

# Notes on the distribution and taxonomy of White-eared Honeyeaters in South Australia

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## Abstract

A phylogeographic division within the White-eared Honeyeater, *Nesoptilotis leucotis*, at the Eyrean Barrier has prompted taxonomic revision. The division occurs within the long acknowledged inland subspecies *N. l. novaenorcae*, such that previously recognised subtle differences in plumage and morphology within it are now seen to be of biogeographic and taxonomic significance. Type specimens of that subspecies are from Wongan Hills, Western Australia and its name will apply also to western South Australian populations, unless they prove diagnosably distinct, when a new name would be needed for them. Eastern mallee and Kangaroo Island populations belong, with the nominate subspecies, to the eastern phylogroup but are differentiated from them and may be recognised as *N. l. depauperata* and *N. l. thomasi* respectively. The subspecies *N. l. novaenorcae* and *N. l. depauperata* are allopatric, separated across the northern reaches of Spencer Gulf and southern Lake Torrens by terrain devoid of suitable habitat.

## INTRODUCTION

At present, most authorities (e.g. Menkhorst *et al.* 2017) recognise three subspecies within the White-eared Honeyeater, *Nesoptilotis leucotis* (Latham, 1802), following Schodde and Mason (1999). They include firstly an eastern Australian forest form *N. l. leucotis* in southeast Queensland (Qld) and New South Wales (NSW) east of the Great Divide, and in southern Victoria and the South East of South Australia (SA). A western/inland subspecies *N. l. novaenorcae* (Milligan

1904), is named for White-eared Honeyeaters that occur in the wheatbelt mallee and eucalypt woodlands of southern Western Australia (WA) and extreme south-western SA and, as a separate population, between Eyre Peninsula, the Flinders Ranges, Mid North, Yorke Peninsula, Murray Mallee and inland of the Great Divide in Victoria, NSW and Qld. The third subspecies *N. l. thomasi* (Mathews 1912) is a Kangaroo Island endemic (Baxter 2015). The species' Australian distribution, as recorded in the Atlas of living Australia (ALA), is shown on the map Figure 1.

Schodde and Mason (1999) separated the two mainland subspecies by size and plumage, the nominate being larger, brighter above, more intensely yellow over the belly and with broader cream tips to tail feathers, but found that their presumed zone of contact through the upper South East of SA and inland slopes of the Great Divide required clarification. Higgins, Peter and Steele (2001) found, as had Ford (1971) that plumage differences between the three subspecies were subtle but that *N. l. novaenorcae* had shorter wings and tails than *N. l. leucotis*. Within subspecies *N. l. novaenorcae* itself, they reported (*pace* Ford 1971) an east to west decrease in size, confirming Schodde and Mason's (1999) finding that birds from Eyre Peninsula were smaller than those from inland eastern Australia, and shared with the smallest WA specimens a smaller tail/wing ratio and brighter yellow bellies.

Schodde and Mason (1999) found that *N. l. thomasi* was intermediate in size between the mainland subspecies but darker, duller and

greyer than either, both above and below, with a more restricted area of yellow on the belly. Higgins, Peter and Steele (2001) found that they were closer to *N. l. novaenorcaiae* with respect to plumage but approached the nominate in size.

Dolman and Joseph (2015) included the White-eared Honeyeater in a phylogeographic study of 12 southern Australian bird species and identified two phylogroups, separated by 21 nuclear base pair differences in the mitochondrial gene ND2 (net divergence 2.23%). They found that the two clades showed both phylogeographic and spatial discontinuity and thus represented Evolutionarily Significant Units (ESUs). Further, they had diverged across the Eyrean Barrier, a periodic Pleistocene arid intrusion at the longitude of present day Spencer Gulf and the Lake Torrens and Lake Eyre basins (Ford 1987).

