

Martindale Valley surveys 2018-2024: insights into seasonal and climatic effects on the valley's bird populations

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A total of 190 bird species were recorded in quarterly surveys in the Martindale Valley, near Denman in New South Wales, during 2018-2024; 145 of those species each having multiple records. Eighteen threatened species were found, including eight species with regular records: Spotted Harrier *Circus assimilis*, Little Lorikeet *Glossopsitta pusilla*, Brown Treecreeper *Climacteris picumnus*, Speckled Warbler *Pyrrholaemus sagittatus*, Grey-Crowned Babbler *Pomatostomus temporalis*, Varied Sittella *Daphoenositta chrysoptera*, Dusky Woodswallow *Artamus cyanopterus* and Hooded Robin *Melanodryas cucullata*.

Another threatened species, the Painted Honeyeater *Grantiella picta* was not detected after 2021. Conversely, Martindale Valley has become a regional stronghold for the Spiny-cheeked Honeyeater *Acanthagenys rufogularis*.

Twenty-six species having multiple records were only ever recorded in the spring or summer visits. Mostly they were well-known to be spring-summer migrants in the Hunter Region but others, such as Australasian Figbird *Sphecotheres vieilloti*, are not considered migratory. Five species were only ever recorded in the autumn or winter visits, most notably Rose Robin *Petroica rosea* and White-eared Honeyeater *Nesoptilotis leucotis*.

Spring and summer generally had the greatest abundance and diversity of birds, with winter having the lowest diversity. An El Niño drought period in 2018-2019 brought several species into the valley, although mainly as vagrants or short-term visitors. In 2021-2022 a La Niña period of much above-average rainfall brought different species, and in particular, waterbirds and other species associated with wetlands. The effects were felt beyond 2022 with the arrival of three crane species: Australian Spotted Crane *Porzana fluminea*, Baillon's Crane *Zapornia pusilla* and Spotless Crane *Z. tabuensis*.

The study showed that during very wet La Niña periods, the valley did not become a refuge for coastal species, but rather functioned more like habitat of inland Australia.

INTRODUCTION

The Martindale Valley (**Figure 1**) has long had a reputation for hosting a rich and diverse range of birds (Tarrant 2008; Stuart 1994-2018). However, because most of the valley comprises privately-held property with restricted access, there has been little opportunity for any systematic study of its bird populations. Tarrant (2008) monitored two sites at Martindale over 1998-2008, making quarterly visits to them. Both were riparian sites lying alongside Martindale Creek, and hence not necessarily providing a comprehensive picture of the birdlife in the valley. Most other bird records for the valley were opportunistic ones, involving roadside birding by visiting birdwatchers. These records offered only limited insights into Martindale Valley birdlife. There was some systematic survey effort over 2014-2016 by Conservation Volunteers Australia; six

consecutive quarterly visits were made to several riparian sites within the valley (T. Clarke pers. comm.). However, the results from those surveys are not publicly available. Also, there were occasional visits by birdwatchers to a private property which abutted one of Tarrant's Martindale sites (A. Lindsey pers. comm.).

In 2018, the Hunter Bird Observers Club Inc. (HBOC) entered into an informal collaboration with the Martindale Landcare Group, for the purpose of undertaking a systematic study of the birds of Martindale Valley. The collaboration allowed HBOC to access several private properties; hence there was an opportunity to develop a comprehensive view of the valley's birdlife. The objectives of the study were to assess the status of resident and visiting species and to monitor how the populations of those species varied seasonally and

over time. Various sites were selected to be surveyed once per season; collectively those sites

comprised riparian, woodland, wetland and other habitats considered to be typical for the valley.

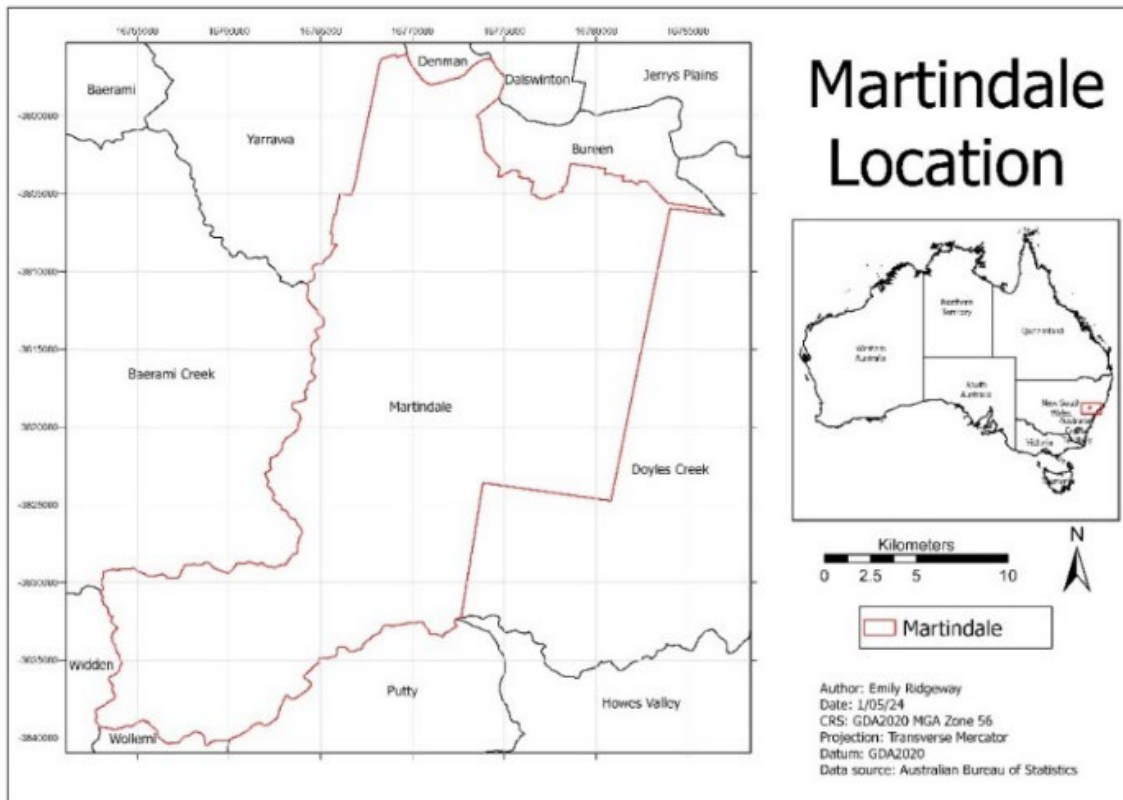


Figure 1. Location of the Martindale Valley.

