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Turquoise Fairywren *Malurus splendens callainus*
Bon Bon Station Reserve, SA, September 2022
Image Bernie Haase

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What is the evidence of contact and interaction between the two divergent lineages of Splendid Fairywren *Malurus splendens* in South Australia?

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ABSTRACT – The two distinctive subspecies of Splendid Fairywren that occur in South Australia, Black-backed *Malurus splendens melanotus* and Turquoise *M. s. callainus* Fairywrens, are not in geographical contact through the Flinders Ranges, as widely reported. Populations of the species in the northern ranges and on its eastern flank, and on its western flank in the south, vary phenotypically, some resembling Turquoise Fairywrens but many appearing intergradient. These highly variable separate populations provide the only firm evidence of hybridisation between the two subspecies. They are separated from Black-backed Fairywrens in the North Olary Plains by over 150 km east of the ranges and from others east of Orroroo in the south by about 80 km across the ranges and southern Willochra Plain. There are few records elsewhere in the Flinders Ranges. We find it likely that secondary contact and hybridisation occurred in the past, presumably during the mid to late Pleistocene, but that contact has since been lost.

INTRODUCTION

Two subspecies of Splendid Fairywren *Malurus splendens* (Quoy and Gaimard, 1832) occur in South Australia: (1) Black-backed Fairywren *M. s. melanotus* Gould, 1841 of the Murray Mallee and Olary Plains, also inland Victoria, New South Wales and southern Queensland, and (2) Turquoise Fairywren *M. s. callainus* Gould, 1867 of northern Eyre Peninsula and the north-west of the state, Central Australia and inland Western Australia. Both were long considered separate species, distinct from *Malurus splendens sensu stricto* (RAOU 1926; Condon 1968). Storr (1973) and Ford (1974a, 1974b) listed the three as conspecific and Ford (1975) described nine specimens demonstrating hybridisation between 'Splendid and Turquoise Wrens' west of the Gibson Desert in Western Australia. He speculated that contact and hybridisation might occur also between Turquoise and Black-backed Fairywrens, because of their occurrence immediately to the west and east of the Flinders Ranges respectively (Schodde 1965). Since Parker's treatment of family Maluridae in the *Interim List of Australian Songbirds* (Schodde 1975), all three have been combined consistently in one species (Schodde 1982; Rowley and Russell 1997; Schodde and Mason 1999; Higgins *et al.* 2001; Christidis and Boles 2008).

Habitats of the two subspecies are similar, dense shrublands as understorey to a variety of tall shrublands and low woodlands, including Mallee *Eucalyptus* spp., Mulga and other *Acacia* spp., *Casuarina/Allocasuarina* spp., Sugarwood *Myoporum platycarpum*, *Callitris* spp. and *Melaleuca* spp., and attributes that distinguish between the two are unclear (Higgins *et al.* 2001). Compared with its broadly allopatric congener the Purple-backed Fairywren *Malurus assimilis*, the presence of an overstorey and a more dispersed shrubland appear to favour the Splendid Fairywren, which forages more widely and is a stronger flyer (Schodde 1982; Rowley and Russell 1997).

Recent reviewers (Schodde 1982; Rowley and Russell 1997; Schodde and Mason 1999; Higgins *et al.* 2001; Kearns *et al.* 2009) have presented *callainus* and *melanotus* (subspecific names generally used hereafter for brevity) as

intergrading continuously through the Flinders Ranges. Such a putative zone of contact was examined by Reid *et al.* (1977), who reviewed distributional records for each taxon, then only recently combined in one species, and made field trips to critical localities where they took voucher specimens. They found no evidence of contact between the two subspecies, reporting a gap of about 160 km between *callainus* at Wertaloona on the eastern flank of the North Flinders Ranges and *melanotus* at Koonamore on the North Olary Plains. A narrower gap of about 80 km was identified further south, between the Port Germein district and east of Orroroo (Figure 1 shows key localities named in the text).

Reid *et al.* (1977) described and compared the plumages of ten male specimens: six *callainus*, including three from the Port Germein area that Mack (1934) had recognised as a darker subspecies *M. callainus whitei*, two recently collected *melanotus* specimens from east of Orroroo and Terowie and two from the Murray Mallee. They agreed that '*whitei*' specimens (see Discussion regarding the misuse of this name) were darker than *callainus* from elsewhere but that the crown and mantle of all were a greener blue than in *melanotus*, while specimens from east of Orroroo and Terowie fell within the range of variation of Murray Mallee *melanotus*. Schodde (1982) identified the Port Germein group as intergradient and questioned whether intergradation extended west of the Flinders Ranges, across northern Eyre Peninsula. Consequently, Schodde and Mason (1999) placed the holotype of *M. s. callainus*, taken

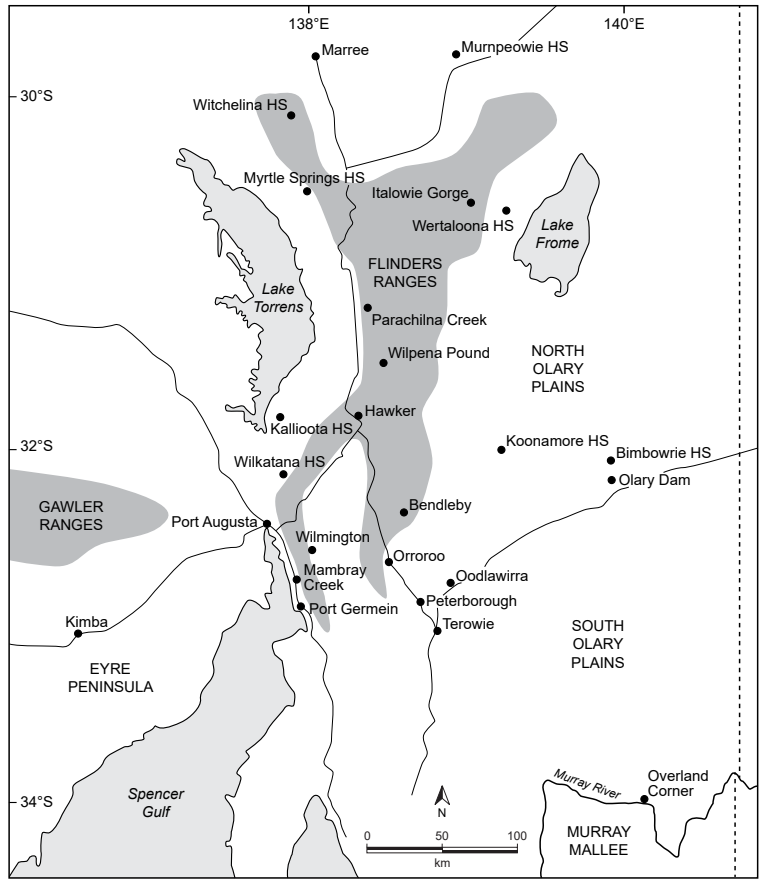

Figure 1. Map of the Flinders Ranges and adjacent regions of South Australia, showing key localities referred to in the text. Artwork Belinda Cale

immediately west of northern Spencer Gulf, in that intergradient zone; they therefore applied the name *M. s. musgravi* Mathews, 1922 to that subspecies. The holotype specimen of *Malurus callainus* Gould, 1867 in the Natural History Museum, Tring (NHMUK 1881.5.1.674) was later found to be representative of the subspecific phenotype and not intergradient when examined by R. Schodde (pers. comm.) in 2004 and by PH on 6 March 2020. The long-established name *callainus* was therefore restored and *musgravi* returned to synonymy (Schodde in Dickinson and Christidis 2014: 145; Horton *et al.* 2020; Gill *et al.* 2022).

Kearns *et al.* (2009) tested present taxonomy in a phylogeographic study of the species. They sequenced the mitochondrial gene ND2 and applied spectrophotometry to the males' coloured plumage patches whose differences in hue and shade largely define subspecies boundaries. In their genetic analysis they recovered three clades with net divergences between 1.2% and 1.4%, corresponding closely with subspecies *splendens*, *callainus* and *melanotus*. The fourth subspecies *emmottorum*, a pallid form in inland Queensland, was in the *melanotus* clade. Their limited samples from within the presumed *callainus–melanotus* hybrid zone (*sensu* Schodde and Mason 1999), one from the eastern Gawler Ranges and two from the North Flinders Ranges, were placed within the *callainus* haplogroup. Spectrophotometry was effective in recognising changes in shade between forest-occupying southern and more arid-country northern populations of *splendens* and in defining the boundary between *melanotus* and *emmottorum*. It also distinguished between subspecies *splendens*, *callainus* and *melanotus* by analysing chromatic variation of their plumage patches.

Black *et al.* (2022a) showed that the plumages of breeding males of the three subspecies *splendens*, *callainus* and *melanotus* are distinct, the hues of colour patches corresponding closely with the spectrophotometric findings of Kearns *et al.* (2009). Specimens of subspecies *callainus* are pale blue to greenish blue ('turquoise') above and have a dark violet throat and upper breast, hereafter 'bib', that contrasts with a paler blue lower breast and abdomen, hereafter 'belly', and even more strongly with the upperparts. On the other hand, the colour patches of *melanotus* specimens lie within the violet-blue to blue range and show relatively little contrast, apart from the ear patches that are paler than upperparts in all members of the species, although least obviously in *callainus*. The breast band is generally broad in *callainus* and narrow in *melanotus*, with some overlap due to the extremes of variation but with strong statistical separation; nape band widths show the same trend.

In view of the genetic divergence that Kearns *et al.* (2009) identified between *callainus* and *melanotus*, we turn to matters raised by Reid *et al.* (1977) but which remain unresolved: (1) is the Splendid Fairywren distributed continuously through the Flinders Ranges and (2) what is the nature of contact and interaction, if any, between *callainus* and *melanotus*?

We review the species' distribution in South Australia and analyse plumage variation in testing the following hypotheses concerning Flinders Ranges populations:

1. that, except for *melanotus* in the south-east, they belong to subspecies *callainus*, without intergradation, as inferred by Reid *et al*. (1977);

2. that they show continuous intergradation between *callainus* and *melanotus* as represented by Rowley and Russell (1997), Schodde and Mason (1999) and Higgins *et al.* (2001);

3. that they intergrade as a result of secondary contact between divergent lineages as hypothesised by Kearns *et al*. (2009).

METHODS

Distribution

Distributional records of the Splendid Fairywren in South Australia were collated from museum specimens, the published literature, personally obtained individual reports, and the Atlas of Living Australia (ALA https://www.ala.org.au) (including eBird records) and Birdata (https://birdata.birdlife.org.au). We closely scrutinised all records from within the Flinders Ranges by following up reports with observers where feasible and accepted those with corroborative evidence supporting correct identification.

Plumage

Plumages of all fully coloured male specimens of Splendid Fairywren in the South Australian Museum, Adelaide (SAMA) were examined by AB and PH, and those in the Natural History Museum, Tring (NHMUK) by PH. We point out here that variation in hue of the 'blue' colour patches among Splendid Fairywren subspecies extends across and beyond the nominal range of blue in the spectrum, between violet and turquoise, a greenish blue (Kearns *et al.* 2009; Black *et al.* 2022a). In total 13 variables were scored or measured:

i) dorsal patch hue, ii) bib hue, iii) belly hue, all scored visually by AB as 1 = violet, 2 = violet-blue or 3 = blue;

iv) dorsal patch shade, v) bib shade, vi) belly shade, all scored visually by AB as 1 = dark, 2 = medium or 3 = pale;

vii) dorsal patch colour, viii) bib colour, ix) belly colour, all scored visually by PH between 1 (violet) and 10 ('turquoise');

x) breast band maximum, xi) nape band maximum, the breadth of both black bands measured by AB to the nearest 0.5 mm at maximum breadth;

xii) breast band midline, xiii) nape band midline, the breadth of both black bands measured by PH to the nearest 0.5 mm within 5 mm of the midline.

