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ARTICLES

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A FAKE BUSH CAPITAL? BIRD SPECIES LOCAL EXTINCTIONS IN BLACK MOUNTAIN NATURE RESERVE AND ASSOCIATED NATURAL AND SEMI-NATURAL FRAGMENTS

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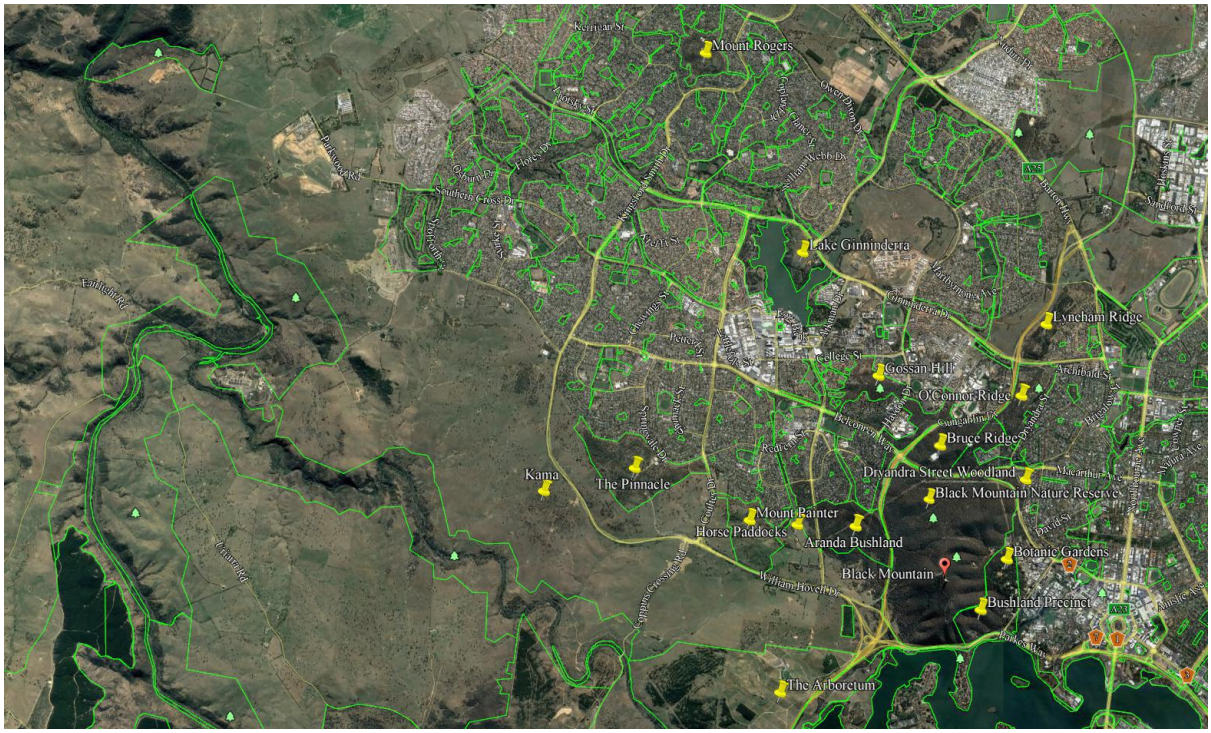
Abstract: *Fennell (2018) discussed several woodland bird species that were locally extinct in Black Mountain Nature Reserve by 2016. The hypothesis of this study is that since 2016, six additional species have become locally extinct in Black Mountain. The study species are Painted Button-quail* (Turnix varius)*, Brown-headed Honeyeater* (Melithreptus brevirostris)*, Speckled Warbler* (Pyrrholaemus sagittatus)*, Scarlet Robin* (Petroica boodang)*, Varied Sittella* (Daphoenositta chrysoptera)*, and Grey Currawong* (Strepera versicolor)*. Including Black Mountain, the study area covers 16 natural and semi-natural fragments (see Map 1, Table 1). 96 surveys were conducted in a subset of 8 of the 16 fragments. The 8 survey areas are the Arboretum, Aranda Bushland, Black Mountain, Bushland Precinct, Bruce Ridge, Gossan Hill, Lyneham Ridge and O'Connor Ridge. eBird data was harvested to identify the latest records for each study species in each of the 16 fragments. Population estimates and status ratings are given for each study species in each of the 8 survey areas and, combined with eBird records, status ratings are given for each species in the 16 fragments. The hypothesis is not supported. None of the study species became locally extinct in Black Mountain by end February 2021. However, for the 16 fragments there are clear patterns of range reduction, reductions in status from present, though vagrant to locally extinct, and very low populations. This demonstrates that current populations in the 8 survey study areas are unsustainable and that, unless things change for the better, more local extinctions are inevitable. The study species need connection with regional populations to survive. Connectivity via the western axis – the Horse Paddocks, Mount Painter, the Pinnacle and Kama is critical to the persistence of the study species in Black Mountain as well as in the other fragments. Fragment size is a significant variable in determining species survival.*

Connectivity between fragments and fragment size in the Molonglo Valley west to the Murrumbidgee River Valley must be given priority in urban planning. Current management resources are inadequate.

1. Background

The Proceedings of the Black Mountain Symposium (Friends of Black Mountain, 2018) constitute a valuable set of papers which provide comprehensive biophysical data and analyses. Pressures on the biota are described in detail.

The robustness of connectivity with regional populations is best understood in the context of pressures identified in various Symposium papers. This study arises in part from a suggestion by Fennell (2018) in his Symposium paper.



Map 1. Natural and modified fragments in Canberra's inner north-west.

Historical disturbance in the fragments was extensive and in places intensive. Current disturbance (climate change, feral animals, weeds, domestic animals, overgrazing by macropods, fire regimes and human uses) is general.

Across the fragments a land banking approach has resulted in land use being progressively transferred from biodiversity values to the built environment. The high edge-to-area ratios of some of the fragments reflect land use planning and design compromises that are inherently destructive of biodiversity values, especially taking into consideration human pressures along the edges and the inevitable measures taken inside the fragments to reduce fire risk to people and property outside the fragments.

The following events are highly likely to have had a recent negative impact on the populations of some of the study species. There were major regional fires in 2019-20. There was a record high December temperature in Canberra in 2019 and world-record levels of toxic smoke in late 2019. A severe drought broke only in early 2020. By the end of the drought herbivores had eaten out the grassy areas in places to bare soil. A severe hailstorm in early 2020 stripped a large segment of Aranda Bushland and Black Mountain of their canopy leaves and smaller twigs, and generated a mat of coarse and tangled litter. 2020 was wetter than average, as were the first months of 2021. Covid triggered a very large increase in human pressures in many of the fragments in the first half of 2020.

The Molonglo Valley to the south and west of the fragments is being suburbanized to host a population of 51,400 by 2041.

Local extinctions from Black Mountain commenced in the 1820's with grazing and clearing. The first wave is undocumented and is inferred from adjacent areas. The exact species can only be guessed at. An example would be the Regent Honeyeater (*Anthochaera phrygia*)

which was recorded as being common at times just a few kilometres upstream along the Molonglo River from Black Mountain.

Based on Fennell's work, the following woodland species became locally extinct in Black Mountain between 1964 and 2016: Brown Treecreeper (*Climacteris picumnus*), Spotted Quail-thrush (*Cinclosoma punctatum*), Crested Shrike-tit (*Falcunculus frontatus*), Restless Flycatcher (*Myiagra inquieta*) and Hooded Robin (*Melanodryas cucullata*). The same set of species has also largely disappeared from other Canberra Nature Parks.

The latest Annual Bird Report for the ACT and COG Area of Interest (Fennell ed 2020) gives the status of the six study species for the period 2018/2019 as follows:

- Painted Button-quail: There were only three records.
- Brown-headed Honeyeater: The reporting rate was at the lowest level ever.
- Speckled Warbler: The reporting rate was at the lowest ever.
- Scarlet Robin: Both the abundance and the reporting rates were at the lowest level since records began.
- Varied Sittella: The reporting rate was low and continuing its decline since 1988.
- Grey Currawong: The reporting rate has undergone a long, gradual decline since 1991.

2. Methods

The six study species were chosen to reflect a range of autecologies taking into particular account potential variations in connectivity with their regional populations. Nomenclature follows COG as at 2017.

There were 40 surveys in Black Mountain and 8 surveys in each of the remaining 7 survey areas. 10 Black Mountain surveys were carried out in each quarter. In general 2 surveys per quarter were carried out for the remaining survey areas. The surveys were conducted from April 2020 to February 2021 (the study period).

The surveys were carried out using the eBird traveling protocol. All individuals seen and heard were recorded. The duration was usually around 2-3 hours per survey but some surveys were shorter. Most surveys included at least an hour of observations before 10 am. It was aimed to achieve cumulative comprehensive geographical coverage of all fragments. This was achieved except for the lower portions of several of the very steep valleys running south and south-west of Black Mountain.

The author estimates that he had previously spent well in excess of 2,000 hours in the fragments over the past 35 years, so knows both the study species and the study area well.

During the surveys, a running check was kept on what other observers were reporting in eBird. In terms of presence/absence, these checks tended to give confidence in the survey outcomes with two notable exceptions. The author had early difficulty finding the O'Connor Ridge Speckled Warblers reported by others. The author observed no Varied Sittellas in Aranda Bushland during the surveys despite their presence being reported by several other observers. The latter reports are included in the data and considered in the analysis.

The survey effort was skewed heavily to searching for the study species. One result is that many study species individuals were recorded multiple times. The population estimates are therefore regarded as being more accurate than derived reporting rates and abundance from the raw counts. Particular attention was given to only counting birds inside the reserve fence lines. Loud traffic noise inhibited observations in many locations of the fragments. The thicker growth towards the end of a wet La Niña year tended to skew records against ground level birds, including several study species, in the latter part of the survey period. Searches for Painted Button-quail platelets were conducted as a routine element of the surveys. Careful searches were made in all areas which Painted Button-quail are known to have frequented Each Arboretum survey covered the eucalypt plots in detail.

Data sources are limited to surveys carried out by the author and to publicly available eBird records. The closing date for data was the end of February 2021.

The study generated the following data for each study species for the 8 survey area subset of the Arboretum, Aranda Bushland, Black Mountain, Bruce Ridge, Bushland Precinct, Gossan Hill, Lyneham Ridge and O'Connor Ridge:

- presence in each survey area from April 2020 to February 2021.
- latest eBird record.
- total number of records per study species per survey area.
- total number of records per species for all survey areas combined.
- total number of individuals per study species per survey area.
- total number of individuals per species for all survey areas combined.

The study generated the following data for each study species in all 16 fragments:

- eBird records which show presence or absence. 'Presence' denotes an eBird record from April 2020 to February 2021.
- latest eBird record for each species in each fragment.

The purpose of the data is to enable populations to be estimated and status ratings to be made. Population estimates were made for each fragment taking into account repeat observations and considerations of time and space. 'Absent' = no survey or other eBird records at all; 'locally extinct' = recorded previously but no recent records and unlikely to return; 'vagrant' = isolated and irregular records; and, 'present' = likely to be recorded in a given year.
Population estimates and status are then applied to considerations of connectivity and fragment size.

3. The surveyed study sites

Aranda Bushland contains large areas of native woodland, pasture with paddock trees, and some old growth along a water course. A dense shrub layer is regenerating in some areas.

The Arboretum is a plantation of diverse, mostly exotic tree species. These lack an understorey. Relict bushland on the eastern and southern fringes of the cork oaks, a plot of short Acacia species, and a native garden plot add small areas of habitat variety. The extensive areas of grass are mown and dead trees and fallen branches are removed. Some plots consist of young exotic trees which give a structural aspect of scattered shrubs in grassland. The Arboretum will change considerably as a bird habitat while the trees mature.

Black Mountain was gazetted as a nature reserve in 1970. It is mainly hilly and covers about 435 hectares. The dominant vegetation types are dry sclerophyll forest and a lesser amount of grassy woodland. Black Mountain lies to the west of inner northern suburbs of Acton, Turner and O'Connor and to the east of the suburb of Aranda. Lake Burley Griffin has flooded its riparian bank connection with the Molonglo River. At its closest point it is about 2 km from the Civic Post Office. Black Mountain is girt by multi-lane and high speed urban highways.

Bruce Ridge is split by the Gungahlin Drive Extension. It is almost entirely native woodland. It hosts much urban infrastructure and many kilometres of management tracks and mountain bike trails.

Bushland Precinct is part of the Botanic Gardens. It is contiguous with Black Mountain and consists mainly of native woodland.

Gossan Hill contains native woodland, grassland, and areas of dense regenerating shrub layer. Much of its inner margin has the shrub layer removed to reduce fire risk. A fuel reduction burn some time before the surveys seems to have been a hot one. Accelerated tree death is a particularly conspicuous feature of this fragment.

Lyneham Ridge is a trial site of several eucalypt species to supply firewood. It contains little understorey. The margins on the eastern and western sides are grassland with occasional tangles of weedy patches. It contains a small patch of old growth woodland and several paddock trees.

O'Connor Ridge contains an extensive and poorly-rehabilitated rubbish dump. It hosts power pylons and extensive management tracks and trails. There is a small area of old growth with regrowth vegetation mainly fringing the western side of the rubbish dump. There are extensive areas of grassland.

4. General results

The survey recorded 15,915 individuals during 96 surveys in the 8 survey areas. For the 6 study species, there were 120 records for a total of 322 individuals counted in 7 of the 8 survey areas. The population estimates for the 8 survey areas are: Painted Button-quail 0, Brown-headed Honeyeater 18-21, Speckled Warbler 13-15, Scarlet Robin 13-14, Varied Sittella 16-24 and Grey Currawong 5.

None of the woodland species previously rated as locally extinct were sighted during the surveys.

4.1 Study species individual results

For each study species a brief description is provided. The focus is on factors affecting the likelihood that it would be observed during the surveys, and on any behaviours that bear on connectivity.

The data are tabulated. The data are used to generate a population estimate for each survey area as at the end of February 2021. The Scarlet Robin population is estimated at its autumn/winter peak.

Using the population estimates and the status ratings, issues of connectivity and fragment size are canvassed for each study species.

4.1.1. Painted Button-quail

This species appears to have the capacity to turn up at any time just about anywhere in Canberra, including suburban back yards. This may be a consequence of confusion during night landings. It is cryptic and can be difficult to locate, but its platelets often alert observers to its presence.

Table 1. Painted Button-quail records by fragment, by number of survey records, by number of survey individuals, by latest eBird record to end February 2021.

Fragment	No. records	No. individuals	Last eBird record	Observer
Aranda Bushland	0	0	No records	
Arboretum	0	0	No records	
Black Mountain	0	0	10/10/2020	D. Dedenczuk
Botanic Gardens			29/07/2011	Birdlife Aus.
Bruce Ridge	0	0	No records	
Bushland Precinct	0	0	No records	
Dryandra Street Woodland			No records	
Gossan Hill	0	0	No records	
Horse Paddocks			No records	
Kama			No records	
Lake Ginninderra			11/02/2011	M. Butterfield
Lyneham Ridge	0	0	No record	
Mount Painter			No records	
Mount Rogers			No records	
O'Connor Ridge	0	0	No records	
Pinnacle			1/12/2020	V. Rolland
Total	0	0		

It was not recorded in the study surveys (Table 1). There are records for 2020 in 2 of 16 fragments. The total population in the study areas as at the end of February 2021 is highly likely to have been 0.

The Painted Button-quail is rated as absent from the Arboretum, Aranda Bushland, Bruce Ridge, Bushland Precinct, Dryandra Street Woodland, Gossan Hill, the Horse Paddocks, Kama, Lyneham Ridge, Mount Painter, Mount Rogers and O'Connor Ridge. It is rated as locally extinct in the Botanic Gardens (2011) and Lake Ginninderra (2011). It is rated as vagrant in Black Mountain (2020) and the Pinnacle (2020).

Painted Button-quail are no longer able to maintain persistent populations in any of the fragments. The author was familiar with the Black Mountain population prior to 2005. The distribution of the many hundreds of platelets correlated strongly with deeper, older, finely granulated litter. This type of litter has disappeared following the changes in the fuel reduction burning regime which, in turn, was a response to the disastrous 2003 Canberra fires.
In terms of connectivity, there is a significant potential for odd birds to turn up sporadically in the future. This potential depends on regional populations. Any potential to re-establish lost populations in the fragments requires substantial changes to current management practices and resources.

4.1.2. Brown-headed Honeyeater

This is a relatively noisy species that is generally easy to observe. It was seen during the study flying above traffic height across multi-lane roads.

It was recorded during surveys in 6 of the 8 survey areas. There are records from April 2020 to February 2021 in 12 out of 16 fragments.

With 35 records for 108 individuals in the surveys (Table 2), the Brown-headed Honeyeater seems the most successful of the study species. However, many of the records are repeat observations. The population is estimated as follows. Aranda Bushland 1-2 groups, Black Mountain 2 groups, Bruce Ridge 1 group, Gossan Hill 1 group, O'Connor Ridge/Lyneham Ridge 1 group. This gives a range of 6-7 groups, and a total population for the study areas of 18-21 individuals. A breeding attempt during the study period in Black Mountain is likely to have failed.

The Brown-headed Honeyeater is absent from the Bushland Precinct, Dryandra Street Woodland and Mount Rogers. It is rated as locally extinct in the Arboretum (2015) and present in Aranda Bushland, Black Mountain, Botanic Gardens, Bruce Ridge, Gossan Hill, Horse Paddocks, Kama, Lake Ginninderra, Lyneham Ridge, Mount Painter, O'Connor Ridge, and the Pinnacle.

The lack of Arboretum records since 2015 is notable. C. Davey (*pers comm*.) who has also surveyed the Arboretum has noted the same general phenomenon. The Arboretum hosts a small number of single-age and single-species eucalypt patches. These might be presumed to be capable of hosting the Brown-headed Honeyeater but it has instead become locally extinct. Small numbers of Yellow-faced Honeyeaters have been recorded in the Arboretum eucalypt stands from time to time and the Brown-headed Honeyeater may be mobile enough to fly through the Arboretum but, as none has been recorded, the data tends strongly to demonstrate that this is not happening.

The author has visited the adjacent Zoo on numerous occasions and has not observed any of the six study species there.

While the causes are uncertain it is highly likely that, for the Brown-headed Honeyeater, the Arboretum is effectively both a habitat desert and a barrier to connectivity. This state of affairs is repeated for the Speckled Warbler, Varied Sittella and Grey Currawong.

Given the very low population of the Brown-headed Honeyeater, it is imperative that the current level of connectivity along the western axis is maintained, to enable it to persist in the fragments.

Table 2. Brown-headed Honeyeater records by fragment, by number of survey records, by number of survey individuals, by latest eBird record to end February 2021.

Fragment	No. records	No. individuals	Last eBird record	Observer
Aranda Bushland	6	26	25/02/2021	T. Willis
Arboretum	0	0	08/07/2015	R. Callaway
Black Mountain	22	62	4/02/2021	C. Boekel
Botanic Gardens			21/06/2020	R. Geraghty
Bruce Ridge	1	2	25/10/2020	C. Boekel
Bushland Precinct	0	0	No record	
Dryandra Street Woodland			No record	
Gossan Hill	1	4	12/04/2020	S. Rapley
Horse Paddocks			14/02/2021	S. Lashko
Kama			26/01/2021	N. Froelich
Lake Ginninderra			7/01/2021	R. Rehwinkel
Lyneham Ridge	1	4	14/01/2021	C. Boekel
Mount Painter			28/10/2020	A.&C. Drake
Mount Rogers			No record	
O'Connor Ridge	4	10	15/12/2020	C. Boekel
Pinnacle			26/11/2020	J. Brannan
Totals	35	108		

4.1.3. Speckled Warbler

The Speckled Warbler is sedentary when breeding but may move around, often with mixed feeding flocks, outside the breeding season. One Speckled Warbler is known to have crossed a multi-lane highway on at least one occasion during the study period.

It was recorded during surveys in 4 of 8 survey areas. There are records in 10 of 16 fragments (Table 3) from April 2020 to February 2021. One group, probably of two males

and a female, which was located in the south-west of Black Mountain at the start of the study period, is no longer being recorded there.

The population as at the end of February 2021 is estimated as follows. Aranda Bushland hosted 2-3 pairs, one of which included 2 independent young. Black Mountain hosted up to 2 single individuals. O'Connor Ridge hosted a pair with 2 young reaching independence in the year, plus another individual. The total population for the 8 study areas is estimated to be 13-15 individuals.

The Speckled Warbler is rated as absent in Dryandra Street Woodland. It is rated as locally extinct in Gossan Hill (2014), Lake Ginninderra (2016), and Mount Rogers (2017). It is rated as vagrant in the Arboretum (2021), Botanic Gardens (2019), Bruce Ridge (2020), Bushland Precinct (2020) and Lyneham Ridge (2019). It is rated as present in Aranda Bushland, Black Mountain, the Horse Paddocks, Kama and Mount Painter, the Pinnacle, and O'Connor Ridge.

Table 3. Speckled Warbler records by fragment, by number of survey records, by number of survey individuals, by latest ebird record to end February 2021.

Fragment	No. records	No. individuals	Last eBird record	Observer
Aranda Bushland	6	16	23/02/2021	C. Boekel
Arboretum	1	2	11/02/2021	C. Boekel
Black Mountain	9	10	13/12/2020	C. Boekel
Botanic Gardens			7/03/2019	J. Hassell
Bruce Ridge	0	0	2/06/2020	A. Roe
Bushland Precinct	0	0	13/10/2020	Christine D., S. Westlin
Dryandra Street Woodland			No records	
Gossan Hill	0	0	11/08/2014	P. Milburn
Horse Paddocks			21/05/2020	S. Lashko
Kama			19/06/2020	J. Robinson
Lake Ginninderra			15/05/2016	P. Milburn
Lyneham Ridge	0	0	15/08/2019	M. Lenz
Mount Painter			27/08/2020	S. Lashko
Mount Rogers			9/9/2017	T. Bonnet
O'Connor Ridge	6	14	23/01/2021	C. Boekel
Pinnacle			18/02/2021	L. Read
Totals	21	42		

A continuation of present trends will see the Speckled Warbler lost from the fragments.

Additional management resourcing would improve the Speckled Warbler's habitat potential in fragments such as Mount Rogers and O'Connor Ridge, both of which have significant weed problems.

4.1.4. Scarlet Robin

The Scarlet Robin is an autumn/winter migrant into the study area. Birds were often seen moving as singles or pairs with mixed feeding flocks. One pair took up a lengthy residence in the south-west corner of Black Mountain.

It was recorded during surveys in 5 of 8 survey areas. There are records for 13 of the 16 fragments (Table 4) from April 2020 to February 2021.

Table 4. Scarlet Robin records by fragment, by number of survey records, by number of survey individuals, by latest ebird record to end February 2021.

Fragment	No. records	No. individuals	Last eBird record	Observer
Aranda Bushland	1	1	5/07/2020	S. Lashko
Arboretum	1	2	5/08/2020	C. Boekel
Black Mountain	13	21	6/08/2020	C. Boekel
Botanic Gardens			3/08/2020	S. Holliday
Bruce Ridge	1	1	16/05/2020	C. Boekel
Bushland Precinct	0	0	11/07/2020	C. Boekel
Dryandra Street Woodland			No record	
Gossan Hill	0	0	5/07/2020	R. Rehwinkel
Horse Paddocks			21/05/2020	S. Lashko
Kama			8/06/2020	C. Davey
Lake Ginninderra			14/06/2019	Christine D.
Lyneham Ridge	0	0	6/02/2021	N. Froelich
Mount Painter			29/7/2020	S. Playford
Mount Rogers			25/05/2017	T. Bonnet
O'Connor Ridge	2	4	14/07/2020	J. Brown
Pinnacle			3/08/2020	P. Higgins
Totals	18	28		

The population is difficult to estimate because birds were mobile and were only rarely observed in the same place twice. The population is estimated as follows. Aranda Bushland 1-2 birds, Arboretum 1 bird, Black Mountain 6 birds, Bruce Ridge 1 bird, the Bushland

Precinct 2 birds and O'Connor Ridge 2 birds, bringing the total number of individuals in the survey areas in winter 2020 to 13-14.

Connectivity does not appear to be an issue. Survival in the fragments depends on sustaining regional populations.

4.1.5. Varied Sittella

An easily heard species which was observed moving above traffic height across multi-lane roads during the study.

It was recorded during surveys in 6 of the 8 survey areas. There are records for 10 of the 16 fragments (Table 5) from April 2020 to February 2021.

Table 5 Varied Sittella records by fragment, by number of survey records, by number of survey individuals, by latest eBird record to end February 2021.

Fragment	No. records	No. individuals	Last eBird record	Observer
Aranda Bushland	0	0	13/12/2020	P. Higgins
Arboretum	0	0	No records	
Black Mountain	15	56	19/12/2021	C. Boekel
Botanic Gardens			27/6/2020	R. Geraghty
Bruce Ridge	3	9	9/01/2021	C. Boekel
Bushland Precinct	2	7	10/10/2020	C. Boekel
Dryandra Street Woodland			No records	
Gossan Hill	2	5	11/09/2020	R. Rehwinkel
Horse Paddocks			31/01/2016	A.&C. Drake
Kama			2601/2021	N. Froelich
Lake Ginninderra			14/06/2019	Christine D.
Lyneham Ridge	0	0	No records	
Mount Painter			28/06/2020	D. Montes
Mount Rogers			No record	
O'Connor Ridge	1	5	15/12/2020	C. Boekel
Pinnacle			3/02/2021	D. Baldwin
Totals	23	82		

The population estimate is as follows. The Black Mountain/Bushland Precinct complex hosted 2-3 groups. Aranda Bushland hosted 1 group. Bruce Ridge hosted 1 group. Gossan

Hill sometimes hosts a group which also uses nearby sections/parts of adjacent habitat. Total population of individuals in the study areas is estimated to be 16-24 individuals.
The Varied Sittella is rated as absent from the Arboretum, Dryandra Street Woodland, Lyneham Ridge and Mount Rogers. It is locally extinct in the Horse Paddocks (2016) and vagrant in Lake Ginninderra (2019). It is present in Aranda Bushland, Black Mountain, Botanic Gardens, Bushland Precinct, Bruce Ridge, Gossan Hill, Kama, Mount Painter, O'Connor Ridge and the Pinnacle.

In terms of connectivity to the south, the Arboretum appears to be a barrier and a habitat desert for this species. The species appears to be unable to reach Mount Rogers to the north. It is absent from Lyneham Ridge. With the exception of the Horse Paddocks, there are recent records along the western axis from Mount Painter through the Pinnacle to Kama.

The Varied Sittella may be subject to mobility and/or habitat constraints that are unknown. For example, the Arboretum may lack the vertical dead branches with forks which are preferred nest sites. Four fragments have no records at all. Among these, the Arboretum and Lyneham Ridge eucalypts are largely exotic to the region. There are gaps between eucalypt patches in the Arboretum. Dryandra Street Woodland's area is only 15 hectares. Mount Rogers is not only isolated by suburbia but also contains only a limited area of original vegetation. The habitat corridors into Mount Rogers are narrow and contain little habitat. Taken together these support the view that Varied Sittellas need both good connectivity and a larger area of native eucalypt vegetation than some fragments contain. Corridors need to be wide and to contain suitable habitat.