METHODS

Site descriptions

The Martindale Valley straddles Martindale Creek, which flows from the Wollemi National Park until it joins the Goulburn River near Denman in New South Wales. In early 2018, we (BW and AS, with Dennis Neader) selected fifteen sites to be surveyed. Most of those sites were 2 ha in size; two of them were of nominal 500-m radius. After 2020, access to one of the 2-ha sites (MVS 11, a woodland site) was lost after the property was sold. In replacement, two woodland sites on the adjoining property were added from the beginning of 2021 (sites MVS 16 and MVS 17). In October 2020, a new survey site (MVS 12-1) was added, it being a larger area (of c. 500-m radius) surrounding what until then had been a fruitful 2-ha woodland site (MVS 12).

In addition to the above survey sites, data were collected for two nominally 5-km radius sites, named in this report as MVS Upstream and MVS Downstream. These two sites were located, respectively, upstream and downstream from Medhurst Bridge (sites MVS 7 and MVS 8 are located near that bridge). **Table 1** summarises some details about all of sites, while **Figure 2** shows where the 2-ha and 500-m radius sites were located.

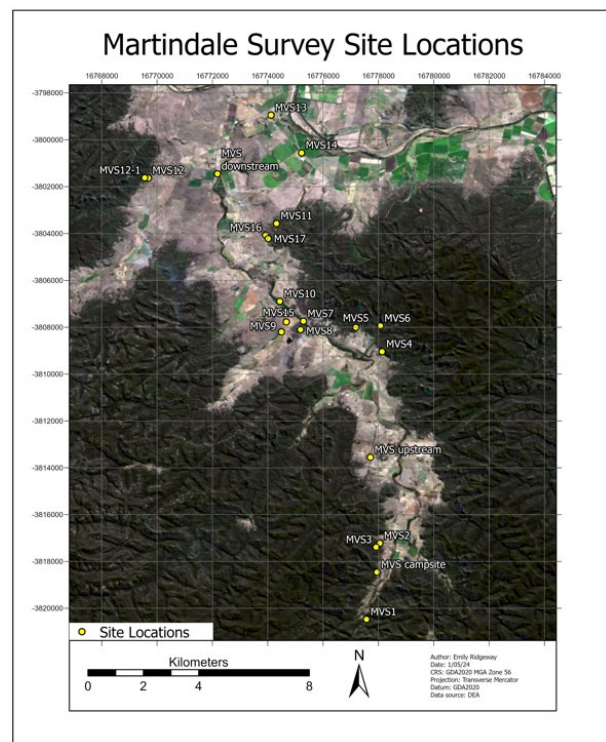


Figure 2. Location of the main survey sites in the Martindale Valley.

Five sites were riparian – straddling Martindale Creek and with varying extents of vegetation. Ten sites were woodland ones, with varying extents of vegetation. There were two wetland sites, one having a few trees and the other with none. Other 2-ha sites were a well-established garden and a dry rainforest gully. The two 5-km radius sites had multiple habitats (although, principally they were open paddocks with a limited number of trees). More extensive site descriptions (covering vegetation and topography) are available in Ridgeway (2024).

The 500-m radius woodland site MVS 8 was the same property that was surveyed occasionally by A. Lindsey (pers. comm.) and it abutted one of Tarrant's survey sites.

Survey methods

The surveys, which commenced in July 2018, were conducted quarterly – in January, April, July and October. There was no survey in April 2020 because of travel restrictions associated with the COVID-19 pandemic. In 2022, only the January survey was able to be carried out, because heavy rains later that year prevented access to most of the sites. Also, occasionally we were unable to access sites MVS 12 and MVS 12-1.

Each visit to the valley spanned three days. The survey team members (2-8 people, typically 4-5 people) convened in the afternoon of Day 1, collecting data for the Upstream and Downstream sites that afternoon and evening. In the morning of Day 2, sites MVS 1-7 and MVS 16-17 were surveyed using Birddata's 2-ha/20-minute methodology (<https://birddata.birdlife.org.au>). During 2018-2020, site MVS 11 was surveyed on Day 2 instead of sites MVS 16 and MVS 17. In the afternoon of Day 2, the hilly woodland behind the campsite was surveyed as a nominal 500-m radius site, for a period of about two hours. The remaining 2-ha and 500-m radius sites were surveyed during the morning of Day 3. The MVS Upstream and MVS Downstream surveys essentially were continuous, being underway whenever team members were not actively surveying a 2-ha or 500-m radius site.

The surveys were done in the same general order on each visit to the valley. However, whenever there were four or more surveyors available, the teams were split so that several sets of two sites could be surveyed simultaneously (MVS 2 and MVS 3; MVS 16 and MVS 17; MVS 9 and MVS 15; MVS 12 and MVS 12-1; MVS 13 and MVS 14). For every 2-ha and 500-m radius survey, the numbers present for each species were estimated as accurately as possible (by consensus amongst the survey team). In general, numbers were not recorded for the MVS Upstream and MVS Downstream surveys, except when the survey team felt confident about the accuracy of the count.

Data management

During or immediately after each quarterly visit, we entered the results for each site into Birddata (<https://birddata.birdlife.org.au>). We retrieved the complete survey dataset for 2018-2024 in April 2024 and exported it into an Excel file, and we then used standard Excel tools for analysing and charting.

For each site we determined how many species were recorded there annually and across various time periods as specified later in the report. We also calculated a relative abundance measure, by summing the counts for every individual species in each survey and for each visit to the valley, as well as summing the counts for various time periods as specified later. In most cases, the same individuals will have been counted multiple times over the specified time period.

We sourced information about quarterly and annual rainfall patterns in eastern Australia, and the rainfall at various Australian locations, from the Bureau of Meteorology website (Bureau of Meteorology 2024). We assigned a rainfall rating for each quarter year from Q4 2017 to Q2 2024 by assessing the rainfall deciles for the eastern half of Australia and classifying that quarter's rainfall as either: very dry (below 20th percentile); below average (20-40 percentile); average (40-60 percentile); above average (60-80 percentile); very wet (above 80th percentile).

RESULTS

Overview

From 20 visits to the Martindale Valley spanning mid-2018 to mid-2024, 190 species were recorded including 18 species which are classified as threatened under Commonwealth or NSW legislation. We have summarised the annual results in **Table 2**. A total of 67 species were recorded in at least 15 of the 20 visits, and 92 species were recorded in at least ten of the visits. Full details about the 190 species (dates recorded, the numbers present etc.) are available in Ridgeway (2024).

Many of the 190 species were recorded infrequently – 27 of them were only found during one of our visits to the valley and an additional 18 species were only present in two visits.