The contrast in hue and shade between colour patches was noted but not scored. Two specimens in NHMUK from Wertaloona and two in the Australian National Wildlife Collection (ANWC) Canberra from Italowie, in the north-eastern Flinders Ranges, as well as additional NHMUK *callainus* specimens including the holotype, were included in the study but not analysed statistically because of incomplete data. During this phase of plumage analysis, all specimens from west of Spencer Gulf and Lake Torrens were assigned provisionally to *callainus* and all from east of the Flinders Ranges to *melanotus*. Specimens from within the Flinders Ranges and immediately adjacent were compared individually against a representative range of variation within those subspecies, as assigned.

Statistical methods

For analysis of variation among all SAMA specimens, independent of subspecific assignment, each was included in one of seven geographic samples (see Figure 2): (1) 13 western specimens from north of 28° S; (2) 8 western specimens from south of 28° S; (3) 14 eastern specimens from the Gawler Ranges and surrounds and Eyre Peninsula; (4) 8 specimens from the south-western Flinders Ranges (Kallioota Station east of southern Lake Torrens, Mambray Creek and the Port Germein area) (SW); (5) 2 specimens from the Italowie area in the north-eastern Flinders Ranges (NE); (6) 5 specimens from east and south-east of Orroroo in the south-eastern Flinders Ranges (SE); and (7) 32 specimens from the Murray Mallee and South Olary Plains.

Principal Components (PC) Analysis was used to summarise variation in scored or measured variables among SAMA specimens from the

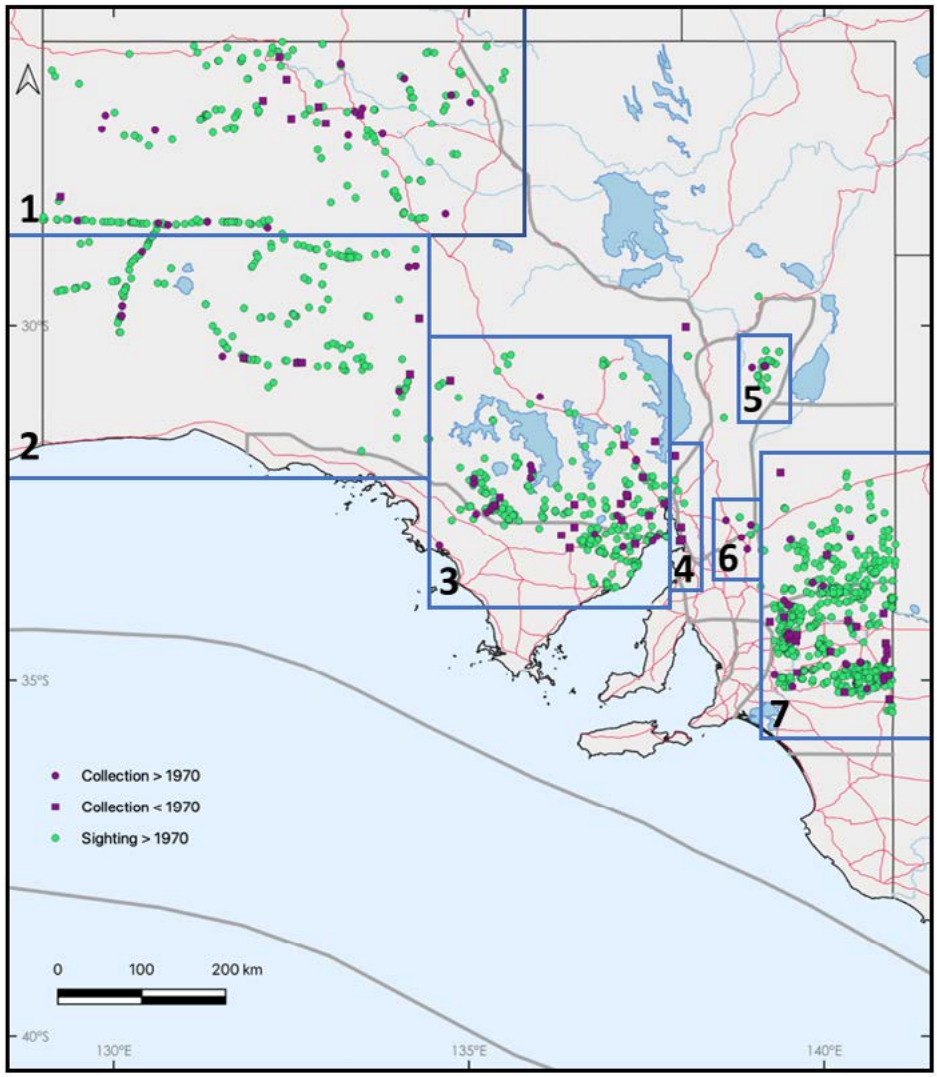

Figure 2. Distribution of Splendid Fairywren in South Australia showing records of *callainus* west of Lake Torrens and Spencer Gulf (boxes 1–3) and *melanotus* east of the Flinders Ranges (box 7). Within the Flinders Ranges there are few records except the cluster in the north-east (box 5) and those flanking the extreme south-west (box 4), and the south-east in continuity with *melanotus* (box 6). Green symbols are sight records, purple symbols are specimen records. Not all specimens examined in this study are shown on the map.

seven geographic samples, as above, and one-way Analyses of Variance and Scheffe *post hoc* tests were used to identify homogeneous groups among them, based on PC scores.

Linear Discriminant Function (DF) Analysis was then applied to samples 1–3 (*callainus*) and sample 7 (*melanotus*) as *a priori* groups to test whether they could be consistently distinguished from each other and to determine which traits best distinguished between them. Univariate comparisons were made between the two groups, using Mann–Whitney U statistic for ordinal variables and one-way analyses of variance for integral variables. DF scores from that analysis were then calculated for specimens from samples 4–6 to test whether they clustered with either of the *a priori* groups or were

separate, with DF scores intermediate between the two *a priori* groups.

All statistical analyses were performed using IBM SPSS Version 28.0 (IBM Corp, 2021).

RESULTS

Distribution

Our assessment of the distribution of Splendid Fairywren in South Australia is shown in Figure 2. Key localities are shown in Figure 1 and the latitudes and longitudes of all places named in the text are provided in the Gazetteer.

Subspecies *callainus* is broadly distributed west of Spencer Gulf and Lake Torrens, extending into Central and Western Australia, but is largely absent from the lower Lake Eyre basin (Badman 1979). Recent records on the western flank of the South Flinders Ranges include Mount Brown, and Mundallio and Wilkatana Stations (Birds SA records; P. Langdon pers. comm.). A century ago, they extended south to Mambray Creek (SAMA B3033) and the footslopes of the ranges east of Port Germein (Mellor 1913; SAMA B8405, B8406, 52790, 52802, 52803, 52820), and north to Kallioota Station between the southern tip of Lake Torrens and the ranges, where they were described as common in the scrub-covered sandhills (Morgan 1914a, 1914b; SAMA B329). Earlier records include a specimen that Frank Gibson forwarded to the SA Institute Museum from Woolundunga below Mount Brown in January 1868 and three from Marachowie immediately south of Kallioota the following year (Waterhouse 1868–1873; SA Museum archived documents). Those specimens are missing; the first was prepared as a mount for display but was probably discarded between 1882 and 1885, and a skin of the species exchanged with the Australian Museum in 1869 might account for another (Horton *et al.* 2018; AB and PH unpublished data). Within the ranges further north, a record from Parachilna Creek (Joan Paton, 4–5 birds, 16 May 1985) is supported by two subsequent observations nearby (Birdata). Beyond Parachilna are records at Myrtle Springs (Reid *et al.* 1977) and Witchelina (C. Cain, egg clutch, SAMA B22132; Birds SA surveys, Figure 3). Immediately north of the North Flinders Ranges, AB saw five birds, including a blue-winged uncoloured male, on Murnpeowie Station on 5 September 2007.

A substantial population, well documented by observations and skin specimens, is present in the northern Flinders Ranges and on its eastern flank between Nepabunna, Italowie Gorge, Balcanoona and Wertaloona. The species was not recorded elsewhere during biological surveys of the Flinders Ranges (Brandle 2001). Other reports (ALA, eBird, Birdata) from the North Flinders Ranges (9), the surroundings of Wilpena (6) and South Flinders Ranges near Melrose and Quorn (8) lacked corroborative documentation, and 11 of 13 responding reporters acknowledged errors of identification or data entry (pers. comm. to AB). Of nine eBird lists, four contained other likely errors and eight missed the locally common Purple-backed Fairywren. One observer listed both species from Wilpena Pound, identifying a Splendid Fairywren female as subspecies ‘melanotus’.

The eastern subspecies *melanotus* extends from the Victorian and South Australian Murray Mallee north through the South Olary Plains, generally to the Barrier Highway, with records beyond in Bimbowrie Conservation Park (Reid *et al.* 1977; B. Haase pers. comm.), at Olary Dam (AB 7 May 2001) and in remnant mallee between Orroroo, Peterborough and Oodlawirra (Reid *et al.* 1977; Bonnin and Rix 1980; SAMA B29320, B30406, B30407, B30408) (Figures 1 and 2). The subspecies is not generally found further north, being unrecorded from the Bendleby Range (K. Bellchambers unpublished report; AB pers. obs.) or during surveys of the North Olary Plains (Playfair and Robinson 1997), the Koonamore specimen SAMA B25354 (Schodde 1965) being an exception.

Figure 3. Male Turquoise Fairywren *Malurus splendens callainus* near Teatree Swamp, Witchelina Nature Reserve, 1 September 2014, showing typical traits of the subspecies: pale blue crown and dorsum (though lacking the turquoise seen in many individuals, perhaps as an artefact of photographic reproduction), dark violet bib and contrasting paler blue belly separated by a broad breast band. Image B. Blaylock

Plumage

Diagnostic attributes of the plumages of *callainus* and *melanotus* were published by Black *et al.* (2022a) and are provided numerically in Table 1 (see also statistical results and Discussion). Colour patch colours are described from a greenish blue ('turquoise') across the blue spectrum and into the violet range. Dorsal patch shade closely parallels colour, the palest blue of *callainus* being the most turquoise and the darkest blue of *melanotus* approaching the violet range. More variation is present in bib and belly patches but the bib in *callainus* is almost always violet and darker than the bluer belly.

Plumages of specimens from the flanks (SW and SE) and interior and eastern flank (NE) of the Flinders Ranges are summarised in Table 2 and compared with those of subspecies *callainus* and *melanotus*.

We affirm that the holotype of subspecies *callainus* lacks intergradient traits, its dorsum (scored 10) and belly (9) being among the palest and most turquoise, although its breast band midline width of 2.5 mm is towards the narrow end of the range for *callainus*.

Of six male skins known from the North Flinders Ranges only the two in SAMA were fully assessed; SAMA B32488 from 8 km south-west of Italowie Gorge is darker dorsally than all *callainus* specimens, as defined above, and its hue is intermediate between *callainus* and *melanotus*, whereas its dark bib and broad breast band are typical of *callainus*; SAMA B32489 from 3 km west of Nepabunna is slightly paler dorsally, although still darker than most *callainus*, and has a paler bib and a narrow breast band typical of *melanotus*. The two NHMUK specimens, 1965.5.56 and 1965.5.57 from near Wertaloona Homestead, are among the palest examples assigned to *callainus* by Harrison (1974: 200–201) and are confirmed as such by PH (pers. obs.), but the breast band of 1965.5.56 is of *melanotus*

Table 1. Comparison between *Malurus splendens callainus* (samples 1–3, n = 35) and *M. s. melanotus* (sample 7, n = 32) for 13 variables. Descriptive statistics are given as mean ± standard deviation (minimum–maximum). Statistic and p-values are derived from [1]Mann–Whitney U for ordinal variables or [2]one-way analyses of variance.