The western phylogroup comprised 16 samples from Eyre Peninsula, the Great Victoria Desert (Maralinga area) and southern WA, and the eastern phylogroup of 35 samples were from either side of the Great Divide in NSW, from south-eastern Qld, Victoria, the South East of SA, the Murray Mallee and Kangaroo Island. They reasoned that their findings were taxonomically significant and warranted a revision that recognised either intraspecific or even specific division at the Eyrean Barrier.

They could not exclude significant gene flow between the two phylogroups and therefore proposed that the two ESUs, respectively distributed west and east of the Eyrean Barrier, redefine the circumscriptions of subspecies *N. l. novaenorcaiae* and *N. l. leucotis*, the latter including *N. l. thomasi*. They predicted that quantitative analysis of plumage and morphometrics, coupled with more extensive genetic sampling, would reject the historical basis for plumage variation in the species.

The principal aim of this study is to test alternative views of how *N. l. novaenorcaiae*

and *N. l. leucotis* might be recognised taxonomically by reviewing the distribution of named subspecies and examining variation in morphometrics, plumage and voice among them. Particular attention is paid to the critical region corresponding to the Eyrean Barrier, i.e. to populations traditionally assigned to subspecies *N. l. novaenorcaiae* from either side of Lake Torrens and Spencer Gulf. The focus is therefore on SA populations but their extension into adjacent States is necessarily taken into account.

## METHODS

Adult White-eared Honeyeater specimens in the South Australian Museum, Adelaide (SAMA) include 16 (11 male, 5 female) *N. l. novaenorcaiae* from Eyre Peninsula and farther west, including Maralinga and 17 (9 male, 8 female) from the SA and Victorian mallee; 13 (7 male, 6 female) *N. l. leucotis* from South East SA and southern Victoria; and 11 (9 male, 2 female) *N. l. thomasi* from Kangaroo Island. The following were measured: bill length (skull attachment to tip) and depth (at feathered limit), to nearest 0.1 mm; and straightened wing (from carpus to tip of longest primary) and tail (insertion to tip of longest rectrix) lengths, to nearest 1 mm.

Plumage characters addressed were: dorsal tone, extent of black on throat and upper breast and of pale tipping to rectrices, and brightness and extent of yellow of underparts.

Songs of White-eared Honeyeaters recorded by David Stewart from across its range will be reported separately (Black and Stewart in preparation).

Distributional records of the species in SA were obtained from the published literature and the database of the Department for Environment and Water, incorporating records of Birds SA, Biological Survey SA and Birdlife Australia (courtesy Helen Owens, DEW).



Figure 1. Map from the Atlas of living Australia ([www.ala.org.au](http://www.ala.org.au)), showing records of the White-eared Honeyeater. There are outlying records of doubtful validity, such as those on Yorke Peninsula, and an apparently continuous distribution between Eyre Peninsula, the Flinders and Mount Lofty Ranges and the Murray Mallee.

