Ecography

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Supplementary material

Appendix 1: Supplementary Methods

Table A1. Metrics quantifying the compositional similarities and configurational differences in mosaic structure between the aggregated and dispersed mosaic types. Test statistics (W) and p-values of the Wilcoxon rank sum tests for significant differences amongst these metrics for the two mosaic types are shown.

Structural component	Mosaic metrics	Mosaic Type				Wilcoxon rank sum test results	
		Aggregated (n=5)		Dispersed (n=5)			
		mean	SE	mean	SE	W	p-value
Composition	Area of eucalypt cover (ha)	23.38	4.18	21.04	2.95	14	0.841
	Area of pine cover (ha)	75.28	3.65	77.46	2.96	10	0.691
Configuration	Number of patches	6.40	0.98	12.6	2.01	2	0.033
	Mean Patch Size (ha)	16.90	2.05	8.90	1.55	23	0.033
	Edge Density	107.93	9.04	172.02	12.42	1	0.016
	AWMPFD*	1.28	0.01	1.32	0.01	0	0.008

*AWMPFD – Area Weighted Mean Patch Fractal Dimension – is a measure of patch shape complexity irrespective of patch size. Higher values have more complex patch perimeters (Rempel et al. 2012).

Figure A1. Images of a typical eucalypt forest transect (top) and a typical pine forest transect (image source: Wendy Neilan 2014).