Variable	*callainus* n = 35	*melanotus* n = 32	Statistic	p
Dorsal patch hue	3.0 ± 0.00 (3–3)	2.4 ± 0.50 (2–3)	0.00[1]	< 0.001
Bib hue	1.0 ± 0.00 (1–1)	2.1 ± 0.23 (2–3)	0.00[1]	< 0.001
Belly hue	3.0 ± 0.00 (3–3)	2.9 ± 0.29 (2–3)	925.00[1]	0.050
Dorsal patch shade	2.97 ± 0.17 (2–3)	1.0 ± 0.00 (1–1)	0.00[1]	< 0.001
Bib shade	1.0 ± 0.00 (1–1)	1.0 ± 0.00 (1–1)	n/a	n/a
Belly shade	2.3 ± 0.45 (2–3)	2.1 ± 0.29 (2–3)	825.00[1]	0.048
Dorsal patch colour	8.5 ± 1.09 (7–10)	3.9 ± 0.70 (3–5)	0.00[1]	< 0.001
Bib colour	2.9 ± 1.28 (1–5)	4.9 ± 1.42 (3–7)	371.00[1]	< 0.001
Belly colour	6.9 ± 0.99 (4–9)	4.8 ± 1.36 (3–7)	347.00[1]	< 0.001
Breast band maximum	5.5 ± 1.30 (3.5–8.0)	3.0 ± 0.76 (1.5–5.5)	83.68[2]	< 0.001
Nape band maximum	6.2 ± 1.89 (3.0–9.0)	5.3 ± 1.06 (3.0–7.5)	5.49[2]	0.022
Breast band midline	4.0 ± 1.07 (2.0–6.0)	1.6 ± 0.67 (0.5–3.5)	91.60[2]	< 0.001
Nape band midline	5.2 ±1.73 (2.0–9.0)	4.3 ± 1.47 (1.0–9.0)	7.23[2]	0.009

width. The other two specimens, ANWC 48282 and ANWC 48283 from Italowie Gorge are dark dorsally, resembling SAMA B32488, and have narrow breast bands (estimated from photographs *per* L. Joseph).

Five specimens from Mambray Creek and the Port Germein area are darker above than all but one *callainus* specimen (SAMA B15407 from Coniston, Central Australia), while two are darker still, and the hue of all seven is mid blue and intermediate between *callainus* and *melanotus* (Figure 4); underparts vary, not all showing the typically dark violet bib of *callainus* and the belly hue in most is less contrasting (Figure 5). Breast band widths are variable but many fall between the means of each subspecies and within their overlapping range (Table 2). The Kallioota specimen SAMA B329, while typical of *callainus* in plumage colouration, has a distinctly narrow breast band. A coloured male photographed at Mundallio Station east of Port Augusta in October 1998 (Brian Furby in Collier *et al.* 2000 opposite p. 148) shows less distinction between the hues of bib, belly and dorsum than is generally found in *callainus* and it too has a narrow breast band, typical of *melanotus*.

The five specimens from east of Orroroo, Peterborough and Terowie were all judged consistent with *melanotus* in plumage, although SAMA B29321 is among the palest and bluest

Table 2. Summary findings among South Australian Museum specimens from within or near the Flinders Ranges, compared with *M. s. callainus* specimens to the west (samples 1–3) and *M. s. melanotus* specimens from the Murray Mallee (sample 7). NE, SW and SE refer to specimens in the north-east interior and flank of the ranges (sample 5), and south-west (sample 4) and south-east (sample 6) flanks of the ranges, respectively. Breast band measurements for the two main populations are mean ± standard deviation (minimum–maximum). Note that the scoring system for dorsal patch shade and colour is coarse and the numbers do not always reflect the subtle differences between specimens.

Population (sample number)	Registration number SAMA B	Dorsal patch shade and colour (scores)	Contrast dorsum with bib: hue, shade	Breast band Midline, mm	Breast band Maximum, mm	Phenotype
West of Flinders Ranges (1–3)		pale blue to greenish blue (2–3, 7–10)	strong, strong	3.96 ± 1.07 (2–6)	5.47 ± 1.30 (3.5–8)	*callainus*
NE (5)	32489	mid blue (2, 7)	strong, strong	1.5	4	intergrade
NE (5)	32488	darker blue than 32489 (2, 7)	strong, strong	3	4.5	intergrade
SW (4)	8405	as 32488 (2, 7)	strong, moderate	2	4.5	intergrade
SW (4)	8406	as 32488 (2, 7)	strong, moderate	1.5	3.5	intergrade
SW (4)	3033	as 32488 (2, 7)	strong, moderate	3.5	5.5	intergrade
SW (4)	52790, 52820	as 32488 (2, 7)	strong, moderate	3–4	4.5	intergrades
SW (4)	52802, 52803	as 32488 but slightly darker (2, 6)	strong, moderate	3–4	4.5–5	intergrades
SW (4)	329	pale blue, near greenish blue (3, 8)	strong, strong	1.5	3.5	intergrade, close to *callainus*
SE (6)	29320, 30406, 30407	dark violet-blue (1, 4)	little, none	2–2.5	2.5–3.5	*melanotus*
SE (6)	29321	dark blue, paler and less violet-blue than 29320 (1, 5)	little, none	1	2	*melanotus*
SE (6)	30408	darker violet-blue than 29320 (1, 3)	none, none	3.5	4	*melanotus*
Murray Mallee (7)		medium to dark violet-blue to blue (1, 3–5)	little or none, none	1.58 ± 0.67 (0.5–3.5)	2.95 ± 0.76 (1.5–5.5)	*melanotus*

in our sample. Breast band width is in the narrow, *melanotus* range for three specimens, but intermediate in B29320 and broad, slightly below average for *callainus*, in B30408.

Statistical results

Bib shade differed little among specimens (Figure 5) and all were scored equally (Table 1) so this variable was excluded from the multivariate analyses. Principal Components (PC) Analysis showed that 79.7% of the variation in the remaining twelve variables could be summarised by four PCs (Table 3). There were significant differences among the seven geographic samples in PC1 scores ($F_{6,75} = 63.555$, $p < 0.001$) and PC3 scores ($F_{6,75} = 3.086$, $p = 0.009$) but none for PC2 and PC4 scores ($p \geq 0.42$).

Figure 4. Dorsal view of male specimens of Splendid Fairywren from South and Central Australia: three *melanotus* from the Murray Mallee (left) showing extremes of colour variation in this subspecies, five intergradient specimens from the Flinders Ranges region (middle) and three *callainus* (right) also showing extremes of colour variation. SAMA skins left to right: (1) B19937 Sandleton; (2) B1077 Overland Corner; (3) B23281 Pungonda; (4) B32488 Italowie Gorge; (5) B52802, (6) B8406 and (7) B8405 all Port Germein; (8) B3033 Mambray Creek; (9) B15407 Coniston, Central Australia; (10) B23405 Wilcherry, Eyre Peninsula; (11) B5687 Kimba, Eyre Peninsula. Image P. Horton

Figure 5. Ventral view of male specimens of Splendid Fairywren from South and Central Australia: three *melanotus* from the Murray Mallee (left) with narrower breast bands, five intergradient specimens from the Flinders Ranges region (middle) with variable breast bands, and three *callainus* (right) with broader breast bands. Variability is limited in the appearance of the bib but is very evident in the belly. Specimen order, registration numbers and localities are the same as in Figure 4. Image P. Horton

Scheffe *post hoc* tests did not identify consistent homogeneous groups based on PC3 scores, but identified two homogeneous groups on PC1 scores, consisting of samples 1–5 ($p \geq 0.105$) and samples 6 and 7 ($p \geq 0.556$). These two groups differed significantly ($p \leq 0.0005$; Figure 6). Within the Flinders Ranges, samples 4 and 5 did not differ significantly from each other or from samples 1–3 ($p = 0.08–1.00$) although PC scores from samples 4 and 5 trend to the left margin of the combined cluster (Figure 6). Sample 6 did not differ significantly from sample 7 ($p = 0.98$).

Discriminant Function (DF) Analysis of the 12 variables using *callainus* (samples 1–3, n = 35) and *melanotus* (sample 7, n = 32) as *a priori* groups resulted in a highly significant DF (Wilk's $\lambda = 0.010$, $\chi^2 = 273.9$, $p \leq 0.0005$) which accounted for 100% of the variance and correctly identified all 67 specimens. All variables showed statistically significant differences between the *a priori* groups (Tables 1, 4). The variable 'dorsal patch shade' had the highest DF loading and correlation with the DF (0.81 cf. ≤ 0.31 for all others, Table 4), suggesting that this was the most diagnostic character separating *callainus* and *melanotus*.

From this DF, scores were calculated for the 15 Flinders Ranges specimens. All five from sample 6 (SE) were identified as *melanotus*. Seven of eight SW specimens (sample 4) and the two NE specimens (sample 5) clustered between *callainus* and *melanotus* close to the zero but on the positive (*callainus*) side, reflecting their inclusion among *callainus* in the PC analysis, as above. The eighth SW (Kallioota) specimen clustered with *callainus* and one *callainus* specimen (SAM B15407 from Coniston, Northern Territory) clustered with the Flinders Ranges group (Figure 7).

Table 3. Loadings of twelve variables, used in a Principal Components (PC) Analysis of *M. splendens,* on the four resulting PCs. Bib shade was excluded from the PC analysis because its score did not vary among specimens. * loadings <0.3

Variable	**PC1**	**PC2**	**PC3**	**PC4**
Dorsal patch hue	0.615	*	*	0.422
Bib hue	-0.877	*	*	*
Belly hue	*	*	*	0.953
Dorsal patch shade	0.882	*	0.317	*
Belly shade	*	*	0.805	*
Dorsal patch colour	0.847	*	0.423	*
Bib colour	-0.694	*	0.341	*
Belly colour	0.505	*	0.691	*
Breast band maximum	0.873	*	*	*
Nape band maximum	*	0.925	*	*
Breast band midline	0.867	*	*	*
Nape band midline	*	0.931	*	*
Variance explained (%)	**47.0**	**13.4**	**10.7**	**8.6**

Table 4. Raw (unstandardised) Discriminant Function (DF) coefficients between variables, in descending order of correlation with the resulting DF. Note that a negative figure has the same discriminant value as the equivalent positive figure. Bib shade was excluded from the DF analysis because its score did not vary among specimens.

Variable	DF coefficient	Correlation with DF
Dorsal patch shade	7.835	0.81
Dorsal patch colour	0.084	0.25
Breast band maximum	0.369	0.13
Breast band midline	0.025	0.12
Dorsal patch hue	0.522	0.09
Belly colour	0.110	0.09
Belly shade	-0.009	0.03
Nape band maximum	0.027	0.03
Nape band midline	0.067	0.03
Belly hue	0.043	0.02
Bib hue	-0.242	-0.08
Bib colour	-1.975	-0.31
constant	**-16.309**	

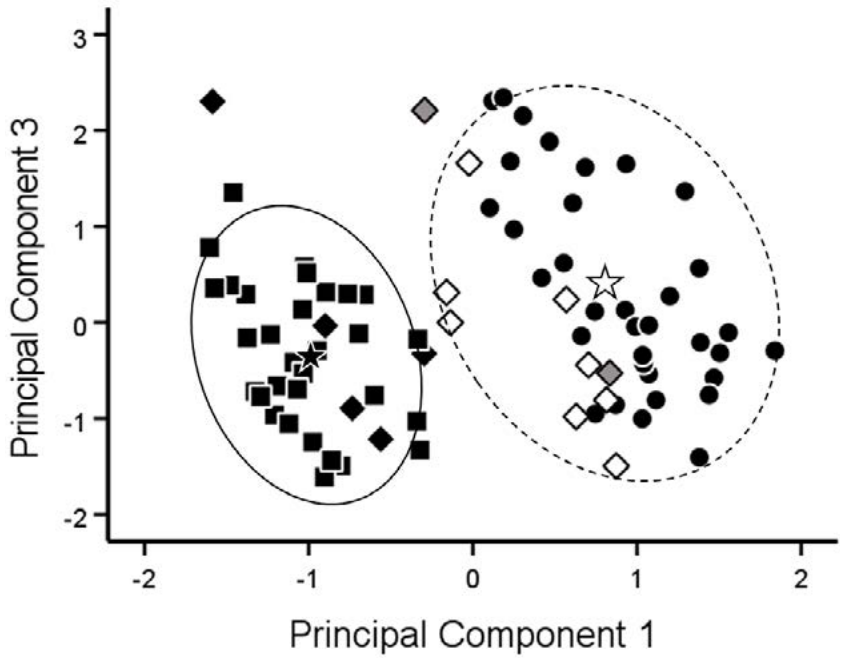

Figure 6. Scatter plot of Principal Components 1 and 3 scores for Splendid Fairywrens from west of (samples 1–3 ●), within (sample 4 ◇, sample 5 ◈, sample 6 ◆) and east of (sample 7 ■) the Flinders Ranges. The stars show the PC centroids and ovals show 95% confidence ellipses around two groups.

