Threatened birds on Dirk Hartog Island: preliminary report on September 2014 survey

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Summary

Three threatened bird subspecies are endemic to Dirk Hartog Island: subspecies of the Rufous Fieldwren, Southern Emu-wren and White-winged Fairy-wren (black and white subspecies). The Western (Thick-billed) Grasswren has also been recorded from the island, but is possibly locally extinct.

During a survey in September 2014, we resurveyed birds in 15 of the 34 sampling sites that were established the previous year. Rufous Fieldwrens were found at 15 of the 15 locations, Black and White Fairy-wrens at 7 and Southern Emu-wrens at 5. No grasswrens were located. In addition, two common shrubland inhabiting insectivores, the Variegated Fairy-wren and White-browed Scrubwren, were detected at 9 and 13 sites respectively. These proportions are broadly comparable to those found in the 2013 survey.

Preliminary modelling of vegetation data is planned to occur during the latter half of 2015. Once vegetation data are analysed, we will attempt to model the distribution of the target species across the island and use these models to formulate guidelines for management of the threatened bird taxa on the island.

Preliminary analysis of genetic samples suggests that the Dirk Hartog Island Fieldwren *Calamanthus campestris hartogi* is not taxonomically distinct from mainland populations of the species. While the genetic analysis is not yet complete, results to date suggest that *C. campestris hartogi* is not a valid taxon, and therefore consideration should be given to removing it from the threatened species list.

Introduction

There are three bird subspecies endemic to Dirk Hartog Island: the Dirk Hartog Island Black-and-White Fairy-wren *Malurus leucopterus leucopterus*, Dirk Hartog Island Southern Emu-wren *Stipiturus malachurus hartogi* and Dirk Hartog Island Rufous Fieldwren *Calamanthus campestris hartogi* (Appendix 1). In addition, the Western Grasswren *Amytornis textilis textilis* once also occurred on Dirk Hartog Island.

The current study was initiated to gather base-line data that can be used as the basis for future management action and to monitor the status of these taxa. The first aim was to establish the distribution of the threatened bird species on the island, and to determine their habitat preferences. Combined with genetic assessments that are in progress, one outcome of this will be a review and revision of the conservation status of these taxa. Although Dirk Hartog Island Rufous Fieldwrens are thought to be of a separate subspecies to Rufous Fieldwrens on the nearby mainland, we hypothesised that there would be few if any genetic differences between these populations. The second aim was to develop a monitoring framework that can be used to assess population trends in the threatened birds following the removal of cats and other threats from the island.

Methods

Sampling Sites

In 2013, we selected 34 sites, reasonably evenly spread across the length and breadth of Dirk Hartog Island (Figure 1), for assessments of vegetation (habitat) characteristics. Field work was carried out on Dirk Hartog during the 2nd to 12th October, and on Peron Peninsula on 13 October 2013. In 2014, a subset of these sites was visited and surveyed for the presence of the target species.

Bird survey

Bird surveys in 2014 were carried out in the same way as in 2013 (see earlier report: Burbidge *et al*. 2013).

Genetic Analysis

Several birds were trapped (using mist nets) for the collection of genetic material. Some birds were collected from Dirk Hartog Island, and two from south of the island, to test the current taxonomic opinion that Dirk Hartog birds are separable from mainland birds at the subspecific level. Genetic analysis was carried out in the molecular systematics laboratory at the Western Australian Museum, using 1029 base pairs of the mitochondrial NADH dehydrogenase subunit 2 (*ND2*) gene region, in a procedure similar to that used by Donnellan *et al*. (2009) for analysis of *Stipiturus* (emu-wren) phylogeny. An *ND2* sequence from *C. campestris* from Riddles Heath, ca 20 km ENE of Meningie, South Australia was downloaded from Genbank (Gardner *et al*. 2010). This allowed a comparison at 945 base pairs.

Figure 1. Location of survey sites on Dirk Hartog Island (n=34) and Peron Peninsula (n=3).

Results

Bird Survey

At least one of the four target birds was found at each of the 15 survey sites visited in 2014 (Table 1). As in 2013, no grasswrens were found. The most frequently recorded species was the Rufous Fieldwren, detected at 15 of the 15 sites, followed by the White-browed Scrubwren at 13 sites, Variegated Fairy-wren at 9, White-winged Fairy-wren at 7 and Southern Emu-wren at 5 sites (Tables 1, 2). The species of interest were found at broadly similar levels to those in 2013, although Southern Emu-wrens were recorded less frequently in 2014.

