Flat and Goorooyarroo
Banded Lapwing	*Vanellus tricolor*	Reporting not required for COG AoI outside ACT
Australian Painted-snipe	*Rostratula australis*	
Common Sandpiper	*Actitis hypoleucos*	
Little Buttonquail	*Turnix velox*	Reporting not required for TSR 48
Powerful Owl	*Ninox strenua*	
Barking Owl	*Ninox connivens*	
Osprey	*Pandion haliaetus*	
Square-tailed Kite	*Lophoictinia isura*	
Turquoise Parrot	*Neophema pulchella*	
Little Lorikeet	*Glossopsitta pusilla*	
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	
White-cheeked Honeyeater	*Phylidonyris niger*	Reporting not required for JWNR
Blue-faced Honeyeater	*Entomyzon cyanotis*	
Black-chinned Honeyeater	*Melithreptus gularis*	
Pied Honeyeater	*Certhionyx variegatus*	
Black Honeyeater	*Sugamel niger*	
Crimson Chat	*Epthianura tricolor*	
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	
Little Wattlebird	*Anthochaera chrysoptera*	
Regent Honeyeater	*Anthochaera phrygia*	

Singing Honeyeater	*Lichenostomus virescens*	
Yellow-plumed Honeyeater	*Ptilotula ornata*	
White-fronted Honeyeater	*Purnella albifrons*	
Grey-crowned Babbler	*Pomatostomus temporalis*	
Australasian Figbird	*Sphecotheres vieilloti*	
Black-faced Monarch	*Monarcha melanopsis*	Reporting not required for Tallaganda
Apostlebird	*Struthidae cinerea*	
Pink Robin	*Petroica rodinogaster*	
Tawny Grassbird	*Megalurus timoriensis*	
Red-whiskered Bulbul	*Pycnonotus jocosus*	

CONSIDERATIONS FOR LISTING ON THE 'UNUSUAL BIRDS' LIST

In compiling this list, the COG Rarities Panel considered records only from the previous 10 years. This list primarily contains species for which there have been fewer than 10 endorsed records of clearly separate individuals or groups over this time. Where a bird or group of birds has been seen in roughly the same location for an extended period that has been counted as a single occurrence.

This list is selective - there are many additional species which might be considered 'rare' on any number of grounds, including those that occur naturally in very low numbers. Included on the list are relatively rare species that present identification challenges, such as the female Black Honeyeater, and the Pink Robin. The Panel has excluded from this list species rare in the ACT that are particularly easy to identify, such as the Red-necked Avocet and Bell Miner. Nor has the plethora of possible shorebirds which might appear at Jerrabomberra Wetlands NR been included, though unusual bird reports are encouraged for all but the Sharp-tailed Sandpiper.

This list self-evidently excludes species not yet recorded in the ACT or COG's AoI but which might turn up at some time in the future: an unusual bird report is required for any bird that does not appear in the most recent COG annual bird report or on the list of ACT birds on the COG website. Clarification can be sought from rarities@canberrabirds.org.au if in doubt.

The Panel has included in the list one species whose continued existence might be threatened by the January 2020 fires – the Brush Bronzewing. It has also included for the first time the Little Lorikeet. To keep the list of 'unusual' species to a reasonable length, birds that have not been recorded in over ten years have been excluded; should they reappear, of course, an unusual bird report would be required. Several other species have been dropped from earlier versions of the list as they are now being recorded more frequently, for example Pied Butcherbird, Musk Lorikeet, Red-backed Kingfisher and Azure Kingfisher.

REPORTING UNUSUAL BIRDS

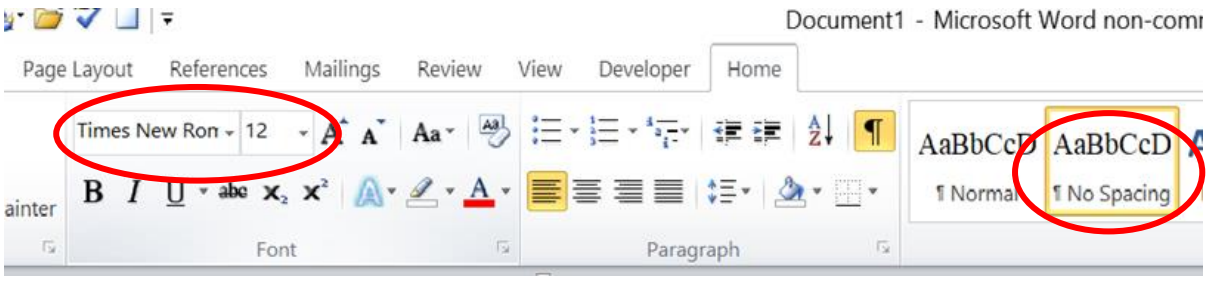
An unusual bird report must be completed for the species here mentioned, then provided to and endorsed by the COG Rarities Panel before the record will be published as an accepted record in any formal COG publication. A form is available on the COG website for this purpose (canberrabirds.org.au/observing-birds/frequently-asked-questions/unusual-birds/). The Panel will also accept as a report an eBird record with a full description of the observation. It particularly welcomes photos or sound recordings in support of the observation.

Canberra Bird Notes

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

CBN@canberrabirds.org.au or michael.lenz.birds@gmail.com

Please submit contributions in *Times New Roman, with 12-point Font Size and 'No Spacing'* (see illustration below):



Please note that the views expressed in the articles published in *Canberra Bird Notes* are those of the authors. They do not necessarily represent the views of the Canberra Ornithologists Group. Responses to the views expressed in CBN articles are always welcome and will be considered for publication as letters to the editor.

Note to contributors regarding copyright and dissemination of contents
Copyright in the contents of *CBN* is retained by the individual contributors, not by the publisher, the Canberra Ornithologists Group, Inc. (COG). COG publishes *CBN* in digital formats, including as pdf files at COG's website, as well as in the printed format.

In addition, COG has entered into an agreement with the firm EBSCO Information Services for them to include *CBN* in their international online journals database Academic Search Ultimate. Information on this database is available online at https://www.ebscohost.com/academic/academic-search-ultimate. This means that the contents of *CBN* are indexed by EBSCO Information Services and included in the databases that they make available to libraries and others, providing increased exposure of its contents to Australian and international readers. Contributors of material published in *CBN* are requested to provide written permission for their contributions to be indexed by EBSCO Information Services.

We refer to 'contributors' rather than 'authors' as sometimes we publish photographs, as well as written content.

Contents continued from outside back cover

Columnist's Corner

Book Reviews

CANBERRA BIRD NOTES 45(3) DECEMBER 2020

Articles

Notes

Contents continued on inside back cover

Printed November 2020