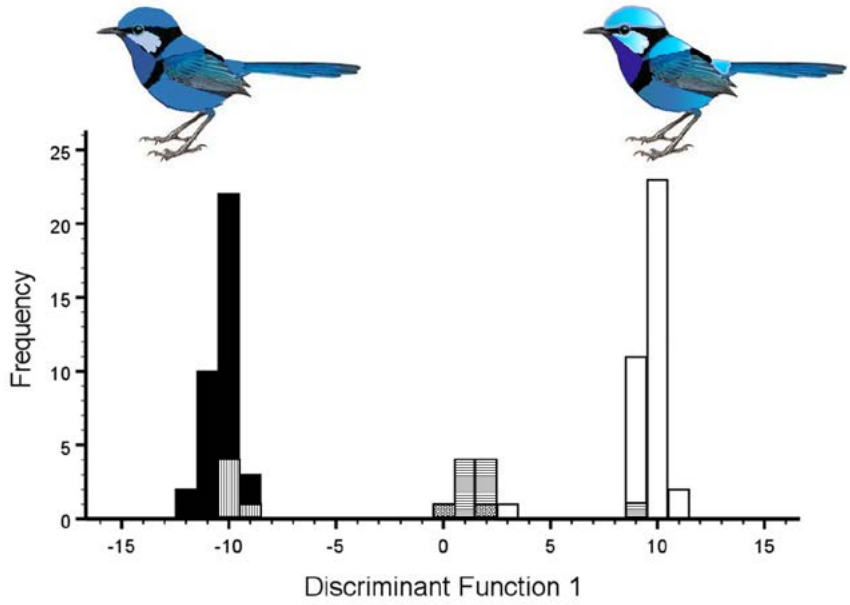

Figure 7. Histogram of Discriminant Function scores for Splendid Fairywrens based on twelve plumage variables. DF scores below zero were assigned to *melanotus* (sample 7 = black, sample 6 = vertical lines) and scores above zero to *callainus* (samples 1–3 = white, sample 4 = horizontal lines, sample 5 = stipple). Artwork characterises the distinctive phenotypes of *M. s. melanotus* (left) and *M. s. callainus* (right).

DISCUSSION

Distribution

Contrary to assumptions in recent reviews (Schodde 1982; Schodde and Mason 1999; Higgins *et al.* 2001; Kearns *et al.* 2009), we find that Splendid Fairywren distribution is disjunct across the Flinders Ranges and thus confirm the findings of Reid *et al.* (1977). In the North Flinders Ranges, apart from the population centred on Italowie Creek, the few corroborated records are on Murnpeowie, Myrtle Springs and Witchelina, and along Parachilna Creek. In the south, records immediately east of Lake Torrens and Spencer Gulf are limited to the western margins of the ranges between Kallioota in the north and Port Germein in the south. Other reports from around Wilpena, Quorn, Wilmington and Melrose have not been verified and the species is either absent from those parts of the Flinders Ranges or occurs rarely, perhaps as vagrants.

Ford (1974b) considered *callainus* to be partly nomadic, a suggestion not rejected by Kearns *et al.* (2009) whose computed lack of geographic mtDNA structure and low nucleotide diversity might alternatively be simply the consequence of population expansion. Schodde (1982) speculated that Splendid Fairywrens east of the Flinders Ranges might not be sedentary either. While we are unaware of any detailed studies of *M. s. callainus*, long-term studies of *M. s. splendens* in south-western WA (Rowley and Russell 1997) and of *M. s. melanotus* east of the Flinders Ranges (Van Bael and Pruett-Jones 2000) found that both subspecies are generally sedentary and inhabit stable territories. Of 8,603 *M. splendens* banded, the average movement recorded from 2,694 recoveries was 1 km and the maximum was 6 km (https://www.environment.gov.au/cgi-bin/biodiversity/abbbs/abbbs-search0.pl). We provide no evidence of nomadism

in either subspecies but suspect that vagrancy beyond distributional limits might explain some reports from the Flinders Ranges, as well as the Koonamore specimen and the Olary Dam observation, which was unreplicated during at least four subsequent visits to the site between 2010 and 2017 (AB pers. obs.).

Reid *et al.* (1977) deduced that *callainus* and *melanotus* had been isolated historically by the Eyrean Barrier but, since *callainus* had penetrated the Flinders Ranges, there appeared to be no geographical barrier between the two. They therefore suggested a thorough search for evidence of contact between Wertaloona and Koonamore. Paton's (1980) subsequent Parachilna Creek record provided further evidence against a barrier between Turquoise and Black-backed Fairywrens. Reid *et al.* (1977) showed that the two populations approached more closely between the western foothills of the Flinders Ranges south of Port Augusta and the mallee east of Orroroo but found no evidence of contact there; neither do we. Their map showed the distributional limit for *callainus* enclosing all of the area between Lake Torrens and the ranges. We have found only the Parachilna Creek records as firm evidence for their occurrence between Kallioota and Myrtle Springs; the distributional gap identified on the eastern flank of the ranges appears precisely as they assessed it.

It is of interest that the Purple-backed Fairywren *Malurus assimilis* has a continuous west to east distribution through the Flinders Ranges, between subspecies *M. a. mastersi* and *M. a. assimilis*. The genetic divergence (1.1–1.2%) between subspecies *mastersi* and *assimilis* (McLean *et al.* 2017) is close to the 1.4% separating *callainus* and *melanotus* (Kearns *et al.* 2009).

Plumage

Despite considerable variation in many of the plumage characters within both subspecies and some overlap between them, particularly in belly patch colour (Figure 5), statistical analysis of all plumage data in this study amply confirms the diagnostic separation of subspecies *callainus* and *melanotus* (Table 1, Figures 6 and 7).

A notably dark specimen of *callainus* (with the most violet bib and least turquoise dorsum) from Coniston (B15407, Figures 4 and 5) among a limited Central Australian sample brought to mind Harrison's (1974: 201) report of 'a distinct clinal increase in the depth of colour of the breast and belly [= belly in this study] from a paler blue on the eastern side of the [Flinders] range near Lake Frome, to a deep blue near Warburton [WA] in the west'. He also reported 'a similar but less striking increase in the depth of colour on the throat' [= bib] but did not note any trend in dorsal colour. Although we noted a slight increase in mean belly colour score from sample 3 north-westwards to sample 1, we detected no significant geographical trend in other plumage variables and so failed to support Harrison's inference which was evidently based on an examination of as few as 17 coloured males taken during the Harold Hall Australian Expeditions. Furthermore, our three geographic samples of *callainus* clustered consistently, and evidence of intergradation was detected only within Flinders Ranges samples 4 and 5 that Reid *et al.* (1977) had included among *callainus*.

Despite incomplete data for the six NE Flinders Ranges skins, we find that their dorsal plumages vary from matching the palest of *callainus* (the two NHMUK Hall Expedition specimens) to exceeding the darkest (including the two ANWC specimens), thus approaching that of *melanotus*; breast band widths, measured or estimated, are also variable but appear mostly to fall between the means of both subspecies (Table 2).

Reid *et al.* (1977) found that three SW Flinders specimens that Mack (1934) had identified as subspecies *whitei* (see below) were darker than other *callainus*, providing possible evidence of hybridisation, but inferred rather that they were

an isolated population of *callainus* under the selective influence of a more humid environment along the western scarp of the southern Flinders Ranges. We find that the specimens that they examined and four others from the Port Germein area in the S. A. White Collection in SAMA are 'close to a perfect intermediate of the two' (Schodde 1982: 56). Their breast bands are variable and many are in the overlap range and between the means of the two subspecies (Table 2), while the Kallioota and Mundallio birds have narrow breast bands of *melanotus*-width.

SE specimens from east of Orroroo, Peterborough and Terowie are consistent with the *melanotus* phenotype although recognition of intergradient traits among them might be precluded by the limited sample size, with one specimen among the palest and another with a breast band among the broadest.

Interaction in the Flinders Ranges

Our first hypothesis, that SW and NE Flinders birds (samples 4 and 5) belong to subspecies *callainus*, is not rejected by all statistical analyses, the PC scatterplot showing them clustered with *callainus*, although mostly placed towards the *melanotus* cluster (Figure 6). On the other hand, the DF histogram places all but the Kallioota specimen in an intermediate position between the two subspecies albeit on the *callainus* side of zero (Figure 7). While the SW sample's darker phenotype might result from climatic influences of reduced temperature and aridity on an isolate of *callainus*, as argued by Reid *et al.* (1977), we find a phenotypic intergradient explanation more plausible. Furthermore, the variable but mostly intermediate breast band width present in that sample seems an unlikely character to respond to such selection. More pronounced variation occurs among the NE population, as observed by Schodde (1982), where the plumages of some specimens are as dark as in the SW, while others resemble the palest within *callainus*. Support for our first hypothesis is therefore qualified and limited.

Our second hypothesis, that the two taxa are in contact through an intergradient zone, is rejected by the recognition of two distinct groupings in the PCA and by their discontinuous distribution.

Our third hypothesis of hybridisation between the two subspecies, despite their present allopatry, is supported by the variation within both NE and SW samples and in the statistical analyses. Moreover, while the NHMUK and Kallioota specimens closely resemble the *callainus* phenotype, almost all representatives of these two populations show intermediate plumage traits of colour patch hue and/or breast band width. Such hybridisation would have resulted from past contact across the Eyrean Barrier through the Flinders Ranges. The NE and SW Flinders Ranges populations might both be considered small hybrid swarms (see below).

The evidence of intergradation present in the SW population (sample 4) suggests earlier reproductive contact with the SE population (sample 6) across the southern Willochra Plain between Wilmington, Booleroo Centre, Orroroo and Peterborough. While this appears plausible, much of the plain's natural cover immediately preceding its development for pasture and cereal production consisted of Irongrass *Lomandra* Tussock Grassland (Specht 1972). Because mallee scrub was evidently greatly restricted across the plain, there might have been little or no suitable habitat then for the species across this potential zone of interaction. Limited information about historical bird distribution in this area from Gray (1931, 1932, 1933) and Brandon (1936, 1948) included lists of birds identified from the vicinity of Orroroo and Wilmington respectively. Both recorded White-winged *Malurus leucopterus* and Purple-backed *M. assimilis* Fairywrens but neither Turquoise nor Black-backed Fairywren.

Absence of the species between Wertaloona and Koonamore is probably also explained by the lack of suitable habitat for the species. An almost corresponding gap between subspecies of Thick-billed Grasswren *Amytornis modestus*

was attributed to the relatively limited extent of shrubland between the range and Lake Frome (Black *et al.* 2011).

Mathews (1912) described the SW population from the Port Germein area as *Malurus melanotus germaini*. Earlier, Campbell (1902) had named specimens from 'the interior' (of New South Wales, not South Australia) as *M. whitei* but later, Mathews (1922) mistakenly gave the names *whitei* and *germaini* as synonyms and the error was not corrected until Schodde (1982), who included *germaini* in *callainus* and *whitei* in *melanotus*.

Hybrid swarms

The concept of the hybrid swarm (Anderson 1949; Short 1969) is of hybrid populations existing largely or entirely independently of populations of one or both parental taxa. Their development can follow anthropogenic habitat and other changes (Hasselman *et al*. 2014; Freed *et al.* 2015; Wells *et al.* 2019) or occur naturally in an evolutionary context, potentially giving rise to hybrid species (Seehausen 2004; Masello *et al*. 2019). Australian examples of hybrid swarms include those involving non-sister thornbill *Acanthiza* species (Black *et al.* 2015), genetically divergent subspecies of Australian Ringneck *Barnardius zonarius* (Joseph and Wilke 2006) and Copperback Quailthrush *Cinclosoma clarum* (Black *et al.* 2019), and genetically close subspecies of Crimson Rosella *Platycercus elegans* (Black *et al.* 2022b).