The continued presence of this species in at least some of the fragments depends at least on maintaining the current connectivity to the west, as well as reserving fragments of appropriate size.

4.1.6. Grey Currawong

Grey Currawongs were observed repeatedly flying high over multi-lane highways. They are conspicuous in flight, can be easy to hear from long distances, but may be difficult to observe when feeding quietly on the ground. The Grey Currawong is sometimes recorded within urbanized areas.

It was recorded during surveys in 2 out of the 8 survey areas. There are records in 6 of the 16 fragments (Table 6) from April 2020 to February 2021. The population estimate is as follows. Aranda Bushland hosted 1 pair. Black Mountain hosted 1 pair plus a young of the year. The total population for the 8 study areas is estimated to be 5 individuals. It bred successfully in Black Mountain during the study period.

The Grey Currawong is rated as absent from Dryandra Street Woodland and from Kama. It is rated as locally extinct in Lake Ginninderra (2016), Lyneham Ridge (2016) and O'Connor Ridge (2016). It is rated as vagrant in the Arboretum (2020), the Bushland Precinct (2021), Bruce Ridge (2019), and Gossan Hill (2019). It is rated as present in Aranda Bushland, Black Mountain and the Pinnacle.

The Grey Currawong appears to have withdrawn to a core of suitable habitat in the two largest fragments: Aranda Bushland and Black Mountain. These pairs may also be using habitat fragments in the Glenloch Interchange and Lake Burley Griffin foreshores.

The bird is a powerful flyer, has extensive territories, and will move through or over suburbia. Therefore connectivity for this species ought not to be a significant survival consideration. The best connectivity prospect, along the western axis, has most recent records as follows: the Horse Paddocks (2019), Mt Painter (2017), the Pinnacle (2018) and Kama (no records).

The withdrawal of this species from some fragments therefore probably relates to a decline in the availability of suitable habitat in the fragments, combined with an intensification of urban pressures. The fuel-reduction regime is probably a factor for a species that feeds much of the time on the ground.

A continuation of present trends will see the Grey Currawong become locally extinct in all the fragments.

Table 6. Grey Currawong-records by fragment, by number of survey records, by number of survey individuals, by latest eBird record to end February 2021.

Fragment	No of records	No of individuals	Latest eBird record	Observer
Aranda Bushland	7	11	23/02/2021	C. Boekel
Arboretum	0	0	12/08/2020	Anon.
Black Mountain	16	27	19/02/2021	D. Dedenczuk
Botanic Gardens			23/07/2020	J. Robinson
Bruce Ridge	0	0	28/01/2019	D. Baldwin
Bushland Precinct	0	0	21/02/2021	C. Boekel
Dryandra Street Woodland			No record	
Gossan Hill	0	0	21/12/2019	C. Davey
Horse Paddocks			27/10/2019	A.&C. Drake,
Kama			No record	
Lake Ginninderra			10/07/2018	M. Butterfield
Lyneham Ridge	0	0	21/0/2016	J.Brown
Mount Painter			26/11/2017	S. Holliday
Mount Rogers			5/01/2016	Anon.
O'Connor Ridge	0	0	27/11/2016	P. Cannon
Pinnacle			1/12/2020	V. Rolland
Totals	23	38		

5. Discussion

The population of each of the study species in the 16 fragments is too low to be sustainable. Ratings of locally extinct and vagrant are common and are increasing. There are many ratings of 'absent' from the fragments. Even when rated as 'present' in a fragment, the

rating might depend on a single bird. Distribution across the fragments is limited for most of the study species, and is contracting for some of the study species.

Pressures on Black Mountain's avifauna and other biodiversity elements were analysed extensively in the 2018 Symposium papers. There was particular concern about the fuel-reduction regime. The impact on the litter layer has probably had deleterious impacts on the populations of the ground-feeding Painted Button-quail, Speckled Warbler, Scarlet Robin and Grey Currawong.

Suburbanization of the Molonglo Valley will bring with it an increase in human pressures. It also presents a major additional potential threat to connectivity.

While fragment size was not factored into the study design, there is very strong incidental evidence that fragment size matters significantly for the survival of the study species in the fragments. The author spent hundreds of hours in Dryandra Street Woodland during 2020 and early 2021. At 15ha, Dryandra Street Woodland is the smallest discrete fragment. Only a single individual of the 6 study species was recorded during that time. Mount Rogers is much altered and has only limited suitable habitat for the study species. It entirely lacks several of the study species. The reduction in size of the residual fragments of the original Lake Ginninderra natural areas by urbanization appears to be having a significant impact on the persistence of several of the study species there. The smaller, separate part of Bruce Ridge west of the Gungahlin Drive Extension delivered only a single survey record of Varied Sittella and no records of the other 5 study species during the surveys. Study species records for Lyneham Ridge, another of the smaller fragments, were very low. The pattern is clear. Fragment size matters significantly.

The situation with connectivity varies by species. Two species, the Painted Button-quail and the Scarlet Robin, are likely to keep turning up in at least some of the fragments occasionally. This depends almost entirely on their regional populations. Connectivity for the remaining four study species varies but is generally precarious.

The urbanized areas to the east of the fragments and the water barrier of Lake Burley Griffin are considered to be effective connectivity barriers for these species. This leaves four possible connectivity axes through the fragments. The north-western axis consists of Bruce Ridge, Gossan Hill, Lake Ginninderra and Mount Rogers. The survey data for Gossan Hill, the last eBird record data, and the pattern of attrition demonstrate that this axis increasingly lacks either the capacity to maintain populations or to provide connectivity.

The northern axis, Bruce Ridge through O'Connor Ridge to Lyneham Ridge is weak in terms of connectivity. For the terminal fragment, Lyneham Ridge, there were no records of Speckled Warbler, Varied Sittella or Grey Currawong and only one record of Brown-headed honeyeater in the survey records.

The south-western axis, the Arboretum, is an effective barrier to connectivity. There was an almost complete lack of records of all 6 study species during the surveys. There is a prospect of improving connectivity through parcels adjacent to the Arboretum as the Molonglo valley land uses are allocated. Small changes to the management of the Arboretum would better support struggling woodland bird species. For example, the small line of shrubs along the northern margin of the Fig plantation hosted Southern White-face (*Aphelocephala leucopsis*) for many months during the survey period. The single Speckled

Warbler sighting was made in the same area. A single line of eucalypts could successfully link the eucalypt patches while occasional patches of shrubby understorey would make a significant difference. The objective would be to re-create effective connectivity between Black Mountain, Aranda Bushland and the Molonglo River corridor.

This leaves the western axis: Aranda Bushland, the Horse Paddocks, Mount Painter, the Pinnacle and Kama and, beyond these, further through the Molonglo Valley to the Murrumbidgee Valley. Of all the connectivity axes, this appears to form the critical connection to wider regional populations for most of the study species.

To maintain connectivity along the western axis in the face of adjacent suburbanization requires wide corridors. Narrow corridors such as those radiating from Mount Rogers are not currently delivering connectivity. It is important to consider the dynamics of corridors set in urbanized surrounds. Rather than being undisturbed channels for biodiversity movement, existing corridors have become the focal point for all sorts of disturbance. Children gather wood to build numerous tepees. Typically, existing corridors, such as those radiating from Gossan Hill and from Mt Rogers, are channels for human and domestic animal movement as well for recreation. This will undoubtedly happen to future corridors. In judging effective corridor width it is critical to bear in mind that the corridors will inevitably be managed to give priority to safety for adjacent persons and property. The corridors will be burned, cleared of shrubs and mowed for fire control as required. If the regulatory fire management zones are inside the corridors then the biodiversity values of the corridors are automatically severely compromised *by design*. The corridors cannot simply be conceived of as treetop flyways. They need to contain sufficient habitat. Further, the corridors need to link large fragments to deliver connectivity

Detailed planning for connectivity through the western axis should strongly be informed by Barrett and Love (2012). They report that most small bird species cannot disperse when gaps between appropriate fragments or paddock trees are greater than 100 m. Regardless of the intermediate stepping stones, substantial habitat fragments need to be closer than about 1100 m apart. It is highly likely that cobbling together already tenuous pathways between existing fragments will not be sufficient in the face of additional pressures from 51,000 people. Regeneration work to firm up habitat values will be required.

There is one final and important note in the context of multiple local extinctions. Despite highly sophisticated management strategies and the best efforts of staff and volunteers, management resources across the 16 fragments are patently inadequate. Just two of many possible examples of the actual loss of habitat for want of resources will demonstrate this. Many hectares of potential habitat for the study species in the centre of O'Connor Ridge are dominated by weeds. Shrub layer plantings along the margins of Lyneham Ridge would significantly boost habitat potential for some of the study species.

6. Conclusion

The idyllic 'Bush Capital' title hides a dark reality of very low populations, range reductions, and continuing local extinctions among woodland bird species.

The trend in the study fragments is beyond doubt. There have been many local extinctions and there are more to come.

Poorly contained urban pressures are progressively eliminating woodland species from urban reserves. Declining regional populations are reducing the recruitment pool for the survey species in the fragments. The small size of some fragments is a significant factor as is the distance between the fragments. Apart from the western axis, connectivity in other directions is poor to non-existent. Connectivity thought the Arboretum could be significantly improved through minor management changes.

Urbanization involving some 51,000 additional people in the Molonglo Valley represents a massive increase in urban pressure. Critically, it represents an additional threat to the connectivity between the inner north-western woodland birds and their regional populations.

If the Bush Capital is to live up to its name, connectivity and fragment size in the Molonglo Valley west to the Murrumbidgee River must be given priority in land-use planning. Resources to manage existing and new urbanization pressures must be increased.

Acknowledgements

My partner in most of the surveys was Trish Boekel. Many of the observations are results of her keen eye and ear. Typically, each survey involved a smoko where we sat on a log somewhere in one of the fragments and discussed many of the issues canvassed in this paper. Thank you, Trish.

Numerous eBird contributors provided data used in the Study. The contributors are named in the tables. Michael Mulvaney helped inform my thinking about connectivity in particular. Chris Davey, Michael Lenz and Kevin Windle provided many useful suggestions to drafts of the paper.

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Appendix 1. Conventions used to name locations in the text.

Records are located as defined in eBird hotspot and personal sites.
Aranda Bushland = Includes Aranda Bushland Nature Reserve, Aranda West, and Snow Gums Nature Reserve
Arboretum = The National Arboretum including the Cork Oak Plantation
Black Mountain = Black Mountain Nature Reserve
Botanic Gardens = Australian National Botanic Gardens excluding the Bushland Precinct.
Bruce Ridge = Bruce Ridge Nature Reserve. The study surveys included the fragment west of the Gungahlin Drive Extension.
Bushland Precinct = Bushland Precinct of the Botanic Gardens
Dryandra Street Woodland = Dryandra Street Woodland
Fragment = any of the discrete natural or semi-natural areas listed in the species tables
Gossan Hill = Gossan Hill Nature Reserve
Horse Paddocks = Cook Horse Paddocks
Kama = Kama Nature Reserve
Lake Ginninderra = all eBird locations, for example Diddams Close and Lake Ginninderra Reach, that abut the shores of Lake Ginninderra
Lyneham Ridge = Lyneham Ridge and ebird location ‘North Lyneham Ridge’. The Study surveys covered the plantation area but not the grassland paddock to the north. Other eBird records possibly include both.
Mount Painter = Mount Painter Nature Reserve.
The Pinnacle = Pinnacle Nature Reserve and any eBird locations within the reserve
Mount Rogers = Mount Rogers Nature Reserve
O’Connor Ridge = O’Connor Ridge Nature Reserve
Survey area = any of the fragments wherein study surveys were carried out.

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KOOKABURRA SITS IN THE NEW GUMTREE: LAUGHING KOOKABURRA (*DACELO NOVAEGUINEAE*) BREEDING HABITAT IN SUBURBAN BELCONNEN

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Abstract: *North-western Belconnen's suburbs were established in the early 1970s on former grazing lands. Previous clearing had removed all Laughing Kookaburra nesting habitat from the floodplains and lower slopes. About 200 hollow remnant eucalypts on higher ground were retained in the new suburbs – mostly within Urban Open Space. 20 – 30 hollows were suitable for kookaburra nesting. For two decades, the presence of suitable, reliable nest sites among the hollow remnant eucalypts, and the increasing extent, diversity and productivity of foraging habitat in the developing Urban Forest of planted native trees and shrubs, sustained an urban breeding kookaburra population, and allowed the establishment and maintenance of strong, stable family groups. Since the mid-1990s, evidence of breeding failure has become more common than that of success, strong family groups are rare, and the long-term viability of the breeding population is not assured. The availability of nest hollows in remnant eucalypts continues to decline through natural attrition, tree removal and lopping, and increased competition from other hollow-nesting species – particularly Common Mynas. In our study area, where remnant eucalypts are absent, some useful hollows have formed in exotic softwood trees in Urban Open Space through the combined actions of fungal decay and chewing by cockatoos, but these hollows provide only short-term nesting opportunities before ongoing decay causes collapse of the host tree. Despite the lack of suitable, reliable nest sites, a pair of kookaburras has maintained a territory in our study area for the past seven years, and has regularly attempted to breed there. They have nested successfully only once in the first six years of the study - in a hollow exotic poplar. Recently, they have explored some unsuitable artificial cavities, risking possible injury or death to themselves or to nestlings. This led us to commence a trial of a dedicated kookaburra nestbox in a private garden within their territory. By strategic management of the nestbox, including exclusion of competitor species, our aim is to provide them a safe, reliable, long-term nesting option to enable them to reach their breeding potential in an otherwise suitable habitat. In the first breeding season of the trial, the kookaburras successfully produced two fledglings from the nestbox.*

1. Introduction

The Laughing Kookaburra (*Dacelo novaeguineae*) is an icon of the Australian bush. It is commonly associated with native eucalypt forests and woodlands (where it may be an important indicator of woodland health), but it is also remarkable for its ability to adapt to human-modified habitats including farmland, parklands and suburbia (Legge 2004).

Kookaburras are sedentary and territorial all year round, and they are obligate cavity-nesters (Legge 2004). Their territories, therefore, must produce a supply of suitable prey (predominantly arthropods and small reptiles) throughout the year, and provide elevated perches from which kookaburras can hunt, using their 'sit-and-wait' technique. More fundamentally, their territories must also include at least one naturally-occurring tree hollow, or some other suitable natural or artificial cavity, if they are to reproduce. Nest hollows must be large, aligned more or less horizontally, with the floor not far below the entrance lip to enable kookaburras to shuffle in and out on their weak ineffectual feet (Legge 2004). Such hollows are likely to occur only in very old trees.

2. Kookaburra breeding habitat in Canberra

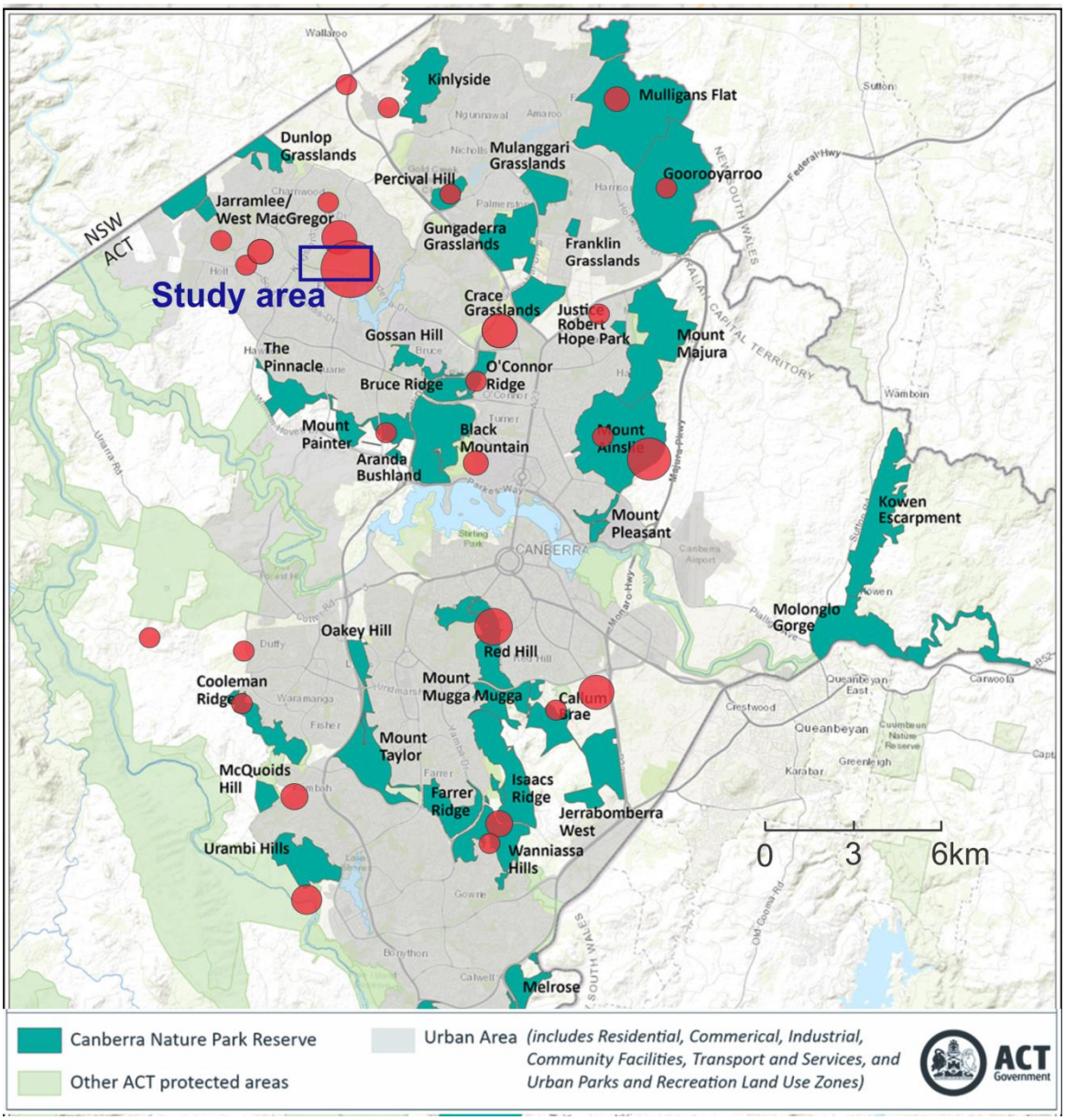
It is both fitting and pleasing that the Laughing Kookaburra is a common breeding resident of Canberra, the 'Bush Capital' (COG 2020b). Canberra's urban landscape abuts and encloses a diversity of suitable kookaburra habitats, ranging from forested hills to lowland native grassland and Yellow Box - Red Gum grassy woodland, in 39 nature reserves that make up Canberra Nature Park (ACT Government, 2021a). Kookaburras are particularly common in Canberra suburbs bordering nature reserves (Wilson 1999; COG 2020a). There, kookaburra foraging habitat may include neighbourhood parks, roadsides and private gardens in addition to the neighbouring reserves – whereas suitable nesting hollows are generally available only in ancient eucalypts protected within the reserves.

Given the kookaburra's sedentary habits, it follows that the majority of kookaburra breeding records in Canberra are from nature reserves or from suburbs bordering nature reserves (*e.g.* Map 1). Notable exceptions are several suburbs in north-western Belconnen, where kookaburra breeding has been reported from places that are well within the urban area and remote from nature reserves (Map 1).

As long-term residents of north-western Belconnen, we have been fascinated and delighted by the continuing presence of breeding kookaburras in our neighbourhood. We are concerned, therefore, that the ACT kookaburra population has been in a slow, slight but steady decline in recent decades (Wilson 1999; COG 2020b). We are interested in how that trend might be reflected in aspects of kookaburra breeding ecology in suburban north-western Belconnen, and how the Belconnen human community might become involved in sustaining a resilient suburban kookaburra population.

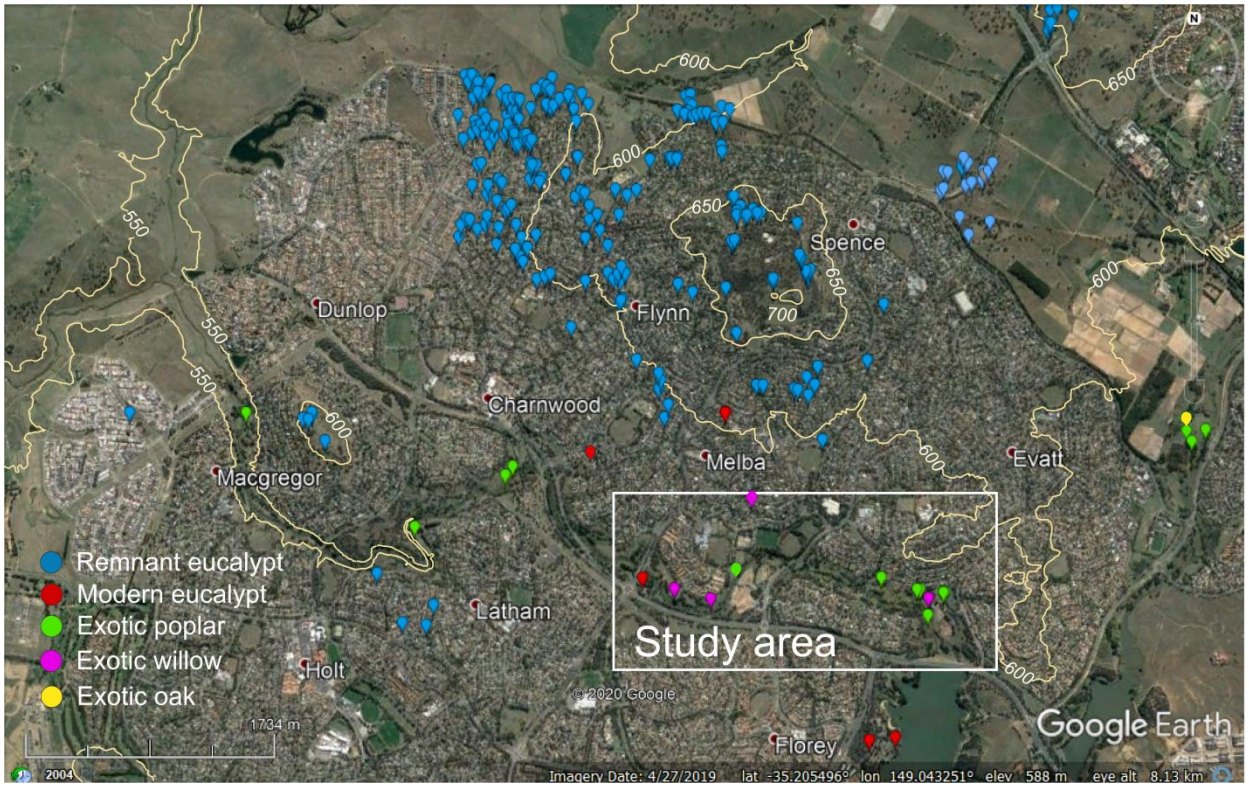
3. The rise and fall of north-western Belconnen's kookaburra population

Beginning in the late 1960s and early 1970s, Belconnen was established on former grazing lands. Clearing of the area in the 19th and 20th centuries had removed all native trees from the floodplains and lower slopes (below 580 m elevation); scattered eucalypts remained above the 580 m contour. More trees were cleared for the establishment of north-western Belconnen's suburbs. Of those that were retained, about 200 contained hollows – an average of about 31 hollow trees/ km^2 (Map 2). A few remnant hollow trees were located on some of north-western Belconnen's new residential blocks, but the majority were incorporated into Urban Open Space



Map 1. Distribution of Laughing Kookaburra breeding activity, Canberra, 2014-2020 (red dots). Dotsize indicates the number of reports at each site (1–9 reports). Many sites are associated with native forests and woodlands contained within Canberra Nature Park Reserves and other protected areas. In contrast, the sites in our study area are in the Urban Area, associated with Urban Open Space, and are remote from formal reserves and protected areas. (Kookaburra breeding data: eBird 2020)**.**

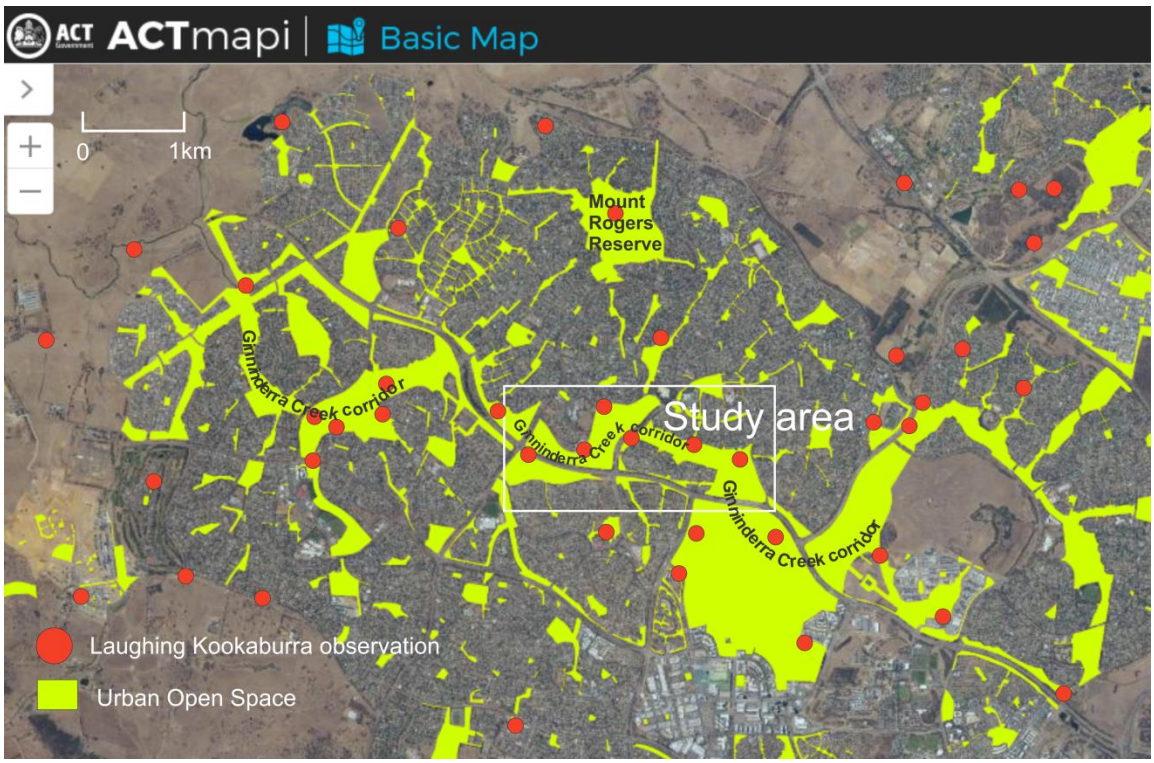
(see Map 3), including the 52-ha expanse of Mount Rogers Reserve, and a mosaic of small neighbourhood parks, easements and nature strips scattered throughout the adjacent suburbs. Some of these remnant hollows (perhaps as many as 15%) were suitable for use by kookaburras.