Figure 3 shows the number of species found at each site over the full survey period. At most of the 2-ha sites, around 50-60 species were recorded. The exceptions were MVS 2 (a garden, 45 species) and MVS 15 (a wetland, 37 species). Four woodland sites (MVS 3-5, MVS 12) and two riparian sites (MVS 1, MVS 7) had more than 60 species

recorded. Species counts were greater at the three 500-m radius sites (78-105 species) and highest for the two 5-km radius sites. Similar patterns occurred when we assessed the total numbers of birds found at each site over the full survey period (**Figure 4**).

However, site MVS 8 had a total of more than 2,500 birds (an average of around 125 birds per visit), substantially more than for the two other 500-m radius sites.

Table 1. Details of the Martindale Valley survey sites

Habitat type	Site ID	Centrepoint coordinates	Site nominal size	Survey duration	Survey period	No. of surveys
Riparian	MVS 1	-32.609, 150.715	2 ha	20 min	2018-2024	20
	MVS 7	-32.512, 150.695	2 ha	20 min	2018-2024	20
	MVS 10	-32.506, 150.687	2 ha	20 min	2018-2024	20
	MVS 13	-32.445, 150.684	2 ha	20 min	2018-2024	20
	MVS 14	-32.457, 150.694	2 ha	20 min	2018-2024	20
Garden	MVS 2	-32.584, 150.720	2 ha	20 min	2018-2024	20
Dry Rainforest	MVS 6	-32.513, 150.720	2 ha	20 min	2018-2024	20
Wetland	MVS 9	-32.515, 150.688	2 ha	20 min	2018-2024	20
	MVS 15	-32.512, 150.689	2 ha	20 min	2018-2024	20
Woodland	MVS 3	-32.585, 150.719	2 ha	20 min	2018-2024	20
	MVS 4	-32.522, 150.721	2 ha	20 min	2018-2024	20
	MVS 5	-32.514, 150.712	2 ha	20 min	2018-2024	20
	MVS 8	-32.515, 150.694	500 m radius	c 45 min	2018-2024	20
	MVS 11	-32.480, 150.686	2 ha	20 min	2018-2020	9
	MVS 12	-32.465, 150.645	2 ha	20 min	2018-2024	18
	MVS 12-1	-32.465, 150.644	500 m radius	c 45 min	Oct 2020-2024	11
	MVS 16	-32.484, 150.683	2 ha	20 min	2021-2024	11
	MVS 17	-32.485, 150.683	2 ha	20 min	2021-2024	11
	MVS Campsite	-32.594, 150.719	500 m radius	c 2 h	2018-2024	20
General	MVS Upstream	-32.556, 150.717	5 km radius	c 10 h	2018-2024	20
	MVS Downstream	-32.464, 150.667	5 km radius	c 10 h	2018-2024	20

Table 2. Number of species and number of threatened species recorded annually in the Martindale Valley surveys.

Year	Number of visits	All species			Threatened Species		
		Number of species	Total birds	Birds/visit	Number of species	Total birds	Birds/visit
2018	2	111	1422	711	12	46	23
2019	4	126	3621	905	9	98	25
2020	3	129	3134	1045	9	95	32
2021	4	147	5370	1343	11	116	29
2022	1	93	885	885	5	13	13
2023	4	143	4905	1226	10	128	32
2024	2	118	2448	1224	7	45	23

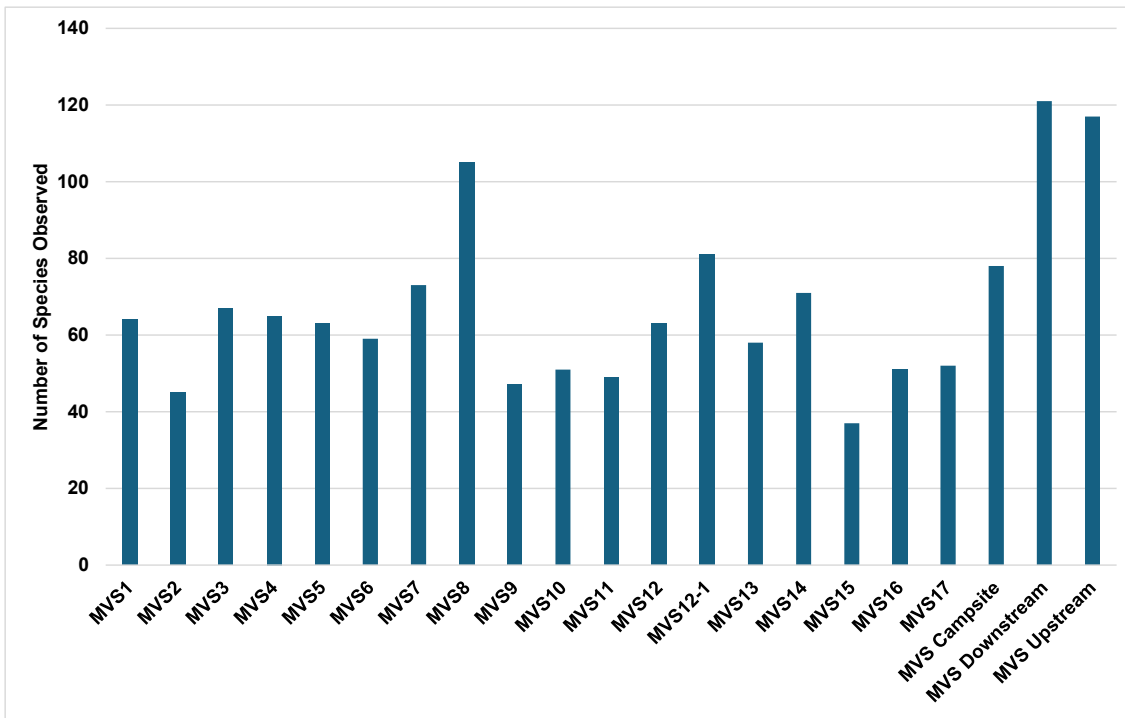


Figure 3. Number of species recorded at each site in the Martindale Valley 2018-2024.