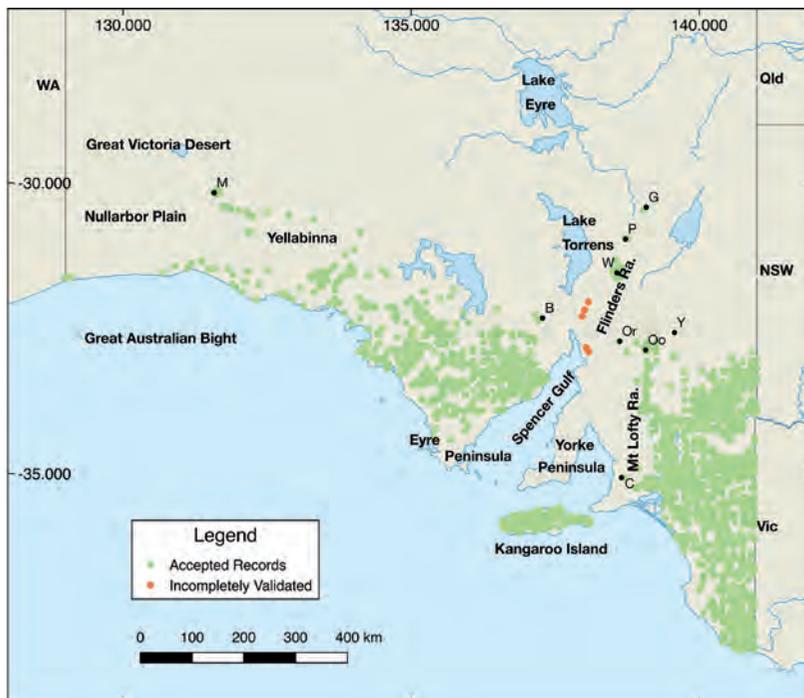


Figure 2. Map showing records of the White-eared Honeyeater in South Australia, derived from the database of the Department for Environment and Water. Outlying records, if uncorroborated, have been omitted. Also shown (as orange circles) are records from the South Flinders Ranges, where evidence for the species' presence remains inconclusive. Places referred to in the text are shown as: B = Baxter Range, C = Cherry Gardens, G = Gammon Ranges Plateau, M = Maralinga, Or = Orroroo, Oo = Oodla Wirra, P = Patawarta, W = Wilpena Pound, Y = Yunta.

## RESULTS

### Distribution

A review of distributional records in SA (Figure 2; compare with Figure 1) shows that the species is extensively represented on Eyre Peninsula, west to the Head of the Great Australian Bight and through the Yellabinna, northwest to Maralinga, where they appear to be resident (Black and Badman 1986; AB personal observations, specimens in the Australian National Wildlife Collection, Canberra and SAMA). There are also records in the coastal mallee south of the Nullarbor Plain, an extension of its WA distribution.

Records from the Gawler Ranges (Paton 1975; Joseph and Black 1983; Blaylock *et al.* 2017) occur east to the Baxter Range, Cariwerloo Station (C. Baxter 17 February 1993; P. Langdon pers. comm.). There is a distributional gap between that most easterly Eyre Peninsula mallee outlier and Wilpena Pound (H. P. Haselgrove in Glover 1972; SAMA B29303; H. Bakker 14 August 1975), including Edeowie Gorge (5 June 1982) and Mount Ohlssen-Bagge (12 April 1993) (Carpenter *et al.* 2003). There have been many subsequent reports from the Wilpena Pound area.

Other confirmed records from the Flinders Ranges are from further north, Patawarta (AB 11 April 1993; D. Hopton 17 March 1999) and the Gammon Ranges Plateau (G. Carpenter, L. Pedler 23 October 1999). Reference to the species from the South Flinders Ranges (Condon 1968; Higgins, Peter and Steele 2001 and online database maps Birddata and ALA) are uncorroborated by experienced local observers (W. Klau, B. Haase, P. Langdon). Paton (1980) did not include the species from her list of birds known from the Flinders Ranges at the time.

The closest published records south of Wilpena are a single reference to the Orroroo district (Gray 1931) and observations at the base of the Olary Spur near Oodla Wirra (Darke 1929; Bonnin and Rix 1980) and Spring Dam south of

Yunta (Mack 1970). From there it extends through Pitcairn Station (AB Waite Hill, 23 April 1984), along the eastern flank of the North Mount Lofty Ranges into the northern Murray Mallee.

The species is not reliably reported from Yorke Peninsula (Terrill and Rix 1950; Condon 1962, 1968) and sporadic claims from the Adelaide Plains (Higgins, Peter and Steele 2001) and Mount Lofty Ranges are largely confined to the eastern margins of the latter at the mallee interface. They include specimen records from near Woodchester (SAM B14152) and Hartley (SAM B18594) and vagrant records at Cherry Gardens (Ragless 1961), Strathalbyn (Eckert 2000) and Charleston Conservation Park (Carpenter *et al.* 2003). The Murray Mallee distribution appears to continue uninterrupted and without a recognised subspecific boundary into the South East and Victoria.