Map 2. Distribution of hollow trees in northern Belconnen, 2014-2017. Trees with hollow entrances ≥ 50mm diameter are shown. With urbanisation of the area, beginning in the early 1970s, many of the hollow eucalypts remaining on higher ground (above 580m elevation) were incorporated into Urban Open Space. An exotic oak, planted around 1829 as part of the establishment of the Palmerville settlement, bears hollows that may have developed prior to urbanisation of Belconnen. All other hollows, including those in our study area, are in trees planted in the five decades since urbanisation. Descriptions of the hollow trees in the study area are in Table3. (Hollow tree data: darylking@aapt.net.au).

Kookaburras were here from the beginning. From the mid-1970s, kookaburra breeding territories occupied much of north-western Belconnen above 580 m, where there were suitable hollow eucalypts. Territories covered Mount Rogers Reserve and parts of the suburbs of Spence, Melba, Flynn, Charnwood and Fraser. We (BK and DK) had the good fortune to build our house within the territory of an established breeding pair. One of their nest sites, a solitary remnant hollow *Eucalyptus blakelyi*, is just 140 m from our back door. Our earliest recollection of a kookaburra visiting our backyard is from 1974.

The establishment of Belconnen coincided with new approaches to urban landscape design that have enhanced kookaburra habitats in the suburbs. The Belconnen landscape of today is largely a product of the third major phase (from 1969 to 1989) in the establishment of Canberra's Urban Forest (Taylor 2006; ACT Government 2021b). New plantings in that period focused on the use of native species in public and private spaces. Incentives were provided to the new settlers of Belconnen to plant their gardens with native species, including eucalypts. Urban Open Space (Map 3) was extensively planted with mixed eucalypt species set out in an informal and naturalistic landscape style (ACT Government 2021b). Where initially, the kookaburras' remnant hollow nest trees stood stark against a harsh, bare, windswept landscape of new houses, pavement, and disturbed dry grasslands, they were to become embedded in a sheltered Urban Forest enriched by a diversity of new native trees and shrubs, and well-watered areas of grasses and herbs.



Map 3. Belconnen Urban Open Space, and the distribution of Laughing Kookaburras in Belconnen during the nesting season (September–December), 2014–2020. Our study area encloses about 88 ha of Urban Open Space, including the floodplain and lower slopes of a 3km stretch of the Ginninderra Creek corridor. (Kookaburra data: Atlas of Living Australia, 2020

Kookaburras took full advantage of the increasing diversity and productivity of the new environment. By 1990, some kookaburra territories in north-western Belconnen were occupied and defended by stable family groups of 4 - 6 birds (ALA 2020). The presence of strong, stable groups is a conspicuous indicator of habitat quality and breeding success. Auxiliary members of the group (usually the previous season's offspring) help the parents with territory defence, and help to incubate the eggs and brood the nestlings when they are young. They also feed the nestlings and fledglings, provide a sentinel system and defend the young against potential predators (Legge 2004).

Since the mid-1990s, signs of kookaburra prosperity in north-western Belconnen have gradually faded. The last record of a family group of four in the remnant-hollow belt above 580 m is from 1992 (ALA 2020). Successful breeding events continue to be reported (*e.g.* eBird 2019), but rarely. Ninety-six percent of sightings since 1992 have been of single birds or pairs (median = 1 (ALA 2020; eBird 2020)).

There may be various factors involved in these demographic changes. A probable key factor is a decline in availability of suitable nest hollows, leading to reduced breeding success. After five decades in the suburbs, some remnant hollow trees or hollow limbs have collapsed or been removed, and no suitable new hollows have been recruited. Some of the planted eucalypts have developed large hollows prematurely (Map 2) but, in all cases, the developing hollow appears to have been an indicator of a general structural fault, and the whole tree has collapsed or has been removed on public safety grounds. It is likely to be

another century before suitable hollows develop in the new eucalypt forest – provided they are not removed in the meantime.

Increased competition for the remaining hollows is probably another key limiting factor. Kookaburras have evolved with other native hollow-nesting birds and hollow-denning mammals, and they have adapted to compete successfully with them for available hollows. Belconnen's kookaburras appear less well adapted to compete with some recently-arrived invasive exotic birds.

The potential for Common Starlings (*Sturnus vulgaris*) and Common Mynas (*Acridotheres tristis*) to out-compete kookaburras for nest hollows has long been of concern (Taylor 1992; Wilson 1999; Legge 2004). Grarock *et al.* (2012) found that, 29 years after mynas became established in Canberra, kookaburra abundance had decreased by an estimated 0.4 (± 0.2) birds per km^2 each year. Wilson (1999), noting that the ACT kookaburra population was already in decline by 1995, raised the possibility that competition from mynas for nest holes in urban areas and nearby parks may be the cause.

Mynas arrived in north-western Belconnen during the 1990s (Davey 1991), and became established there by 2006-2007 (Grarock *et al*. 2013). One of us (DK) found no evidence of kookaburra breeding success in the 2010-11 and 2011-12 breeding seasons in a sample of suburban north-western Belconnen where mynas occupied about half of remnant hollow eucalypts (King 2012). A wider survey of 152 myna nests across Belconnen in the 2013-14 season found that 47% were in hollow remnant eucalypts (DK, unpublished). DK (unpublished) witnessed failed kookaburra breeding attempts in north-western Belconnen in the 2013-14 and 2014-15 breeding seasons, when mynas were seen to remove kookaburra eggs from hollows.

While the breeding-habitat quality of the remnant hollow belt above 580 m appears to have declined since the 1990s, other suburban areas of north-western Belconnen are emerging as suitable kookaburra habitats.

4. North-western Belconnen's new kookaburra habitats

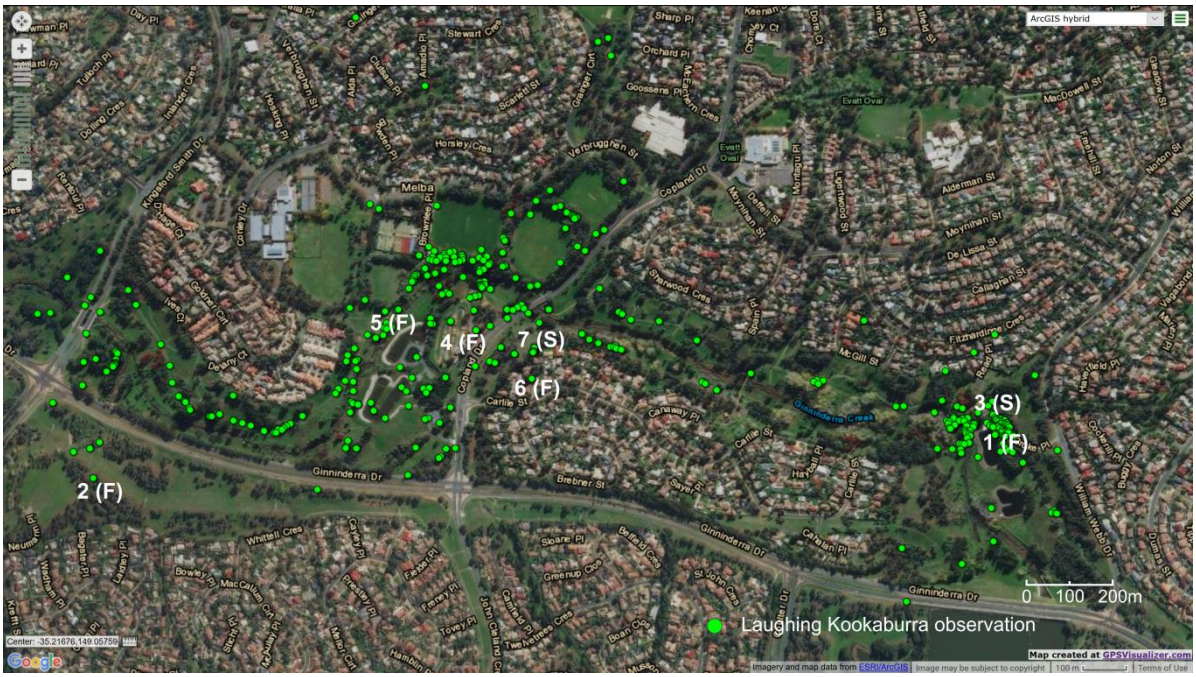
As the Urban Forest matures, kookaburras have become increasingly common in parts of Urban Open Space below the 580m contour, where hollow remnant eucalypts are absent. They are particularly common, including during the nesting season, in the Ginninderra Creek corridor - a broad continuous band of Urban Open Space stretching from east to west and containing the Ginninderra Creek floodplain and adjacent lower slopes (Map 3). This well-watered landscape was among the first to be occupied for agriculture in the early nineteenth century, with a total loss of kookaburra nesting habitat.

Now, tree density in the Ginninderra Creek corridor Urban Open Space averages more than 40 mature trees/ha. Many of the mature trees (planted natives and planted or invading exotics) are in closely-spaced clumps with intersecting crowns, with sparse understorey, and surrounded by extensive short and tall native and exotic grasslands. The most recent tree plantings are more widely spaced, with a grassy understorey. When these mature, they may provide an open woodland habitat consistent with Belconnen's pre-European landscape (Gillespie 1992; Taylor 2006; Gammage 2011).

Habitat quality in the Ginninderra Creek corridor Urban Open Space is enhanced by native plantings in adjoining gardens, and by other developments that contribute to habitat

diversity and productivity. For example, recent water-quality infrastructure projects in the area have added 14,300 m^2 of new permanent ponds and ephemeral wetlands, with associated new plantings of aquatic and terrestrial vegetation, and extensive boulder-armament-embankments that provide new micro-habitats for a range of kookaburra prey species (ACT Government 2019).

Kookaburras are now permanent, territorial residents of the Ginninderra Creek corridor in Umbagong District Park (about 50 ha), and in our study area, which includes about 88 ha of Ginninderra Creek corridor Urban Open Space downstream from Lake Ginninderra (Map 3).



Map 4. Laughing Kookaburra observations (green dots) and sites of kookaburra nesting activity (numbers and letters) in the study area between July 2014 and November 2020. Table 2 provides descriptions of each numbered site and the outcome of kookaburra nesting activity there - (S)ucceed, (F)ail.

5. The sedentary, territorial kookaburras of our study area

We recorded and analysed observations of kookaburras in the study area between July 2014 and November 2020. Our observations were made on an *ad hoc* basis during surveys, recreation, commuting, shopping and other activities in the study area. The location of each sighting was recorded by GPS (Map 4), and data were uploaded to eBird, where they were assigned to the nearest public hotspot (eBird 2021). Our study area is largely contained within five eBird hotspots: 3x Urban and 2x Urban Open Space (Table 1 and Map 5). Data from these hotspots formed the basis of our analyses of kookaburra distribution in the study area.

Table 1. Laughing Kookaburra occurrence in Urban Open Space and in other Urban habitats in the study area, June 2014 – November 2020 (data: eBird, 2020). See Map 5 for hotspot boundaries used in our study.

Habitat Type	eBird Hotspot ID	Total eBird check-lists	No. of eBird checklists reporting kookaburras	Kookaburra reporting frequency (% of eBird checklists)
Urban	L2543555 Melba L2543436 Evatt L4703829 Florey	686	23	3.35
Urban Open Space	L4684926 Ginninderra Creek—Melba L4689870 Ginninderra Creek—Evatt	1043	341	32.69
All habitats	All hotspots	1729	364	21.05

Map 5. Use of eBird hotspots (eBird, 2021) as spatial units in our analysis of Laughing Kookaburra distribution in the study area (see Table 1 for details)**.**

Over the course of the 77-month study, kookaburras were observed in the study area 364 times (Table 1 and Map 4). They were recorded in both Urban and Urban Open Space hotspots, but were more common – by an order of magnitude – in Ginninderra Creek corridor Urban Open Space than elsewhere in the study area (Table 1). Ginninderra Creek corridor Urban Open Space, therefore, appears to contain the primary habitat for kookaburras in the study area.

The hotspot data support the conclusion that kookaburras are sedentary in Ginninderra Creek corridor Urban Open Space (Fig. 1). The frequency of sightings is reasonably consistent throughout the year, with a slight (non-significant) increase during the nesting

season (September – December). Kookaburras were seen there in all months of the study period, except December 2017. Breeding behaviour was recorded in five of the study's seven breeding seasons, and two successful breeding events were recorded (Table 2).

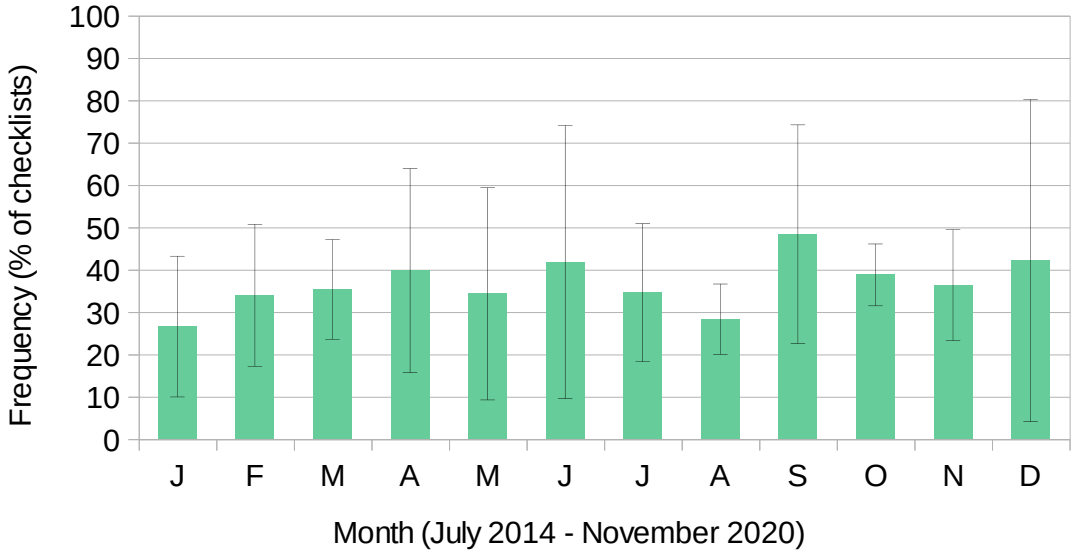


Figure 1. Mean monthly frequency of kookaburra sightings (% of eBird checklists) in Ginninderra Creek corridor Urban Open Space (green columns)**.** Vertical bars are standard deviations from the means (data: eBird, 2020).

It appears that the area is occupied by a single breeding pair and their offspring. The majority of sightings (96.2%) were of single birds or pairs (median = 1). The largest groups comprised 3 birds following a successful breeding event in the 2016-17 season, and 4 birds following a successful breeding event in the 2020 season (Table 2). It is possible that the same pair has held the territory throughout the seven-year study. The average life-span of kookaburras around Canberra is 12.5 years (Legge 2004). One member of the current pair has visited one of us (JA) in her garden on the edge of Ginninderra Creek corridor since 2017, and has gradually become accustomed to being hand-fed by JA. Since early 2019, both members of the pair have visited regularly and have readily accepted artificial food from JA.

The extent of their territory is uncertain. We have observed territorial behaviour in the Ginninderra Creek corridor Urban Open Space in most years of the study. It has generally taken the form of nest-site defence during the nesting season, including adult birds attacking their own reflection in parked vehicles, and occasional 'belly-flop displays' (Legge 2004) at other times of year. We did not see territorial interactions with other kookaburra groups that might indicate the location of territory boundaries, but there is evidence that their territory includes parts of adjacent suburbs (Table 1 and Map 4). Our *ad hoc* observations of their dawn and dusk choruses indicate that some of their roost trees are in suburban parts of Melba and Evatt, including some of the mature eucalypts in JA's garden.

Table 2. Nesting activity of Laughing Kookaburras in the study area between July 2014 and December 2020. (For locations of numbered sites, see Map 4).

Site (Map 4)	Nest type	Breeding season	Nesting outcome	Notes
1	Hollow in decaying exotic poplar H03	2014-15 and 2015-16	Fail	The tree was in Urban Open Space. A kookaburra pair occupied and defended the cavity from July to December in 2014, and again from August to November in 2015. At the beginning of each season, they spent considerable time and effort enlarging the cavity. There was no evidence of nestlings or fledglings at the site in either season.
2	Nestbox B26	2016-17	Fail	The box was mounted on a tall *Eucalyptus melliodora* in Urban Open Space. It was of a suitable design for kookaburras, but was derelict and open to the weather. A lone kookaburra occasionally inspected the box until it was removed in 2017.
3	Hollow in decaying exotic poplar H04	2016-17	Succeed	The tree was in a clump of decaying poplars in Urban Open Space (see also site 1 above). A kookaburra pair occupied the cavity in early September 2016, and a single chick fledged in the first week of January 2017. The tree was not used again by kookaburras. It continued to decay rapidly and collapsed.
4	Vent in wall of building S20	2018-19	Fail	The building is on land managed by the Canberra BMX Club. A kookaburra inspecting the vent became entangled in the ducting and was freed uninjured by members of the club. Subsequently the vent has been made inaccessible to kookaburras.
5	Hollow in decaying exotic poplar H1871	2018-19	Fail	The tree is in Urban Open Space. The cavity developed rapidly in 2018-19, largely due to intensive chiselling by Sulphur-crested Cockatoos. It was regularly inspected in 2018-19 (and at the beginning of 2019-20) by a range of hollow-nesting species, including kookaburras, but was abandoned after September 2019 when it filled with rain-water.
6	Nestbox B29 and nestbox B30	2020-21	Fail	In August 2020, a pair of kookaburras repeatedly inspected two parrot/possum nestboxes in a tall *Eucalyptus mannifera* in a private garden adjoining Urban Open Space. We judged that the deep, vertical boxes were unsuitable for kookaburras, particularly for chicks attempting to fledge, and any breeding attempt there was unlikely to succeed. This prompted us to install an alternative nestbox in a nearby garden (see site 7 below). Subsequently, inspections of the parrot/possum boxes ceased, although kookaburras continued to perch in the host tree from time to time.
7	Nestbox B31	2020-21	Succeed	In the first week of September 2020, we installed a nestbox designed specifically for kookaburras in a tall *Eucalyptus cinerea* at 3.7m above ground in a private garden adjoining Urban Open Space. The kookaburra pair began inspections of the box on the same day. Three eggs were laid at the end of September, and two chicks fledged on 30 November.

Taking the distribution of sightings in Map 4 as a guide, we suggest that their territory exceeds 100 ha, and likely includes urban parts of Florey, Flynn, Melba, Evatt and McKellar, as well as parts of the Lake Ginninderra foreshore. A territory of that size is

consistent with other kookaburra territories in woodland around Canberra (average 69 ha; range 16 - 224 ha (Legge 2004)).

6. Limits to kookaburra breeding success in the study area

The quality of kookaburra nesting habitat in the study area is, at best, fair. There are no remnant hollow eucalypts; the nearest hollow eucalypts known to host kookaburra breeding attempts during the study period are between 2 km to 3 km from the study area. Suitable hollows are unlikely to form naturally in the even-aged hardwood eucalypt forest until sometime in the 22nd century, but hollows already exist in some of the exotic willows (*Salix babylonica*) and poplars (*Populus* spp) lining the creek (Table 3; Map 2).

Hollows have developed rapidly in the soft wood of exotic poplars, in particular, through the combined actions of chiseling beaks and fungal decay. Decay begins at the site of an injury – often caused by the chewing activity of rosellas and cockatoos. Decaying wood yields readily to further chewing, and a useful nesting hollow can develop in the course of two or three decades. The resident kookaburra pair participates in the acceleration of hollow development by chiseling away at the decaying wood within developing hollows (Table 2; Plate 1), but much of the work is undertaken by cockatoos, particularly visiting flocks of Yellow-tailed Black Cockatoos (*Calyptorhynchus funereus*), which can chip as much softwood in a few hours as the local Galahs (*Eolophus roseicapilla*) and Sulphur-crested Cockatoos (*Cacatua galerita*) process in a full season.

While hollows form rapidly in the exotic softwood trees, they are ephemeral (Table 3). By the time a cavity large enough for kookaburra use has developed, much of the host tree is likely to be affected by decay, and parts or the whole tree proceed rapidly to collapse. Kookaburras nested successfully in a hollow Lombardy Poplar (*P. nigra*) at site 3 in the 2016-17 breeding season (Table 2; Plate 2) but, by the following season, ongoing decay had collapsed parts of the floor and walls of the hollow, and the whole tree collapsed soon after. Of 13 hollow trees in the study area in 2014, nine are no longer available (Table 3).

Table 2 illustrates how, despite the area's severely limited stock of suitable nest sites, the resident kookaburras have persisted in their attempts to breed there. Most attempts have been unsuccessful (Table 2; Map 4). Only when a viable hollow became available in the 2016-17 season, were they first able to reproduce (Table 2). That fledgling survived to independence and remained in their territory until at least September 2017.

Two recent nesting attempts (at site 4 in 2018-19, and site 6 in 2020-21) involved the risk of injury or death to either an adult kookaburra or to nestlings (Table 2). In the later attempt, the resident pair made repeated visits to two nestboxes whose deep, vertically-aligned design, while suitable for parrots or possums, appeared unsuitable for kookaburras. Unlike parrots and possums, kookaburras have weak ineffectual feet and are not adapted for climbing in and out of a deep hollow that is aligned vertically (Legge 2004). Even if the adults managed to produce eggs and raise nestlings in such a nestbox, the risk of the nestlings being trapped inside, unable to fledge, would be high.

Table 3. Hollow trees in the study area, July 2014 – November 2020.

Hollow tree		Description of cavity at start of survey period (July 2014)*							Current kookaburra nesting potential (Nov 2020)
ID	**Spe-cies**	**Hol-low loca-tion**	**Height (m)**	**Orien-ted**	**Align -ment**	**Entran-ce h x w (mm)**	**H depth (mm) ******	**Entr. lip to floor (mm)* *****	
H02	*Pn*	T	3.5	NW	H	100 x 100	150	150	**nil** (collapsed, remains of trunk on ground)
H03	*Pn*	T	2.5	W	H	110 x 130	150	200	**nil** (collapsed, remains of trunk on ground)
H04	*Pn*	T	3.5	S	H	150 x 150	200	120	**nil** (collapsed, remains of trunk on ground)
H05	*Pa*	T	13	NNE	H	300 x 150	220	120	**fair** (intact, no signs of current use)
H06	*Sb*	T	6	SW	V	65 x 65	200	300	**nil** (collapsed, remains of hollow occupied by honey bees)
H07	*Pa*	TB	18	E	V	300 x 300	150	200	**nil** major branch collapsed)
H08	*Pa*	TB	17	S	H	400 x 200	120	120	**nil** (major branch collapsed)
H1740	*Pn*	T	2.5	W	H	80 x 50	100	100	**nil** (collapsed, remains of trunk on ground)
H1866	*Sb*	T	1	N	H	150 x 110	200	50	**v low** (intact, hollow inundated by the flooding creek three times during the study period)
H1868	*Ev*	TB	6	N	V	250 x 120	200	250	**nil** (collapsed, tree removed)
H1871	*Pa*	T	15	E	H	500 x 300	200	250	**low** (intact, no signs of current use)
H69	*Sb*	T	12	NE	V	200 x 150	250	250	**nil** (collapsed, remains of trunk on ground)
H908	*Sb*	S	5	S	H	150 x 250	175	50	**low** (intact, no signs of current use)

Species: *Pn - Populus nigra; Pa - Populus alba; Sb - Salix babylonica; Ev - Eucalyptus viminalis.*

Hollow location: T - main trunk; TB - junction of main trunk and major branch; S - spout, end of major branch.

Aligned: H – horizontal; V – vertical.

* Dimensions estimated from the ground.
** Dimensions estimated from the ground by observation of bird movements in the cavity.

Plate 1 (left). Laughing Kookaburras occupying and enlarging a hollow in the trunk of decaying exotic poplar H03 in Ginninderra Creek corridor Urban Open Space, Evatt, October 2015. This nesting attempt was unsuccessful (see Table 2).

Plate 2 (right). Laughing Kookaburra nestling shortly before fledging from a hollow in the trunk of decaying exotic poplar H04 in Ginninderra Creek corridor Urban Open Space, Evatt, January 2017.

7. Trial of a dedicated kookaburra nestbox

Kookaburras have nested successfully in suitably-designed nestboxes elsewhere in Belconnen (*e.g.* Allan 2016). We decided to trial a purpose-designed nestbox in JA's garden (site 7, Table 2). The trial offered the opportunity to provide the kookaburras with a suitable, reliable nest site in an environment where such a resource was lacking.

JA's garden is ideal for the trial. It is located in the core of the kookaburras' territory, and is close to other sites of recent kookaburra breeding attempts. Its northern frontage connects with Ginninderra Creek corridor Urban Open Space, where it provides warm micro-habitats suitable for various prey species. The kookaburras' long experience of being hand-fed in the garden has habituated them to the presence of humans there and in nearby Urban Open Space.

The garden contains several mature trees that are suitable for installation of a nestbox. We chose a tall *E cinerea* that is visible from the garden and the house, with a strong fork at a height of about 3.7 m in which to mount the nestbox (Plate 3). The nest height is within the natural height range reported by Legge (2004), and is convenient for ongoing monitoring, management and maintenance of the box. The design of the box is similar to that recommended by Birdlife Australia (2020).

Plate 3. (A) Laughing Kookaburra inspecting nestbox B31 in a private garden adjoining Ginninderra Creek corridor Urban Open Space, Evatt, September 2020. (B) Laughing Kookaburra nestlings, approx 4 days old, 1 Nov 2020; (C) approx 16 days old, 13 Nov 2020; (D) approx 28 days old, 25 Nov 2020.

The kookaburras showed immediate interest in the nestbox. One perched within a few metres while it was installed. Both birds began inspecting the box that same day, 8 Sep 2020 (Plate 3). By 17 Sep, the female was spending extended periods in the nest, and her first egg was laid around 30 Sep.