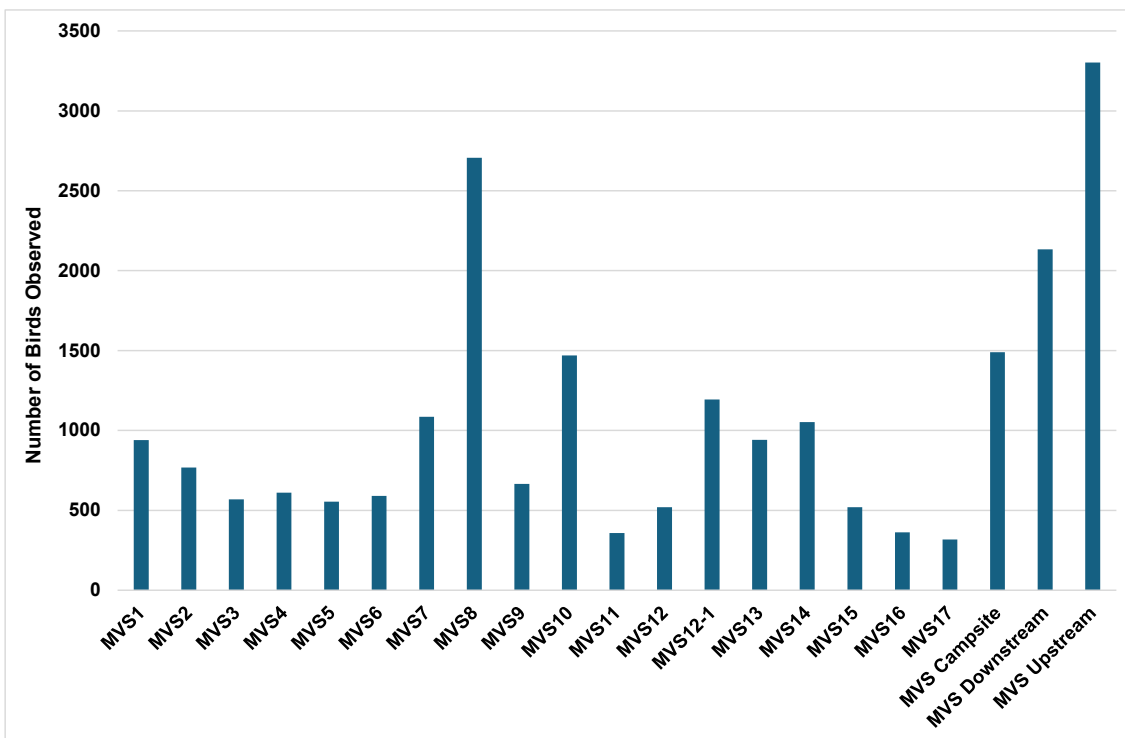


Figure 4. Total number of birds recorded at each site in the Martindale Valley 2018-2024.

Threatened species

The 18 threatened species found during the surveys are listed in **Table 3**, with their total annual counts. There was only one set of surveys carried out in 2022. Ten threatened species were only recorded occasionally (with 1-2 records of each in six years). The Painted Honeyeater *Grantiella picta* was detected annually but not after 2021. Eight species

were regularly recorded, albeit in fluctuating numbers: Spotted Harrier *Circus assimilis*, Little Lorikeet *Glossopsitta pusilla*, Brown Treecreeper *Climacteris picumnus*, Speckled Warbler *Pyrrholaemus sagittatus*, Grey-Crowned Babbler *Pomatostomus temporalis*, Varied Sittella *Daphoenositta chrysoptera*, Dusky Woodswallow *Artamus cyanopterus* and Hooded Robin *Melanodryas cucullata*.

Table 3: Total numbers of threatened species recorded annually

Species	2018	2019	2020	2021	2022	2023	2024
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	1	0	0	0	0	0	0
Latham's Snipe <i>Gallinago hardwickii</i>	1	0	0	0	0	1	0
Powerful Owl <i>Ninox strenua</i>	0	0	0	0	0	1	0
Little Eagle <i>Hieraaetus morphnoides</i>	2	0	0	0	0	0	0
Spotted Harrier <i>Circus assimilis</i>	1	4	1	3	0	3	0
Black Falcon <i>Falco subniger</i>	0	0	0	4	0	1	0
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	1	0	0	0	0	0	0
Gang-Gang Cockatoo <i>Callocephalon fimbriatum</i>	0	0	1	6	0	0	0
Little Lorikeet <i>Glossopsitta pusilla</i>	0	6	2	4	0	7	0
Brown Treecreeper <i>Climacteris picumnus</i>	0	2	0	14	2	8	3
Painted Honeyeater <i>Grantiella picta</i>	8	7	1	4	0	0	0
Speckled Warbler <i>Pyrrholaemus sagittatus</i>	14	24	24	28	2	29	4
Grey-Crowned Babbler <i>Pomatostomus temporalis</i>	6	41	38	34	3	72	23
Varied Sittella <i>Daphoenositta chrysoptera</i>	2	7	12	12	0	3	6
Dusky Woodswallow <i>Artamus cyanopterus</i>	2	4	16	1	1	0	3
Scarlet Robin <i>Petroica boodang</i>	0	0	0	0	0	0	1
Hooded Robin <i>Melanodryas cucullata</i>	4	3	1	10	2	3	5
Diamond Firetail <i>Stagonopleura guttata</i>	3	0	0	0	0	0	0

Habitat types

Including the discontinued woodland 2-ha site MVS 11, we surveyed at seven 2-ha woodland sites and three 500-m radius ones, five 2-ha riparian sites, two 2-ha wetland sites, a dry rainforest gully and a native garden, plus the two 5-km radius sites. The latter had the largest species diversity, with an average of 119 species recorded. The average number of species per habitat are shown in **Figure 5**. The two wetland sites had the lowest species diversity, closely followed by the native garden.

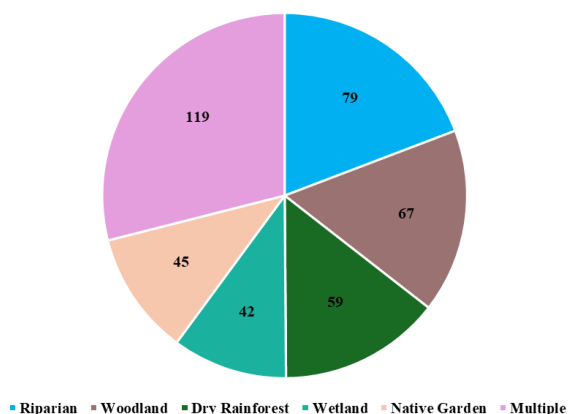


Figure 5. Average number of species recorded per quarterly visit in each group of habitat types 2018-2024.

Honeyeaters

During the six years of surveys, 22 types of honeyeater were recorded. Thirteen of those species were recorded on at least 50% of our visits to the valley, hence probably they were resident. The

Spiny-cheeked Honeyeater *Acanthagenys rufogularis* was one of seven honeyeater species recorded in every visit; its mean count was 11 birds and there were five visits when 15-20 birds were recorded. We also had breeding records for the species.