Appendix 2: Supplementary Results

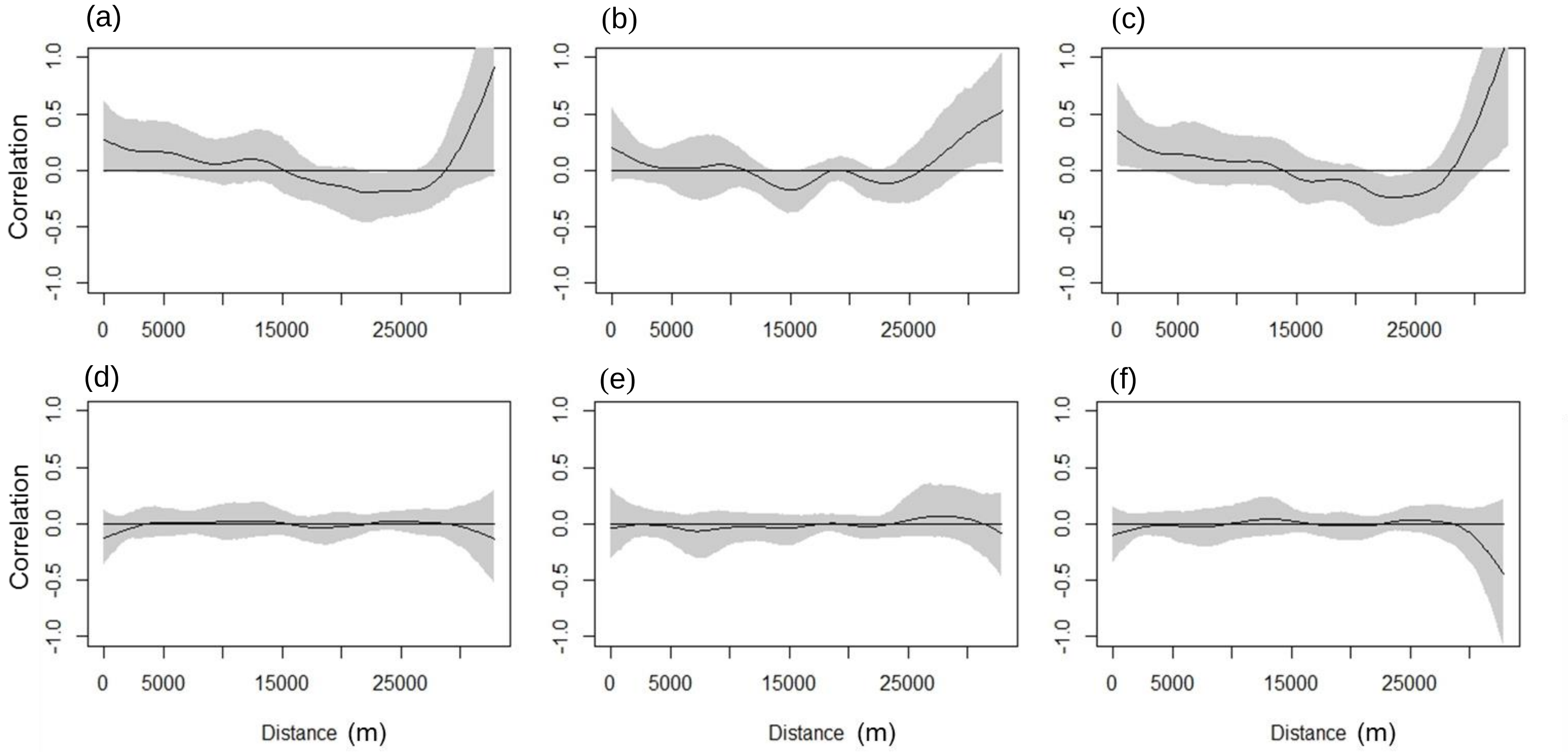

Figure A2. Spline correlograms of the raw data (a-c) and of the residuals (d-f) from the mixed effects models of the effect of mosaic type on (a & d) within-transect species richness, (b & e) within-transect evenness and (c & f) within-transect species diversity (D^1).In each figure the correlation on the y-axis refers to Moran's Index. Upper and lower lines show the 95% confidence intervals around the mean centre line. Data displays significant spatial autocorrelation where the upper and lower 95% confidence limits cross the zero mid-line.

Table A2. List of bird species recorded during 2014 field surveys. Taxonomy follows Christidis and Boles (2008).

Order	Family	Scientific name	Common name	Four-letter species code used in surveys	Response to landscape alteration states[1]
Columbiformes	Columbidae	*Leucosarcia picata*	Wonga Pigeon	wopi	S
Accipitriformes	Accipitridae	*Halistur sphenurus*	Whistling Kite	whki	n/a
Psittaciformes	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black Cockatoo	ytbc	n/a
	Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	ggco	S
	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	scco	I
	Psittacidae	*Alisterus scapularis*	Australian King-Parrot	akpa	n/a
	Psittacidae	*Platycercus elegans*	Crimson Rosella	crro	G
Cuculiformes	Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	sbcu	I
	Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	ftcu	G
	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	brcu	P
Coraciiformes	Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	lako	I
	Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher	saki	S
Passeriformes	Menuridae	*Menura novaehollandiae*	Superb Lyrebird	suly	G
	Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	wttr	I
	Climacteridae	*Climacteris erythrops*	Red-browed Treecreeper	rbtr	S
	Climacteridae	*Climacteris picumnus*	Brown Treecreeper	brtr	n/a
	Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	sabo	S
	Maluridae	*Malurus cyaneus*	Superb Fairy-Wren	sufw	I
	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	wbsw	n/a
	Acanthizidae	*Smicrornis brevirostris*	Weebill	weeb	n/a
	Acanthizidae	*Gerygone albogularis*	White-throated Gerygone	wtge	S
	Acanthizidae	*Acanthiza lineata*	Striated Thornbill	stth	S
	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	yeth	n/a
	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	brth	G