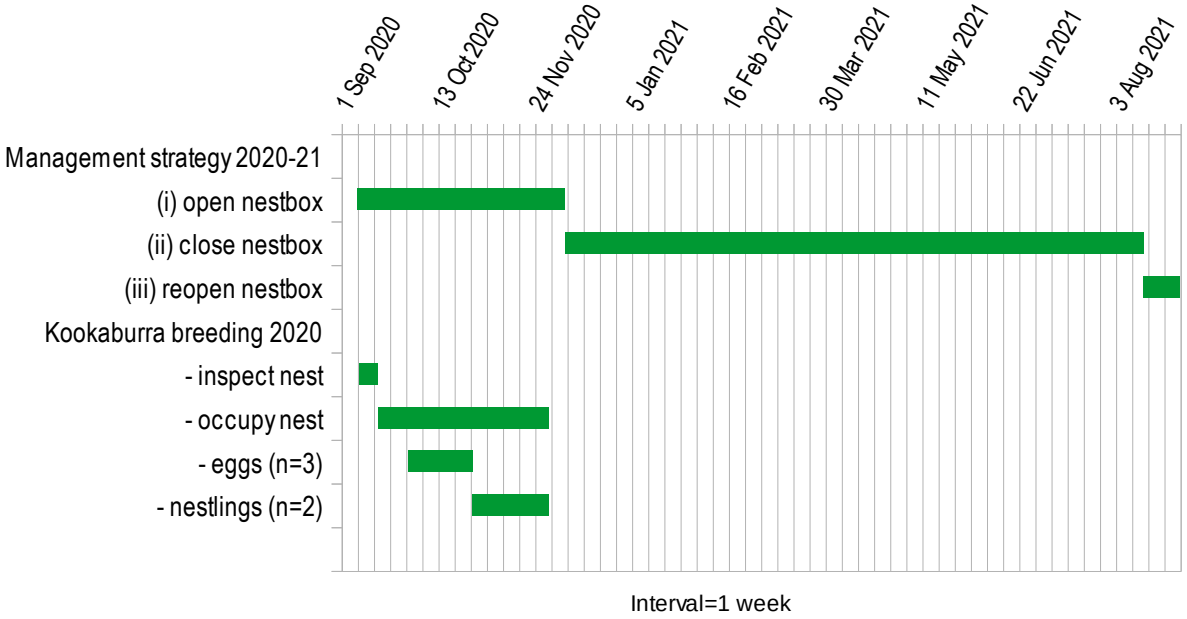


Figure 2. Management and use of nestbox B31, Ginninderra Creek corridor, Evatt, ACT, 2020-2021.

Nesting progress (Fig. 2) was monitored by daily casual observations and by (approx.) weekly inspections of the nestbox using a pole-mounted video camera (selected images at Plate 3). Camera inspections were made in daylight using ambient lighting only, and were limited to about 20 seconds duration, to minimise disturbance of the occupants.

Clutch size (three eggs) and hatching success (2 hatchlings) were typical for the Canberra area (Legge 2004). Hatching was around 28 Oct. The third egg was abandoned and apparently removed from the nest by the adults within a few days after the other eggs had hatched. Both nestlings appeared healthy and vigorous from the outset, and appeared to grow at identical rates, suggesting that they were fed at similar rates. Both adults delivered food to the nest throughout the day – occasionally arriving simultaneously and jostling at the entrance.

The adults were accustomed to being artificially fed by JA, and feeding was continued during the nesting period. To ensure that the nestlings' diet mostly comprised natural prey items, artificial feeding of the adults was reduced to one small portion in the late afternoon. Prey items delivered to the nestlings included moths, cockroaches, cicadas, skinks and a juvenile Eastern Brown Snake (*Pseudonaja textilis*). Their final week in the nest coincided with a flush of emerging cicadas. During this period, the adults showed little interest in artificial food, suggesting that their food requirements, and those of the nestlings, were met by natural prey.

Both chicks fledged from the nestbox between 0930 and 1100 on 30 Nov (Plate 4). For the first few days after fledging they remained in JA's garden, roosting in the nest tree. After 7 Dec, they regularly accompanied the adults as they hunted in other parts of their territory, and roosted with the adults in one of their traditional roost trees, about 500 m upstream from the nest tree. At the time of writing (April 2021), both juvenile kookaburras remain in the adults' territory. We see them regularly in parts of the Ginninderra Creek corridor Urban Open Space, foraging individually and in groups of two, three or four. All members of the family group regularly visit JA's garden where they continue their association with humans, enjoy the occasional hand-fed snack, and make occasional cursory inspections of the now-closed nestbox.

Our management of the nestbox (Fig. 2) aims to favour ongoing use by kookaburras, while minimising the likelihood of their being displaced by competitor species. We closed the nest entrance with a metal plate within a week of the fledglings' departure in the 2020 season. We plan to leave it closed, thus preventing its use by other species, until we see evidence of the kookaburras actively inspecting prospective nest sites at the beginning of the 2021-22 breeding season (around mid-August, or earlier/later if justified by their behaviour). Kookaburras' nest-site fidelity is high - about half of nests are re-used in successive years (Legge 2004) – so we anticipate that these kookaburras will re-use the nestbox when it is re-opened in the coming season.

Perhaps we will have the pleasure and privilege of watching them raise another successful brood in JA's garden – this time with the support of two enthusiastic helpers.

8. A local perspective on a regional problem

The slow, steady decline of Laughing Kookaburras across the ACT should be a matter of regional concern. At the regional scale, a key conservation objective should be to ensure that the kookaburras' most limiting resource – a supply of suitable nest hollows – is not further reduced and, in time, is increased. This objective applies, not only to kookaburras, but to a range of other regional woodland and forest species that rely on big, old eucalypts.

While kookaburras are widespread, they are sedentary and territorial, so changes in their fortunes at the regional scale are likely to result from the cumulative effects of numerous local-level changes. We suggest that an appropriate scale for understanding and addressing the effects of changes in nest hollow availability is that of a single breeding territory. If large tree hollows become unavailable in the territory of a breeding pair (because of land-clearing or competition from feral animals like honeybees, mynas and starlings), kookaburras will disappear from that area (Legge 2004). The loss of kookaburras from a 100-ha urban breeding territory may have a similar impact on the regional kookaburra population to their loss from a 100-ha territory in remnant woodland.

North-western Belconnen's once-strong urban kookaburra population now faces an uncertain future. Declining availability of suitable hollows in the remnant eucalypt belt above 580 m, and a lack of reliable hollows elsewhere, now prevents them from reaching their breeding potential in an otherwise suitable habitat.

Plate 4. Laughing Kookaburra fledgling (R), accepting a skink from an adult (L) - in a private garden adjoining Ginninderra Creek corridor Urban Open Space, Evatt, on the day of fledging, 30 November 2020.

Our experience so far with our nestbox trial suggests a way that members of the Belconnen community might intervene to improve the supply of reliable nest sites. A single, purpose-designed, well-maintained, strategically-managed nestbox, located in a kookaburra-friendly garden, might be all that is needed for a territorial pair to meet their breeding potential. One or two others, scattered around their territory, and managed in a complementary, coordinated way, could provide them with choice, as well as insurance against accidents or unintended occupation by competitor species.

In our experience, the rewards would justify the effort.

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THREE UNUSUAL BREEDING EVENTS FOR THE ACT: SILVER GULL, GREAT CRESTED GREBE AND BLUE-BILLED DUCK – PERSONAL OBSERVATIONS (MOSTLY)

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During the Spring-Summer breeding season of 2020-2021, I followed closely the breeding of Silver Gulls (*Chroicocephalus novaehollandiae*) at Parliament House, Great Crested Grebes (*Podiceps cristatus*) on the far reaches of the Cotter Dam, and also caught up with the Blue-billed Ducks (O*xyura australis*) breeding on Upper Stranger Pond. All three were unusual for the ACT.

Silver Gulls

Silver Gulls are quite common birds in the ACT, with hundreds often present at both Lake Tuggeranong and Lake Burley Griffin, as well as smaller numbers at other local lakes and wetlands. They breed in Canberra, most often on Spinnaker Island in Lake Burley Griffin. In the latest breeding season, they chose a major new breeding site, perhaps because the grass on Spinnaker Island was much longer than usual.

In late August 2020 I received a text message from my son-in-law, who is employed at Parliament House, with a photo he had been sent labelled “pigeon”, showing a bird in the ground-cover grevilleas in the raised garden beds of the ornamental pool in the Parliament House forecourt. Of course the bird was not a pigeon, it was a Silver Gull, and it was one of

[1] All photos by author unless indicated otherwise.

many. On my first visit to the area in August, I estimated there were 20 nests, but by mid-September I was able to count 40 nests. It was difficult to get a good look at the nests, as many were almost completely hidden down in the grevilleas, with many birds sitting tight even when I was within a couple of metres. The birds were probably very fortunate that the House was closed to visitors because of the COVID-19 pandemic during much of the breeding event, so very few members of the public were wandering on the forecourt.

The pond is circular, with a large walkway over it, and raised beds next to the walkway. For reasons that are unclear, the birds used only three quarters of the area, ignoring completely the quarter nearest the House of Representatives side of the House.

The cleaners, who spent several hours every day removing bird droppings from the Indigenous mosaic (*Possum and Wallaby Dreaming*) in the centre of the walkway over the pond, were not impressed with the birds, but some of the ever-present AFP officers I occasionally chatted to seemed interested.

The nests were very close together, often within 30cm of each other and some were only centimetres from the walkway over the pond. At the peak of breeding I believe there were about 50 nests, and although I could not see into most of them, those I could see into contained two eggs.

By early October, small chicks were scrambling in the vegetation, and worried parent birds were hovering and screaming overhead.

As some of the chicks fledged late in October, a few late starters were still incubating eggs. During November, dozens of juvenile Silver Gulls were wandering around the forecourt, begging from parent birds, and there seemed to be a steady procession of adults between Parliament House and the lake.

By the end of the year, the birds had departed.

Silver Gulls also had a few nests on the water-quality apparatus set up in Lake Tuggeranong not far from the dam wall.

Great Crested Grebes

Most years it is possible to see one or two Great Crested Grebes on Cotter Dam, by walking along the service road from Cotter Reserve to the enclosed ICON Water area at the dam, at the end of the Honyong-Cotter walking track. Some years a few immature grebes have been seen, but there do not seem to be any documented breeding events for these birds in the ACT.

In mid-October 2020 I walked along Concrete Road in Pierces Creek Forest, alongside the Cotter River, with Ryu Callaway. and Prue Watters. At the point where we turned around, there were two Great Crested Grebes on the river, and I heard a peculiar call from the other side, which finished with an odd barking sound, which I likened at the time to the call of a Barking Owl. By checking the Pizzey app later, I realised that those odd calls were from Great Crested Grebes, and that they are most vocal when breeding. The following day I walked out along Bracks Hole Road, which seemed to be the closest point to where the calls came from. Ten Great Crested Grebes were visible in the inlet at the end of the track. The inlet is an area probably not flooded regularly until the dam was raised (completed 2013). The road disappears into the dam, and a narrow walking track leads to the inlet.

Map showing Cotter dam wall (red pin), and the inlet at the end of Bracks Hole Road where the breeding event was observed.

A view of the inlet. The dead vegetation at the far end indicates the area where the birds nested.

Two weeks later (29 Oct) 17 Great Crested Grebes were counted, some exhibiting obvious display behaviour, and one bird was observed carrying nesting material.

Over the next few visits, birds could be seen on nests in the areas of drowned vegetation towards the back of the inlet. Six nests were identified, but there may have been more, since the nest area was some distance from the end of the track. The profusion of blackberry clumps meant closer approaches were difficult.

Nest seen when adult left it briefly.

The first four chicks were seen on 18 Dec, when I took two of our young birders out to Bracks Hole Road. The very small chicks were being kept well away from us, right at the back of the inlet, sometimes swimming, and at other times on the back of an adult.

First sighting of youngsters on 18 Dec 2020.

Subsequent visits showed more youngsters, but it appears not all nests were successful, since the maximum number of young observed was five. In more recent months immature

birds have been spotted close to the dam wall, indicating they have spread out over the dam, well away from the nest site.

Youngster sighted on its own near the dam wall, 19 Feb 2021.

An examination of maps of the area and the view from the dam lookout off Brindabella Road indicate that there are other inlets which could possibly also be used by nesting Great Crested Grebes.

As a bonus, many of those who made the trek out to the inlet also saw nesting Australasian Darters (*Anhinga novaehollandiae*), Little Pied Cormorants (*Microcarba melanoleucos*) and Great Cormorants (*Phalacrocorax carbo*), as well as adult and juvenile White-bellied Sea-Eagles (*Haliaeetus leucogaster*), and the pair of Red-capped Robins (*Petroica goodenovii*) which were often seen around the locked gate at the start of the walk.

Blue-billed Ducks

Female Blue-billed Duck with five young (*Julie Clark*).

During the COG Blitz in October 2020 Lia Battisson reported Blue-billed Ducks engaging in courtship behaviour at Upper Stranger Pond. The birds were reported by several observers over the next couple of months. Julie Clark reported four adults and five ducklings on 12 Jan (see photo above). A very unusual breeding record for the ACT!

On 9 Mar I went to Upper Stranger Pond to check out the report by Peter Bijlmakers of possible Musk Duck breeding. Like the Musk Duck, the Blue-billed Duck is a pin-tailed species, and the females of the two species are quite similar, and can easily confuse a visitor to this country! It was indeed a Blue-billed Duck with two ducklings.

On 14 Apr only a single female adult could be found on the pond.

Female Blue-billed Duck with two young.

Male Blue-billed Duck

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BEFORE PHOTOGRAPHY: THE NORTHERN SHOVELER IN CANBERRA AND IN 'THE BIRDS OF AMERICA' BY JOHN JAMES AUDUBON (1785-1851): AN EXAMPLE OF THE ACTION SCENE IN BIRD ART

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Audubon's famous published images of North American birds, or images based on them, may be found everywhere. Many examples are now available online. Among his work, plate 327 in Elephant Folio volume IV is a striking picture, as so many Audubon prints are. This one is of a pair of birds, labelled 'Shoveller Duck'.

That species is now known as 'Northern Shoveler *Spatula clypeata*'. It is a migratory species, widely distributed across the northern hemisphere. It occurs in Australia as a vagrant, but with sufficient frequency to justify a full entry in the *Australian Bird Guide*.

In 1865, lacking a specimen from his colonial travels, John Gould asked his 'ornithological readers both in Australia and Europe to take [his] word for the occasional appearance of the bird in Australia'. In 1839 Gould's brother-in-law Stephen Coxen, a settler at Yarrandi in the Upper Hunter, showed him the skin of a male that Gould found to be identical with the shoveler of Britain and Europe. Soon after, the skin was partly eaten by a rat, and Gould did not keep the remains, thinking he would obtain another one. This was his advice to Australian birdwatchers:

> To this subject, therefore, I recommend the attention of those in Australia, who will doubtless meet with the bird some day when the country is subject to partial inundation.

According to HANZAB, the first 'authenticated and acceptable record' of the species in Australia was from Louth, NSW, in 1975.

Although the drake is very distinctive, females and non-breeding males sufficiently resemble the Australasian Shoveler to be likely to be undetected as single birds.

A male appeared as a visitor at Kelly Swamp, ACT, in September 2019 and July 2020. During the second visit Sandra Henderson made her own visit to the Erindale Library where she was able to examine the species in a book of Audubon prints. Those massive second-hand volumes containing replicas of Audubon prints are surprisingly inexpensive, the result of over-supply over the years from printings in Japan and China. This is a contrast with the very high prices demanded for the original 19th century prints.

Audubon's plate 327 (of the shovelers) has become number 64 in the book in the Erindale Library, the one with introductory text by R. T. and V. M. Peterson. This is because the

sequence is rearranged 'in phylogenetic order' (as it was in 1981). There is a lengthy essay by Roger Tory Peterson on the history of bird art in North America.
Before discussing what the birds are doing in the shoveler plate, the history of the Audubon prints might be briefly considered. There are at least three versions of each scene.

First, Audubon created the preparatory (or 'original') bird paintings, usually in watercolour. Assistants, who included one of his sons, were responsible for much of the work needed for the backgrounds, some making use of oils. Sometimes the picture needed further additions at the engraving stage. Those 'original' paintings are held in a collection in New York, and a full set of copies has been published.

Secondly, *The Birds of America* was published between 1826 and 1838. Initially in Edinburgh, then in London, the original paintings were copied onto a copper plate by etching, some through the acid etching process ('aquatinting'). The copper plate produced black and white impressions on paper sheets measuring 39 ½ x 26 ½ inches before trimming. Colours were applied to the individual sheets by a team of colourists. (Similar colouring of individual sheets was needed for Gould's lithographs.)

The prints for *Birds of America* have been described as representing, in bird art, 'a final great triumph for copper engraving'. A good example of an addition by the engraver is the Bluebird pursued by Cooper's Hawk in plate 36. This was simply copied from the separate painting of Eastern Bluebirds (plate 112).

Thirdly, in 1840-1844 Audubon published smaller 7-volume editions of the larger work in 'octavo' format (6 ½ x 10 ½ inches). The work was done in New York and Philadelphia by the lithographic process. This entailed copying the large-format images onto stone using a prismatic lens (a 'camera lucida'), then printing, and then colouring. After Audubon's death in 1851, other octavo editions were published by his relatives.

Audubon's pair of shovelers are in the same attitude, shape and proportions in each version, faithfully following the original. However, the colouring and the backgrounds vary considerably. In order to show the features, the birds are in a rather unnatural pose, with open, upward-reaching bills, the wings of the male half-spread. In the original, Audubon used the technique of adding a food item to the composition to justify the unusual posture of the bird subject.

A notable example of this style of composition may be found in the Mallard plate where a pair of the birds are reaching for a snail, although whether competitively or cooperatively is not clear. In the shoveler drawing the attention-attracting object is a small dark shape, apparently a caterpillar, on the underside of the overhanging leaf of a water plant.

In the later engraving the insect, now a blue-green beetle, is placed on a lower blade of the background plant, much closer to the female's bill. In the octavo version, the background has been redrawn to show a single stalk against a plain background. The beetle has grown to at least twice the previous size and has become a focal point in an action scene. As with several of the lithographs, this version of the plate has been recomposed to simplify it and enhance the dramatic effect. Perhaps Audubon had learnt something about the tastes of his customers in his years of marketing the original *Birds of America* and hearing comments on his work from critics.

The working lives of Audubon (1785-1851) and John Gould (1804-1881) overlapped. The Goulds sailed for Australia in 1838, the final year of publication of *Birds of America*. Audubon's lively pair of shovelers might be compared to the more placid but perhaps more satisfying scene published by Gould in his *Birds of Great Britain.* That was the work of Joseph Wolf and Henry Richter some 40 years after Audubon painted his watercolour.

A comparison between Audubon's and Gould's plates refers to the 'spectacular and striking appeal' of the former compared to the more sedate style of the latter. 'Audubon astounded his audience with his portrayal of bird vitality and movement previously undreamed of ', although 'the dramatic sometimes emerged as melodrama' (McEvey). The shoveler plate is an example of vitality and movement, although in a small way.

Today, when an unlimited number of digital bird images may be called up at the touch of a button, one can forget that the creations of Gould and Audubon were made without the help of the camera. Now bird movement is easily captured by video, and published or replayed at any chosen speed. Digital image-capture and editing can produce endless variations of any bird subject.

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Note on spelling: Shoveller v. Shoveler. Audubon (1840s) and Gould (1865) used 2 'll's. However Noah Webster's dictionary of 1828 had the entry: 'SHOVELER. A fowl of the genus Anas or duck kind'. The Shorter Oxford Dictionary (1933 to 1964) does not mention the single 'l' spelling, but gives 'shoveller' as a name for the spoonbill, later extended to the duck. However, Macquarie 4th ed. (2005) gives 'shoveller' for 'someone or something that shovels', while recognizing 'shoveler' as the U.S. spelling for that sense. It gives 'shoveler' as the only spelling for the duck. In the artist Archibald Thorburn's editions of bird illustrations, 'shoveller' is the spelling inscribed on the relevant plate, but 'shoveler' is the

spelling in the text, written later but no later than 1917. 'Shoveler' is used in books on British birds by W. P. Westell (1910 – which lists various local country names) and W. Ramsay (1923). That year (1923) saw the publication by BOU of a list of vernacular names in *Ibis*, which also gave 'shoveler'. In Australia, 'shoveller' was used in Lucas & Le Souef (1911) and Leach (1911), but Mathews used 'shoveler' in his *Birds of Australia*, volume 4 (1914-1915). RAOU used 'shoveler' in its 1926 list, which became standard in Australian bird books. (Angus & Robertson's *Australian Encyclopedia*, also published 1926, lagged behind with 'shoveller'.)

Therefore, the single 'l' spelling did not originate in Gill & Wright (2006) where choices were made, for a list of recommended world bird names, between American and British spellings. Rather, by the 1920s in the UK and Australia the single 'l' had been adopted for the bird name in bird books, if not in all dictionaries.

Text to explain illustrations

Figure 1 (p. 49)

1. Audubon plate of Cooper's Hawk with the Eastern Bluebird later inserted by the engraver. Audubon has drawn a young hawk with white spots, as sometimes occurs in the young of our Collared Sparrowhawk. The Bluebird was copied from a separate Audubon watercolour also included in *Birds of America*.
2. The Mallard plate in which both members of the pair are reaching for a snail. The drake seems to be bringing the snail into reach of the female.
3. A detail from the original watercolour for the shoveler plate. The caterpillar is out of reach of both birds. Was it included as a reminder for the engraver to complete that part of the scene?
4. In the original print the insect is a beetle placed lower on a different blade of vegetation.
5. The octavo print with the background redrawn. The beetle is much larger, clinging to an isolated plant stalk.

Figure 2 (p. 50)

Above: The Northern Shoveler in Gould's *Birds of Great Britain* (J. Wolf and H. Richter). A second drake is included to show the plumage of the back. Gould's ducks are noticeably thin-necked compared to those of modern illustrators. This is perhaps the fashion of the time, or the result of his artists drawing subjects from mounted specimens.

Below: A scene composed from photographs taken at Kelly Swamp in September 2019. Unless you are looking at a printed version of this article, you are seeing images that exist only in digital form.

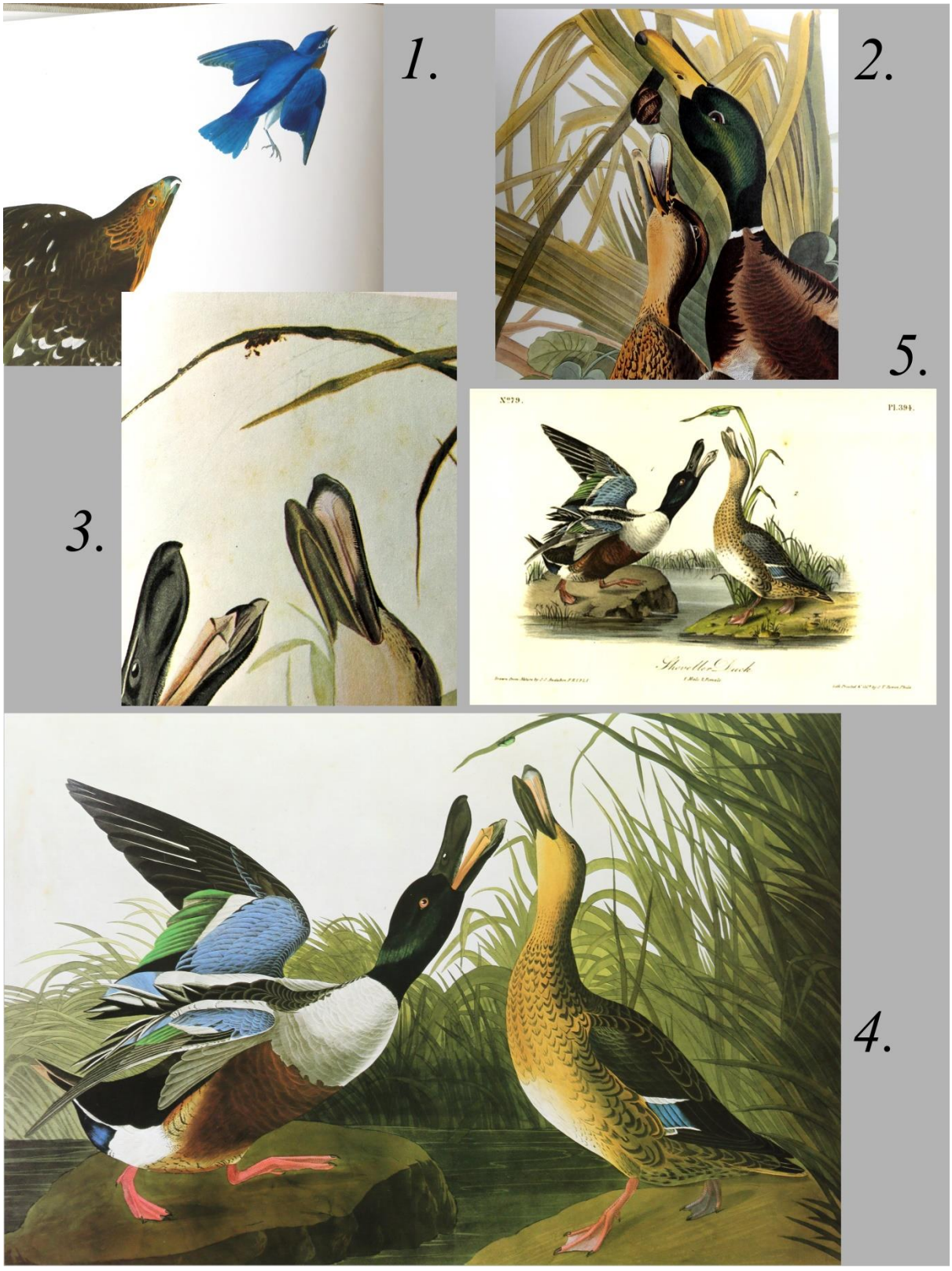

Figure 1 (see explanations page 48).