Seasonal differences

In **Table 4** we show the total numbers of birds and total numbers of species recorded in each season over 2018-2024. The highlighted cells indicate periods when eastern Australia was experiencing either very dry conditions (much-below-average rainfall) or very wet conditions (much-above-average rainfall) based upon our assessment of the quarterly rainfall decile maps. The most birds and species were in spring (averages: 1160 birds, 109 species). Winter had the least number of species (an average of 62 species; and three times with only 44-46 species) but the second highest average number of birds (1150).

The results for summer 2019 were substantially lower than for the four other summer visits. It was during an extended El Niño period but we note that there were only two surveyors that visit, also there were heatwave conditions plus several of the woodland sites had unusually high levels of cicada activity, which suppressed calling by birds and decreased their detectability. If that year's data are excluded, the summer results were similar to the spring ones (with averages of 1033 birds and 101 species).

Table 4. Annual and seasonal numbers of species and numbers of birds. The highlighted cells indicate seasons where eastern Australia had well-below-average rainfall and well-above-average rainfall.

Season	Total visits		2018	2019	2020	2021	2022	2023	2024
Summer	6	No. of birds	–	558	1013	1068	885	1012	1187
		No. of species	–	64	97	112	93	100	103
Autumn	4	No. of birds	–	726	–	1456	–	613	1261
		No. of species	–	70	–	95	–	95	93
Winter	5	No. of birds	662	1271	959	1570	–	1288	–
		No. of species	46	46	81	92	–	44	–
Spring	5	No. of birds	1047	1066	1162	1276	–	1154	–
		No. of species	98	100	110	117	–	109	–

Some seasonal specialists could be identified. Species which were only recorded in spring and/or summer are listed in **Table 5** (which ignores any species with only one-off season records). There were 26 species although ten of those only had records in four visits or fewer (of the 11 spring or summer visits carried out in the six-year time period). Three additional species should be mentioned: Shining Bronze-Cuckoo *Chalcites lucidus* (present in two summer and three spring visits, but also recorded in July 2021); Australian Reed-Warbler *Acrocephalus australis* (present in

five summer and five spring visits, but also recorded in April 2023); Dusky Woodswallow *Artamus cyanopterus* (present in four summer and four spring visits, but also recorded in July 2020).

Three species were recorded in every summer visit: Eastern Koel *Eudynamys orientalis*; Oriental Dollarbird *Eurystomus orientalis*; Common Cicadabird *Edolisoma tenuirostre*. Two species were recorded in every spring visit: Channel-billed Cuckoo *Scythrops novaehollandiae* and Rainbow Bee-eater *Merops ornatus*.

Table 5. Spring-summer specialists in the Martindale Valley surveys (species with records from more than one set of summer or spring surveys).

Species	No. of spring seasons	No. of summer seasons
Stubble Quail <i>Coturnix pectoralis</i>	1	3
White-throated Nightjar <i>Eurostopodus mystacalis</i>	3	4
Eastern Koel <i>Eudynamys orientalis</i>	3	6
Channel-billed Cuckoo <i>Scythrops novaehollandiae</i>	5	3
Horsfield's Bronze-Cuckoo <i>Chalcites basalus</i>	1	1
Brush Cuckoo <i>Cacomantis variolosus</i>	0	2
Pallid Cuckoo <i>Heteroscenus pallidus</i>	4	0
Buff-banded Rail <i>Hypotaenidia philippensis</i>	2	0
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>	2	0
Pied Stilt <i>Himantopus leucocephalus</i>	1	1
Latham's Snipe <i>Gallinago hardwickii</i>	0	2
Rainbow Bee-eater <i>Merops ornatus</i>	5	4
Oriental Dollarbird <i>Eurystomus orientalis</i>	4	6
Sacred Kingfisher <i>Todiramphus sanctus</i>	1	1
Painted Honeyeater <i>Grantiella picta</i>	4	0
Large-billed Scrub-wren <i>Sericornis magnirostra</i>	1	1
Buff-rumped Thornbill <i>Acanthiza reguloides</i>	2	2
Australasian Figbird <i>Sphecothebes vieillotii</i>	3	2
Common Cicadabird <i>Edolisoma tenuirostre</i>	1	6
White-winged Triller <i>Lalage tricolor</i>	3	2
White-browed Woodswallow <i>Artamus superciliosus</i>	1	1
Leaden Flycatcher <i>Myiagra rubecula</i>	1	4
Brown Songlark <i>Cincloramphus cruralis</i>	3	1
Rufous Songlark <i>Cincloramphus mathewsi</i>	4	4
Tawny Grassbird <i>Cincloramphus timoriensis</i>	0	2
Fairy Martin <i>Petrochelidon ariel</i>	4	3

Five species were only recorded in autumn and/or winter, as listed in **Table 6**. Rose Robin *Petroica rosea* was recorded in seven of the nine autumn or winter visits carried out in the six-year time period,

and White-eared Honeyeater *Nesoptilotis leucotis* in four of them. The three other species each had only 2-3 seasonal records.

Table 6. Autumn-winter specialists in the Martindale Valley surveys (species with records from more than one set of autumn or winter surveys).

Species	No. of autumn seasons	No. of winter seasons
Australian White Ibis <i>Threskiornis moluccus</i>	0	2
Whistling Kite <i>Haliastur sphenurus</i>	1	1
White-eared Honeyeater <i>Nesoptilotis leucotis</i>	3	1
Rose Robin <i>Petroica rosea</i>	3	4
Painted Button-quail <i>Turnix varius</i>	1	2