Of two hybrid swarms identified here, the northern population is a typical example, distant from parental *melanotus* by over 150 km, and only loosely associated with *callainus* through small isolates or possible vagrants such as those identified on Murnpeowie and Witchelina. Also typically, it consists of highly variable individuals covering a phenotypic range between parental forms. The southern '*germaini*' group is less distantly isolated from *melanotus*, and its association with *callainus* is also closer but tenuous nonetheless, separated from Myall *Acacia papyrocarpa* woodland to the west by about 20 km of sparsely vegetated flats and salinas between Lake Torrens and the northern tidal reaches of Spencer Gulf. While its plumages are more consistent among the seven '*germaini*' specimens, there is variation in that population also, that is especially evident from inclusion of the Kallioota and Mundallio examples.

Biogeography and taxonomic rank

Kearns *et al.* (2009) inferred that subspecies *callainus* (as *musgravi*) and *melanotus* diverged in allopatry across the biogeographic Eyrean Barrier during the Pleistocene but are continuously distributed through the Flinders Ranges. We find on the contrary that the subspecies are allopatric and that the species' presence within the Flinders Ranges is limited to one small hybrid population and a few isolated records, with a second hybrid population on the SW flank and one *melanotus*-like population on the SE flank. Our findings support the hypothesis that separation and divergence of *callainus* and *melanotus* in allopatry have been followed by expansion, secondary contact and hybridisation. However, there is no existing hybrid zone and only remnant populations of hybrid phenotype persist, principally as hybrid swarms, showing that secondary contact has been lost.

Because conditions have ameliorated since the extreme aridity of the last glacial maximum (LGM) c. 18,000 years ago, the two divergent lineages might not have been in contiguous distribution at any time during this period, making it likely that contact was lost at LGM or earlier. Kearns *et al.* (2009) inferred a population expansion in both subspecies, sufficient to allow secondary contact and hybridisation. This could have taken place during an inter-glacial pluvial period of the Pleistocene before LGM.

Turquoise and Black-backed Fairywrens show a degree of phenotypic and genetic distinction

that attests to a prolonged period of independent evolution. Hybridisation between the two has occurred in the past but to a limited extent. The process of speciation was incomplete at the point of secondary contact, but the two lineages now appear to be allopatric and, if gene flow has ceased, speciation may continue. Such taxa are recognised as semispecies or allospecies (Short 1969; Ford 1987; Winker 2021) or as evolutionarily significant units (ESUs) (Moritz 1994; Fraser and Bernatchez 2001); their reproductive isolation is moot but gene flow is likely at least to be restricted. Under the biological species concept, they fall into Winker's (2021) 'Gray Zone' of 'almost-species' but are treated taxonomically as subspecies on the basis of present evidence.

Limitations to the study

Given the phenotypic similarities of subspecies of Splendid Fairywren and the variation present within them, sample size will limit the resolving power of statistical analysis. Our samples from within the critical Flinders Ranges region were necessarily small, many specimens were very old, and not all were included in the full analysis. Yet the use of museum specimens allows a degree of objectivity not necessarily achieved with field-based research, because of difficulties in the interpretation of colour in naturally variable lighting conditions, or with photographic studies unless closely standardised methods are employed. We anticipate the need for further research into the interaction between subspecies *callainus* and *melanotus* and between *splendens* and *callainus*, including genome-level analysis of adequate samples across the species' distribution.

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Gazetteer of localities named in the text. Those given in **bold** are shown on the map (Figure 1). HS = homestead.

Locality	Latitude, Longitude
Balcanoona HS	30° 32′ S, 139° 18′ E
Bendleby	**32° 31′ S, 138° 47′ E**
Bimbowrie HS	**32° 03′ S, 140° 09′ E**
Booleroo Centre	32° 53′ S, 138° 21′ E
Coniston	22° 03′ S, 132° 30′ E
Italowie Gorge	**30° 31′ S, 139° 12′ E**
Kallioota HS	**31° 50′ S, 137° 55′ E**
Koonamore HS	**32° 03′ S, 139° 23′ E**
Kimba	**33° 08′ S, 136° 28′ E**
Mambray Creek	**32° 50′ S, 137° 59′ E**
Marachowie HS	31° 59′ S, 138° 03′ E
Melrose	32° 50′ S, 138° 11′ E
Mount Brown	32° 30′ S, 138° 00′ E
Mundallio HS	32° 28′ S, 137° 53′ E
Murnpeowie HS	**29° 35′ S, 139° 03′ E**
Myrtle Springs HS	**30° 27′ S, 138° 13′ E**
Nepabunna	30° 35′ S, 138° 59′ E
Olary Dam	**32° 13′ S, 140° 18′ E**
Oodlawirra	**32° 53′ S, 139° 04′ E**
Orroroo	**32° 44′ S, 138° 37′ E**
Overland Corner	**34° 09′ S, 140° 20′ E**
Parachilna Creek	**31° 11′ S, 138° 28′ E**
Peterborough	**32° 59′ S, 138° 50′ E**
Port Augusta	**32° 30′ S, 137° 47′ E**
Port Germein	**33° 01′ S, 138° 00′ E**
Pungonda	34° 28′ S, 140° 52′ E
Quorn	32° 31′ S, 138° 03′ E
Sandleton	34° 28′ S, 139° 21′ E
Terowie	**33° 09′ S, 138° 55′ E**
Warburton	26° 08′ S, 126° 35′ E
Wertaloona HS	**30° 38′ S, 139° 21′ E**
Wilcherry	32° 50′ S, 136° 30′ E
Wilkatana HS	**32° 10′ S, 137° 54′ E**
Willochra Plain, southern	32° 40–55′ S, 138° 10–30′ E
Wilmington	**32° 39′ S, 138° 06′ E**
Wilpena Pound	**31° 33′ S, 138° 34′ E**
Witchelina HS	**30° 01′ S, 138° 03′ E**
Woolundunga	32° 32′ S, 137° 57′ E

Bird Notes

A Western Sandpiper *Calidris mauri* in Gulf St Vincent, South Australia

PAUL TAYLOR

INTRODUCTION

The Western Sandpiper *Calidris mauri* breeds in Alaska and eastern Siberia, and winters in coastal United States, Central America, the Caribbean, and northern South America (del Hoyo *et al.* 1996: 521). It is one of the most abundant shorebirds in North America. Vagrant birds have occurred in Japan, Taiwan and Hawaii (Higgins and Davies 1996), and New Zealand has six accepted records (Jamieson 2013). There have been six reports to the BirdLife Australia Rarities Committee (BARC) of Western Sandpiper in Australia (all in New South Wales, Victoria, Tasmania, 1969–2015), but none of these have been accepted. This note details a recent sighting I made of a Western Sandpiper in South Australia.

THE SIGHTING

I was birdwatching at Bald Hill Beach, northern Gulf St Vincent, South Australia, on the afternoon of 19 April 2022. At about 1530 hours, I noticed a shorebird among a small flock of Red-necked Stints *Calidris ruficollis* (Figure 1). About the same size as the stints, perhaps marginally larger, it had a longer bill and plainer back. The flock was roosting at high tide, and allowed quite a close approach of 10 to 20 metres. The weather was fine with good visibility and I took several photographs.

The long bill was noticeable, and the fairly plain grey-brown upperparts had fine dark shaft streaks on the feathers, while the shaft streaks on the stints were much broader (Figure 1).

Figure 1. The Western Sandpiper (bird nearest centre) in a group of Red-necked Stints, at Bald Hill Beach, 19 April 2022. Note its longer bill and plainer back than the stints. Image P. Taylor

Figure 2. The Western Sandpiper, showing the high base of the culmen and a few fresh outer scapular feathers. Image P. Taylor

Figure 3. Comparison of Western Sandpiper (at front) and Red-necked Stint (behind), showing the shorter tail and shorter projection of primary feathers compared with the stint. Image P. Taylor

My photos also showed a rather high base to the culmen of the bill (Figure 2), and the bird appeared to have a shorter tail and shorter projection of the primary feathers (Figure 3) and a longer hind toe than Red-necked Stints.

As the tide continued to come in, the flock had little space to roost on the beach, and all flew off in a north-westerly direction.

Despite several return visits to Bald Hill Beach following this sighting (including by other birdwatchers), the bird could not be located again. I also searched at Port Clinton, Clinton Conservation Park at the head of the gulf, and further south at Thompson Beach.

Unsure of the identification of this bird, I posted my photos on the Australian Twitchers Facebook site (https://www.facebook.com/groups/718576241555767/posts/5002536423159706), resulting in much discussion and debate. There was a suggestion of an aberrant Red-necked Stint, but the general consensus was of a Western Sandpiper. A characteristic of this species is partial webbing between the toes; unfortunately, none of the photos I obtained showed the bird's feet.

A joint submission with David James was sent to BARC (case number 1245). David, a former BARC committee member who has had experience with Western Sandpipers, added detailed notes based on my photos. My sighting was accepted by BARC on 17 September 2022; this represents the first confirmed record of Western Sandpiper for Australia.

DISCUSSION

On acceptance of our submission, BARC provided a report. The main points that confirmed the bird as a Western Sandpiper were:

1. The long bill, which was slightly decurved at the tip.

2. It was aged as a first winter bird, with thin dark shaft streaks on the dorsal contour feathers. The report noted that 'a few fresh outer scapulars (first alternate feathers) showed broader black centres, a feature typical of first alternate Western Sandpiper in northern South America in May to July' (see Figure 2). Red-necked Stints have much broader black shaft streaks at this stage of moult.

3. The high base of the culmen of the bill extending onto the forehead.

The small size and some similarity of Western Sandpipers in non-breeding plumage to other shorebirds makes this species one that could be easily overlooked. This particular bird may well have been in Gulf St Vincent for some time over summer before my sighting.

ACKNOWLEDGEMENTS

I wish to thank David James for adding details to our BARC submission, and Philippa Horton for assistance in the preparation of this note.

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Agonistic behaviour from Noisy Miners *Manorina melanocephala* toward Australian Magpies *Gymnorhina tibicen* swooping humans

MATTHEW MO

Animals may display agonistic behaviour, especially when there is a need to distract predators or drive them away (Ostreiher 2003; Mo *et al.* 2016). Both the Australian Magpie *Gymnorhina tibicen* and Noisy Miner *Manorina melanocephala* are well adapted to urban environments, thus readily observed, and are well documented to exhibit agonistic behaviours (Cilento and Jones 1999; Koboroff *et al.* 2013; Fountain and McDonald 2022). Swooping of humans by Australian Magpies presents an important urban wildlife management issue but is generally restricted to their nesting season (Van Vuuren *et al.* 2016; Kaplan 2019). Noisy Miners are also documented to swoop humans during their nesting season but these events are infrequent (Mo 2019).

This note reports on observations of Noisy Miners displaying agonistic behaviour toward Australian Magpies immediately following the latter species performing swooping toward humans in defence of their nests. The observations were made in public parklands within 10 km of the Adelaide central business district, South Australia, over a period of four days during September 2022.

I observed 32 events in which nesting Australian Magpies swooped humans, either myself or another person. In eight of those events, magpies were set upon by flocks of three to seven Noisy Miners within five to 20 seconds of magpies commencing swooping. In six observations, magpies remained at the same perch throughout

Figure 1. Two Noisy Miners that have followed an Australian Magpie to tree perch. Image Matthew Mo

the time they were subjected to agonistic behaviour from three to five Noisy Miners, and in three of those events, magpies retaliated by performing snaps at the Noisy Miners (Figure 1). In the other two observations, harassment from six to seven Noisy Miners caused magpies to flee.

In these observations, it appeared that active nest defence by magpies was almost immediately met by agonistic behaviour from Noisy Miners, which suspended the magpies' swooping. Although my sample size of eight observations was small, the period in which they were made was also small. Thus, I consider that instances in which swooping magpies are in turn subjected to harassment from Noisy Miners are possibly common occurrences. I should acknowledge that there were also 122 other observations of Noisy Miners harassing magpies that were not preceded by magpies performing swooping.