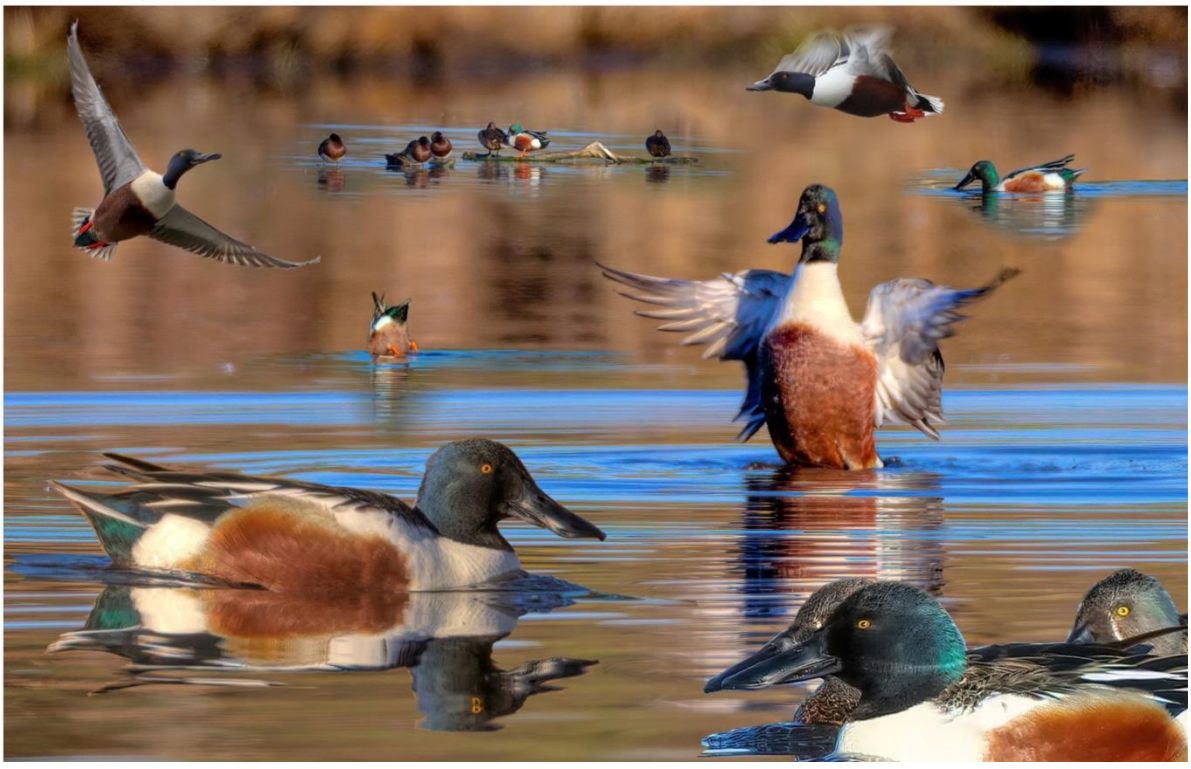

Figure 2 (see explanations on page 48)**.**

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FIRST BREEDING ATTEMPT BY SINGING HONEYEATER IN CANBERRA

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Abstract: *During the summer of 2020/2021 a pair of Singing Honeyeaters, generally a rare visitor to the ACT, made a series of breeding attempts at the Franklin Pond in Gungahlin. Unfortunately these attempts were unsuccessful, and the birds have since left the area.*

Background

The Singing Honeyeater (*Gavicalis virescens*) is a small to medium mostly grey-brown honeyeater, distinguished by a long black line through the eye which is underlined with a yellow stripe (Fig. 1). It is found over most of Australia, except for the east coast and ranges, (Barrett *et al.* 2003;) and is a rare visitor to the ACT and COG's Area of Interest (Wilson 1984, 1999; Cooper *et al*. 2020), with only 10 records of single birds over the past twenty years (see Table 1). Wilson (1999) mentions three further records for our area between 1962 and 1975.

Figure 1. Singing Honeyeater at Franklin Pond (*Shorty Westlin).*)

On 2 Jul 2020 a single bird was reported at Franklin Pond, Gungahlin, by Daniel Gautschi. Over the next few weeks many birders and photographers went to this location to observe and photograph this bird. As a result of visiting this site, Michael Lenz (ML) decided to survey the breeding birds along this waterway through the suburb of Franklin, started to visit the area regularly, and continued to report the presence of the Singing Honeyeater.

Table 1. Records of Singing Honeyeaters in COG's Area of Interest.

Date	Location	Observer
30. 07.2006	Tarago, NSW	Michael Lenz
24.10.2010	Lake Burley Griffin, West Basin	Con Boekel
22.09.2013	Lake Ginninderra, Diddams Close	Alex Blanden
29.10.2013	Mulligans Flat NR	Peter Milburn
03.12. - 20.12.2013	Australian Institute of Sport wetland	John Bundock *et al.*
30.12.2013 - 17.02.2014	West Belconnen Pond	Christine Darwood *et al.*
22.06.2014	University of Canberra	Peter Milburn
21.4. -25.04.2018	Macgregor, Macfarlane Burnet Ave. Pond	Peter Christian *et al.*
02.07.2020 – 13.02.2021	Franklin, Franklin Pond	Daniel Gautschi *et al.*
26.03.2021	Melba	Daryl King

Something New

On 1 Oct 2020, Christine Darwood (CD) visited Franklin to bird along the waterways, and observed the Singing Honeyeater at Franklin Pond. There were two interesting aspects to this observation. Firstly, the bird appeared to have a white feather in its tail, and secondly it seemed to be collecting white fluffy material from the case of a case moth (see Fig.2). CD observed the bird collect the fluffy material three times, each time taking it to a group of bushes on the edge of Franklin Pond.

Figure 2. Singing Honeyeater (female) collecting nest material (*Christine Darwood*) [see text for details].

Observations

After the initial observation CD and ML went individually to the site two or three times a week to watch the Singing Honeyeater, and to determine if there were actually two birds present, and if they had a nest. Over the first few weeks a single bird was seen, it did not

have a white feather in the tail, and it seemed to stay close to the bushes identified on 1 Oct as a possible nest site (see Fig. 3). It would call occasionally, as well as foraging in nearby vegetation, or just perch on a bare branch above the 'nest site'. Then on 25 Oct CD observed a Singing Honeyeater with a white feather in its tail foraging near the nest site. Could this be a sign that eggs had hatched, and both birds were now out and about collecting food for the young birds? By now we were convinced that the bird with a white feather in its tail was the female. The female Singing Honeyeater incubates alone (Higgins *et al.* 2020), hence she would rarely be seen while incubating, as in our case.

On 30 Oct, however, ML made an unsettling observation. Twice the female was seen carrying white fluffy material from the nest site to a new location at the eastern end of the boardwalk. For a couple of days both birds were very active, but the activity now centred around the new nest site (N2, see Fig. 3), and often the honeyeaters were foraging close to the ground, most likely collecting spider webs for nest construction. But soon again only the male was seen, and always closer to N2.

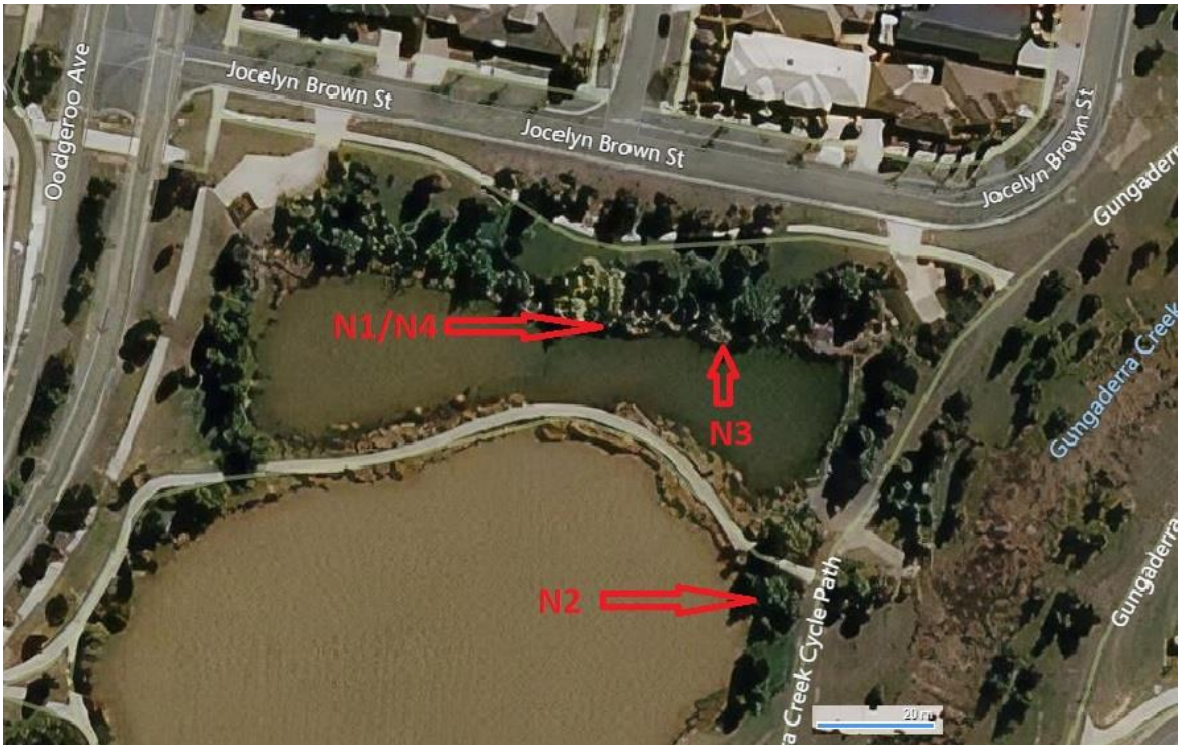

Figure 3. Location of the four nest sites at Franklin Pond.

Over the next few weeks the Singing Honeyeaters were very cryptic, hardly seen at all, and heard only occasionally, but always from around the N2 area. However, on 27 Nov CD observed one of the Singing Honeyeaters carrying white material from the first nest area (N1) to a new area of Banksias and bushes several metres to the East. This was soon termed N3 (see Fig. 3). Again for the next couple of weeks the activity centred on this area, mostly the bird with a normal tail (male) was noted, though both birds were heard calling. The male was seen, usually either perched above or near to the nest area, or chasing White-plumed Honeyeaters (*Ptilotula penicillata*) and Red Wattlebirds (*Anthochaera carunculata*) away from that area.

On 19 Dec ML noted that the activity seemed to have partially shifted back to the original nest area N1, though there was still some activity around N3. However, on 22 Dec he

observed the collection and transport of nest material to the site of N1, now to be N4 (see Fig. 3), a fourth nest site!

Over the following few weeks the familiar pattern continued: two birds heard, but only the male seen, often perched above N4, sometimes chasing other honeyeaters, but also feeding nearby, and on one occasion having a bath. On 19 Jan the pattern of activity changed, the calls changed, and both birds were seen both feeding and preening close to the nest site.

Geoffrey Dabb also visited the site, and saw and photographed both birds, obtaining images of the female showing the twisted white undertail covert poking through the main tail feathers (see Fig. 4).

Figure 4. Under-tail region of the female Singing Honeyeater, showing the twisted undertail covert (see arrows) poking upwards through the tail feathers [see also Fig. 2**] (*Geoffrey Dabb*).**

On 25 Jan CD observed a lone Singing Honeyeater on the eastern edge of the pond. It called often, associated with other honeyeaters showing no aggression, and flew longer distances, but nowhere near N4. This bird appeared to have a moulting tail, so we could not determine if it was the male or female, but at this time it was realised that the fourth nesting attempt had also failed, and that there was now only one bird left at the site.

On 31 Jan the Singing Honeyeater was rediscovered by other birders, and a number of observers visited the site to get their year tick. Many reported hearing the 'pirrr' call, sounding quite like a Rainbow Bee-eater. This is a call which we had not been hearing at all over the months of observations.

Only one bird was seen or heard after 21 Jan, and this bird was last observed on 13 Feb by Liam Manderson. A Singing Honeyeater was reported by Daryl King at Melba on 26 Mar. It is possible that this was one of the birds from Franklin.

The Singing Honeyeater is noted for foraging at all vegetation levels, but generally lower than other honeyeaters, up to 22% of foraging observations being on the ground (Higgins *et al.* 2020). However, the birds at Franklin Pond were seen in ground vegetation only during

times of nest construction, when they seemed to gather spider webs and once brought back a blade of grass to the nest site.

Discussion

Despite there being no offspring seen, or even a nest found, we are certain that there were in fact four nesting attempts by a pair of Singing Honeyeaters at Franklin Pond. This is because of these observations: a. two birds present, b. collection and carrying of nest material, c. aggressive behaviour toward other honeyeaters at each nesting site, and d. just one bird (male) staying near to a certain spot continually over a few weeks of each cycle, and the female not being seen (though occasionally heard) for about a 2-week period (the incubation time) during that time.

As Table 2 indicates, the presence of birds at each nest site ranged from about 23 to 35 days. Allowing for nest-construction and an incubation period of 12-14 days (Higgins *et al.* 2020), one can expect the female to be more visible and active again towards the latter parts of these periods, just as we have observed. Nest failure must have happened when young were in the nests.

Table 2. Approximate periods over which Singing Honeyeaters were observed at each nest site.

Nest site	Period
N1	1 Oct – end Oct
N2	30 Oct – end Nov
N3	27 Nov – 19 Dec
N4	22 Dec – 25 Jan

We have not included information about the weather in our observations, but we did note that it was a very wet summer in Canberra, and there is a strong possibility that the failure of each nesting attempt coincided with reasonably heavy rainfall or rainfall lasting for several days.

The location and other factors seemed to favour a good outcome: good vegetation for a well-hidden nest, plenty of food and water available and other honeyeaters successfully breeding nearby. However, Singing Honeyeaters are rare in the ACT and have never been known to breed here, so there may be factors in this environment which make it a marginal area for successful breeding.

Perhaps there will be another occasion which will be more favourable, and a pair of Singing Honeyeaters will be able to successfully rear a brood of young in the ACT.

Acknowledgements

We are grateful to Geoffrey Dabb and Shorty Westlin for giving permission to use their photos and to them, to Julie Clark, and other observers for sharing their observations of the Singing Honeyeater(s) at Franklin Pond on eBird. Barbara Allan provided information on past Singing Honeyeater records.

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BREEDING SUCCESS AND DIET OF LITTLE EAGLES IN THE ACT AND NEARBY NSW IN 2020

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Abstract. *Twelve Little Eagle* (Hieraaetus morphnoides) *territories were occupied in the ACT in 2020. There were nine pairs, seven of which were confirmed to have nests, and it is not known if the other pairs had nests. There were single birds, a male and female, at two territories, and at one previously successful territory a female was seen with a lined nest but no male and no eggs were seen. Eggs were laid in at least six nests and young were hatched in all nests with eggs laid. At least three chicks died while still young, two in each of two nests with single chicks. Prolonged heavy rainfall was a possible cause of failure at these two nests and one nest was disturbed by Pied Currawongs* (Strepera graculina) *and Brown Goshawks* (Accipiter fasciatus) *probably causing chick death. A minimum of three pairs successfully fledged one chick each. In nearby NSW, four previously known nest sites in NSW were occupied and single young fledged from all. One chick died in one of these nests where two chicks had hatched. A fifth, new, pair with a nest were located but they apparently did not lay eggs. Despite higher loss of nestlings than in the previous three (drought) years, overall breeding success was slightly higher. The diet was composed of mammals (60.6%), of which European Rabbit* (Oryctolagus cuniculus) *was 52.4%, small/medium-sized birds (36.1%) and reptiles (3.3%). Rabbits made up a greater percentage of the diet than in the previous three breeding seasons.*

Introduction

The Little Eagle (*Hieraaetus morphnoides*) hunts and nests in woodland and open country. It is a generalist feeder; taking mainly small to medium-sized mammals, birds and reptiles (Marchant and Higgins 1993). The main laying period in south-east Australia is August-October, the usual clutch is 1 or 2 eggs, and most fledged broods are of one, occasionally two chicks (Marchant and Higgins 1993).

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

The previous three successive years were dry and there was more than twice the rainfall in the study area in 2020 than in 2019 (790 mm and 358 mm respectively) (Bureau of Metrology (BOM 2021). Grasses and herbs grew tall after the late winter and spring rain, up to 1.8 m in areas where there had been bare ground in 2019, and European Rabbit

(*Oryctolagus cuniculus*) numbers were high in south-east Australia (Local Land Services 2020, *The Canberra Times* 2021). Therefore, rabbits were abundant during the Little Eagle breeding season, but there was also heavy rain during the nesting period when young are vulnerable to poor weather.

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

Methods

Continuity of methods is important in a long-term study, therefore the methods followed were as described in the previous years' reports (Rae *et al*. 2018, 2019, 2020) and Hardey *et al*. (2013). The main procedures were: checking for occupancy of all nests and territories known from previous surveys; watching for eagles from vantage points from late July 2020 to February 2021; following up any sightings of eagles for possible nests; monitoring the progression of the breeding stages at each nest to fledging (Figs. 1 and 2); and collecting food remains and cast pellets from below nests and perches. Prey remains were identified from diagnostic body parts and the pellets were stored for later analysis (Rae *et al* 2020). A digital camera, which recorded still images at time-lapse settings, was deployed at one nest to monitor the birds' behaviour at the nest.

Figure 1. A fledgling Little Eagle, on the right, perches on a branch outside its nest while the adult female perches above and behind. Although fledged and almost fully grown, the fledgling is smaller, an indication that it is a male as the species is dimorphic in size. Some females are more than twice the weight of some males.

Figure 2. A recently fledged Little Eagle flies over the nesting area. Note the clean edge to all the recently grown flight feathers. At this post-fledging time the adults are usually moulting flight feathers, and other flight feathers are notched or broken-tipped.

Results

Number of Little Eagle pairs and breeding success

Twelve Little Eagle territories were occupied in the ACT in the 2020/21 breeding season. There was a minimum of nine pairs, and there were two single birds at other sites, a male who occupied a previously known nesting area and a female who was tagged and followed by GPS for a second consecutive year. She was not seen at a nest in either year. Another female was seen with a lined nest but no male and no eggs were evident. Seven pairs were confirmed to have nests, two were suspected to have. Eggs were laid in at least six nests and young were hatched in all nests with eggs. Three chicks died while young and downy in late October - early November. The causes of these chicks dying are uncertain, although one nest was disturbed by Pied Currawongs (*Strepera graculina*) and Brown Goshawks (*Accipiter fasciatus*) and any chicks were possibly killed, and there was prolonged heavy rainfall in the period when the other two young died. These two nests were at the tops of trees with no canopy above them, which probably increased exposure to the elements. A minimum of three pairs successfully fledged a chick each.

Four previously known nest sites in nearby NSW were occupied and single young fledged from each. A new territory was identified in nearby NSW, and a nest was built by that pair, which apparently did not lay eggs. At the nest where a camera was deployed, there were two chicks no more than eight days old on 8 Oct. On the next day one chick was dead. There had been 35 mm of rain between 6th and 8th, and the chick probably died of hypothermia. The other chick subsequently fledged.

There was a small increase in the number of chicks fledged per nesting pair, compared with that in 2019 (0.43 and 0.80 in the ACT and NSW in 2020, compared with 0.30 and 0.75

respectively in 2019, and 0.58 overall in 2020 compared with 0.46 in 2019). The number of chicks reared per pair that laid eggs was 0.5 in the ACT, 1.00 in NSW and 0.70 overall, compared with 0.50, 0.75 and 0.60 respectively in 2019. The proportion of pairs with a nest that laid eggs was 85%, and 100% of those hatched. In the previous three years the proportions of pairs that laid eggs were 67, 77 and 67%, and hatching success was 50, 71 and 67%. Therefore, laying and hatching rates were higher in 2020 than in previous years. However, a greater number of nestlings failed to fledge than in previous years: 50% of chicks known to have hatched subsequently fledged, compared with 100, 100 and 75% in previous years.

One nest site in the ACT that had been used in 2017-2019 was not used in 2020 and the male moved to a nest site 12 km away, possibly with a different female. The male was fitted with a GPS-satellite tracker and was followed and identified at the new site as he was marked with individually numbered colour bands. The female was not marked in either year. There was a lined nest but no eggs were recorded. The new site was in an area where the male had hunted in the two previous breeding seasons (GPS data).

Early in the breeding season at another territory in the ACT, on 28 Aug, one marked adult male was seen mating with an unmarked dark-morph female at his nest site of the previous three years, and they were last seen together at the nest site on 21 Sep. Then on 2 Oct he was at the nest with a pale-morph bird, probably the one from that nest site in the previous years, as that bird was a pale-phase type. This second female was the one who incubated on the nest and reared a chick. The dark-morph female was not observed again.

Another tagged male was observed with a female on a nest in an adjacent territory to the one he had occupied in the two previous years. He later returned to his original territory when a second male was observed to be paired with the female in the adjacent territory. The second male was unmarked and it is not known if he was the male from that site in the previous year who had returned from migration later than the tagged bird.

Diet

The remains of 61 food items and 128 pellets were collected. The main items in the food remains were mammals (37 items, 60.6%), of which rabbits were the most frequently taken species (32 items, 52.4%) and were eaten throughout the breeding season. Birds were the second most frequently taken group (22 items, 36.1%) and there were only two reptiles (3.3%) (Fig. 3). There were single records of Ring-tailed Possum (*Pseudocheirus peregrinus*), Brush-Tailed Possum (*Trichosorurus vulpecula*), Brown Hare (*Lepus europaeus*) leveret, Swamp Wallaby (*Wallabia bicolor*) and lamb (*Ovis aries)*. It is considered that the wallaby and lamb would have been taken as carrion, as there were only parts of a wallaby tail and lamb skin. The main bird species eaten were Red-rumped Parrot (*Psephotus haematonotus*) (4), Starling (*Sturnus vulgaris*) (3), Crimson Rosella (*Platycercus elegans*) (3) and Eastern Rosella (*P. eximius*) (2). Birds were eaten from November to February and nine of the 22 birds were identified as juveniles of the year. The two reptiles were Eastern Blue-tongue Skink (*Tiliqua scincoides*) and Cunningham's Skink (*Egernia cunninghami*) and they were taken in late October and early November.

The number of rabbits eaten in 2020 was high compared with the expected figures from chi-square analysis of the numbers of rabbits, birds and reptiles eaten in all four years (χ^2=27.89, df = 6, P < 0.0001). The percentage deviation (PD) was +33.2%, and those for birds and reptiles were lower than expected, PD -17.5% and -62.3% respectively.

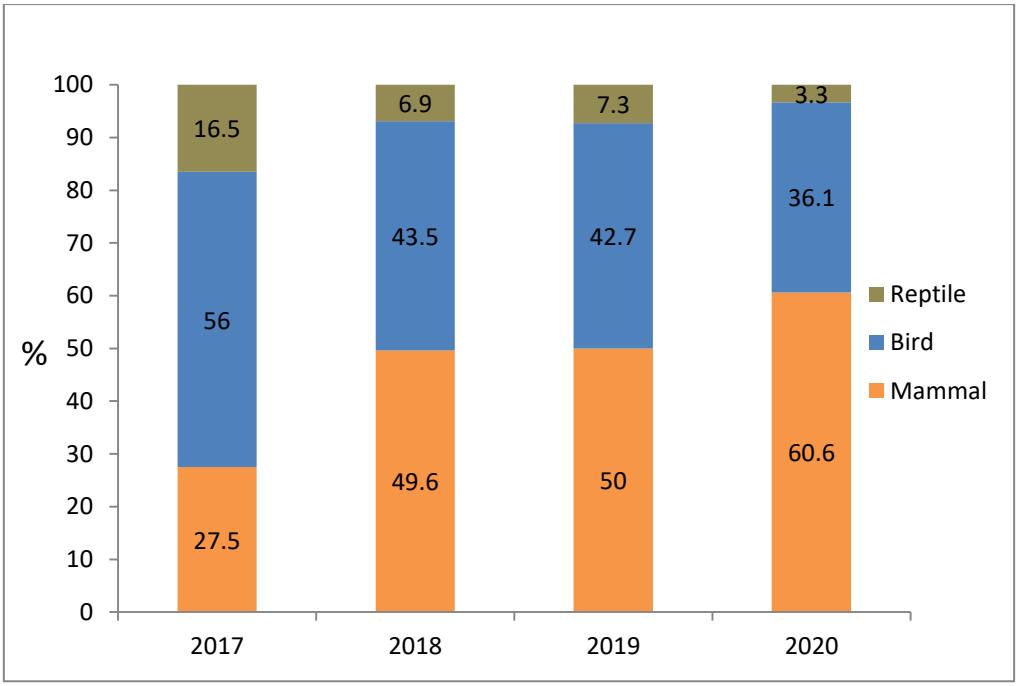

Figure 3. Proportions of food types in the diet of Little Eagles during the breeding season in the ACT and nearby NSW in 2017, 2018, 2019 and 2020.

Discussion

High rainfall was a likely contributory factor to higher proportions of pairs of Little Eagles laying eggs and hatching young in 2020 than in the three previous years. Rainfall in the ACT in 2020 was the highest since 2010, in contrast to the previous three dry years (BOM 2021). By the beginning of the Little Eagle breeding season in August, there was an increase in vegetative growth and abundant rabbits, their main food. If food is insufficient raptors will not lay eggs (Newton 1979), and that might have been a cause of lower laying rates in the previous dry years. When food is abundant birds can lay larger clutches and eggs (Lack 1968, Galbraith 1988), which is related to greater hatching success (Krist 2011).

The main cause of breeding failure this year was chicks dying. Three of four chicks that died possibly did so from hypothermia and/or lack of food during high rainfall. Heavy rain fell on numerous occasions between late July and November. August, at the beginning of the Little Eagle breeding season, was the wettest month, with 105 mm falling, compared to 17.8 mm in August 2019. Rainfall in October and November was also high: 133 and 93 mm. Most of the Little Eagles had downy young in late October and early November when 99 mm of rain fell (24 October - 9 November; BOM 2020). These chicks would have been vulnerable to cold wet conditions. Exposure to rain and starvation, which can be caused by the adults inability to catch enough food during prolonged rainfall, are the two most frequent causes of death in young European Sparrowhawks (*Accipiter nisus*) (Newton 1986). Heavy rain is also the major cause of reproductive failure in Peregrine (*Falco peregrinus*) and Brown Falcons (*Falco berigora*) (Olsen and Olsen 1989; McDonald *et al.* 2004).

A higher proportion of rabbits was eaten than in previous years, likely in response to greater rabbit numbers, which increase after rainfall (King *et al.* 1983). Fewer reptiles might have been eaten because the eagles could not see or catch lizards concealed by tall ground layer

vegetation. Also, reptiles are less active in cooler, rainy conditions. The two skinks that were recorded were taken in spring soon after they would have emerged from winter hibernation and prior to the vegetation growing tall.

It is not known whether the Little Eagles selectively fed on rabbits rather than birds or ate them in proportion to availability, as prey numbers were not measured. However, the lower proportion of birds in the diet might have been because the main prey species of birds were less abundant in 2020 following the three previous dry years. The taking of young birds in the latter part of the breeding season might be indicative of the eagles responding to an increase in birds available once the young of the season had fledged.

In summary, the higher rainfall in 2020 was associated with lush vegetation growth and abundance of prey, especially rabbits, which likely influenced an overall increase in the Little Eagle breeding success, especially egg-laying and hatching success. However, high rainfall was also probably a cause of the death of three chicks and so negatively affected fledging success.

Acknowledgements

The findings reported here are the results of the cooperative study by the Little Eagle Research Group with the help of a growing number of landowners and managers who enthusiastically allow access to nest sites and hunting areas. We thank other members of the group, Don Fletcher, Melissa Snape and Zohara Lucas for their continued assistance and we are especially grateful to others outside the group for information on Little Eagle whereabouts and other information. Diana Tracy and Rob Magrath gave helpful comments on the draft.