### Plumage

Specimens of *N. l. novaenorciae* from west of Spencer Gulf show differences in plumage compared with those from the eastern mallee. Most obviously, they are brighter and more extensively yellow below, whereas eastern specimens are duller and have paler bellies (Figure 3). In this respect the underparts of eastern birds show greater distinction from the more brightly plumaged nominate subspecies, with which they are in extensive but incompletely evaluated contact (Schodde and Mason 1999). Western birds are also very slightly yellower and brighter dorsally than both eastern mallee birds and those of the nominate subspecies (Figure 4). Western birds generally have a smaller black bib, covering chin and throat, whereas in eastern birds this black area often extends to the upper breast, as in the nominate subspecies.

The Kangaroo Island isolate, *N. l. thomasi*, is duller and greyer above and below than all mainland populations (Figures 3 and 4). Pale cream tipping of less than 4 mm to some tail feathers was evident in specimens of *N. l. leucotis*



Figure 3. Ventral view of male specimens SAMA B28176, east of Kimba EP; SAMA B 55328, south of Pinnaroo; SAMA B25251, south of Naracoorte; and SAMA B3041, Kangaroo Island. Note the more extensive and brighter yellow underparts of the Kimba and Naracoorte specimens compared with the specimen from Pinnaroo, and the darker and greyer Kangaroo Island specimen.



Figure 4. Dorsal view of specimens, as in Figure 1. The Kimba specimen is brighter and subtly yellower and the Kangaroo Island specimen is duller and greyer. Both images Philippa Horton

but barely recognised among the other three groups.

### Morphometrics

Previous reviewers have found significant sexual dimorphism in all populations and comparisons are made here only among males because of their generally larger sample sizes. Western populations of *N. l. novaenorciae* have wings of similar length to those of the eastern mallee (mean 91.9 mm *vs* 92.4 mm), but shorter tails (mean 86.5 mm *vs* 89.8 mm) and a smaller tail/wing ratio (mean 0.94 *vs* 0.96). All these parameters are smaller than those of the nominate subspecies (respectively wing 97.3 mm, tail 96.0 mm and ratio 0.99). That trend accords with the findings of Schodde and Mason (1999).

The Kangaroo Island subspecies, *N. l. thomasi*, has shorter wings (mean 93.6 mm) than the nominate but tails of similar length (mean 96.1 mm), and the highest tail/wing ratio of all (1.03). Bill size and shape vary considerably but bills are relatively thicker in western than in eastern mallee populations (mean length/depth ratios 3.7 and 4.0 respectively) and are slenderer in the nominate and Kangaroo Island subspecies (ratios 4.2 in each).

The differences detected among these relatively small samples are at trend level only but support the findings of earlier reviews of the species (see Discussion).

### DISCUSSION

Reid, Carpenter and Pedler (1996) wrote that the Wilpena District was the species' known northern distributional limit in the Flinders Ranges. There are now records from further north, and Wilpena is therefore the southernmost verified record in the Flinders Ranges, as commonly construed.

Condon (1962, 1968) included the South Flinders Ranges in the distribution of White-eared Honeyeater, perhaps on the basis of Terrill and

Rix's (1950) most northerly records from Oodla Wirra (Darke 1929) and Orroroo (Gray 1931).

The present isolation of Flinders Ranges (Wilpena) birds from mallee populations further south might not necessarily be a natural occurrence; a more continuous distribution in mallee along the eastern flank of the South Flinders Ranges might have been interrupted by clearance and unsustainable grazing at that margin of agricultural development during the late 19<sup>th</sup> century.

The White-eared Honeyeater is almost entirely restricted to eucalypt forest and woodland with a dense shrub understory and, in SA, the subspecies *N. l. novaenorciae* occupies mallee virtually exclusively (Higgins, Peter and Steele 2001; G. Carpenter pers. comm.).

