Ecography

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Supplementary material

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418 **Appendix 1:** Overview of studies used and the climate sensitivity (correlation *r*) of annual
419 reproductive success (ARS) to the Indian Ocean Dipolar Mode Index (DMI) and local rainfall.

Study	Species	Location	Years	$r_{(DMI,ARS)}$	$r_{(rain,ARS)}$
1	*M.cyaneus*	Acton, ACT	1988-2011	-0.60	0.41
2	*M.cyaneus*	Campbell, ACT	1998-2003;2011	-0.71	0.24
3	*M.cyaneus*	Gungahlin, ACT	1956-59	-0.92	0.50
4	*M.cyaneus*	Armidale, NSW	1981-85	-0.51	0.85
5	*M.cyaneus*	Scott Creek, SA	2005-07;2009-10	0.54	0.43
6	*M.cyaneus*	Newland Head CP, SA	2006-07;2009-10	-0.91	0.67
7	*M. coronatus*	Timber Creek, NT	2001-03	0.56	-0.77
8	*M. coronatus*	Mornington, WA	2006-09	0.53	0.51
9	*M. elegans*	Smith Brook, WA	1981-86; 2008-11	-0.42	0.30
10	*M. leucopterus*	Eglinton, WA	1987-1990	-0.81	-0.40
11	*M. melanocephalus*	Atherton (DF), QLD	2004-2010	-0.09	0.81
12	*M. melanocephalus*	Atherton (MM), QLD	2004-2010	-0.06	0.78
13	*M. pulcherrimus*	Dryandra, WA	1991-95; 1997	-0.91	0.79
14	*M. pulcherrimus*	Wyalkatchem, WA	1993-1998	-0.57	0.90
15	*M. splendens*	Brookfield CP, SA	1992-99; 2004-10	-0.44	0.26
16	*M. splendens*	Perth, WA	1973-2010	-0.22	0.40

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Appendix 2: Identification of the critical time period during which rainfall , DMI and ENSO explains most of the variation in annual reproductive success in Malurus populations.

Local rainfall

Difference in model deviance (compared to the best fitting model; gray cell) of models in which rainfall calculated over different time periods (start to end month) explained variation in annual reproductive success in 16 populations of 7 fairy-wrens species. The gray cell indicates the time window (April-December) over which rainfall best explained variation in annual reproductive success within populations. For most populations the peak of the breeding season is in the months October to December.

		End month													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Start month	Jan	28.2	29.4	28.1	27.0	24.5	20.4	18.4	15.9	13.3	9.4	10.9	8.0	9.7	14.9
	Feb		31.4	30.2	29.4	27.6	24.5	22.4	20.3	18.0	14.1	13.5	9.4	10.9	15.9
	Mar			30.2	29.8	27.7	23.9	21.4	18.9	16.2	11.9	9.1	4.4	5.5	12.9
	Apr				30.8	28.3	23.7	20.9	18.1	15.3	10.4	4.9	0.0	2.7	11.4
	May					24.5	19.4	17.3	14.6	13.2	8.0	5.0	1.5	4.8	12.8
	Jun						25.8	22.3	19.7	18.1	12.7	8.9	5.3	7.9	15.1
	Jul							25.8	22.2	19.7	14.3	10.8	8.1	10.8	17.3
	Aug								28.6	24.7	18.6	13.9	11.1	13.7	19.4
	Sep									24.8	17.4	14.5	12.3	15.2	20.6
	Oct										20.9	17.5	14.6	17.6	22.5
	Nov											24.5	19.0	21.7	25.4
	Dec												19.1	24.1	27.4
	Jan													31.0	30.8
	Feb														31.4

DMI

Difference in model deviance (compared to the best fitting model; gray cell) of models in which DMI (Indian Ocean Dipolar Mode Index) calculated over different time periods (start to end month) explained variation in annual reproductive success in 16 populations of 7 fairy-wrens species. The gray cell indicates the time window (March-January) over which DMl best explained variation in annual reproductive success within populations. For most populations the peak of the breeding season is in the months October to December.

		End month													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Start month	Jan	16.1	16.4	16.5	15.8	14.4	12.5	10.0	7.5	5.7	3.7	2.9	2.2	1.0	1.7
	Feb		16.6	15.9	14.5	12.6	10.5	8.0	5.7	4.3	2.7	2.0	1.6	0.5	1.2
	Mar			13.6	12.0	10.2	8.4	6.1	4.2	3.1	1.8	1.4	1.0	0.0	0.7
	Apr				10.5	8.8	7.3	5.2	3.5	2.8	1.6	1.3	1.1	0.1	0.7
	May					7.8	6.6	4.6	3.1	2.7	1.7	1.5	1.3	0.3	1.0
	Jun						5.9	3.8	2.6	2.6	1.8	1.7	1.5	0.5	1.3
	Jul							2.4	1.9	2.5	1.8	1.9	1.8	0.8	1.6
	Aug								2.1	3.3	2.4	2.5	2.5	1.4	2.2
	Sep									4.6	3.0	3.1	3.1	2.0	2.8
	Oct										1.8	2.8	3.0	2.1	2.9
	Nov											4.1	4.1	3.4	4.1
	Dec												4.5	4.5	4.9
	Jan													6.5	6.6
	Feb														7.8

ENSO

Difference in model deviance (compared to the best fitting model; gray cell) of models in which ENSO (El Nino Southern Oscillation) Index calculated over different time periods (start to end month) explained variation in annual reproductive success in 16 populations of 7 fairy-wrens species. The gray cell indicates the time window (May) over which ENSO best explained variation in annual reproductive success within populations. For most populations the peak of the breeding season is in the months October to December. Note that ENSO explained little of the overall variation when accounting for effects of DMI (difference in model deviance was a maximum of 4), see also main text.

		End month													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Start month	Jan	2.4	1.0	1.3	1.8	2.1	1.9	2.3	2.5	2.7	2.8	2.8	2.8	2.8	2.9
	Feb		1.2	1.1	1.8	2.3	2.1	2.5	2.7	2.7	2.8	2.8	2.8	2.9	3.0
	Mar			2.5	2.9	3.0	2.7	2.7	2.5	2.3	2.3	2.4	2.6	2.7	2.9
	Apr				3.3	2.3	2.4	1.9	1.7	1.6	1.7	2.0	2.4	2.5	2.9
	May					0.0	1.6	1.1	1.1	1.2	1.4	1.9	2.3	2.5	2.9
	Jun						2.8	2.4	2.0	1.9	2.0	2.3	2.6	2.8	3.1
	Jul							1.3	1.4	1.5	1.7	2.2	2.6	2.8	3.2
	Aug								2.0	2.0	2.1	2.6	2.9	3.0	3.3
	Sep									2.2	2.3	2.8	3.1	3.2	3.4
	Oct										2.8	3.1	3.3	3.4	3.6
	Nov											3.4	3.5	3.5	3.6
	Dec												3.7	3.6	3.7
	Jan													3.7	3.8
	Feb														4.0