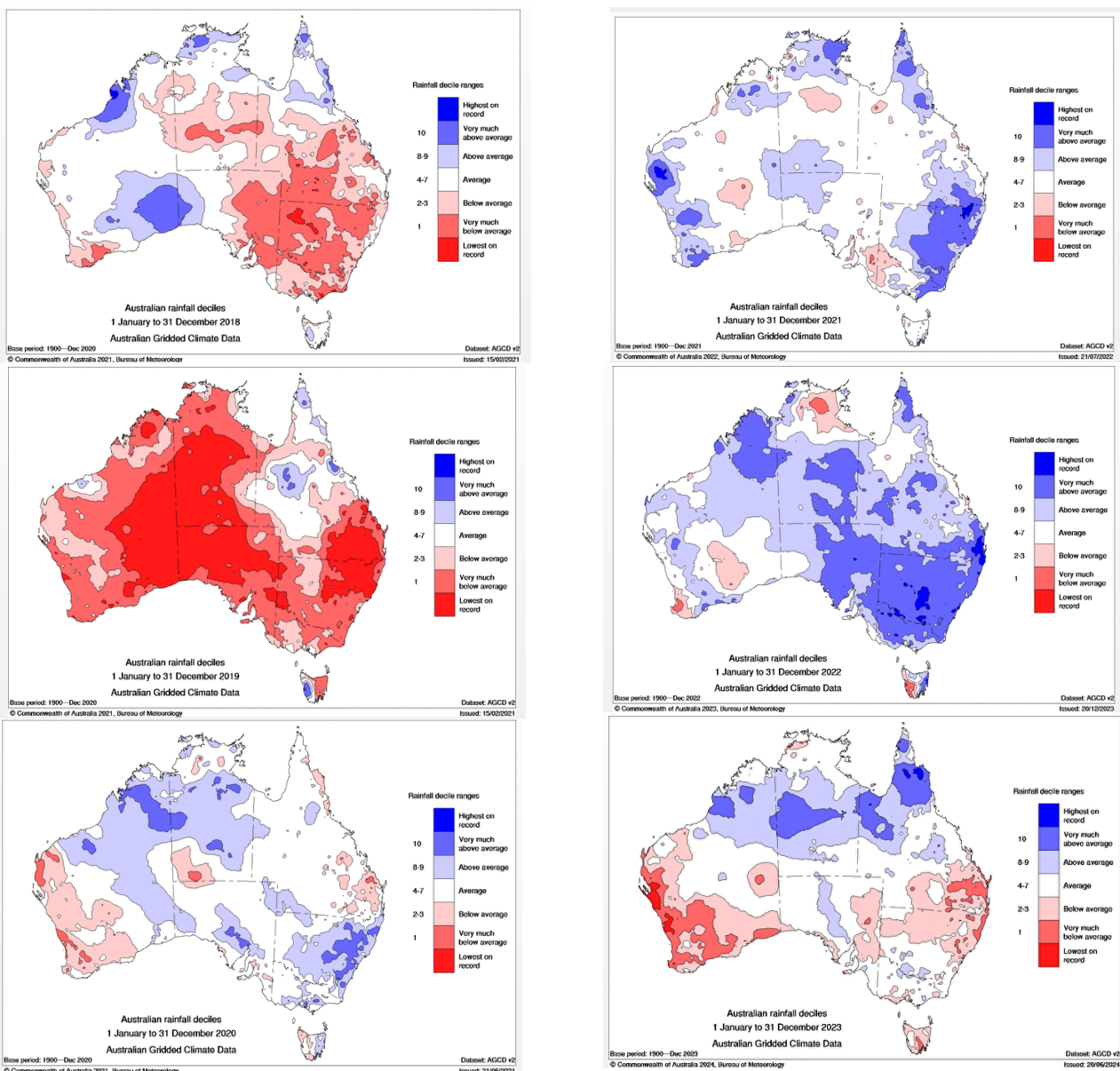


Figure 6. Annual rainfall distributions in Australia for 2018-2023 (Bureau of Meteorology 2024).

El Niño and La Niña events

Figure 6 shows the rainfall distribution across Australia for each year spanning 2018-2023

(source: Bureau of Meteorology 2024). Years 2018 and 2019 were very dry ones in eastern Australia (and more widely). Only the fourth quarter of 2018 had about the average rainfall; overall, 2018-2019 was an extended El Niño period. There was a shorter very dry period in eastern Australia in 2023, lasting for about six months. Rainfall in 2020 was patchy; the first and fourth quarters were much wetter than the middle two quarters. Years 2021 and 2022 were very wet ones in eastern Australia – only the second quarter of 2021 had normal rainfall i.e. this was an extended La Niña period. Another very wet period began in April 2024.

For additional insights into rainfall patterns, in **Table 7** we present rainfall information for four inland Australian sites plus Doyles Creek (which is the closest weather station to Martindale). The data

are presented as the percentage of each location's mean annual rainfall. **Table 7** shows that the 2018-2019 El Niño was widespread, as was the 2021-2022 La Niña. Rainfall in 2020 and 2023 was heavier in central Australia than it was at more easterly locations, particularly in 2023.

Eleven species only had records during the 2018-2019 El Niño event; they are listed in **Table 8**. Another three species had elevated numbers during that period. The mean counts of Double-barred Finch *Taeniopygia bichenovii* and Zebra Finch *T. castanotis* were 30-40 birds; their means were 8-10 birds in later years. Pallid Cuckoos *Heteroscenes pallidus* were present over 2018-2021 (only in the spring visits), but as single birds except in October 2019 when seven birds were recorded.

Table 7. Annual rainfall at specified weather stations, as percentages of the average annual rainfall.

Weather Station	2018	2019	2020	2021	2022	2023
Wilcannia	31%	62%	124%	110%	237%	55%
Alice Springs	60%	23%	86%	142%	155%	139%
Cooper Pedy	56%	17%	171%	136%	141%	157%
Birdsville	66%	30%	148%	92%	159%	56%
Doyles Creek	64%	49%	111%	122%	147%	63%

Table 8. Species recorded in the Martindale Valley surveys during 2018-2019 only.

Species	No. of seasons present	Maximum count
Great Egret <i>Ardea alba</i>	1	1
Glossy Ibis <i>Plegadis falcinellus</i>	1	6
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	1	3
Little Eagle <i>Hieraaetus morphnoides</i>	1	1
Black Kite <i>Milvus migrans</i>	2	8
Brown Honeyeater <i>Lichmera indistincta</i>	1	2
Fuscous Honeyeater <i>Ptilotula fusca</i>	1	1
Masked Woodswallow <i>Artamus personatus</i>	1	2
White-browed Woodswallow <i>Artamus superciliosus</i>	2	19
Spangled Drongo <i>Dicrurus bracteatus</i>	1	1
Diamond Firetail <i>Stagonopleura guttata</i>	1	3

In **Table 9** we have listed the 30 species that were not recorded in the valley prior to 2021, which is when the La Niña event began. Fourteen of those species appeared for the first time during 2021-2022 although most of those were only recorded in one to two of our five visits. The exception was the Eurasian Coot *Fulica atra*, which was present in

low numbers during four of the five visits. **Table 9** also lists the species recorded during the six visits of 2023-2024, that had not been present prior to 2021. Most noteworthy amongst those are the crane and rail species, and the egrets.

Table 9. Species recorded in the Martindale Valley surveys only after 2020.