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PREY ITEMS IDENTIFIED FROM LITTLE EAGLE PELLETS COLLECTED IN AND AROUND THE AUSTRALIAN CAPITAL TERRITORY

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Abstract: *We describe the prey items identified in 810 food pellets ejected by Little Eagles* (Hieraaetus morphnoides) *in the ACT and nearby NSW. European Rabbit* (Oryctolagus cuniculus) *was the most frequent prey species, found in 87% of pellets. The remains of birds were in 31% and reptile remains were in 13%. The most frequent birds eaten were Eastern and Crimson Rosellas (*Platycercus eximius *and* P. elegans*), and European Starling* (Sturnus vulgaris). *The reptiles were all lizards, and the most frequent remains were of Eastern Blue-tongue* (Tiliqua scincoides scincoides), *dragon sp. and skink sp. Miscellaneous items included, Black Rat* (Rattus rattus), *Red Fox* (Vulpes vulpes), *Eastern Grey Kangaroo* (Macropus giganteus) *and sheep* (Ovis aries). *Traces of insects eaten were scarce (in 1.8% of pellets) and all were either beetles* (Coleoptera) *or grasshoppers* (Caelifera). *The minimum numbers of the main prey types were: rabbit 141, bird 122 and reptile 52. Prey remains were collected at the same time as the pellets and on comparison, there were similar counts of rabbits (134) in the prey remains as in the pellets, more birds (159) and fewer reptiles (34).*

Introduction

The diet of raptors is fundamental to their population ecology, affecting their distribution, abundance, and breeding success (Newton 1979). As such, this study of prey remains in pellets regurgitated by Little Eagles (*Hieraaetus morphnoides*) is an integral part of a current wider study of these eagles in the Australian Capital Territory (ACT) and New South Wales (NSW), within 30 km of the ACT border (Rae *et al*. 2018, 2019, 2020).

This study quantifies Little Eagle diet as identified from prey remains in pellets collected over three years, between August 2017 and March 2020. These results are then compared with prey remains collected at the same times, and previously reported in Rae *et al* 2018, 2019, 2020. More detailed examination of long-term dietary trends will be conducted in future years.

Methods

Pellets cast by Little Eagles were collected during a study of Little Eagles in and around the ACT in 2017-2020, mainly in the breeding seasons, approximately August to February. Many of the birds moved out of the study area outside the breeding season. Pellets were found by searching the ground below the nest and trees used by the birds for roosting, plucking or general perching. Collected pellets were dried, placed in individual plastic sample bags, and then in larger bags per collection batch (Figs. 1-4), batches being sets of pellets taken from one nest or home range on one day at minimal intervals of one week. Their contents were later separated and examined under a microscope, when necessary, for identification. As food items can occur in more than one pellet in subsequent days, comparative analysis was done using the minimum numbers of items per collection batch as units rather than individual pellets (as per Watson *et al.* 1993). Prey items were collected in batches from the same sites at the same times as the pellets and identified to the lowest

Figure 1. (left) Three Little Eagle pellets with binoculars (10 x 32) for scale. The two smaller pellets are more likely from a male and the larger one from a female.
Figure 2. (right) A Little Eagle pellet containing fur from a rabbit and scales from a lizard.

Figure 3. (left) A Little Eagle pellet containing rabbit fur and whiskers, and feathers.
Figure 4. (right) The Little Eagle pellets (810) were bagged individually, then in batches and collated into annual bags.

taxonomic level possible. Pellets were analysed for prey content by Georgeanna Story and prey remains were identified by Stuart Rae. The items in the pellets were small and many required laboratory techniques for identification, the prey items were large, readily identified body parts, feathers or fur.

A simple analysis was conducted of the overall contents of the pellets according to prey type, and this was compared with that for items in batches of other prey remains collected at the same time. Fisher and chi-square tests were used to test for differences between the sampling methods.

Results

810 pellets were examined and the most frequent prey remains were of European Rabbit (*Oryctolagus cuniculus*), which occurred in 703 pellets (87%). Birds, all species combined, formed the next most frequent category of prey; their remains occurred in 249 pellets (30.7%). Reptiles, all species, were identified from 108 pellets (13.3%). 470 pellets were entirely of rabbit remains, 71 were entirely bird remains and none were solely reptile remains. There were remains of other mammals in 19 pellets (2.3%), and insect remains occurred in only 15 (1.8%). A list of all species and prey type frequencies is presented in Table 1.

Two pellets contained remains of ants and these were considered to have been non-intentionally ingested while eating a larger prey item which the ants had been attracted to. One pellet was composed entirely of Little Eagle eggshell, one was beetle remains and seeds in a matrix of paper, and another from nylon wadding, the origin of which was not identified.

Analysis of the prey items in batches of pellets allowed counts of minimum numbers of prey items eaten (Table 1). This confirmed rabbit as the main species, with a minimum of 141 individuals eaten, and there were minima of 122 birds and 52 reptiles. There were minima of 11 other mammals eaten, or parts thereof, and 15 insects. Kangaroo, sheep, and fox would have likely been taken as carrion and only parts of the animals eaten. The carrion and insects were regarded as insignificant by proportion in the birds' diet and not included in further analysis.

On comparison, in the identified body parts found at the same time as the pellets were collected, there were minima of 134 rabbits, 159 birds and 34 reptiles. There were significantly fewer birds and more reptiles detected in the pellets than in prey remains counted at the same sites ($\chi^2 = 8.6$, $P = 0.014$, $N = 642$). The percentage deviation (PD) was -11.5% for birds and +23.2% for reptiles. The PD for rabbits in pellets was +4.5%

A sample of 200 pellets were measured and the mean length and breadth were 30.7 x 20.6 mm (s.d. = 9.81 and 3.82). The minimum length and breadth were 14.5 and 3.82 mm, respectively, and the maxima were 73.3 and 29.6 mm.

Discussion

This summary analysis of pellet remains confirms that rabbits and birds are the main prey items of Little Eagles in our study population. Other prey items, including reptiles, were uncommon. These results are consistent with previous evidence based on analysis of prey remains found in the same locations during the same period (Rae *et al.* 2018, 2019, 2020).

One difference was that fewer birds were recorded in pellets than in prey remains. This was possibly because fewer parts of birds, mostly feathers, were identified by species and hence counted as fewer species per batch. Also, more reptiles were recorded in pellets than by body parts, perhaps because the smaller of these, skink and dragon species, were completely eaten and no remains left on site. Such biases in both prey-collection methods has been reported previously (Collopy 1983; Simmons *et al*. 1992). They point to the value of aggregated assessments of diet, and the need to compare like with like in dietary studies (Steenhof and Kochert 1985; Marti *et al*. 2007).

Table 1. The minimal frequencies of prey species and taxa remains in Little Eagle pellets collected in the Canberra region over three years, August 2017 - March 2020.

Species		**Minimum number in pellets**	**Minimum number in prey remains**
Rabbit	*Oryctolagus cuniculus*	141	134
Black Rat	*Rattus rattus*	3	0
Eastern Grey Kangaroo	*Macropus giganteus*	3	1
Brush-tailed Possum	*Trichosorurus vulpecula*	2	0
House Mouse	*Mus musculus*	1	0
Red Fox	*Vulpes vulpes*	1	1
Sheep	*Ovis aries*	1	0
Brown Hare	*Lepus capensis*	0	6
Ring-tailed Possum	*Pseudocheirus peregrinus*	0	1
All mammals		*152*	*143*
Bird unidentified		71	18
Starling	*Sturnus vulgaris*	19	16
Eastern Rosella	*Platycercus eximius*	13	24
Crimson Rosella	*Platycercus elegans*	6	33
Rosella unidentified	*Platycercus sp*	4	0
Galah	*Eolophus roseicapilla*	3	1
Sulphur-crested Cockatoo	*Cacatua galerita*	1	0
Feral Pigeon	*Columba livia domestica*	1	3
Laughing Kookaburra	*Dacelo novaeguineae*	1	0
Australian Wood Duck	*Chenonetta jubata*	1	0
Grey Teal	*Anas gracilis*	1	0
Superb Fairy-wren	*Malurus cyaneus*	1	0
Tawny Frogmouth	*Podargus strigoides*	0	2
Superb Parrot	*Polytelis swainsonii*	0	1
Red-rumped Parrot	*Psephotus haematonotus*	0	6
Crested Pigeon	*Ocyphaps lophotes*	0	2
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	0	2
Sacred Kingfisher	*Todiramphus sanctus*	0	2

Table 1 continued on following page

Table 1 continued from previous page

Species		**Minimum number in pellets**	**Minimum number in prey remains**
Dollarbird	*Eurystomus orientalis*	0	1
Thornbill sp.	*Acanthiza sp.*	0	2
Red Wattlebird	*Anthochaera carunculata*	0	7
Dollarbird	*Eurystomus orientalis*	0	1
Thornbill sp.	*Acanthiza sp.*	0	2
Red Wattlebird	*Anthochaera carunculata*	0	7
Noisy Friarbird	*Philemon corniculatus*	0	2
White-throated Treecreeper	*Cormobates leucophaea*	0	1
Australian Magpie	*Cracticus tibicen*	0	7
White-winged Chough	*Corcorax melanorhamphos*	0	2
Magpie Lark	*Grallina cyanoleuca*	0	10
Grey Shrike Thrush	*Colluricincla harmonica*	0	1
Eurasian Skylark	*Alauda arvensis*	0	4
Australian Pipit	*Anthus australis*	0	4
Common Myna	*Acridotheres tristis*	0	7
Domestic Chicken	*Gallus gallus*	0	1
All birds		*122*	*159*
Lizard unidentified		33	4
Eastern Blue-tongue	*Tiliqua scincoides scincoides*	17	17
Bearded Dragon	*Pogona barbata*	2	1
Cunningham's Skink	*Egernia cunninghami*	0	11
Jacky Dragon	*Amphibolurus muricatus*	0	1
All reptiles		*52*	*34*
Beetle	Coleoptera	11	0
Grasshopper	Caelifera	4	0
All insects		*15*	*0*

The large range in the sizes of pellets is likely partly related to the large size range in the species. There is a considerable body-size difference between the sexes. The largest females are more than twice the weight of the smallest males (Marchant and Higgins 1993), and in one pair in this study, the female was 1065g and the male was 590g, 1.8 times the weight of her partner. There is also variation in pellet size within the sexes according to the amount of roughage they have eaten. We expected a bimodal distribution in pellet size because of the size difference between the sexes. However, the distribution was normal. This could have been because there was a considerable range in the size of pellets ejected by each sex and a large overlap in sizes.

The results generally accord with previous findings on Little Eagle diet in the ACT and elsewhere (*e.g.* Aumann 2001; Debus *et al*. 2007, 2021; Olsen *et al* 2010). Future analysis

of the diet of Little Eagles in the ACT study population will investigate the diet in more detail, including differences between years, locations and habitat types.

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HISTORY AND TREATMENT OF MALLARDS AND MALLARD-LIKE BIRDS IN THE ACT. SPECIES? DOMESTIC? HYBRID?

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Abstract. *The Mallard was introduced into south west and south east Australia from as early as 1862. Current mallard-like birds in our area are considered to be domestic-type birds. The species also hybridises with wild native ducks (e.g. Pacific Black Duck). In general, it is considered that all or nearly all mallard-like birds in Australia are actually hybrids or descendants of domestic ducks. The Canberra Ornithologists Group and eBird in the ACT are moving towards a consistent approach to mallard-like birds. eBird identification is based on what the bird looks like - if a bird looks like a wild-type Mallard, showing no signs of domestic traits, then it is properly recorded in eBird as a species Mallard. COG will formalise its approach when the 2021 revision of its Annotated Checklist of the Birds of the ACT is complete.*

Introduction

While many people (including some birders) think all domestic ducks are Mallards, this is far from the truth.

Mallard (*Anas platyrhynchos)* is the ancestor of many domestic duck breeds, but the resulting domestic ducks are certainly not Mallards and can often look very different from the Mallard. As one authority explains, 'The Mallard is the source of all domestic ducks, except the Muscovy Duck (*Cairina moschata*)' (Drilling *et al.* 2020*).* Just as confusing as the Mallard-derived domestic ducks are the hybrids of Mallards and wild native ducks which occur in Australia and other parts of the world. Some of these hybrid ducks may look very like the species-type Mallard, while others display obvious differences to the species-type birds.

This presents challenges of identification for birders in the field as well as ornithological organisations and authorities.

This article describes what is and what is not a Mallard in the ACT context, and provides a short history of their introduction to Australasia.

Finally, the article describes how the Canberra Ornithologists Group (COG) and eBird Australia treat observations of Mallard and mallard-like birds in the ACT.

What is a Mallard?

The name Mallard originally referred to any wild male duck (Harper 2001) and it is sometimes still used this way, causing confusion among some birders and the general public alike.

In its natural range the Mallard occurs in the temperate northern hemisphere from Europe through Asia and to North America.

The Mallard is a medium-large dabbling duck with a stocky build; total length 50–65 cm (male 55–70 cm, female 50–60 cm); adult mass 1,000–1,300 g (male 870–1800 g, female 735–1320 g); wingspan 75–100 cm (nominate) (Drilling *et al.* 2020). This makes the Mallard a little larger than the Pacific Black Duck (*Anas superciliosa*), but to the observer in the field the size difference is not very noticeable.

Adult Mallards are strongly sexually dimorphic during most of the year. The **male** in Definitive Basic (breeding) Plumage has a dark green head, narrow white neck ring, chestnut-brown breast, brownish grey upperparts, greyish underparts, black rump and undertail coverts, white outer tail feathers and strongly recurved black central tail feathers. The upperwing has an iridescent blue to violet-blue speculum on the wing bordered with a white line at the leading edge (tips of greater coverts) and trailing edge (tips of secondaries); underwing coverts white contrasting with pale grey underside of remiges; bill yellow to olive; legs and feet orange-red (Drilling *et al*. 2020). (Fig 1).

Figure 1. Adult male Mallard. Stemnitz, Germany, 13 April 2009. (*Jorg Hempel*).

Female plumage is similar all year round, with a broken streaky pattern of buff, white, grey, or black on brown feathers, white outer tail feathers, a pale belly and undertail coverts, and one prominent dark eyeline stripe. The upperwing and underwing of the female are similar to that of the male. The female bill is orange, variably splotched with black, with feet and legs orange (Drilling *et al*. 2020). (Fig. 2).

The **male** in Alternate (non-breeding or eclipse) Plumage, which is held only a short time in late summer, is similar to that of the female but the male is a little larger than the female, with a dark-greenish crown, warm-brown breast, darker upperparts, and a slight upturn to the central tail feathers and - most diagnostic - a yellowish bill (Drilling *et al*. 2020).

Juvenile Plumage is similar to female plumage but is generally darker, with notched tail feathers, and several differences in tertials and some wing coverts. First-year (Formative and First Alternate) birds can be identified by more rounded wing coverts, duller speculums (sex for sex) and more worn and pointed outer primaries. First-year males also have duller body plumage, sometimes mottled brownish (Drilling *et al*. 2020).

For the birder in the field, looking at female and eclipse male Mallards and Pacific Black Ducks, a clear diagnostic difference is the green speculum in the Pacific Black Duck and blue-purple speculum in the Mallard. Female species-type Mallards typically also have warmer brown plumage than Pacific Black Ducks, and typically have dark feather margins on the body whereas Pacific Black Ducks have pale feather margins.

Figure 2. Female Mallard. Lahn, Germany, 25 January 2009 *(Andreas Trepte).*

History of Mallard introductions in Australasia

In Australia, the Mallard was widely introduced into south west and south east Australia from as early as 1862 and around Sydney before 1900. An expansion of its main range in Australia has occurred since the 1950s (Marchant and Higgins 1990, p. 1314).

More information is available about New Zealand, where Mallards of British game-farm stock were introduced from Australia in 1867. Repeated introductions were made by acclimatisation societies, with birds known to have been sourced from England and the USA. The last introduction was made in 1974 (NZ Birds Online 2013). In New Zealand, interbreeding with the Pacific Black Duck (known there as the Grey Duck) has been extensive, and it is considered that few pure [species-type] Grey Ducks may now exist, hence the species' "critical" conservation status (NZ Birds Online 2013).

Equally, few species-type Mallards may exist in New Zealand. It had been assumed 'that far more mallard drakes mate with Grey Duck females than vice versa based on the fact that most hybrids show a mallard-type plumage, but this is not correct'. Genetic analysis indicated that it appears 'that the mallard phenotype is dominant, and that the degree to which species contributed to a hybrid's ancestry cannot be determined from the plumage' (Rhymer *et al.* 1994).

Given this evidence from New Zealand, it is likely that it is not possible to conclusively differentiate between species-type Mallards and Mallard/Pacific Black Duck hybrids on the basis of plumage observations in the field.

Status of Mallards in the ACT

Local authorities on waterbirds hold firm views that there is no evidence, now nor in the past, of any species-type Mallards in the Canberra region. All are considered to be domestic ducks or their descendants (*e.g.* Peter Fullagar, personal communication, May 2021). It is likely that these birds revert, over time, away from the 'barnyard duck' appearance to one more like that of the northern hemisphere Mallards.

These contemporary judgements about the status of this taxon are consistent with the local literature. In 1967 it was seen as 'probable' that the mallard-like birds seen on Lake Burley Griffin in that year 'arose from domestic escapees or releases and … [were] not pure stock' (Wilson 1999). Later, in 1992, *Birds of the Australian Capital Territory* stated that 'several feral populations of abandoned or escaped domestic Mallards can be found in most urban lakes and wetlands' (Taylor and COG 1992).

We are not aware of any authoritative source claiming current or past existence of any pure northern hemisphere Mallards in the Canberra region. This suggests that the birds in our area are domestic Mallards or Pacific Black Duck hybrids. It is acknowledged however, that since species-type Mallards are recorded in other parts of the country, some may visit or reside in the ACT now or in the future.

What is a domestic Mallard?

Domestic mallards are birds that show characteristics of the species-type Mallard as described above, as well as characteristics that are unlike the species-type. Such birds include the white form of the domestic Mallard. While the white plumage is very different to that of a wild-type Mallard their Mallard ancestry can be seen in their general body shape and stance, the yellow bill and legs, and sometimes recurved tail feathers. Other domestic Mallards look much more like the wild-type bird. For males at least, the authors' observations are that these birds may vary from wild-type Mallards in having, for example; a lack of the narrow white neck ring or neck ring wider and beige or cream; breast beige rather than chestnut; belly white, beige or mottled in beige and white; upperwings brown and sometimes mottled; black central tail feathers not recurved or less recurved; legs yellowish or brownish, and bill greenish or brownish (Fig. 3).

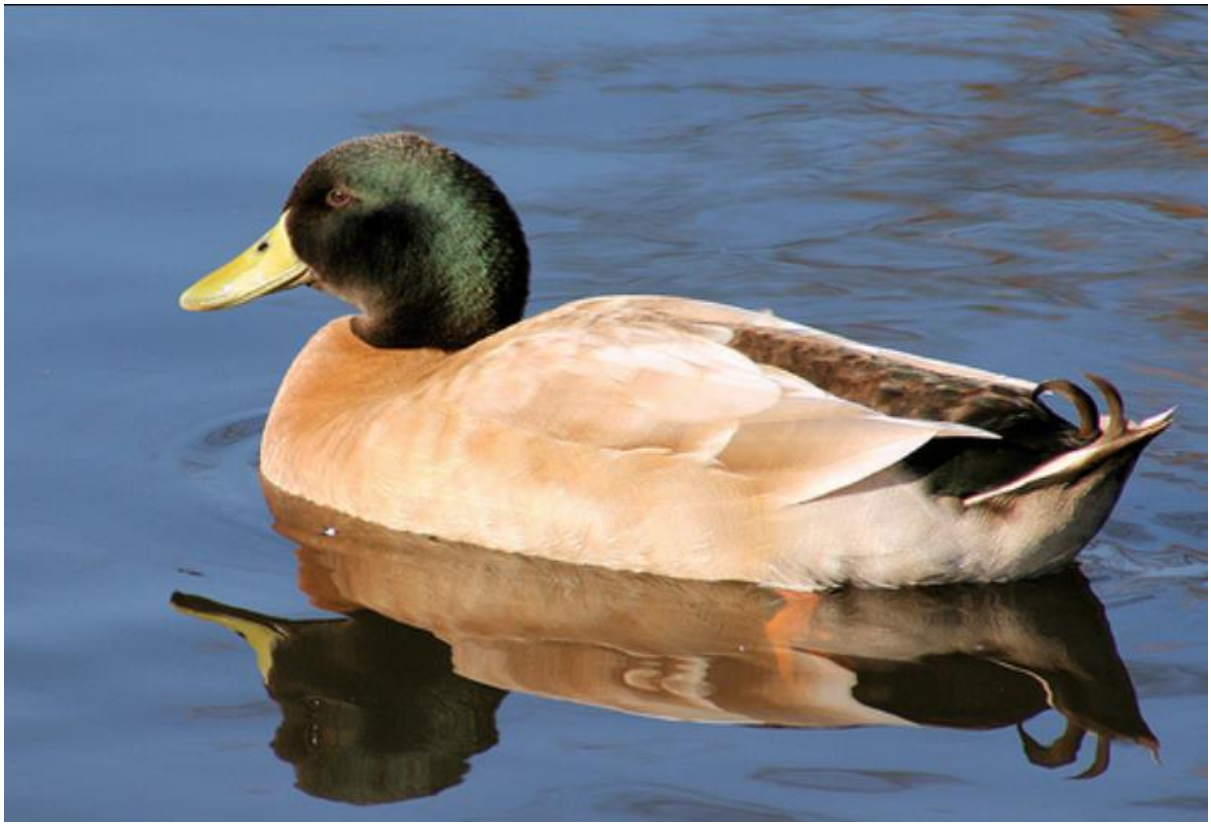

Figure 3. This male bird has similarities with wild-type Mallard including the green head and yellow bill but the lack of neck ring and brown underparts and wings are a giveaway. This is a domestic mallard. 20 December 2007 (*Sujit Kumar*).

Hybrids between Mallard and Pacific Black Duck

There is a wide phenotype variation in of hybrid Mallards in Australia. Any reasonably careful bird observer can attest that, in any large group of mallard-like birds in south east Australia, there will be individual birds displaying plumage features of both Pacific Black Duck and Mallard. Female Mallard/Pacific Black Duck hybrids are the easier to identify as they usually have warmer brown plumage than Pacific Black Ducks and often have more than the one facial stripe of the typical species-type Mallard. Hybrid males can be more difficult to identify but one of the author's observations on the Central Coast of NSW includes a remarkable bird with some green plumage on the head as well as facial stripes.

Given the evidence from New Zealand that the Mallard genotype tends to override that of the Pacific Black Duck, it is the authors' view that it is probably best to err on side of caution and record such birds as domestic Mallards unless there are clear indications that the bird is a hybrid.

Other Mallard hybrids

Hybrids between Mallard and Muscovy Duck have been reported in eBird on five occasions at three sites in the ACT. In our view, the appearance of these hybrids is so different to that of a species-type Mallard that it is unlikely that a careful observer would confuse them with the species-type Mallard.

What are not Mallards?

Given the cultural history of any male duck being named a Mallard, as well as the extensive hybridisation of Mallards with the Pacific Black Duck, it is worth looking at examples of

what are not Mallards. Birds like the ones illustrated, though not these particular birds, are fairly regularly submitted to eBird in the ACT as Mallards (Figs 4 and 5).

Figure 4. Not a Mallard but a domestic Muscovy Duck. Point Hut Pond, Gordon, ACT, 6 December 2015 *(Michael Bedingfield).*

Figure 5. This is also a domestic Muscovy Duck. Queanbeyan River, NSW, 9 August 2018. (*Alison Milton*).

How COG has treated Mallards and Mallard-like birds - past and present

COG's long-standing practice in dealing with bird taxonomy and nomenclature is to follow the practice of leading Australian authorities. COG does not make unilateral judgements on these matters. For many years COG referred simply to 'Mallards' without reference to domestic types, implementing locally the approach of the then Royal Australasian Ornithologists Union (RAOU) *Recommended English names for Australian birds* (RAOU 1978).

This practice was continued with the publication by the RAOU in 1994, of Christidis and Boles' *Taxonomy of Australian birds*, which included 'Mallard' without reference to the domestic type. They took a different approach, however, with the publication in 2008 of their *Systematics and taxonomy of Australian birds* (Christidis and Boles 2008), using the taxon name 'Northern Mallard'. We understand that this nomenclature arose in North America to differentiate the northern Mallard subspecies there from the Mexican subspecies. (The latter was elevated in 2018 to species level as Mexican Duck *Anas diazi*.) 'Northern Mallard' is not used in Eurasia.

Birdlife Australia published its first *Working List of Australian Birds* (WLAB) in 2013, adopting Christidis and Boles' 'Northern Mallard' nomenclature. As per its established policy, COG subsequently adopted the name 'Northern Mallard', following Birdlife Australia. In August 2019, WLAB version 3.0 (the current version) was released. It refers only to 'Mallard' and the 'Black Duck-Mallard hybrid', dropping the 'Northern Mallard' species name.

COG's 2021 *Annotated Checklist of the Birds of the ACT* (in preparation) is expected to include the taxa 1) 'Mallard (Domestic type)' and 2) 'Mallard *Anas platyrhynchos*' with the note 'An introduced species not yet recorded in the ACT but included here to avoid misclassifications within the Mallard group'. This is consistent with the approach taken in

COG's *Annual Bird Report*, listing 'Mallard' and 'Domestic Mallard' and noting that "The status of this exotic feral species as a wild bird in this region is in doubt. It has only been recorded a very few times in Australia and not in this region. However, COG has been reporting the occurrence of introduced feral domestic Mallards …" (COG 2020).

How eBird treats Mallards and mallard-like birds

eBird is a real-time, web-based program that allows bird observers to report sightings and access information about birds. It provides rich data sources for basic information on bird abundance and distribution at a variety of spatial and temporal scales (eBird 2021). COG's *Annual Bird Report* for the year ended 30 June 2019 shows that 94% of the bird records that COG received covering its Area of Interest came from eBird (COG 2020).

In January 2021 the treatment of mallard-like birds in the ACT was brought into line with eBird practice in NSW and other parts of Australia. This means that eBirders have three main options for their observations:

Option 1: Species Mallard. Denoted in eBird as "Mallard *Anas platyrhynchos*". To be confirmed by eBird in the ACT, the bird must show normal wild-type Mallard size and phenotype. Observers need to provide field notes and/or photos to show why the bird is considered to be species-type and not a domestic mallard. Photos are particularly useful here. eBird will review these submissions on their merits, but it should be acknowledged that few records are likely to be confirmed as species Mallard.

Option 2: Domestic Mallard. Denoted in eBird as "Mallard (Domestic type) *Anas platyrhynchos* (Domestic type)". The bird will typically show multiple characteristics of species Mallard but will also show atypical characteristics. In the ACT virtually all eBird reports of mallard-like birds will be domestic mallards. This is consistent with the conclusions of this article.

Option 3: Mallard/Pacific Black Duck hybrid. Denoted in eBird as "Mallard x Pacific Black Duck (hybrid) *Anas platyrhynchos x superciliosa".* This has been recorded in the ACT on numerous occasions, but it is possible that this article and the work of COG in clarifying the status of mallard-like birds in the ACT may result in fewer reports of this hybrid and more reports of domestic Mallard.