Order	Family	Scientific name	Common name	Four-letter species code used in surveys	Response to landscape alteration states[1]
	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	sppa	S
	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	stpa	S
	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	easp	I
	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	yfho	I
	Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater	weho	I
	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	rewb	S
	Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	wnho	S
	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	nofr	S
	Eupetidae	*Psophodes olivaceus*	Eastern Whipbird	eawh	P
	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	vasi	n/a
	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-Shrike	bfcs	I
	Campephagidae	*Coracina tenuirostris*	Cicada Bird	cibi	S
	Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	gowh	G
	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	ruwh	G
	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-Thrush	grst	G
	Orioloidae	*Oriolus sagittatus*	Olive-backed Oriole	obor	S
	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	duwo	I
	Artamidae	*Cracticus torquatus*	Grey Butcherbird	grbu	G
	Artamidae	*Cracticus tibicen*	Australian Magpie	auma	I
	Artamidae	*Strepera graculina*	Pied Currawong	picu	G
	Artamidae	*Strepera versicolor*	Grey Currawong	grcu	S
	Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	rufa	S
	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	grfa	I
	Corvidae	*Corvus coronoides*	Australian Raven	aura	G

Order	Family	Scientific name	Common name	Four-letter species code used in surveys	Response to landscape alteration states[1]
	Monarchidae	*Myiagra rubecula*	Leaden Flycatcher	lefl	I
	Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher	safl	S
	Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	wwch	G
	Petroicidae	*Petroica boodang*	Scarlet Robin	scro	G
	Petroicidae	*Petroica goodenovii*	Red-capped Robin	rcro	n/a
	Petroicidae	*Petroica phoenicea*	Flame Robin	flro	P
	Petroicidae	*Petroica rosea*	Rose Robin	roro	G
	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	eyro	P
	Timaliidae	*Zosterops lateralis*	Silvereye	silv	G
	Turdidae	*Zoothera lunulata*	Bassian Thrush	bath	I
	Turdidae	*Turdus merula*	Common Blackbird#	eubl	n/a
	Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	mist	n/a
	Estrilidae	*Neochmia temporalis*	Red-browed finch	rbfi	n/a
	Fringillidae	*Chloris chloris*	Common Greenfinch#	grfi	n/a

1. Response categories to landscape alteration states sourced from Lindenmayer et al. (2003): S – sensitive, I – intermediate, G – generalist, P- pine increaser, n/a – code unavailable
2. # indicates a non-native species

Table A3. Results of PERMANOVA of differences in assemblage composition among four mosaic types (eucalypt (euc), aggregated (agg), dispersed (disp) and pine) using 999 permutations. Data analysed were Modified $Gower_{10}$ dissimilarity in bird assemblages among transects (n=80.)

	Degrees of freedom	Sums of Squares	Mean SS	Pseudo-F	P (perm)
Mosaic type	3	6.4566	2.1522	6.4228	0.001
Residuals	76	25.467	0.33509		
Total	79	31.924			

Table A4. Pairwise statistical comparisons (PERMANOVA) among eucalypt (euc), aggregated (agg), dispersed (disp) and pine mosaic types of the dissimilarity in assemblage composition on transects. Permutational Multivariate Analysis of Variance (PERMANOVA) (pseudo-$F_{(3, 76)}$ = 6.4497, p=0.001) of the Modified $Gower_{10}$ dissimilarity among transects (n=20) within mosaic type used 999 permutations. Mosaic replicate was included in analysis as a strata variable.

Mosaic type pairwise comparison	t	P (perm.)	Number of unique permutations
agg - euc	2.41	0.001	999
agg - pine	2.0372	0.001	996
agg - disp	0.98312	0.445	999
euc-pine	3.9081	0.001	999
euc-disp	2.9963	0.001	998
pine-disp	2.0772	0.001	997

Table A5. Results of PERMANOVA of dissimilarity in mosaic-level bird composition among eucalypt (euc), aggregated (agg), dispersed (disp) and pine mosaic types using 999 permutations.

	Degrees of freedom	Sums of Squares	Mean SS	F.model	R^2	Pr (>F)
Mosaic type	3	2.8925	0.96417	3.5901	0.40232	0.001
Residuals	16	4.2970	0.26856		0.59768	
Total	19	7.1895			1.0000	

Table A6. Pairwise statistical comparisons (PERMANOVA) among eucalypt (euc), aggregated (agg), dispersed (disp) and pine mosaic types of the dissimilarity in mosaic-level assemblage composition. Permutational Multivariate Analysis of Variance (PERMANOVA) of the Modified $Gower_{10}$ dissimilarity among mosaics (n=5) within mosaic type. Analysis was conducted in the vegan package (Oksanen et al. 2015) in R (R Core Team 2016) using the pairwise.adonis function (Arbizu 2017).