With no obvious adaptive advantage to Noisy Miners of aggression towards magpies that are swooping humans, questions remain concerning this interesting behaviour, for example how common is it, and does it occur only when miners themselves are nesting? Further observations may provide some answers.

ACKNOWLEDGEMENT

Useful comments from an anonymous reviewer helped improve this note.

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Display behaviour by Sharp-tailed Sandpipers *Calidris acuminata* at Tolderol Game Reserve Wetlands in January 2022

COLIN ROGERS

INTRODUCTION

Little is known about the breeding behaviour of Sharp-tailed Sandpipers *Calidris acuminata* apart from the fact they are polygynous and that males make elaborate display flights and calls on their northern hemisphere breeding grounds. That behaviour would not be expected among over-wintering birds in Australia. Yet Backen (1958) provided a comprehensive description of what he assumed was courtship behaviour and apparent coition by Sharp-tailed Sandpipers on a beach near Seaholme, western bayside Melbourne, during the period 8 January to 9 February 1957. In this note I illustrate the behaviour described by Backen that I observed at Tolderol Game Reserve Wetlands (GRW) on 12 January 2022 and briefly consider whether the behaviour represents courtship, aggression, or something else.

OBSERVATION

Like numerous visitors to Tolderol GRW in January 2022, I observed the three displays by Sharp-tailed Sandpipers described by Backen (1958). His display 1 is described as follows:

> The displaying bird held its body in a tense and semi-erect posture with its neck craned forward and its bill pointing diagonally downwards. Feathers of the back were raised from the body—like many brown barbs projecting backwards from its skin; and on occasions the throat appeared to be inflated, perhaps due to a similar erection of the plumage. The wings were held stiffly drooped, the primaries extending below the body. In a few displays of this type, the tail was noted to execute rapid lateral vibrations.

Figure 1. (Time: 11.39.35). Backen's display 1 with the displaying bird approaching an individual who runs off. All images Colin Rogers

Figure 2. (Time: 11.40.02). The displaying bird finds a more compliant partner.

Figure 3. (Time: 11.40.11). Displaying bird mounts the compliant partner.

This behaviour is illustrated in Figure 1, in which the bird subjected to the display was running away.

The two additional behaviours described by Backen (displays 1a and 2) were also observed as part of the activity in Tolderol GRW on 12 January 2022. Figure 2 illustrates a variation similar to Backen's display 1a which '... differed [from display 1] only in that the tail was erected vertically and the tail-feathers were spread in a fan. As in display (1) the bird occasionally shook its tail rapidly side to side.' However, in this case the displaying bird had only its tail raised and fanned, not the feathers of the back, while the bird that was the object of the display did not run off but remained stationary with the feathers on the back of the neck partially raised (Figure 2).

Backen (1958: 270) also observed another behaviour that he interpreted as an act of attempted coition. Key features of the activity involved raised wings by the presumed male as it mounted the back of the presumed female. In the incident described here the displaying bird in Figure 2 mounted the compliant bird in the fashion described by Backen and illustrated in Figure 3.

In addition to the activity between the two participants, Backen also noted that it drew the attention of other Sharp-tailed Sandpipers, attracting two passive observers. In the case described here the activity attracted significant attention with the numbers of passive observers rising rapidly as illustrated in Figures 4 and 5. By the time the displaying bird dismounted the crowd of passive observers had grown to 18 with most having flown in from some distance away.

After the displaying bird had dismounted, all the individuals dispersed and returned to feeding or loafing. The sequence of events illustrated in Figures 1 to 5 took place in one minute and 13 seconds.

DISCUSSION

It is not unusual to occasionally observe Sharp-tailed Sandpipers during their time in Australia engaged in behaviour described by Backen (1958) as display 1, even as early as October–November (pers. obs.). Pringle (1987: 325) briefly described the display as 'apparently associated with courtship'; although not cited in the text, Backen (1958) is in Pringle's index and is presumably the basis for this information. Higgins and Davies (1996: 297) also note that Sharp-tailed Sandpipers are:

> Occasionally seen in display during non-breeding months, with two birds chasing each other: in main display, adopt semi-erect posture with feathers of back and throat raised, wings stiffly dropped, and tail sometimes held vertically, fanned and vibrated sideways; second display involves same actions but with wings raised and arched, and wings, head and tail jerked up and down.

However, although Backen's display 1 is not uncommon, it is unusual to see it followed by the displaying bird mount another bird. Sometimes the displaying bird is confronted and backs off as described below or, more usually, the targeted bird simply runs off as in Figure 1. In that respect, Danny Rogers (pers. comm.) makes several salient points about the behaviour described by Backen.

First, because one bird mounted another, Backen simply assumed that he was observing courtship behaviour followed by an act of coition. However, it is very difficult to separate aggression from courtship and to establish that an act of coition has occurred without first establishing the sexes of the birds involved. Second, the Sharp-tailed Sandpiper is a polygynous species like the Ruff *Calidris pugnax* and, in the latter, cases of male Ruff mounting other males have been recorded. Third, in shorebirds, sperm can only be stored by females for up to 10 days so it is unlikely that successful coition would be observed in January in Australia and birds would be unlikely to expend energy in attempting this.

The behaviour illustrated in Figure 1 certainly appeared to involve aggression, judging by the reaction of most birds at which it was directed. A behaviour that appears to be an example of rebuffed aggression, but not recorded by Backen (1958), was shown in a video taken by Graham Moore (posted on Facebook, South Aussie Birding, 25 January 2022) also at Tolderol GRW. The aggressor exhibited Backen's (1958) display 1 augmented by sometimes raised wings, as described by Higgins and Davies (1996), and it chased the second bird in circles for 10 seconds before that bird turned the tables, raised its tail and advanced on the initial aggressor who immediately stopped its initial display and ran off, chased by the chattering 'victim' now turned aggressor. That activity attracted the attention of a single passive observer.

However, in the case illustrated in Figure 2, aggression does not appear to be involved as the passive bird allows mounting to occur (Figure 3). It is tempting to speculate that it may be either a heterosexual encounter as Backen (1958) assumed, or a homosexual encounter with males practising coition or dominating other compliant or less aggressive males. Without definitive sexing of the participants, it is difficult to be sure.

Rogers (1995) provided measurement criteria for unambiguously sexing about 80 per cent of Sharp-tailed Sandpipers in the hand, but identification of sexes in the field requires experience and is not definitive. Generally, male Sharp-tailed Sandpipers are larger and bulkier than females. That said, the birds in Figures 2

Figure 4. (Time: 11.40.18). Two Sharp-tailed Sandpipers approach as a chattering Pied Stilt *Himantopus leucocephalus* walks past.

Figure 5. (Time: 11.40.48). Dismounted bird with tail still raised and the pair surrounded by 18 passive onlookers before the group dispersed.

and 3 are both of similar size which suggests they are the same sex and, based on relative size, are probably male (Danny Rogers pers. comm.).

CONCLUSION

The behaviour recorded by Backen (1958) and reported here may therefore be aggression or some other interaction between males, rather than courtship behaviour. It may involve elements of aggression as part of a display that may not be limited to heterosexual encounters. When observing such encounters, a careful attempt should be made to sex the birds involved, including the passive onlookers.

ACKNOWLEDGEMENT

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Foraging and feeding behaviour of Greater Sand Plover *Charadrius leschenaultii* and Terek Sandpiper *Xenus cinereus* in Gulf St Vincent, South Australia

COLIN ROGERS

INTRODUCTION

While surveying shorebirds in Gulf St Vincent in 2022, on one occasion I noticed a Greater Sand Plover *Charadrius leschenaultii* throwing items into the air. On closer inspection these items were seen to be Sand Crabs *Ovalipes australiensis*. On another occasion I observed a Terek Sandpiper *Xenus cinereus* actively probing to the full length of its bill angled into the soft mud and was surprised to see it slowly pull a Sand Crab from the mud and then eat it. In this note I document the foraging and feeding techniques of these two shorebird species and note the importance of Sand Crabs as a food source for overwintering shorebirds in Gulf St Vincent.

OBSERVATIONS

i) Greater Sand Plover

When foraging, Greater Sand Plovers often stand still for a minute or more before making a quick run to pick items from the surface. This foraging technique is well suited to flat muddy-sandy areas inhabited by Sand Crabs, so it is not surprising that crabs form part of the plover's diet. The feeding technique reported here, however, was a surprise to the observer when crabs were flung into the air by the plover.

Examining the photographs of one incident, observed on 7 March 2022 near Port Arthur, northern Gulf St Vincent, the Greater Sand Plover systematically removed and consumed the legs, paddles (modified hind legs) and pincers of the Sand Crabs, sometimes throwing the crabs into the air to remove those appendages, before swallowing the legless body whole. The process from confrontation to final ingestion of the body of the crab took about 30 seconds. The photographs in Figure 1 illustrate the process.

The crabs taken by the plover were small, with a carapace width of about 15 mm, and so were probably young individuals, as Sand Crabs can grow to a carapace width of 110 mm (Museums Victoria web page).

(ii) Terek Sandpiper

On 29 November 2022 also near Port Arthur, I noticed a Terek Sandpiper probing with an angled bill into soft mud. In view of the Terek's bill shape I was expecting the bird to extract a worm or something of similar size and dimensions. However, I was surprised to see it exert some effort to pull a sizeable Sand Crab out of the mud. As it walked along, the sandpiper appeared to be using visual clues about the presence of the crabs which, once located, were grasped firmly and pulled from the mud with some effort. The crabs were about 15 mm in carapace width.

The photographs in Figure 2 illustrate one such event which began when the sandpiper pushed its bill at an angle up to the base into the mud. When the crab was extracted, the sandpiper then squeezed and dropped the crab several times before swallowing it. In the process legs and pincers seemed to be lost and these were picked up and swallowed after the body.

Figure 1. (a) A Greater Sand Plover confronts a Sand Crab with pincers raised. **(b)** The plover picks up the crab by one of its paddles. **(c)** The appendages are broken off one by one, often by throwing the crab in the air, and each leg or paddle consumed, leaving the defiant crab on the sand. **(d)** and **(e)** The process is then quickly repeated several times until the crab's legs and pincers are removed and ingested. **(f)** The body is then ingested, and the plover continues foraging. All images Colin Rogers

Figure 2. (a) The Terek Sandpiper probes at an angle into the mud to locate the crab. **(b)** The crab is pulled from the mud to the surface. **(c)** The sandpiper grapples with the crab and squeezes it **(d)**, before dropping it into the shallow water **(e)**. This process (c) to (e) may occur several times. **(f)** The sandpiper then swallows the various pieces of the crab. All images Colin Rogers

DISCUSSION

On their non-breeding grounds, Greater Sand Plovers are known to eat crustaceans, shrimps, and crabs, as well as bivalves, snails, and worms (Marchant and Higgins 1993: 871) but there is no discussion of the feeding technique outlined in this note. Studies of the feeding behaviour of Greater and Lesser Sand Plover conducted in the Middle East, and referenced by Hirschfield *et al.* (2000), noted that Lesser Sand Plover did not feed on crabs at all, while the two races of Greater Sand Plover present, *C. l. columbinus* and *C. l. crassirostris*, made successful 'pecks at crabs' in only 2% and 18% of the attempts, respectively. By comparison, the process described in this note is far too methodical and prolonged to be described as 'a peck'. It consists of the systematic dismemberment of the crab before ingestion.

The forceful extraction of food items from mud or sand by the Terek Sandpiper reported here has been noted before by Austin (1954) although he did not mention the food items involved. Higgins and Davies (1996: 169) noted that Terek Sandpipers have been recorded eating crustaceans, insects, seeds, molluscs, and arachnids so it is very likely that the technique reported by Austin, and in this note, would be applied to crabs when they are available**.** By contrast, the Birds of India web page reports that Terek Sandpipers catch crabs by running after them and that they poke deeply in the mud for worms. No doubt both techniques will be employed and both food items taken by Terek Sandpipers as the conditions dictate. They are known to run rapidly across mudflats so could easily use that technique to attack any unwary crab. Wandering Tattlers *Tringa incana* were observed using that technique to catch small crabs, about 5 mm in carapace diameter, over rocky terrain in the Pacific (pers. obs.).