Conclusion

The identification and treatment of Mallards and mallard-like birds in the ACT has not always been straightforward, with uncertainty as to what constitutes a Mallard, what are domestic birds and what are hybrids. Both COG and eBird have been working to address this uncertainty in the ACT and to articulate how these birds should be identified and recorded in future. This will assist birders in the field as well as clarifying the status of these birds in the ACT.

The incremental changes we have discussed above reflect and are informed by the increasing sophistication of international understanding about bird genetics, which is continuing to create changes in bird taxonomies and nomenclatures in most regions of the world.

It also reflects the willingness of citizen science-focused entities, such as COG and eBird to adapt their approaches to the emerging scientific evidence.

We acknowledge that, for some people and in some circumstances, changing taxonomies and nomenclature can introduce challenges - not least for people who keep personal lists of bird observations, the managers of databases that potentially need to be reprogrammed to reflect the changes, and managers of websites and other communications media that are organised around established taxonomies and nomenclature.

Please contact the eBird reviewer in the ACT, Kim Farley at *kimlouisefarley@gmail.com* if you would like to discuss Mallards and mallard-like observations in the ACT. It is the established policy of eBird Australia to be open about what it does and why, and to be responsive to any concerns that eBirders may have about its policies and practices.

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NOTES

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SWIMMING MR FOX AND DUCKS – SOME HISTORICAL PRECEDENTS

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Alastair Smith's (2020) report of a swimming fox is an event not entirely unknown but one that I suspect few people have witnessed. His note also includes a description of ducks surrounding the fox and appearing to escort it across the water.

Ducks, geese and swans as well as other water birds will swim towards a fox standing on the shoreline. It is thought that this behaviour is driven by a similar instinct that causes small birds to mob a raptor (Kear 1990). Arguably, Alastair's observation of ducks "escorting" a swimming fox across the water is another aspect of this response.

This behaviour has been known to European wildfowlers for centuries and the knowledge used to attract ducks to decoys, which, in this sense, were ponds from which radiated channels or "pipes". These were curved tapering extensions of the ponds, covered with netting hung over semi-circular hoops and narrowing to a point where a net was attached. The net could be shut or tied off, thus ensnaring the quarry. The word decoy is a contraction of two Dutch words, perhaps from *de ende* meaning 'the duck' and *kooi*, 'cage' (Kear 1990). *De ende* (the duck) may or may not be part of it. It could be simply *de kooi* (the cage), in an older form 'de coie'.

A small reddish dog, often called Piper, with a bushy tail resembling that of a fox, was trained to lure ducks into the pipes. In 1886 one Sir Ralph Payne-Gallwey wrote of experimenting with dogs, ferrets, cats and squirrels as a means of luring ducks into decoys. He found that, while they all attracted ducks, only the dog could be controlled from a distance. He even trialled a monkey which the ducks followed, but when it turned and grinned they fled. (Kear 1990; Payne-Gallwey 1886).

Quaintly, foxes dressed as clerics and preaching to flocks of geese appear in English church carvings from the 15th and 16th centuries (Kear 1990).

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FIRST BREEDING RECORD FOR PIED STILTS IN THE ACT

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At the beginning of September 2020 Pied Stilts (*Himantopus leucocephalus*) were being recorded on eBird at Jerrabomberra Wetlands, and this continued through the rest of the year.

On 24 Oct I paid one of my usual visits to the wetlands. To my surprise I noted a pair of Pied Stilts building a nest (or perhaps adding to it), and shortly after the birds copulated. A short time later, one adult started to sit on the nest, but it was unclear if there were eggs in it.

Pied Stilt pair copulating (***Shorty Westlin***).

On a visit on 31 Oct, I witnessed the adult birds swapping incubation duties. The adult taking over would place its beak in the nest and appeared to be moving eggs around, but since I was unable to see inside the nest, this is speculation. On this same visit I also noted that a second pair had been building a nest, which appeared to be almost complete.

On 2 Nov both nests were active, with an adult sitting. Over the next few weeks, a third nest was built, and while at times an adult was sitting on this nest, on most visits it was unattended, so I concluded that it was not viable.

On 19 Nov, three young had hatched from the first nest, and a few other observers also saw them. As the chicks were feeding in the tall grass on the western side of the swamp, it was difficult to see them. But over the coming weeks they were sighted by other observers and me when they came out at the edge of the swamp.

Two of the three chicks from the first nest (*Shorty Westlin*).

Early on 11 Dec, Sandra Henderson reported on eBird that two chicks had hatched from the second nest and that an adult was still sitting. Later that morning Rod and Deb Ralph reported that four chicks had hatched from the second nest, and that two chicks from the first nest were also present, but when I was able to visit the site, I could not find them.

Four chicks from the second nest (*Deb Ralph*).

Young birds were still being recorded through December and into January. with Rod and Deb Ralph recorded an almost fully grown chick on 15 Jan. It is unclear how many of the young survived.

I would like to thank Rod and Deb Ralph in particular for their vigilant recording of the progress of these birds on eBird, and for the photos they supplied, and also all the other observers for adding information on eBird.

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UNPRECEDENTED HARDHEAD BREEDING DURING THE 2020 - 2021 SEASON

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On 31 Dec 2020 I received a phone call from a rather excited Bill Graham to tell me he had just seen 5 very young Hardheads *Aythya australis* in the company of a female Hardhead at Mulanggari Grasslands in Gungahlin. This was a first for him and he was hoping I could go and take some photos for him. I was equally excited as I had never seen Hardhead ducklings before. I visited the Grasslands later that day and also saw the very small Hardhead ducklings and managed to take some photos.

The following day, after a second visit to the Grasslands, I visited Kelly's Swamp at Jerrabomberra Wetlands where I saw a slightly older brood of Hardheads, as reported by others. Seeing the two broods in one day was pretty amazing when I had never seen any before, and I believe breeding records for our area are very uncommon.

A visit to the Valley Ave Ponds in Gungahlin later in the day produced yet another Hardhead brood – 5 more ducklings! These were the largest in size of the three, the Grasslands brood being the youngest and smallest.

After posting this information on the chatline, Marnix Zwankhuizen and Richard Jeremy informed me independently that they had seen a single Hardhead duckling on the Big Dam at Mulligan's Flat. On 2 Jan 2021 a walk around the Big Dam revealed the single chick but photographing it was another matter, as the adults kept the young one well away from the edges of the dam. A second lap around the area in the hope of getting better views of the duckling proved particularly rewarding as I sighted a second Hardhead family – eight ducklings and oh so tiny! Once again, they were probably 150m away and heading out of sight but I did snap a few shots.

In the space of three days, I had seen five Hardhead broods, four of which were in the Gungahlin area. At that point I decided to focus on those broods close to home and try to develop a photographic record of their development.

During the following week I visited the Gungahlin sites on numerous occasions. At the Valley Ave Ponds a second brood of one duckling was initially sighted on 5 Jan and subsequently seen twice more before the final sighting on 9 Jan. It was interesting to observe the plumage changes in the brood of five at the same location. At Mulanggari Grasslands only four of the ducklings were seen on 5 Jan and that proved to be the final sighting of the brood. Three visits to the Mulligan's Big Dam produced the single duckling each visit, and the brood of 8 was seen on 5 Jan, but on 7 Jan I could not locate it. Then on 9 Jan only three ducklings were found. The ducklings of both Mulligan's broods were photographed together on January 2, giving a good size comparison of the two and also the changing plumage colour. (Photo No. P1107777)

By 20 Jan 2 the only brood I was still seeing was the single chick at the Mulligan's Big Dam, and I continued to observe the young Hardhead until early March. Numbers of Hardheads on both the Big Dam and the Valley Avenue Ponds were in the high 20s early in January but two weeks later had dropped to single digits.

A visit to the Valley Avenue Ponds on 27 Jan revealed a new Hardhead brood of six very young mustard-coloured ducklings on the pond behind the scout hall. I returned five days later to find that only three ducklins remained and they had relocated to the northern section of the main pond. My visit on the following day produced only two ducklings. Despite visiting the site on a couple of occasions, I did not see the brood again until 4 Mar, a month after my last sighting. It was interesting to note that there was a noticeable size difference between the two remaining juveniles. (Fig. 4) The plumage now was similar to that of the previous brood of five at this location, leading me to think that the original brood was at least five weeks old when I observed it.

While I was excited to observe so much breeding among the local Hardheads, it was disappointing to witness the very low survival rate. Of the 26 ducklings I had seen on the Gungahlin Ponds, only one on the Big Dam and two on the Valley Ave Ponds survived for longer than two months, and many were lost in the first week or so. It is probably safe to assume that the broods with single ducklings actually began with higher numbers so the real survival rate is even lower.

Figure 1. P1097148 – 31 Dec 2020
Brood of 5 - Mulanggari Grasslands.

Figure 2. P1097393 – 1 Jan 2021
Brood of 5 - Valley Ave Ponds.

Figure 3. P1107989e - 02 Jan 2021
Brood of 8 - Mulligan's Flat Big Dam.

Figure 4. P1135718 - 4 Mar 2021 (first seen 27 Jan) Remaining 2 of Brood of 6 - Valley Ave Ponds.

Table 1. Summary of Hardhead broods 2020-2021

Location	Date	No. Young	Comments	Final Sighting	Observer
Acacia Inlet vicinity	05/10/2020	7			Alastair Smith (Smith 2020)
Jerrabomberra Wetlands	12/10/2020	7			A. Brooks (in Smith 2020)
Fyshwick Sewage Pond 4	17/10/2020	5	Thick bills and a creamy buff-coloured face		Alastair Smith, P Milburn (Smith 2020)
Jerrabomberra Wetlands	24/12/2020	8	Small ducklings, mustard-coloured heads.	10/02/2021 3 young	Deb & Rod Ralph
Mulanggari Grasslands	31/12/2020	5	Young mustard coloured	05/01/2021 4 young	Bill Graham, Julie Clark
Valley Ave Ponds	01/01/2021	5	Older, larger, plumage changing.	09/01/2021 5 young	Julie Clark
Mulligan's Big Dam	02/01/2021	8	Very young, mustard coloured	18/01/2021 3 young	Julie Clark
Mulligan's Big Dam	02/01/2021	1	Older than the other Mulligan's brood	06/03/2021 1 young	Julie Clark
Valley Ave Ponds	05/01/2021	1	Similar age to the single Mulligan's chick	09/01/2021 1 young	Julie Clark
West Belconnen Pond	25/01/2021	6	Older young.		Tony Willis
Valley Ave Ponds	27/01/2021	6	Very young mustard coloured	11/03/2021 2 young	Julie Clark
Mitchell Pond	28/01/2021	1	Older juvenile		Sandra Henderson
Jerrabomberra Wetlands	10/02/2021	6	Little mustard-coloured ducklings		Christine D.
Jerrabomberra Wetlands	05/03/2021	1	1 small duckling seen with 1 adult female		Deb and Rod Ralph

Photos of the Gungahlin broods are on Flickr for anyone interested.
https://www.flickr.com/photos/140414659@N08/albums/72157717655837556

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OBSERVATIONS OF A GANG-GANG PAIR NESTING AT THE PINNACLE NATURE RESERVE

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Activity at a site within the Pinnacle Nature Reserve was first observed in early October, when a pair of Gang-gang (*Callocephalon fimbriatum*) were seen prospecting a site in the area. Activity there was observed throughout November by weeding parties in the Reserve and feeding of young was first heard on 8 Jan 2021. This was first drawn to my attention on 11 Jan.

Starting on 11 Jan, the site was observed on most evenings through to 28 Jan 2021. The site was visited each evening, usually from 1.5 hours before sunset (20:15 h Eastern Summer Time) until the female finally entered the hollow, on a few occasions as late as 21:00 h. The site was located in the limb of a dead tree deemed too unsafe to climb, so it was not possible to place a camera nearby (see Fig. 1). At all times both adults visited and from 11 Jan were seen feeding young from the rim of the hollow although no young was visible.

On the evening of 13 Jan the site was examined with a camera attached to a 9 m long pole and a single male chick (subsequently named Nigel) was observed. As the camera was being set up an adult female flew in and landed next to the hollow, and at the same time an adult female emerged from the hollow, indicating that at times two female adults were visiting the site. At other times up to an additional two pairs would fly past and sometimes land in the nest tree or nearby.

There were no observations between 15 and 18 Jan. The chick was first observed at the hollow entrance on the morning of 19 Jan. By 23 Jan the chick had ventured out of the hollow and was seen perched on the rim. By this time, in addition to both adults feeding the chick, they would encourage the chick to fledge by delaying feeding and flying back and forth to nearby trees and calling.

On 25 Jan, in addition to the usual feeding by both adults and encouraging the chick to fledge, the male was concerned by something not in view at the top of the tree. He was observed calling and raising his wings at what could have been a possum in a hollow (see Fig. 1). The next evening the chick was still present, and again the adults were encouraging him to fly. The chick was eventually fed at 19:51.

On the evening of 27 Jan no adults or chick were seen and it is assumed that the young had either fledged or been predated. At 08:30 h the next morning, although initially there was no sign of adults or young, a pair arrived and the female perched on the rim, looking into the empty hollow and giving a slow moaning, croaking call. There was no sense of alarm or threat on her part. At all times the male was perched at a nearby tree. If there was a possum present in the hollow, there would have been much head and body bobbing with raising of wings and loud screeching, none of which was observed. This observation was most likely to have been of another adult pair checking out the previously occupied hollow of another

pair. To complicate matters, at mid-day 30 Jan the site was checked with a pole camera and there was a Brush-tailed Possum in residence.

There is some question about the fate of Nigel, and interpretations may differ. My conclusion from these reports is that despite the observations on 25 Jan, indicating there may have been a predator of some sort at the top of the tree, subsequent behaviour by the parent birds and from the visiting adults on 28 Jan, I believe the chick fledged, possibly in the early morning on 27 January, and a Brush-tailed Possum took up residence by 30 Jan. Although no adults with young were observed at the time of fledging, subsequent observations have recorded two adult pairs each with a male young in the area.

By back-dating, the egg would have been laid and incubation started sometime around the end of October 2020.

I wish to thank Barbara Allan and John Brannan for their observations and for reports by the Pinnacle Weeders to either Barbara or John.

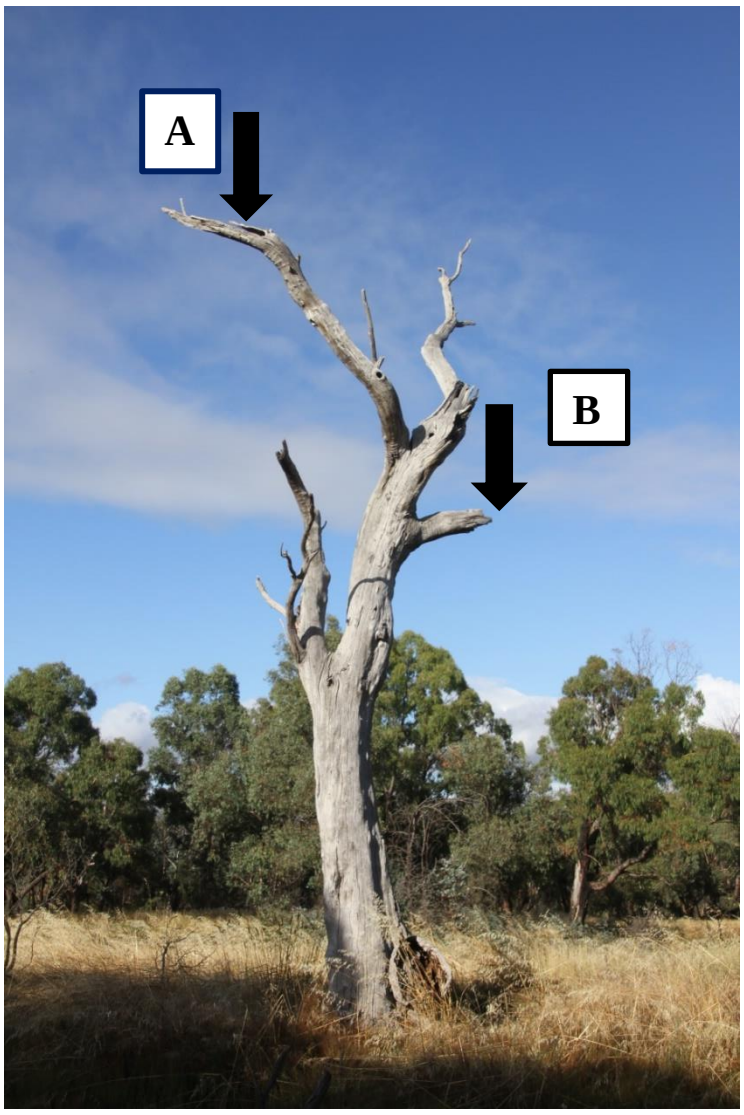

Figure 1. Nest tree showing 'A' possible possum site and 'B' nest site (*Tom Cochrane*).

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BLIND SNAKE KILLED BY TAWNY FROGMOUTH

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The body of a Blackish Blind Snake (*Anilios nigriscens*) was found below a Tawny Frogmouth (*Podargus strigoides*) nest on 25 Oct 2020, in Yellow Box-Blakely's Red Gum woodland in Mount Ainslie Nature Reserve, ACT. The observation was made while monitoring the frogmouth nest as part of a long-term study of the species' breeding biology (Rae 2009, 2017).

The snake's body was intact, 44 cm long. It was found lying on the ground amongst frogmouth faecal droppings (Figs. 1 and 2), 9 m below the frogmouth nest, which was set in a forked branch of a Blakely's Red Gum (*Eucalyptus blakelyi*) (Fig. 3). The snake had probably been killed the previous night, as frogmouths are nocturnal hunters. It had sharp indents mid-length, apparently where the frogmouth had gripped it when lifting it from the ground and knocking it against a branch to kill it. There were two well-grown young in the nest, about 30 days old and near to fledging. The snake was likely taken back to the nest but dropped during transfer to a nestling.

Figure 1. The body of the Blackish Blind Snake was lying amongst Tawny Frogmouth droppings on the ground below a frogmouth nest.

Snakes have rarely been recorded among the prey of Tawny Frogmouths. None are listed in the comprehensive description of the species' diet in Higgins (1999). Two published records are of scales from an unidentified small snake in pellet/faecal remains below a frogmouth nest in Forster, NSW (Rose and Eldridge 1997) and a 20-cm-long Red-naped Snake (*Furina diadema*) in Boggabri, NSW (Madani 2020). Over 500 Tawny Frogmouth nesting attempts have been monitored to date in the current long-term study (Rae 2017, and unpublished data) and no other snakes have been observed as a prey item.

Figure 2. The snake's body alongside binoculars for scale.

Figure 3. The site, showing the habitat where the Blind Snake was found, X, below the Tawny Frogmouth nest, arrow.

Most prey observed to be taken by frogmouths during this study have been moths and other invertebrates as per Higgins (1999). A Peron's Tree Frog (*Litoria peronii*) was found below another nest in 2020 and two frogs of unknown species have been seen delivered to a nest

(*pers obs.* S. Rae). Frogs and mice are the most commonly taken vertebrates (Higgins 1999), the former especially after rainfall (Green *et al* 1988).

Blind Snakes are common in the ACT (Canberra Nature Map: https://canberra.naturemapr.org/species/116960). They are nocturnal and spend most of their time below ground or under rocks and logs, where they burrow in search of soil-living invertebrate prey, and they are more active above ground when it is raining (Bennet 1997). There had been 27 mm of rain in the 48 hours prior to the snake being found. It is likely that one of the adult frogmouths caught the snake while it was on open ground, possibly because its burrow was flooded. This is consistent with the view that Tawny Frogmouths prey opportunistically on any potential prey species (Schodde and Mason 1980, Rose and Eldridge 1997).

The blind snake is the largest snake recorded as taken by a Tawny Frogmouth, and the largest prey item on record. Possibly, it is more energetically efficient for frogmouths to catch vertebrates, when available, rather than the equivalent mass of small invertebrates. However, this strategy would fail when the food items were too large for chicks to swallow, as could have happened in this case. Analysis of pellets, faeces, and crop contents of dead birds (*e.g.* roadkill), would provide better information on the frequency of such larger prey in the frogmouth diet in the ACT, and this could be a topic for further research.

Acknowledgements

Diana Tracy and Penny Olsen gave helpful comments on early drafts of this article and Penny Olsen gave reference information on records of prey taken by Tawny Frogmouths.

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COLUMNIST'S CORNER

Canberra Bird Notes 46(1) (2021): 90-95

About Egrets

If you are looking for a 'British Birds' book from a more relaxed bird-watching time, a helpful little volume is *Birds of the Wayside and Woodland* (1936), edited by Enid Blyton. This lists two British species in the genus *Egretta*: the Great White Heron ('an occasional wanderer') and the Little Egret ('an infrequently recorded wanderer'). So the inhabitants of the British Isles, when at home, did not see all that much of egrets.

As Europeans explored for birds further afield they found there were quite a few species in the heron family that needed new English names, including more members of the egret sub-group. In Australia, Gould found six species to which he gave the name 'Egret'. One of those, he believed, was probably the same as the 'Great White Heron' of Asia and Africa. Another species he called 'Plumed Egret'. This, he said, 'is not only adorned with the redundance of graceful plumes springing from the back, common to other species, but it has a mass of feathers of precisely the same structure depending from the lower part of the neck and from the chest'.

After the settling-down of the *Australian bird list,* three egret species were recognized, White Egret *(E. alba),* Plumed Egret *(E.* intermedia), and Little Egret (*E. garzetta*). Those names, specified in the Official Checklist of 1926, were widely, if not universally, followed for the next 50 years. (The Cattle Egret had not yet arrived.) When those English names were reviewed in 1978, 'Egret' was affirmed as the noun to be used for species with wholly white plumage or a white plumage phase. (That was where 'Eastern Reef Egret' came from.) 'White Egret' was discarded because all egrets were white. 'Plumed' was discarded because all egrets were plumed, and that was a name used only in Australia. Thus, we acquired an Intermediate Egret to go with our Great Egret and Little Egret. '"Intermediate" fits into the series of egrets,' said the committee in 1978.

In other places where the same series occurred, different English names were used for the large and medium ones. In India, S. Dillon Ripley (1961) offered 'Large Egret' and 'Smaller Egret'. Two other Americans, Rand and Gilliard (1967), gave New Guineans 'Greater Egret' and 'Lesser Egret'. The 1978 edition of Roberts *Birds of South Africa* had 'Great White Egret' and 'Yellow-billed Egret'.

A curious thing about these egrets is that the colour of legs, bill and facial skin can vary according to the stage of breeding cycle. In the case of the Great Egret the breeding colours vary according to the subspecies. With respect to what was the 'Intermediate Egret', there is a marked difference between the Australian birds and those of the nominate race, which occurs across Asia. In 2014, that difference, with some other evidence, caused Birdlife International, with its partner (*Handbook of Birds of the World*) to split the Asian, Australian and African birds into different species. According to those authorities, the Australian species is *plumifera*, for which the English name 'Plumed Egret' has been revived.

Birdlife Australia, in its *Working List of Australian Birds* (WLAB), has followed that approach. COG can be expected to follow in due course for its own purposes. The change means that you might once more see a Plumed Egret at Kelly Swamp. Moreover, there is an additional egret species on the Australian list, because the new 'Intermediate Egret' is recorded here as a vagrant. However, to be sure of seeing what eBird, under its own classification, calls an 'Intermediate Egret (Intermediate)' you might need to take that trip to Bali (or other Asian destination of your choice).

In recent years, taxonomists have reviewed the relationships within the heron/egret group, with the following result for species found in Australia (from WLAB v.3):

Genus:

Ardea	***Egretta***	***Bubulcus***
White-necked Heron	Pied heron	Eastern Cattle Egret
Great Egret	White-faced heron	
Intermediate Egret	Little Egret	
Plumed Egret	Western Reef Egret	
	Eastern reef Egret	

As Wikipedia says: 'The distinction between a heron and an egret is rather vague, and depends more on appearance than biology.'

The remainder of this note offers some comments on the visual appearance of the four egret species that can occur as wanderers to Canberra. None of those species breed here. Presumably they arrive in search of suitable foraging conditions. A useful volume for a global view is *The Herons Handbook* (1984) by James Hancock and James Kushlan. This provides a series of plates by Robert Gillmor showing the racial and seasonal distinctions for all the white-plumed species. This requires three seasonal stages to be illustrated, 'non-breeding', 'breeding' and the brief third 'courtship' stage. Two other books used here, *HANZAB* and the *Australian Bird Guide*, give us their own slightly differing views on what you might see at each stage.

The Great Egret is the species most often reported around Canberra. There is some difference of opinion as to whether non-breeding adults are correctly described as similar to juveniles, with black legs and lacking plumes. Without saying that the birds we see in Canberra are representative, my observation is that the typical birds seen here have at least a trace of plumes, either vestigial or emergent, and are yellow-billed with some colour in the legs. Sometimes yellow-billed birds have substantial plumes.

The accompanying three plates of photos were all taken at Jerrabomberra Wetlands at different times over the last 20 years.

The first plate shows examples of the Great Egret. The bird at *1* (Jan 2019) has blackish-pink tibia, first third of bill suffused black, and a couple of remaining matted plumes, quite long, so probably in early post-breeding stage. *2* is an early example of digital photography (Spring 2001). All three breeding egrets are in fresh condition with yellow tibia and plumes considerably longer than the tail. (They are standing, with spoonbills, by the conspicuous arched log in middle of Kelly Swamp, now obscured by typha.) The bird at *3* (Oct 2011) has dark legs, becoming yellowish, and some short plumes, so probably coming into breeding. The bird at *4* (Feb 2005) has some worn plumes, so perhaps past prime breeding. At *5* (Dec

2012) are two birds separated mainly by leg colour, the lower, with blackish-yellow legs, being perhaps more advanced towards breeding condition.

Plate 1 (explanations p. 91).