Genetic Analysis

Genetic material was collected from two Southern Emu-wrens and two Rufous Fieldwrens on Dirk Hartog Island. Samples from three Rufous Fieldwrens were collected from nearby and south of the island (at Steep Point and near Leeman). These collections represent three of the currently recognised subspecies of *Calamanthus campestris*.

Divergence between *C. campestris hartogi* and other specimens was shallow (net divergence, Da = 0.032%). Divergence between the specimen from North of Leeman (*C. montanellus*) versus other WA specimens was slightly deeper (net divergence, Da = 0.502%), while divergence between east and west was substantial (Da = 3.27%) (Figure 2).

Quadrat	Thick-billed Grasswren	Southern Emu-wren	White-winged Fairy-wren	Variegated Fairy-wren	Rufous Fieldwren	White-browed Scrubwren
DHI01			1	1	1	1
DHI02				1	1	1
DHI03		1	1	1	1	1
DHI04			**1**		1	1
DHI05			1		1	1
DHI06			1		1	1
DHI07			**1**		1	1
DHI08			1	1	1	1
DHI09			1	1	1	1
DHI10				1	1	1
DHI11		1	1	1	**1**	1
DHI12		1				
DHI13		1			1	1
DHI14		1			**1**	**1**
DHI15				**1**	1	1
DHI16		1			1	1
DHI17				1		1
DHI18		1	**1**		1	1
DHI19			1		1	1
DHI20			**1**	1	1	**1**
DHI21		1	1	**1**	1	1
DHI22			1		1	
DHI23		1			1	
DHI24		1	1	**1**	1	**1**
DHI25		1		1	1	1
DHI26			1	1	1	1
DHI27		1		1	1	1
DHI28			1		**1**	**1**
DHI29				1		1
DHI30		1		1		1
DHI31				1	1	1
DHI32		1	1	1	1	
DHI33			1	**1**	1	1
DHI34			1	1	1	1
Totals 2013	**0**	**14**	**16**	**17**	**27**	**26**
Totals 2013 + 2014	**0**	**14**	**21**	**21**	**30**	**30**

Table 1. Occurrence of selected bird species at 34 survey sites on Dirk Hartog Island, October 2013 and September 2014. All quadrats were sampled in 2013; only those in bold (n=15) were sampled in 2014. Bold entries in the remaining columns denote species recorded in 2014 but not 2013.

	Thick-billed Grasswren	Southern Emu-wren	White-winged Fairy-wren	Variegated Fairy-wren	Rufous Fieldwren	White-browed Scrubwren
No of quadrats where detected in 2013 (n=34)	0	14	16	17	27	26
Proportion	0	0.41	0.47	0.50	0.79	0.76
No of quadrats where detected in 2014 (n=15)	0	5	7	9	15	13
Proportion	0	0.33	0.47	0.60	1.00	0.87

Table 2. Frequency with which selected bird species were encountered at survey sites on Dirk Hartog Island in 2013 and 2014.