Mosaic type pairwise comparison	F. model	R^2	p-value	Bonferroni adjusted p-value
euc vs agg	2.5366556	0.24074580	0.012	0.072
euc vs disp	4.1546702	0.34181678	0.005	0.030
euc vs pine	6.9999578	0.46666517	0.005	0.030
agg vs disp	0.8654701	0.09762258	0.600	1.000
agg vs pine	3.6243787	0.31179118	0.010	0.060
disp vs pine	3.0157331	0.27376599	0.007	0.042

Figure A3. Mantel correlograms for a) all mosaics, (n=80 transects); b) eucalypt mosaics, (n= 20 transects); c) aggregated mosaics, (n= 20 transects); d) dispersed mosaics, (n= 20 transects); e) pine mosaics, (n= 20 transects), of the correlation between the variation in bird community composition among transects as measured by Modified Gower_{10} dissimilarity measure and the geographic distance among transect pairs. Significant mantel correlations are shown with filled symbols (p<0.05, uncorrected).

Note that the first lag distance of the partial mantel tests was set for transect pairs within 1 km distance of each other (Fig A3). As mosaics were approx. 1130 m in diameter transects less than 1 km apart occurred within the same mosaic. Therefore, values for the first lag distance incorporated beta_1 diversity where the grain was an individual transect and the extent was the mosaic.