Species	2021-2022		2023-2024	
	No. of seasons present	Maximum count	No. of seasons present	Maximum count
Plumed Whistling-Duck <i>Dendrocygna eytoni</i>	1	3	0	–
Wandering Whistling-Duck <i>Dendrocygna arcuata</i>	0	–	1	11
Hardhead <i>Aythya australis</i>	1	1	0	–
Topknot Pigeon <i>Lopholaimus antarcticus</i>	1	3	0	–
Pheasant Coucal <i>Centropus phasianinus</i>	1	1	0	–
Brush Cuckoo <i>Cacomantis variolosus</i>	0	–	2	3
Lewin's Rail <i>Lewinia pectoralis</i>	0	–	1	1
Buff-banded Rail <i>Hypotaenidia philippensis</i>	1	2	1	1
Australian Spotted Crake <i>Porzana fluminea</i>	0	–	3	4
Baillon's Crake <i>Zapornia pusilla</i>	0	–	1	3
Spotless Crake <i>Zapornia tabuensis</i>	0	–	3	3
Eurasian Coot <i>Fulica atra</i>	4	3	0	–
Cattle Egret <i>Bubulcus ibis</i>	1	12	3	6
Plumed Egret <i>Ardea plumifera</i>	0	–	1	1
Little Pied Cormorant <i>Microcarbo melanoleucos</i>	0	–	2	1
Banded Lapwing <i>Vanellus tricolor</i>	0	–	1	2
Barn Owl <i>Tyto alba</i>	0	–	2	1
Powerful Owl <i>Ninox strenua</i>	0	–	1	1
Whistling Kite <i>Haliastur sphenurus</i>	1	1	0	–
Black Falcon <i>Falco subniger</i>	2	2	1	1
White-cheeked Honeyeater <i>Phylidonyris niger</i>	1	1	1	1
White-eared Honeyeater <i>Nesoptilotis leucotis</i>	1	4	3	6
Western Gerygone <i>Gerygone fusca</i>	0	–	1	1
Large-billed Scrubwren <i>Sericornis magnirostra</i>	2	3	0	–
Black-faced Monarch <i>Monarcha melanopsis</i>	0	–	1	1
Scarlet Robin <i>Petroica boodang</i>	0	–	1	1
Horsfield's Bushlark <i>Mirafra javanica</i>	0	–	1	1
Tawny Grassbird <i>Cincloramphus timoriensis</i>	0	–	2	3
Plum-headed Finch <i>Neochmia modesta</i>	1	3	0	–
House Sparrow <i>Passer domesticus</i>	1	1	0	–

DISCUSSION

It is unsurprising that the greater counts of species and of total birds occurred at the 500-m radius and 5-km radius sites, as they were larger than the 2-ha sites and far more time was spent surveying at them. However, the species richness at site MVS 8 was noteworthy, as were the total counts of birds there. MVS 8 is an acacia-rich woodland near Medhurst Bridge, with many mistletoe plants (probably *Amyema* spp). It was the only site where we recorded Painted Honeyeaters, and also the predominant site for finding Spiny-cheeked Honeyeaters. Site MVS 7, a riparian site abutting MVS 8 at Medhurst Bridge, also had noteworthy species diversity, possibly because of movement of species between the two sites. It is no coincidence that Medhurst Bridge is the most popular destination in the Martindale Valley for visiting roadside birdwatchers. It is also where both Tarrant and Lindsey focussed their survey efforts.

Threatened species

Eighteen threatened species were recorded during the surveys but nine of those each had only one or two records. For those latter species, the Martindale Valley played a minor, albeit possibly quite important, role in their survival strategies. For the other nine species, the valley was important to them. They were recorded in at least four visits during the 20 visits spanning six years.

Painted Honeyeaters were only found at the two sites near Medhurst Bridge (MVS 7, MVS 8) and not after 2021, but we found the other eight species at multiple sites (where there was suitable habitat) on multiple occasions.

The Painted Honeyeater is closely associated with mistletoe species (Allen *et al.* 2022; Oliver *et al.* 2003). Its absence from the sites near Medhurst Bridge after 2021 might be associated with there

being better conditions available in other parts of the species' range. However, it might also indicate that there is an issue about the quality of the mistletoe in the MVS 8 woodland. It would be useful to have a botanical assessment made of the site.

Comparisons with earlier studies

Tarrant (2008) surveyed at two riparian locations in the Martindale Valley regularly during 1998-2008. One site was at Medhurst Bridge, the other was at Smiths Bridge near the Martindale school (H. Tarrant pers. comm.). Although he did not have physical access to the adjoining properties, his regular visits helped develop insights about the bird populations at those two locations. Two of the sites in our surveys, MVS 7 and MVS 8, abut Medhurst Bridge, hence comparisons with Tarrant's findings are of interest.

Tarrant found the Diamond Firetail *Stagonopleura guttata* to be prospering at Medhurst Bridge, with its reporting rate about doubling during the period of his study. We only recorded it in July 2018; three birds near Medhurst Bridge. Tarrant concluded that the populations of three other finch species (Double-barred Finch, Zebra Finch, Red-browed Finch *Neochmia temporalis*) had declined. In contrast, we found good numbers of the former two species during the 2018-2019 El Niño, and also recorded them during almost every other visit. We recorded Red-browed Finches in almost every visit, including a peak count of 69 birds in April 2023.

Tarrant did not record the Spiny-cheeked Honeyeater at Martindale until he found a single bird in late 2008. In recent decades the species has substantially increased its range within NSW including in the Hunter Region (McAllan & Lindsay 2016; Williams 2020; Williams in prep.). Martindale in particular has become a stronghold for the species in the Hunter Region, although they are also recorded at many other locations. Tarrant did not find the Striped Honeyeater *Plectorhyncha lanceolata* at Medhurst Bridge until 2002, but then it occurred there regularly. We recorded it in almost every visit (including at the Medhurst Bridge sites on most occasions). Tarrant's first record of Painted Honeyeater was in November 2001 (with subsequent breeding records that year).

There were drought years in 2002 and 2006, but Tarrant did not find any White-browed Woodswallows *Artamus superciliosus* at Martindale (although he recorded them several times in those years at his sites at nearby Doyles Creek). Lindsey made nine visits to the MVS 8 site spanning 2002-2016, plus twice there during the period overlapping with our study (A. Lindsey pers. comm.). She recorded 82 species, which is comparable to the 105 species we found there in our 20 visits. The Striped Honeyeater was regularly present, and she also recorded the Painted Honeyeater in October 2003 and on every other spring visit (but not in other seasons). Her first records of Spiny-cheeked Honeyeater were in April 2010; after that they were recorded regularly.

Seasonal effects

Spring and summer usually had the greatest abundance and diversity of birds; the results for January 2019 are anomalous when compared with the five other January visits. The number of species recorded in April 2019 also are anomalous when compared with the three other April visits. The number of species recorded in those three visits were 85-95% of the spring and summer totals, when many common migratory species had arrived back. Winter had much lower diversity than the other seasons, in particular there were three winter visits with only 44-46 species recorded each time.