Between observations in the Baxter Range and Wilpena, over 200 km to the northeast, is a restricted area of Western Myall, *Acacia pauperiflora*, open woodland and an extensive region of arid low open shrubland, much of it in depressed saline terrain, surrounding Lake Torrens and the northern reaches of Spencer Gulf. There are no conclusively verified records of White-eared Honeyeaters across that gap or from the South Flinders Ranges (*contra* Condon 1968; Glover 1972) which, at their closest, are about 70 km due east of the Baxter Range (Figure 2).

The restricted Flinders Ranges population is represented by a single museum specimen (SAMA B29303 as above) that appears typical of eastern mallee specimens. This isolate has not been included in genetic studies, but it has tenuous connections with eastern mallee populations. Furthermore, the Flinders Ranges lie to the east of the Eyrean Barrier, an indication that its relict population is more likely to belong to the eastern phylogroup.

The western and eastern phylogroups appear from the above assessment to be geographically

separate, the intervening environment providing no suitable habitat for this mallee-dependent honeyeater. The Pleistocene biogeographic barrier responsible for division among White-eared Honeyeaters has resulted in subtly differentiated but genetically distinct populations that remain in allopatry on either side of an environmentally hostile present-day barrier.

The genetic divergence between mainland populations of the White-eared Honeyeater across the Eyrean Barrier creates a division within the species requiring taxonomic resolution. Dolman and Joseph (2015) questioned whether the divergence was of such magnitude that cryptic speciation had occurred, but could not exclude significant gene flow between the two populations. For that reason, pending further sampling and multi-locus analysis, they acknowledged the division at subspecific level.

#### **A review of infraspecific divisions within the species**

The first to recognise variation in the White-eared Honeyeater was Milligan (1904) who described a western form *Ptilotis novae-norciae* with type-locality the Wongan Hills, WA. He found it to be smaller and duller than the eastern bird, more greyish-olive than yellowish-olive dorsally and having less black on the throat and narrower white cheek stripes. Mathews (1912) described *Ptilotis leucotis depauperata* with type-locality Coonalpyn in the Upper South East of SA, as smaller and lighter coloured below than *Ptilotis leucotis leucotis* but did not compare it with *novae-norciae*. Neither author offered an opinion concerning limits of their new taxon's distribution.

Condon (1968) included all White-eared Honeyeaters in SA in the nominate subspecies, believing that the subspecies *novae-norciae* was restricted to southwest WA. Ford (1971) detected little distinction in plumage across the species' range but found that birds from Eyre Peninsula and the eastern mallee were nearer in size to WA birds and therefore distinct from the larger

birds of the east coast. That distinction between a smaller and duller western and inland subspecies and a larger and brighter nominate subspecies in the east has prevailed (Schodde and Mason 1999) until Dolman and Joseph's (2015) finding of a genetic division, which led them to an alternative recognition of *N. l. novae-norciae* and *N. l. leucotis* west and east, respectively, of the Eyrean Barrier.

Morphometric findings in this study accord with those of Schodde and Mason (1999) and Higgins, Peter and Steele (2001), with only subtle and statistically insignificant or untested differences between the three given subspecies (or four populations, as herein). Those differences therefore do not provide diagnosable distinction of utility for taxonomic purposes. It is in the also subtle and unquantified plumage variables that diagnoses are provided.

The genetic divergence at the Eyrean Barrier allows for an interpretation of previously identified (Schodde and Mason 1999) and here confirmed minor morphometric but diagnosable plumage differences between populations of *N. l. novae-norciae* west of and east of Spencer Gulf. To the west they are slightly smaller but distinctly brighter than eastern mallee birds, the latter being smaller and duller than populations of the nominate subspecies.

Mainland White-eared Honeyeaters therefore include, in addition to the nominate subspecies, three individual and plausibly separate populations previously assigned to *N. l. novae-norciae*. They are, from west to east:

- Population 1, in WA's semi-arid woodlands and wheatbelt, extending south of the Nullarbor Plain into far western SA;
- Population 2, separated from Population 1 narrowly near the Head of the Bight and across the Nullarbor Plain, in the south-eastern Great Victoria Desert (Maralinga, Yellabinna), Gawler Ranges and Eyre Peninsula; and

- Population 3, genetically (Dolman and Joseph 2015) and geographically separated across the Eyrean Barrier, occupying the Flinders Ranges (as argued here) and eastern mallee.