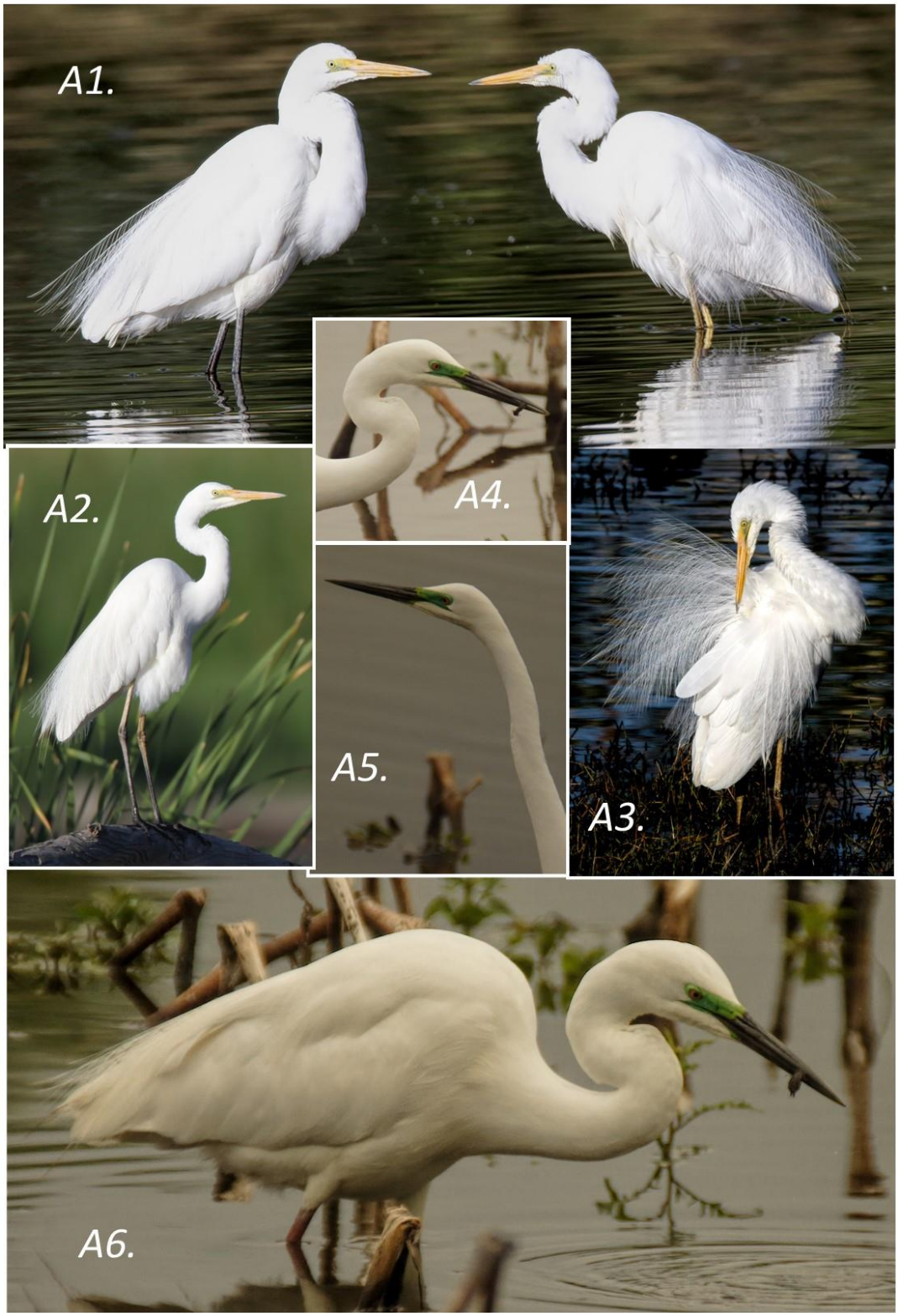

Plate 2 (explanations p. 95).

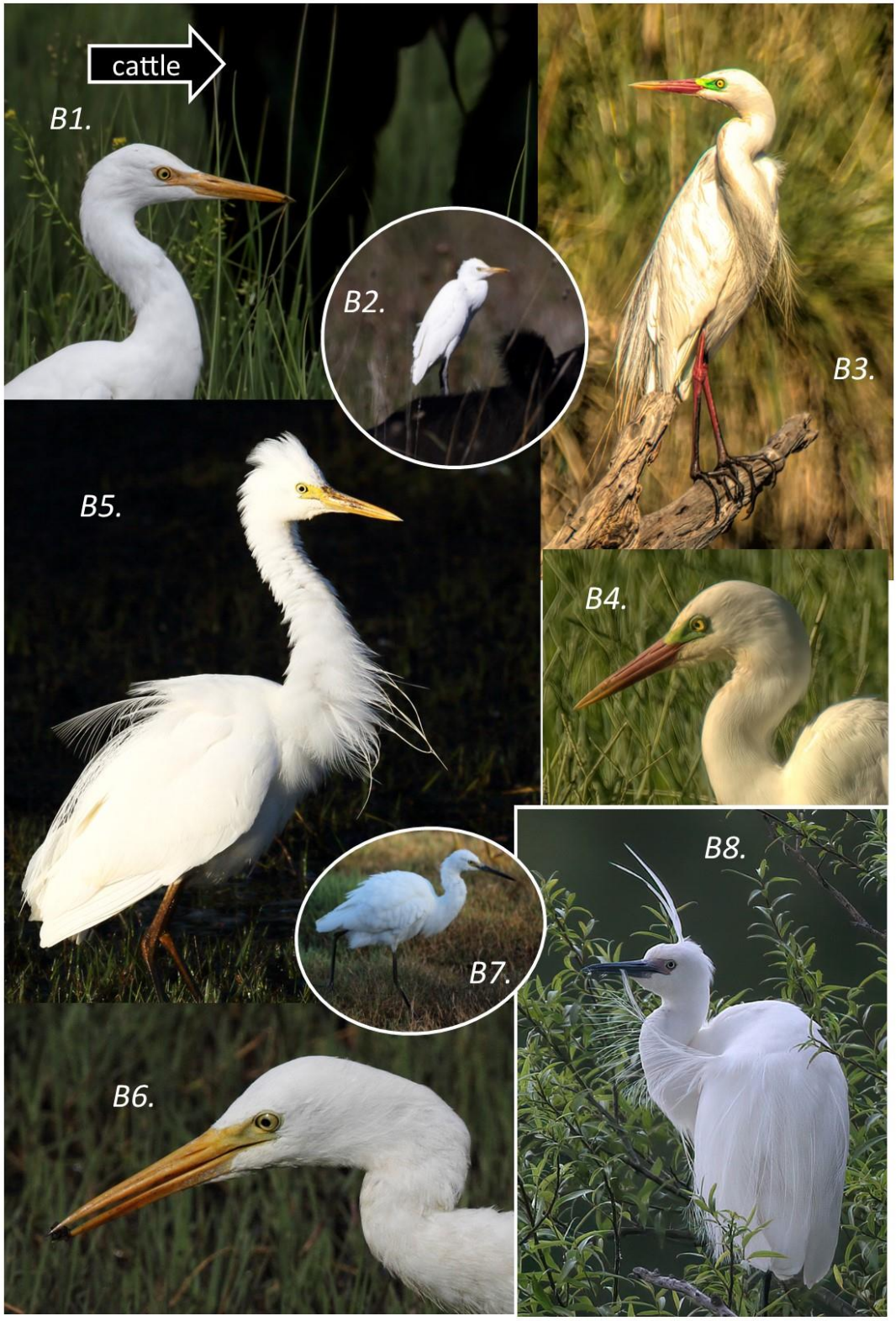

Plate 3 (explanations p. 95).

In the second plate of photos, *A1* (Dec 2012) gives another view of the two egrets at *5* above, the bird at right being more advanced in the cycle, or possibly older (longer plumes, yellow tibia, dark tip to bill). *A2* (5 Jan 2013) is a bird with yellow tibia, plumes still developing. The heavy drooping body plumage of the underparts is not seasonally significant, presumably. *A3* (again, Dec 2012) is possibly the right-hand bird in A1 revealing the lacy texture of the spread plumes. *A4* to *A*6 (all Feb 2005) show a bird with an evenly black bill and turquoise facial skin. That coloration is said to represent a 'courtship flush', achieved only at the height of the breeding season.

B1 in the third plate of photos is a Plumed Egret in April 2012, with cattle on the flats, appearing much like a Cattle Egret. *B2* is a Cattle Egret, in a typical pose, in April 2014. *B3* and *B4* are poor photos of a Plumed Egret, in 'courtship flush', in March 2005. The *B3* bird is standing on a log in Kelly Swamp. The plumage stage of the Plumed Egret at *B5* is not easy to interpret, but as the date is October 2011 it is probably wearing short plumes that are emerging rather than receding, on both back and breast. The same species, possibly same bird, is shown foraging in *B6* (Nov 2011). *B7* is an unusual Little Egret, non-breeding, that was with an influx of other egret species in February 2017. Even more unusual was the fully-plumed Little Egret that appeared in January 2011. This is shown here preening in the willow in the centre of Kelly Swamp.

A very large influx of Cattle Egrets in April 2014 was mentioned in CBN 45(2) of July 2020. Lacking any visible rusty plumage, those must have been birds in their non-breeding phase.

Stentoreus

Canberra Bird Notes 46(1) (2021): 96-97

Birding in Cyberspace, Canberra Style

It is probably not an over-statement that eBird has revolutionised citizen science birding in Australia and abroad. At the time of writing, May 2021, Australia had 14,000 eBirders who had submitted 1.4 million checklists, upon which they had recorded 871 species https://ebird.org/australia. Furthermore, the number of eBirders, and of checklists submitted, continues to increase.

It seems to be a fact, though, that many of these birders (and others) are not familiar with, and hence do not use, the brilliant resources made available online, free of charge, by the Cornell Lab of Ornithology at Ithaca, New York, USA, the managers of eBird. One of these is the portal All About Birds https://www.allaboutbirds.org/news/. Described as 'Your Online Guide to Birds and Bird Watching', it contains a great diversity of content. Although some of it is specific to North American birding (*e.g.* 'How to tell a Sharp-shinned Hawk from a Cooper's Hawk'), much of it is of more general interest. The landing page has major components covering Bird ID skills, Feeding birds, FAQs & common problems, Bird-friendly homes, Try this, *Living Bird Magazine*, Live cams, Courses, and more.

One item that struck me is a 23 April 2021 blog post 'Toward Inclusivity in Birding: Forum Discusses Renaming Eponymous Birds' by Gustave Axelson https://www.allaboutbirds.org/news/toward-inclusivity-in-birding-forum-discusses-renaming-eponymous-birds/. It deals with some of the challenging contemporary discussion about eponyms: 'A person after whom a discovery, invention, place, etc., is named or thought to be named. A name or noun formed after a person' (OED). (Some readers may have come across the 2014 book by Beolens, Watkins and Grayson, *The eponym dictionary of birds*, Christopher Helm, Exeter UK.) Latham's Snipe, Major Mitchell's Cockatoo, Horsfield's Bronze-Cuckoo, Lewin's Honeyeater and Horsfield's Bushlark are the species on the ACT checklist that have eponymous names.

The issue that Axelson discusses is reflected in Australia at present in controversy about monuments to people, mainly historical figures, whose value systems, behaviour, etc., while perhaps acceptable in their time, are considered abhorrent now. He explains that 'One bird's name change in the summer of 2020 perhaps paved the way for balancing inclusivity and order, when the AOS North American Classification Committee announced that the former McCown's Longspur would henceforth be known as the Thick-billed Longspur. John McCown first collected the species for science in 1851, but later chose to join the Confederate Army during the Civil War.' Apparently, it is now considered offensive to have an American bird named after a Confederate Army member.

Are any of the eponymous species' names on the Australian birds' checklist offensive, inviting a discussion about changing them? One that comes immediately to mind is the Major Mitchell's Cockatoo. The 19th-century surveyor cum explorer Major (later Sir) Thomas Mitchell (1792-1855) seems to be increasingly identified with racist attitudes towards Aboriginal people, and increasing attention is being paid to the murders that he—or at the least men under his command, with his approval—committed during the exploration and mapping of the NSW Colony. An example is the 1836 massacre near the spot that Mitchell named Mount Dispersion, now known as the Mount Dispersion Massacre Site Aboriginal Place https://apps.environment.nsw.gov.au/dpcheritageapp/

ViewHeritageItemDetails.aspx?ID=5067415. Should the official name of Major Mitchell's Cockatoo be changed, perhaps to Pink Cockatoo, as a step towards treaty-making and Indigenous Reconciliation?

I imagine that most readers, whether eBirders or not, make use of the eBird data on bird distribution, reporting rates, abundance, etc., that are available to the public at large at the website https://ebird.org/australia/explore. Furthermore, I assume that most eBirders have downloaded their own data for various purposes, which might include undertaking quantitative data analyses, and preparing visualisations such as graphs. These and many other tasks have been facilitated by the dissemination, by Zak Pohlen, of his birdSTAT.com: 'A tool to summarise and visualize your personal eBird data' https://birdstat.com/. You simply download your data from the 'My eBird' menu item in eBird online, and then upload the .zip folder that eBird provides, or your unaltered MyEBirdData.csv file, to birdSTAT.com. The program then displays your data in diverse ways, under tabs that include Checklist summary, Explore species, Calendars, Graphs, Maps, Location summary, Year comparison, Species summary, and Breeding codes. Zak Pohlen has made this brilliant resource available free of charge, but invites users to donate to support its maintenance and development.

Let us give the final word to the Eastern Koel *Eudynamys orientalis*. Presumably, they will have left COG's area of interest, migrating back to warmer climes, by the time you are reading this, but it is not difficult to recall how irritating the calls can be in the wee small hours of the morning in summer. A subscriber to the national Birding-Aus email announcement and discussion list http://bioacoustics.cse.unsw.edu.au/archives/html/birding-aus/ reported there, on 27 November 2020, that they had identified a 'Koel repellent': 'Since playing Powerful Owl calls our resident Koel has not been heard again, 24 hrs later. Hope it's not [a] coincidence.' You may decide to try this approach if you have an irritating koel calling outside your bedroom window next summer!

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.

Canberra Bird Notes 46(1) (2021): 98-99

Vale Jerry Olsen (17 July 1948 -- 31 January 2021)

Jerry Olsen died suddenly and unexpectedly on 31 January 2021 from an aneurysm and serious fall. He was well known in COG circles for his passionate and staunch defence of Little Eagles and other raptors in the ACT, against urban sprawl gobbling up some of their woodland breeding territories, and also for his many contributions to knowledge of the biology of those birds.

Jerry was an expatriate American who migrated first to South Australia in the 1970s as a schoolteacher, before moving to Canberra to finish a BSc in zoology at ANU and then gain an MEd, and ultimately to lecture in education at what became the University of Canberra. I first met Jerry when he came to Armidale in 1980 to discuss his Peregrine Falcon Masters project with Peter Jarman, who was also my supervisor on a postgrad Little Eagle project at UNE. Peter drove us around to look at raptors in the Armidale hinterland, and I recall Jerry remarking about the Little Eagle, 'It has a hellacious stoop on it!' Thus began a long professional association with Jerry, starting with his writing for the Australasian Raptor Association newsletter (*ARA News*), which morphed into *Boobook* (newsletter of the re-named BirdLife Australia Raptor Group), during which time he was the ACT Rep for the ARA/BARG since 1985. He also wrote or co-authored many raptor and owl papers in *Canberra Bird Notes*, other Australian bird journals (*Australian Bird Watcher/Australian Field Ornithology*, *Corella*, *Emu*) and others (*Wildlife Research*, *Journal of Raptor Research*). After retirement, he continued as an adjunct in the Institute for Applied Ecology at the University of Canberra, and with his raptor research and writing.

I also recall seeing early film footage of Jerry with the Leyland Brothers in the Roger Whittaker film 'Hunters of the Skies', in which Jerry was rehabilitating (using free-flying falconry techniques) an injured Little Eagle and Black Falcon for release. His falconry background in the USA (a legal activity there) provided him with the expertise to become a raptor rehab guru in Australia. We had discussed some of the issues in raptor rehab, such as people mistakenly 'rescuing' grounded raptor fledglings when all they need is a safe perch near their nest; the need to reunite such fledglings with their family as soon as possible, even if they have been in care for days; demarcation disputes between the RSPCA and wildlife carers; politics among wildlife care groups, etc. (some of these aspects to the detriment of raptor patients).

Sometime around the 1990s, Jerry felt he was being excluded from some of the high-end Australian bird journals by certain people (referees and/or others influencing editors). So began his 'test' of the perceived situation by asking me to co-author some of his papers, sometimes even as first author, in return for help to organise data and draft or edit some text. This progressed quite rightly to Jerry being senior author on many papers featuring his fieldwork and data collection, though he gave up on *Emu* in favour of what he saw as more helpful journals and procedures.

Jerry published on most of the raptor and owls of the ACT, including the lesser known and less charismatic species, although he described himself as a 'Peregrine person', something he felt others didn't realise. On his travels he also observed and wrote about the raptors and owls of the Solomon Islands and Lesser Sunda Islands and their conservation status, and he discovered a new *Ninox* owl species on Sumba. Latterly he became embroiled in controversy over the impact of urban development around Canberra, and endured harassment and attempts to silence him via approaches to his superiors at the university, as well as a demarcation dispute about where in the ACT he could or could not study raptors.

Jerry was one of the most prominent raptor researchers, conservationists, rehabilitators and defenders in Australia. He was a mentor and supervisor of students, a collaborator on raptor projects and co-ordinator of surveys, and a passionate advocate of raptor science and conservation. He had a healthy scepticism for some of the old dogma or folklore on Australian raptors, busted a few myths on them, and was keen on robust but friendly scientific debate, which he found wanting in Australian raptor biology.

Much of the background to Jerry's time in Australia and elsewhere can be found in his books (1994, 2011, 2014). He wrote a raptor rehabilitation manual (1990), and his many papers can be found on ResearchGate. Further background can be found in forthcoming tributes in *Boobook* and *Australian Field Ornithology*. I thank Penny Olsen for providing the early background on Jerry. He is survived by his partner Sue Trost, his children and grandchildren, to whom I extend sympathy and condolences. He will be sorely missed.

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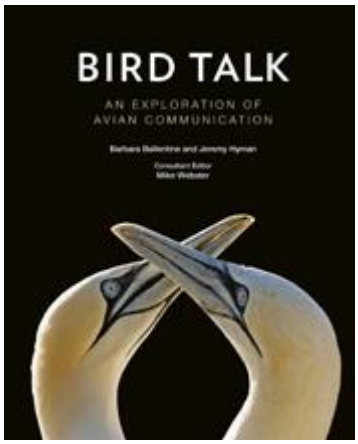
BOOK REVIEW

Canberra Bird Notes 46(1) (2021): 100-102

BIRD TALK. An Exploration of Avian Communication. **By Barbara Ballentine and Jeremy Hyman.** CSIRO Publishing & Otago University Press. May 2021. ISBN: 9781486315307, Hardcover 192pp. with index and Further Reading. RRP AU $ 44.99.

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



The subtitle of this book indicates more clearly the range of topics covered because it is not entirely about bird vocal communication. As the Consulting Editor, Mike Webster, outlines in the Foreword, 'birds sing and call from treetops. They flash brightly coloured plumage. They jump and dance and cavort with elaborate displays. Birds stand out. Birds are constantly communicating.' He goes on to ask: 'but what are they saying, and why are they saying it? Are they born knowing their language, or do they learn how to call to others in the flock? And what intricate mechanisms are responsible for the amazing colours, displays and songs that birds produce? Questions like these have been a central focus of research in animal behaviour for decades, and the scientists doing the work, using both sophisticated and sometimes surprisingly simple experiments, have uncovered a lot about how and why birds talk to each other. This book is about that research.'

The book is divided into an introduction and seven chapters. The introduction explains what communication is all about, introducing Signal Detection Theory and a brief but excellent explanation of the sensory systems of vision and hearing in birds – comparing them with human acuity.

Chapter One is all about communication channels, starting with vocalisation and an excellent short explanation of ways of visualising sound (including the sonagram), followed by a brief explanation of how sound is produced in birds. The chapter then delves into song, including the role of learning, genetics and song development and vocal mimicry. There follows a section on calls, as distinct from song, with discussion of call repertoires and call development. Non-vocal sounds are mentioned before moving onto plumage. Here there is an explanation of pigmentation and the role of melanin, carotenoids, psittacofulvins and porphyrins in the expression of colour. The importance of white plumage is introduced (you will have to read the book to follow up on that matter!). The other ways that plumage colouration is achieved, such as structure, iridescence, ultraviolet perception and the role of green and purple in plumage, are all covered. There is a section on movement display and co-ordinated signal movements that might have benefited by an exploration of the range of such signals in the courtship displays of many waterfowl. Finally, it is good to see mention of olfaction in birds, an aspect of bird biology that was ignored until recently. It is now shown to be a significant method of foraging (Kiwis) and orientation (seabirds). Thankfully, there is mention of the extraordinary 'tangerine' odour produced by Crested Auklets at their breeding colonies.

Chapter Two deals with male-female communication, favoured traits, female mating preferences, song and plumage as signals of quality, displays and dances. The third chapter deals with territoriality and dominance, covering topics such as competition and territory defence, including the function of song: song as a threat, with discussion of escalation, counter singing, song overlapping, matched counter singing, soft song and fights. There is a section on neighbours and strangers. Threat assessment, playback experiments, appearance and dominance, badges of status are covered. The fourth chapter is about parent-offspring communication, covering conflict in bird family life, begging signals, and roles in brood parasites (cuckoos and the like). The fifth chapter is about warning signals, alarm calls, mobbing calls, distress calls, non-vocal alarm sounds, eavesdropping, alarm call reliability and deception. Visual displays are treated, and why the Wryneck contorts its neck and Motmots slowly wag their tails from side to side (you will have to read the book if you want to find possible answers!). The sixth chapter deals with group life, covering subjects such as flocks, contact calls and food calls. The final chapter covers the problem of communication in a noisy world. Here noise is defined as anything that inhibits a signal, whether it be vision or sound detection. There is emphasis on the rising levels of anthropogenic noise, leading to an exploration of the effects of natural noise and anthropogenic noise on visual and acoustic signals in birds.

Throughout, the book is adorned with superb photographs, often extending to a full page and thoughtfully selected to complement the text.

My only quibble is that I found the text a little turgid to read, and I think it might have benefited from a much closer final edit and proof-reading. For example, I found the word ‘impact’ (annoying to me anywhere) used no fewer than five times on just one page! A little editing might have made this less irritating. There is confusion about the plural of the North American thrush, the Veery (pages 20-21). Is it Veery’s or Veeries? According to Merriam-Webster they are Veeries. These are minor quibbles but I found it strange that on only one occasion, as far as I can tell, is the scientific name of a species given (p 119): *Uria aalge* for the Common guillemot or Murre. I think it must have been decided that scientific names would not appear anywhere, and that an accepted, but unspecified, set of English names would be followed. Thank goodness penguins are referred to as breeding in colonies not rookeries!

Although authored by researchers based in North America, it is clear that they have tried to include case examples involving birds from other continents. I found reference to at least sixteen species of Australian birds and a fair scattering of references to birds from South America and Africa. Songbirds come in for the bulk of the discussion and that is not surprising because they have had by far the most attention from researchers. However, this bias could have been offset by more examples discussing the vocal and often complex displays exhibited by waterfowl and gulls, both groups that were so much a part of the early development of behavioural studies in birds. I would have liked more discussion about olfaction in birds, especially work such as that on the Kiwi and the extraordinary advances in the understanding of the sense of smell in many seabirds, especially petrels, shearwaters and albatrosses. My only other disappointment is that I cannot follow up particular points made in the text because there is no citation to the source of the work described. A two-page section on Further Reading does little to overcome this deficiency. Reference to endnotes in the text might have added another six pages, but that would certainly have been appreciated by those of us who like to know more about ideas and interesting conclusions. That said, I think this book is well worth a read for any non-specialist and it is a very good and up-to-

date introduction to this field of research. For example, the short but clear explanation of what a sonogram tells you is about as good as you can find anywhere. If you don't know what the 'dear enemy effect' is, along with many other terms used in discussing bird behaviour, you will simply have to read this book!

Highly recommended, especially for non-specialists but there is much in this book to inspire anyone interested in bird behaviour.

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RARITIES PANEL NEWS

The first half of 2021 has been an interesting period for unusual birds in the ACT and surrounds. Perhaps most noteworthy were the Swift Parrots in May, in Richardson, Callum Brae and Mt Ainslie. Surprisingly, though they are classed as an endangered species, they do not figure on COG's unusual bird list as they occur here in small numbers fairly regularly on their migratory path.

No sooner had the Panel placed the Brush Bronzewing on its revised unusuals list, for want of recent sightings, than records restarted and will hopefully continue. The Scarlet Honeyeater too has appeared and been recorded and photographed by large numbers of COG members and will in all probability be dropped from the list at its next revision.

Little Button-quails are possibly more common in our region than we realise. One was handed in to ACT Wildlife in February, having been discovered in Edison Park, to whence it was returned after being assessed as in perfect health.

Following storms in January, several seabirds were discovered in distress in our area. The Panel is aware of the media coverage but did not receive sufficient information to be in a position to be definitive as to the species. It takes the view that seabirds are vagrants here and while of some interest to birdwatchers, they are not of any local conservation concern to COG.

The Panel was unable to endorse records of a Square-tailed Kite and a White-throated Nightjar, both of which were probable but insufficient detail was provided on the ebird records and no photographs were provided.

Barbara Allan *(allanbm@bigpond.net.au)*

ENDORSED LIST 98, MAY 2021

Brush Bronzewing (*Phaps elegans*)

2; 5 Jan 21; Christine D; Naas Rd (ebird S78699045)

1; 9 Jan 21; John Hurrell; Naas Rd (ebird S78909554)

1; 10 Jan; Steve Holliday; Glendale Crossing (ebird S78978493)

Little Button-quail (*Turnix velox*)

1; 6 Jan 21; Sandra Henderson; Naas Rd (ebird S78752805)

1; Feb 21; Manuela Benson; Edison Park

Little Lorikeet (*Glossopsitta pusilla*)

1; 15 May 21; Ken Black; Hackett

Scarlet Honeyeater (*Myzomela sanguinolenta*)

1; 6 Jan 21; Steve Holliday; Campbell Park (ebird S78748951)

1; 31 Mar 21; Deb and Rod Ralph; ANBG (ebird S84440880)

Blue-faced Honeyeater (*Entomyzon cyanotis*)

1; 6 Jan 21; Zachary D; National Zoo and Aquarium (ebird S78752153)

1; 13-14 Mar 21; Cathy Schmidli; Farrer

Pink Robin (*Petroica rodinogaster*)

1; 3 Apr 21; Matthew Larkin; Cook

Canberra Bird Notes

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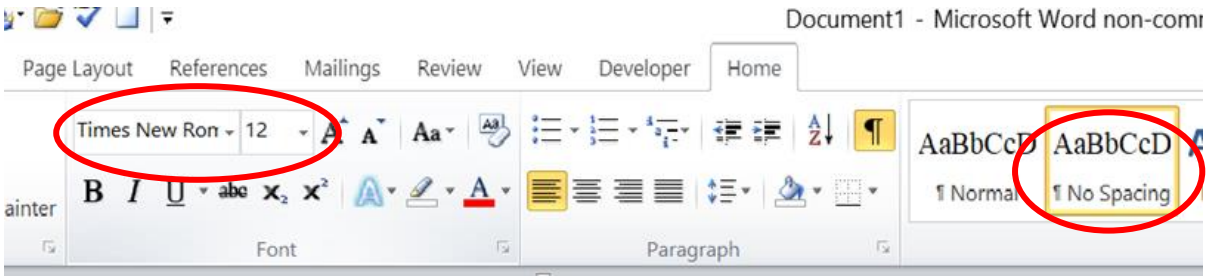
CBN@canberrabirds.org.au or michael.lenz.birds@gmail.com

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



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