Most of the 26 species that were recorded exclusively in the spring-summer surveys (on more than one of our visits) were well-known to be spring-summer migrants in the Hunter Region (Williams in prep.). However, eight species currently are not categorised in that way: Stubble Quail *Coturnix pectoralis*; Buff-banded Rail *Hypotaenidia philippensis*; Little Black Cormorant *Phalacrocorax sulcirostris*; Pied Stilt *Himantopus leucocephalus*; Large-billed Scrub-wren *Sericornis magnirostra*; Buff-rumped Thornbill *Acanthiza reguloides*; Australasian Figbird *Sphecothebes vieillotii*; Tawny Grassbird *Cincloramphus timoriensis*. Although only recorded occasionally, there were some interesting insights.

Stubble Quails are cryptic, and they are mainly detected when calling. There seems no compelling evidence that they migrate, but irruptions do occur (Marchant & Higgins 1993).

It is unclear if the apparent absences at Martindale were due to the movement of birds away from the area, or due to changes in their detectability.

Australasian Figbirds were recorded in five of the eleven spring or summer visits, and none of the autumn or winter ones – which seems to be sufficient to suggest a pattern of movement. Cooper *et al.* (2020) suggested that it was a partial nomad in NSW, with some birds moving to southerly locations in summer. Martindale possibly is one of the places into which they move.

The records for Buff-rumped Thornbill seem intriguing. From three locations, there were two spring and two summer records, in 2010 and 2023. It is unclear if these records point to a pattern of movement, or to a detectability issue. The two records of Large-billed Scrub-wren both occurred in spring-summer of 2021/22, during La Niña; they were records of single birds in the dry rainforest gully (MVS 6) and at a well-vegetated riparian site (MVS 1). All the records for Buff-banded Rail, Little Black Cormorant and Tawny Grassbird occurred during or after the 2021-2022 La Niña event and are discussed in the following section.

Only five species potentially were autumn-winter specialists. However, three of those species did not have many records and the findings should be considered as tentative. Rose Robin and White-eared Honeyeater had many more records. In the Hunter Region, the Rose Robin is an altitudinal migrant – breeding in elevated altitude rainforests and forests in spring and summer, and subsequently moving to sites at lower altitudes (Stuart & Williams 2016). At Martindale (where the altitudes of survey sites were 100-150 m) that behaviour was replicated – Rose Robins were only recorded in the autumn or winter visits. The White-eared Honeyeater has not been identified as making seasonal movements within the Hunter Region (Williams in prep.). However, in HANZAB it is described as “sedentary over most of range, with some local movements, partial altitudinal migrant in the high country of SE Australia” (Higgins *et al.* 2001). The Martindale findings suggest this species might be an altitudinal migrant within the Hunter Region. Another possibility is that some birds of the western subspecies *novaenorciae*, which occurs in western NSW

and further to the west (Cooper *et al.* 2020) move eastwards in winter. These possibilities warrant closer investigation, using a larger database of Hunter Region records.

Climatic effects

1. El Niño

The 2018-2019 El Niño event led to one-off records of several species (Great Egret *Ardea alba*, Glossy Ibis *Plegadis falcinellus*, etc.), and to increased numbers of some finches, woodswallows and raptors. However, overall, it caused a decrease in the number of species recorded in the valley. The summer, autumn, winter and spring visits all had lower total numbers and lower total species counts than in subsequent years. The winter 2023 result was comparable with the 2018 and 2019 winter visits, perhaps because it was during another dry period in eastern Australia.

2. La Niña

It was unfortunate that we were unable to carry out three of the scheduled surveys in 2022, as that denied us the opportunity to assess how Martindale bird populations were affected during what was the peak of the 2021-2022 La Niña event. However, the heavy rains replenished local water bodies which brought longer-lasting effects. Martindale Creek was dry in 2018-2020 but it has been flowing ever since. The two spring-fed wetland sites that we surveyed were dry for two years from summer 2019, but they have been wet ever since. Thirteen of the 30 species that only were recorded at some date after 2020 were waterbirds and two others have a known wetland association – Whistling Kite *Haliastur sphenurus* and Tawny Grassbird. Also, Little Grassbirds *Poodytes gramineus*, which disappeared after our April 2019 visit, returned to the wetland sites in October 2023 and later bred there.

Although a Buff-banded Rail was recorded in January 2021, the main records of crakes and rails were in 2023-2024. Possibly they had been further inland during the main La Niña period and only came to Martindale as inland waterbodies began to dry (for example, Wilcannia and Birdsville each had much below-average rainfall in 2023).

3. General comments

Nix (1972) developed a model to describe bird movements in Australia in response to changing environmental conditions (droughts and floods). From that work, if not before, it is now known to be the norm for inland birds to move towards coastal areas during droughts and to move back again inland after replenishing rains have fallen. Such movements have also been documented for waterbirds (Wen *et al.* 2016) and birds of prey (Baker-Gabb & Fitzherbert 1989).

The Martindale Valley experienced changes in its bird populations during the 2018-2019 El Niño event but there was not a massive influx of birds to the valley. The greater changes were during and after the subsequent La Niña period. These findings suggest that the valley is not a refuge for coastal species (Garnett *et al.* 2013), and that it functions more like a habitat of inland Australia.

The environmental value of retaining or reinstating native vegetation

The Martindale Valley is surrounded on three sides by the Wollemi National Park, but much of the privately held parts of the valley have been cleared for pasture or agriculture. However, we estimate that around 10-15% of the original native vegetation in the valley has been retained or reinstated. Most of the open paddocks have some trees, the riparian zone alongside Martindale Creek has trees and (usually) understorey for virtually its full length, and there are many other sizable pockets of natural vegetation, some with understorey and some not. Godoi *et al.* (2018) identified that bird species richness, composition and abundance in pastures are affected by vegetation structure and distance from natural habitats. This point is confirmed in the Martindale Valley – the national park is close by and the valley including its paddocks are well-vegetated, and hence there is abundant birdlife.

CONCLUSIONS

Six years of surveys in the Martindale Valley have shown its importance for birds, with 190 species recorded in that period including multiple records for about 75% of those species.

There were regular records for eight threatened species; all were found at multiple sites: Spotted Harrier, Little Lorikeet, Brown Treecreeper, Speckled Warbler, Grey-crowned Babbler, Varied Sittella, Dusky Woodswallow and Hooded Robin. Another threatened species, the Painted Honeyeater, known to be present in the valley from at least 2001, was not recorded after 2021.

Bird populations in the valley were affected by seasonal factors and by climatic events. A two-year El Niño period brought several species into the valley, mainly as vagrants or short-term visitors. A subsequent La Niña period resulted in the arrival of some different species, and in particular, waterbirds and other species associated with wetlands. The study showed that during very wet La Niña periods, the valley did not become a coastal refuge, but rather functioned more like habitat of inland Australia. The prolonged period of rain replenished local water bodies, providing longer-lasting habitat for wetland species.

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