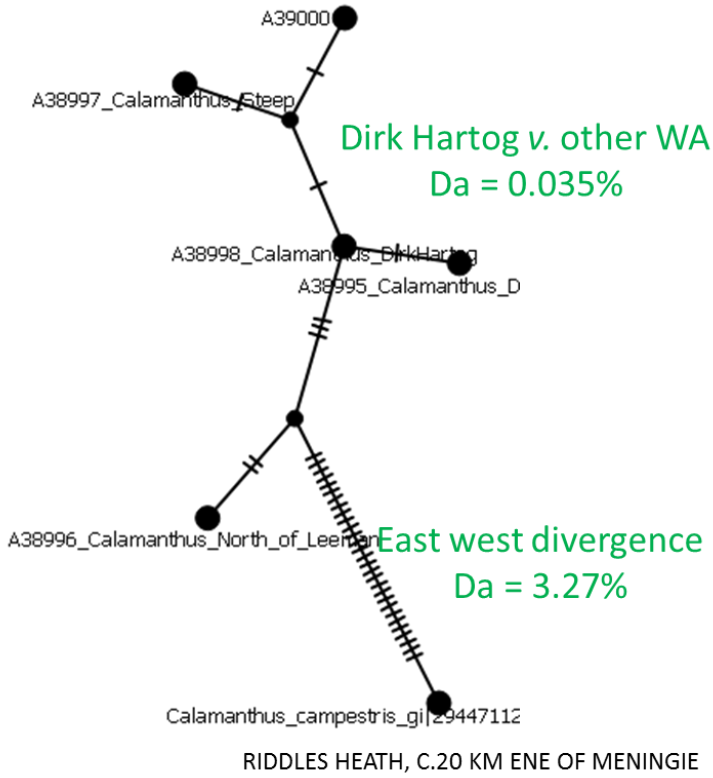

Figure 2. Preliminary network of mitochondrial *ND2* gene region in *Calamanthus* specimens from selected localities in southern Australia.

Discussion

Further analysis is required in order to understand the differences in frequency with which species were recorded in 2013 and 2014. The vegetation appeared to be in better condition in 2014 compared with 2013, as evidenced by field observations during our survey, and by remote sensing (van Dongen *et al*. 2014), and this may be the reason why we recorded Variegated Fairy-wrens, Rufous Fieldwrens and White-browed Scrubwrens more frequently in 2014. Southern Emu-wrens were recorded less frequently in 2014, but further sampling and analysis will be required to determine whether that represents an actual drop in

abundance, a change in detectability due to sampling in different months, or an artefact related to limited sample size.

Our preliminary genetic analysis suggests that the Dirk Hartog Island Fieldwren *Calamanthus campestris hartogi* is not taxonomically distinct from mainland populations of the species. While the genetic analysis is not yet complete, results to date suggest that *C. campestris hartogi* is not a valid taxon, and therefore consideration should be given to removing it from the threatened species list. Further, *C. montanellus* may not be a valid species, and it is likely that specific separation occurs across the Eyrean barrier rather than within south-western WA, in a way parallel to that found in some other bird taxa (Dolman and Joseph 2015).

Further work

In 2015-16, the following will be done:

- census relevant bird taxa on Dirk Hartog Island in August 2015 (see below),
- enter vegetation structural height data into a database,
- using a univariate approach, investigate the habitat preferences of individual bird taxa using vegetation structural height data (obtained in the field), vegetation cover data derived from nadir photography (using Lab2 or Rosin indices), and relevant topographic data from available GIS layers,
- develop a multivariate model of habitat preferences for each bird taxon based on the above data sets,
- develop a spatial interpolation of the model across the island to allow formulation of management guidelines and
- provide a report on the above and liaise with relevant district and regional staff in relation to key outcomes highlighted in the report,
- continue genetic analysis of *Calamanthus* and *Stipiturus* samples by surveying multiple nuclear genes with a view to clarifying the taxonomic and conservation status of each.

During field work in August 2015, we intend to field test distance sampling (Buckland *et al*. 2001) as a monitoring tool, to determine practicality of its use in the Dirk Hartog environment. We will be using the same approach that is used for monitoring the other subspecies of black and white fairy-wren, *M. leucopterus edouardi*, on Barrow Island. This is expected to provide a robust, repeatable measure of density, together with a meaningful comparison with Barrow Island monitoring data.

Acknowledgements

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Appendix 1. Threatened and rare bird taxa known from Dirk Hartog Island. 'Action Plan status' is from Garnett *et al*. (2011).

Common name	Scientific name	Action Plan status	EPBC status	WA status	Range
Dirk Hartog Island Black-and-White Fairy-wren	*Malurus leucopterus leucopterus*	VU	VU	Schedule 1 (VU)	endemic to Dirk Hartog Island
Dirk Hartog Island Southern Emu-wren	*Stipiturus malachurus hartogi*	VU	not listed	Schedule 1 (VU)	endemic to Dirk Hartog Island
Western Grasswren (Shark Bay subspecies)	*Amytornis textilis textilis*	LC	not listed	P4	restricted to Shark Bay area; possibly extinct on Dirk Hartog
Dirk Hartog Island Rufous Fieldwren	*Calamanthus campestris hartogi*	VU	not listed	Schedule 1 (VU)	endemic to Dirk Hartog Island