CONCLUSION

The Sand Crab may be an important food source for the two species examined in this note and the same conclusion may apply to other species such as Common Greenshank *Tringa nebularia* and Eastern Curlew *Numenius madagascariensis* that have been observed taking Sand Crabs. Both species of gull-billed tern (*Gelochelidon macrotarsa* and *G. nilotica affinis*) reported from Gulf St Vincent also appear to show a preference for areas with high densities of Sand Crabs.

A survey of the distribution of Sand Crabs from Port Adelaide across the International Bird Sanctuary to Ardrossan in the north on Yorke Peninsula would therefore be useful information for future conservation efforts. Changes in the density of crabs from south to north in Gulf St Vincent may also be a factor in explaining the changes in the distribution along the gulf of the two wader species examined in this note.

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Obituary: Brian James Blaylock

13 July 1947 to 8 August 2022

PHILIPPA HORTON

Brian was born at Rose Park, Adelaide on 13 July 1947 and was adopted at a young age by Winifred and Arnold Blaylock of Queenstown. Arnold was abusive but died in 1959, leaving Winifred and Brian in financial straits although free of his cruelty. Brian left school before matriculation in order to find full-time work, including as a clerk with Elder Smith's and then as a mail sorter with the Postmaster-General's Department. In March 1970 he married Joanne Tilby and at the end of that year was appointed as a Trainee Computer Operator in the Department of Defence in Canberra. He remained in the Computer Services Division of that department for some years, with several promotions to more senior grades, and in 1982 was awarded a prize in the Staff Suggestions Scheme, for his solution of editing difficulties in a computer pre-processor.

Brian Blaylock in the Bird Section, SA Museum, 2012. Image P. Horton

In 1984 Brian and Jo returned to Adelaide, with young daughters Amy (born 1975) and Kirrily (1978). Before moving to Canberra they had bought a block of land at Eden Hills which they now cleared of olives and planted with fruit trees, also building a house into which they moved in 1992. As with previous properties, they created a garden filled with fruit, vegetables and flowers, becoming largely self-sufficient for food. Brian continued to work in the Commonwealth public service, in the Information Technology Branch of the Department of Education, until briefly working elsewhere before early retirement at the age of 55.

From an early age, Brian was interested in natural history, joining the South Australian Ornithological Association (now Birds SA) in 1963 and the Junior Field Naturalists around the same time. Bird watching and plant collecting were his main passions and over the years he contributed more than 2,300 plant specimens to the State Herbarium of South Australia and many thousands of bird records to the Biological Database of South Australia (BDBSA). Before moving to Canberra, he frequently went bird-banding with Max Waterman's group, with highlights including banding Osprey on an island off Pondalowie Bay, Peregrine Falcon in Onkaparinga Gorge and Yellow-tailed Black Cockatoo at Myponga, as well as mist-netting White-bellied Whipbird at Pondalowie Bay. Once he had bought his first car, a blue Mini Deluxe, he made many banding trips, including one to Port Lincoln 'loaded up with mist nets, poles, food and five young lads' (Blaylock 2001).

After returning from Canberra, Brian participated in more than 30 biological survey field trips, valued for his plant and bird expertise, including those with the Environment Department and the Scientific Expedition Group. He was a team member on all but one of the Birds SA bird surveys of Nature Foundation's Witchelina Nature Reserve from 2011 to 2020 inclusive. He and Jo also did regular bird surveys from 2007 at O'Halloran Hill Recreation Park as part of the 'Million Trees Project' of the Environment Department's Urban Biodiversity Unit. Their survey site was in a cleared area that was being revegetated and so species counts were low but provided an essential basis for future comparisons.

Brian was or had been a member of BirdLife Australia, the Field Naturalists Society of South Australia, Friends of Shepherd's Hill Recreation Park and Friends of Gamble Garden at Blackwood, being at one time President of the last. Together with Amy, he was one of the founding members of Friends of Sturt Gorge Recreation Park, formed in 1999, and was both a committee member (as treasurer, website coordinator and secretary) and active participant in working bees for 20 years. Since 2012 he was one of the Directors of Worlds End Conservation Pty Ltd, a company dedicated to the conservation of hilly grasslands, woodlands and scrublands in the Mid North of SA; he also assisted with their administration and in running bird identification workshops.

In July 2001 Brian offered his services as a volunteer to the SA Museum Bird Section and from 21 August 2001 he worked with me for several hours on most Tuesdays over the next two decades. In November 2020, in recognition of his long-standing contributions to the Museum, he was made an Honorary Associate of the Museum. His duties were varied but significantly included assistance with IT matters as the Bird Section and its collections rapidly became digitised. He improved the quality of information in the bird specimen database by standardising place names, increasing the accuracy of geographic coordinates and entering additional information from undigitised records.

On a practical level Brian assisted with curation of the collections whenever an extra pair of hands was needed. He also assisted with assessment of mounted bird specimens and writing species information in preparation for the Museum's new Biodiversity Gallery, opened in February 2010. He contributed to answering the many ornithological queries directed to the Bird Section, for example in identifying birds on 17th century Japanese screens held by the Art Gallery of SA, using a field guide to Japanese birds from his extensive personal library.

From 1985 a major initiative of the SA Department of Environment and the SA Museum was the Census of South Australian Vertebrates, with the fourth edition being published online (the Birds chapter in 2013). The fifth edition of the bird chapter (2020) was a standalone online publication as *Annotated List of the Birds of South Australia.* Brian was a co-author for the fourth and fifth editions, adding all subspecies to the latter. He spent many hours checking questionable records and compiling other records to add to the distribution maps, produced by the Environment Department, for the fourth edition. Using his IT skills and an online mapping package, he produced the distribution maps for the fifth edition, uploading these to the Birds SA website. For many years previously, he had crafted maps for papers published by Andrew Black and myself. He also monitored online literature and checklists for new taxonomic papers relevant to SA birds, his last update to me being less than three months before he died.

Another major production of the Bird Section was a history of ornithology at the Museum from 1856 to 1939, published as a book chapter (of 217 pages) in 2018. While Andrew Black and I wrote most of the text, Brian contributed facts and figures and obscure pieces of information

that would otherwise have been missed. Because most SA Museum ornithologists were members of the SAOA, and usually committee members, this chapter is also closely entwined with SAOA history. During this project we became aware of the enormous number of 'duplicate' bird skin specimens donated to the SA Museum by the then British Museum (Natural History) in the early 1900s, providing the former with a significant coverage of non-Australian bird families. One of Brian's last major tasks at the Museum was to check and compile a list of these, numbering more than 1,000. Hundreds had been registered at the BM(NH) but no record was kept at the time of what specimens they sent to which museums, so Brian's list will enable current curators at The Natural History Museum finally to annotate their records with 'sent to SA Museum'.

An almost completed project that Brian spent many hours working on was an annotated list of the type specimens of birds in the SA Museum. From a brief list that I began many years ago, it expanded greatly as Brian researched the S. A. White Collection and collaborated with Mary LeCroy of the American Museum of Natural History where the Gregory Mathews collection is housed. Mathews made use of many S. A. White specimens in his *Birds of Australia* (1910–1927) and, in answering queries from LeCroy as she prepared multiple volumes of *Type Specimens of Birds in the AMNH*, Brian discovered dozens of secondary types among our collections. Checking our types list prior to its publication was a high priority for us until COVID-19 and Brian's illness intervened; it remains a priority for me.

Brian's volunteer work for the state's scientific institutions extended beyond the Bird Section. He took part in two of the Museum's *Out of the Glass Case* roadshows to schools in rural and remote regions, presenting talks on birds of the local areas, and he was a volunteer for many years at the State Herbarium.

The greatest beneficiary of Brian's time and energy was Birds SA. While in Canberra, he joined the Canberra Ornithologists Group, formed in 1970, but retained his SAOA membership until 1984 when it lapsed. He rejoined the association in 1998, was elected Assistant Secretary in 1999, and became Secretary in 2000, remaining in that position until April 2018 and serving as an ordinary committee member until the end of 2018. His tenure of 18 years as secretary is the longest in the history of the association, comparable only with those of John Sutton (1922–1938) and Bob Brown (1962–1975), and in 2018 he received a Long Service Award, bestowed by the Committee in recognition of his outstanding service.

Brian's expertise in digital technology was of immediate value to the Birds SA Committee as its new website went online in May 2001. The web pages had been designed by Anna Mobley but Brian provided much of the content and he was in charge of maintenance and updates. In 2012 he began the process of revamping the whole website. Among his initiatives was adding the website in 2008 to Fat Birder's Top 1000 Birding Website, a 'ranking by traffic' site that monitors usage; currently Birds SA sits in 45th position, one above Birds of Ukraine (Avibase is 4th, Birding NZ 35th; Brian loved these details). He also set up a page of links to other birding and conservation organisations, a page of bird identification guides and related information, and the 'Where to go' page, providing localities (with maps) and bird lists for numerous birdwatching sites around SA, together with habitat and historical information for each site. This is an exceptional resource for local, interstate and overseas people birdwatching in SA. All of these pages were works in progress and he continued updating them until only a few weeks before his death.

Another valuable resource on the Birds SA website is the Photo Gallery, set up by Brian using photographs donated by members and by the public, each image requiring resizing and

the addition of details and copyright marks. His last addition to the gallery was on 15 July 2022, taking the total number of images to 4,612. As a keen bird photographer himself, Brian's photos are included in the gallery. He was particularly proud of an exquisite photo he took of two Chestnut-breasted Whiteface at Bon Bon Station in August 2018, that adorned the front cover of *The Birder* issue No. 248 (Summer 2018). Less obvious but equally important was the 'Ask an expert' facility at the bottom of the website, again set up and managed by Brian, with all queries, mostly about bird identification, directed to and answered by himself. These queries are now being answered by Andrew Black and we have become aware of how much time Brian put in to running this facility.

Aside from website and secretarial duties, Brian assisted Birds SA in other ways. He managed the official email accounts, enabling day to day operations for different tasks by the Management Committee. Due to his initiative and drive the association was able to receive tax-deductible donations for conservation purposes; he redrafted the Rules in 2006 to achieve this status and establish the Birds SA Conservation Fund. He served on various subcommittees including the rarities, distribution and Important Bird Areas subcommittees. He re-scanned many of the older issues of *South Australian Ornithologist* to upload onto the website and added new PDFs as each issue of the journal (and *The Birder* magazine and Historical Series) was published. Articles from the journal are among the most frequently downloaded items from the website by members and the public worldwide.

Always keen to promote Birds SA to the wider public, Brian often assisted in staffing the Association's stand at open days and fairs, such as the Sturt Gorge Recreation Park Open Day in May 2014 and the Laratinga Bird Fair in October 2016. He participated in the day field trips, often as trip leader, and organised the October 2013 campout to Bimbowrie Conservation Park and the October 2014 campout to Hiltaba Nature Reserve. Occasionally he made time for private birdwatching, organising trips for himself and Jo to various locations around Australia and overseas, such as Cocos and Christmas Islands (in 2009) and Spain (in 2019).

In 2002, then Birds SA member Colin Clark set up an Access database in which to store the Association's vast accumulations of bird records from field trips and individual members. Brian quickly joined in this initiative and became its manager, adding thousands of records to the database himself. Periodically, he made the database available to the Environment Department for uploading to the BDBSA, thus contributing enormously to the distribution maps discussed above. In producing maps for the website, Brian obtained distribution data from the Atlas of Living Australia, BDBSA, Birds SA and SA Museum databases and other sources, and created Excel files for sight and specimen records before and after 1970 from which he created the maps. These were vetted by the Bird Records Committee before being uploaded by Brian. This service is highly valued by Birds SA members and by the scientific community and birdwatching public.

Brian was co-author on five notes or papers in the *South Australian Ornithologist* but it was his chapter in Birds SA's centenary book that was his greatest publishing achievement. In 'A Century of Presidents' Brian meticulously researched the 37 presidents of the SAOA from 1899 to 1999 and provided a short biography of each, an immensely valuable resource for historians (Blaylock 2000). Brian also produced the revised fifth edition of *A Field List of the Birds of South Australia* (2017 with a 2020 update), the first edition to be a downloadable website version and again an extremely valuable resource.