Population 1 has not been part of this study but has been shown by previous reviewers (Ford 1971; Schodde and Mason 1999; Higgins, Peter and Steele 2001) to be the smallest of all. It also appears to be duller than the eastern mallee population (see images in Dolman and Joseph's 2015 supplementary material) and would consequently be distinctly duller than Population 2, the brightest of all in this review.

From the evidence presented, the name *N. l. novaenoriae* can apply legitimately only to the western phylogroup, i.e. Populations 1 and 2. Should those two populations prove diagnosably distinct, *N. l. novaenoriae* would apply only to Population 1 and a new name would be needed for Population 2.

Population 3, east of Spencer Gulf, is in a separate phylogroup that includes Kangaroo Island birds as well as the nominate subspecies of chiefly forest habitats. The interaction of mallee and forest populations along an extensive contact zone has not been analysed fully (Schodde and Mason 1999), and published evidence of differentiation between the two in size and plumage might reflect a selective response to environmental gradients, rather than differentiation in allopatry (Dolman and Joseph 2015; R. Schodde pers. comm.).

Evidence of potential pertinence to that question has been published by Lamb *et al.* (2018), who confirmed the identification of two phylogroups by Dolman and Joseph (2015) but found divergence also within the eastern phylogroup, a small largely eastern clade, and another larger and more widespread clade. Their distribution is not strictly concordant with that of the two named subspecies but supports the hypothesis of earlier division within eastern populations.

Moreover, this study affirms previous reviews that have found eastern inland and eastern subcoastal populations to be phenotypically distinct. Therefore, whether their differentiation has resulted from local selection or from sustained separation followed by secondary contact, or both, long held taxonomic recognition of the eastern mallee population is retained, pending more thorough examination of its interaction with the nominate subspecies. The name *Nesoptilotis leucotis depauperata* Mathews, 1912 is available for that smaller, duller inland population.

It would be desirable that future DNA sequencing includes a Flinders Ranges sample, to clarify its subspecific status. Being situated east of the Eyrean Barrier, the Flinders Ranges avifauna include many eastern Bassian elements and its relict population is therefore provisionally aligned with eastern mallee populations, with which it may have been connected through eastern arms of the South Flinders and North Mount Lofty Ranges before European settlement.

The Kangaroo Island population is also part of the eastern phylogroup but is differentiated from mainland forms and is substantially isolated from them, the species being unrepresented in the Mount Lofty Ranges. This review therefore supports continued recognition (*pace* Dolman and Joseph 2015) of the subspecies *N. l. thomasi*.

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## GAZETTEER

Localities mentioned in the text, including those shown on the map (Figure 2).

Baxter Range 32° 20' S, 137° 17' E

Charleston Conservation Park 34° 55' S, 138° 57' E

Cherry Gardens 35° 04' S, 138° 39' E

Coonalpyn 35° 42' S, 139° 51' E

Edeowie Gorge 31° 29' S, 138° 31' E

Gammon Ranges Plateau 30° 28' S, 139° 02' E

Hartley 35° 12' S, 139° 01' E

Maralinga 30° 10' S, 131° 35' E

Mount Ohlssen-Bagge 31° 33' S, 138° 36' E

Orroroo 32° 44' S, 138° 37' E

Oodla Wirra 32° 53' S, 139° 04' E

Patawarta 30° 58' S, 138° 40' E

Spring Dam 32° 46' S, 139° 40' E

Strathalbyn 35° 16' S, 138° 54' E

Waite Hill 33° 01' S, 139° 14' E

Wilpena Pound 31° 33' S, 138° 34' E

Wongan Hills 30° 49' S, 116° 38' E

Woodchester 35° 12' S, 138° 58' E

Yunta 32° 35' S, 139° 34' E

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