With so many activities and duties the question is how did he fit them all in? Perhaps by occasionally diverging from his colleagues' expectations, perhaps by spending less time with his family than he might have, and certainly

with no time wasted in frivolous conversation, but always with boundless enthusiasm, determination and dedication to natural history and conservation. In July 2022 the Birds SA committee began preparing a nomination for Brian to be awarded Honorary membership. Sadly, this was conferred posthumously on 30 August 2022 but, when Andrew Black told him about it five days before he died, he expressed his utmost appreciation.

In November 2019 Brian began to suffer from painful recurring pancreatitis and, after a number of procedures, was diagnosed with pancreatic cancer in April 2021. In July 2022 his condition deteriorated; he entered the Mary Potter Hospice on 27 July and died on 8 August. A moving funeral, complete with bird song both recorded and live, was held graveside at Wirra Wonga, Enfield Memorial Park, on 15 August. A celebration of Brian's life was held at Belair National Park on 18 September; among the large gathering were family members from Canada and representatives of the numerous organisations for which he had volunteered. All were in awe of Brian's tireless contributions, for which we remain immensely grateful. We extend our deepest sympathy to Jo, Amy, Kirrily and family.

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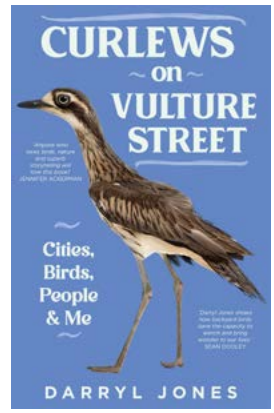
Book Review

Curlews on Vulture Street

DARRYL JONES, 2022

NewSouth Publishing, Sydney
$33, softcover, 336 pages
ISBN 9781742237367



This memoir is an exploration of birds and their behaviours that have shaped the scientific work of Darryl Jones, its author and subject. Jones has had a distinguished career as a behavioural ecologist at Griffith University, where he is now Professor Emeritus, specialising in urban bird ecology.

Each of the eight chapters focuses on one or a few bird species of particular significance in the author's life, beginning with a Common Blackbird, then a rare find in 1960s Wagga Wagga, sparking the realisation that careful observation can lead to fascinating discoveries.

Observations on the breeding biology of Brush Turkeys in Armidale led to his first publication while still an undergraduate, and on to his ground-breaking Ph.D. project on the same species in Queensland. As an expert in the field, he was then called upon to sort increasing human – Brush Turkey conflicts as the latter adapted to urban life in Brisbane. He recounts an episode in which an irate homeowner found her newly landscaped garden, with a tonne of compost and 50 seedlings neatly planted in mulched beds, had been comprehensively removed overnight by an enthusiastic male Brush Turkey, delighted to find so much easily raked material for his new mound. Jones's quick-witted handling of the situation is a delight to read.

Other chapters describe work by the author and colleagues on exotic bird species in urban Wagga Wagga, swooping Australian Magpies, communal roosting of Torresian Crows, roost choice in brightly-lit areas by Rainbow Lorikeets, feeding of wild birds by humans, the diet of Australian White Ibis in a big city, and how Bush Stonecurlews are thriving in Brisbane where foxes abound. Jones skilfully combines scientific accounts with a relaxed writing style sprinkled with humorous anecdotes. We are entertained by his experiences of bird monitoring in suburbia (and the hazards of binocular use among prying eyes), colour-marking white ibis in a city park (with food dye squirted from children's water-soaker guns – a tricky task when sharing your field site with the public), and innovative methods to band and wing-tag wary and cunning Torresian Crows.

Throughout the book Jones reminds us that scientific investigation often produces unexpected results, as he describes testing widely-held assumptions that time and again prove to be wrong: 'everyone hates crows', 'Rainbow Lorikeets don't eat meat' and 'nobody feeds birds in Australia', among others. The final section of the book lists published references, including many of the author's key scientific papers and books, providing a valuable resource for further reading.

I recommend this book to all who have an interest in Australia's birds.

Philippa Horton

NOTES

The South Australian Ornithological Association Inc. (Birds SA)

FOUNDED 1899

Birds SA is the trading name of The South Australian Ornithological Association Inc.

The principal aims of the Association are to:

- promote the study and conservation of Australian birds and their habitats,
- encourage interest in and develop knowledge of South Australian birds,
- record and disseminate the results of research into all aspects of bird life, and
- maintain a public fund 'Birds SA Conservation Fund' to support the Association's environmental objectives.

The *South Australian Ornithologist* is supplied to all members and subscribers, and is usually published as two issues per year. A quarterly magazine, *The Birder*, reports on activities of the Association, announces its programs and includes items of general interest. A monthly e-newsletter is also sent to all members.

Meetings are held at 7.30 pm on Tuesday in the last week of each month (except December when there is no meeting); the venue is usually the Charles Hawker Building, University of Adelaide, Waite Road, Urrbrae. Occasional meetings will be held at a country location; the venue will be advised by e-newsletter. Meetings feature presentations on topics of ornithological interest. Visitors are welcome.

Regular day trips are arranged to places of ornithological interest, both during the week and at weekends, and weekend campouts are held two or more times per year.

The Association's Library is now housed in the boardroom of the Conservation Council of SA at The Joinery, 111 Franklin St, Adelaide and is open to members twice a month. For opening times and the Library Catalogue, see the Association's website.

Manuscripts to:
editor@birdssa.asn.au

Birds SA membership (e-publications only):

Single member	$50
Family	$60
Full-time student	$10

Add $30 to each membership fee for printed copies of the Journal and *The Birder* (Birds SA magazine)

Register online at www.birdssa.asn.au
or write to
Birds SA c/o South Australian Museum
North Terrace, Adelaide, SA 5000, Australia

Libraries, institutions and organisations, annual subscriptions:

SA Ornithologist journal online + print	AU$50
The Birder magazine online + print	AU$50

Register online or write as above
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ADVICE TO CONTRIBUTORS

Aims: The *South Australian Ornithologist* aims to publish material on the birds of Australia, with an emphasis on the birds of South Australia. We publish papers and bird notes that are peer-reviewed, plus book reviews and obituaries that are the authors' personal views, and annual bird reports. Submissions should be concise, original, and consider previous relevant literature. Manuscripts should be exclusively submitted to this journal. Contributors need not be Birds SA members.

Submissions: We prefer manuscripts that are submitted electronically but, if necessary, accept printed copies. Manuscripts should be typed with >2.5 cm margins, with text unjustified and without end-of-line hyphenation, except for compound words. Manuscripts should be consistent and simple without special fonts, elaborate formatting or indents (except for long quotations). Papers should begin with an abstract but notes and other articles should not. Avoid footnotes unless they are absolutely necessary. The following word limits are advised: papers 8,000 words, bird notes and obituaries 3,500, book reviews 1,700; however, longer articles will be considered.

Figures and Tables: These should be self-explanatory and designed to fit within the margins of the journal (single page width 146 mm). Tables should be placed at the end of the text, and figures should be saved separately, not embedded in the text. Place captions for the tables and figures *after* the references as they will be formatted separately. Letters, numbers and symbols within the graphics must be clear. Ensure that stippling and/or symbols are legible at the size likely to be used in the published paper. Photographs and figures should be sharp and high quality (1200 dpi for line art, 600 dpi for greyscale and 300 dpi for colour). Please credit relevant photographers, artists and cartographers.

Nomenclature: When a species of animal or plant is first mentioned give both its English and scientific name, the latter unbracketed and italicised, e.g. Square-tailed Kite *Lophoictinia isura*. Thereafter only use one, and always the same name. Nomenclature and systematic order are based, subject to revision, on

Horton, P., Blaylock, B. and Black, A. 2020. *Annotated List of the Birds of South Australia*, 5th edition, version 5.1. Birds SA, Department for Environment and Water, South Australia, and South Australian Museum, Adelaide. AVES_Jan 2020 (birdssa.asn.au). For world bird names refer to: IOC World Bird List – Version 13.1 (worldbirdnames.org).

Scientific plant names, subject to revision, are according to the Electronic Flora of South Australia, Census of SA Plants, Algae and Fungi (flora.sa.gov.au). Note use of capitals, e.g. six Superb Fairywrens, but an unidentified fairywren; one Fat-tailed Dunnart, but several dunnarts; one Ruby Saltbush.

References: List references alphabetically at the end of the paper with names of authors and periodicals given in full. Avoid referring to web pages if possible because they constantly change and have poor longevity. Authors are cited in the text thus: Baxter (2010); (Marchant and Higgins 1993); (Mathews 1912; Blakers *et al.* 1984) (multiple citations in date order). Note *et al.* is used where a cited paper has three or more authors. In the reference list, for references with seven or fewer authors, list all author names. For those with more than seven authors, list the first six followed by *et al.*

Authors must reasonably endeavour to locate and cite the primary or original sources of their information. In some cases handbooks, field guides and compendiums (although valuable resources) do not suffice as the primary reference.

The following style should be used for references:

Pavey, C. R. and Joseph, L. 2004. The occurrence of the Slender-billed Thornbill *Acanthiza iredalei* in the Northern Territory. *South Australian Ornithologist* 34: 170–175.

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

Close, D. 1982. Birds of the Ninety Mile Desert. In *The Ninety Mile Desert of South Australia*. C. R. Harris, A. R. Reeves and D. C. Symon (eds). Nature Conservation Society of South Australia, Adelaide, pp. 85–87.

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

SAOA. 1995. Bird Records. *South Australian Ornithological Association Newsletter* No. 155: 15. OR:
Birds SA. 2022. Bird Records. *The Birder* No. 264: 49.

Style, measurements and abbreviations: Style generally follows the *Style Manual: for authors, editors and printers*, Sixth edition, Australian Government Publishing Service, Canberra 2002, or the current online edition. We encourage the use of the first person for a direct and engaging style. Spelling follows *The Macquarie Dictionary*, Eighth Edition, Macquarie Dictionary Publishers, Sydney, 2020. Use 's' not 'z' in words such as 'recognise', and 'ou' in words like 'colour'. Use single quotation marks, except where 'a quotation is "within" a quotation'. Check that all references mentioned in the text are in the References, and vice versa. To abbreviate, first use the full wording followed by the abbreviation in brackets, then use the abbreviation only. Numbers under 10 are spelled out and then Arabic numerals are used, e.g. nine whistlers but 10 finches. However, if a sentence or paragraph contains other numbers larger than 10, all numbers, including those under 10, should be given as Arabic numerals. No sentence should start with an Arabic numeral. Type a space between a numeral and its unit, e.g. 3 m. For time use the 24-hour clock system, e.g. 0735–2050 h. Give dates in the form 1 November 2008, though in tables and figures dates may be given as 1/11/2008, 20/9/2021 or 20/9/21. Geographical references should be in the form: 20 km NE (or north-east) of Adelaide; southern areas of South Australia; 35° 24′ S, 138° 39′ E. Other abbreviations are in the form: 8 x 42 binoculars; 2% (two per cent); 3 m (three metres); $\bar{x}$ (mean); sd (standard deviation); χ^2 (Chi square); birds/km^2 or birds per km^2. Statistical symbols should not be italicised. Use lower case p for probability, N for population size, n for sample size.

Population Studies: Reviews of the birds of an area should include the habitats and climate and a summary of relevant literature. Include a map showing localities mentioned in the text, an insert showing the locality in Australia, and a scale. Extensive data on many species should be given in a table(s) or an annotated list. Summarise repeated patterns as ranges on each visit (e.g. 3–10 during Aug–Oct 2011–13), using measures of variance if there are sufficient data (e.g. means and standard deviations). If possible report breeding, seasonal movements, population trends, and other significant observations.

Editorial assistance: The editors will provide some assistance in the preparation of a manuscript. Submissions without a reasonable attempt to conform to the specifications above will be returned to the author for correction before being refereed. Acceptance of a manuscript will be subject to the decision of the editors.