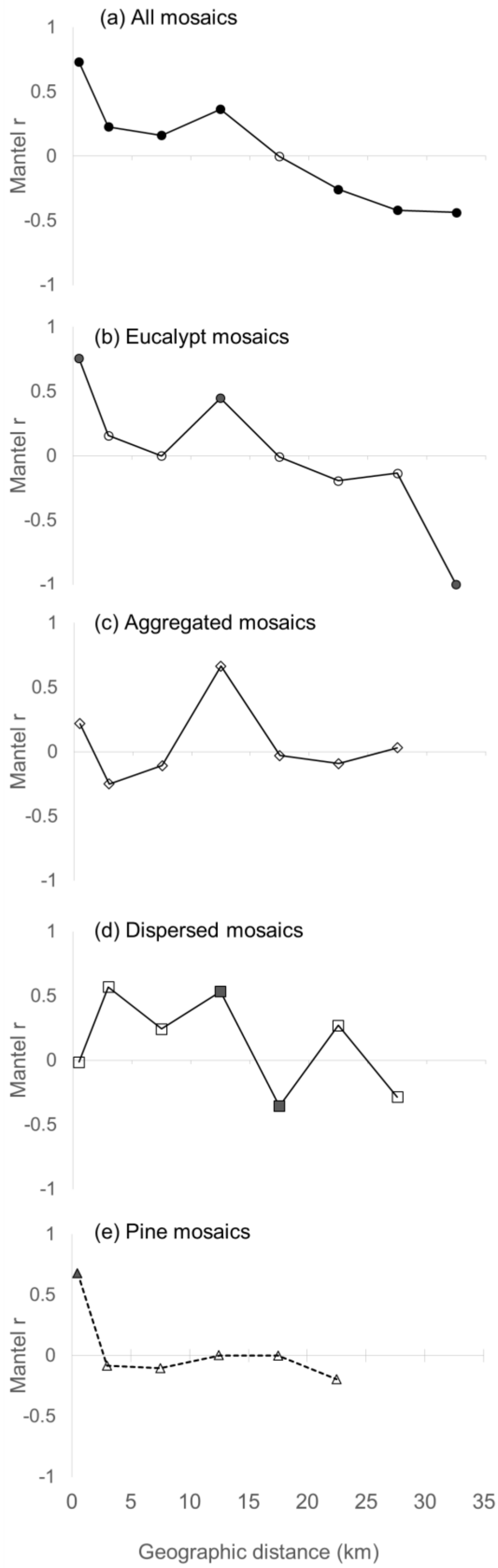

Table A7. Results of partial mantel tests for each mosaic type of the correlation between the variation in bird community composition among transects as measured by Modified Gower$_{10}$ dissimilarity measure and the geographic distance among transect pairs. Analyses were conducted using the ecodist package (Goslee and Urban 2007) in R (R Core Team 2016).

				Mosaic Type												
	All mosaics			Eucalypt			Aggregated			Dispersed			Pine			
Mean of the lag distance class (m)	number of transect pairs	r	p-value	number of transect pairs	r	p-value	number of transect pairs	r	p-value	number of transect pairs	r	p-value	number of transect pairs	r	p-value
500	138	0.732	0.0001	30	0.757	0.0002	30	0.218	0.1873	30	-0.013	0.9384	31	0.677	0.0002
3000	446	0.229	0.0001	16	0.158	0.6084	16	-0.249	0.306	8	0.570	0.1223	63	-0.082	0.4408
7500	367	0.163	0.01430	0	0	n/a	32	-0.107	0.5202	40	0.244	0.0931	32	-0.103	0.5395
12500	229	0.365	0.0001	41	0.446	0.0054	8	0.666	0.0612	16	0.535	0.0311	0	0	n/a
17500	816	-0.001	0.9807	39	-0.007	0.9685	57	-0.030	0.7915	64	-0.357	0.0011	0	0	n/a
22500	887	-0.257	0.0001	16	-0.192	0.5112	34	-0.092	0.5676	17	0.272	0.2735	64	-0.196	0.061
27500	205	-0.420	0.0001	9	-0.134	0.722	13	0.031	0.9071	15	-0.284	0.2784	0	0	n/a
32500	72	-0.437	0.0026	39	-0.999	0.0001	0	0	n/a	0	0	n/a	0	0	n/a

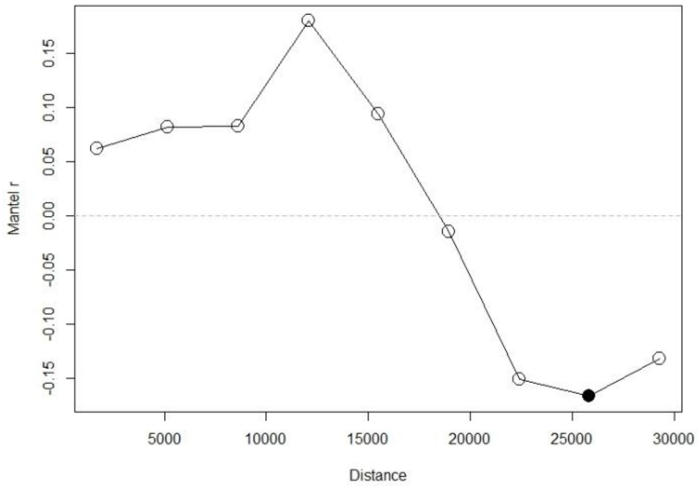

Figure A4. Mantel correlogram of among-mosaic dissimilarities in bird assemblage composition and geographic distance (in metres) among mosaic pairs. Unfilled circles show non-significant (p >0.05 uncorrected) correlations. The analyses were based on a grain size corresponding to the individual mosaic (n=20) and the extent was the entire study area.

Table A8. Results of a mantel test of the correlation between mosaic-level dissimilarities in bird assemblage composition and geographic distance (in metres) among mosaic pairs (p-values shown are uncorrected)

Mean of lag distance class (m)	Number of mosaic pairs	Mantel r	P value	Lower limit	Upper limit
1721.460	20	0.06168806	0.38633863	-0.009815001	0.14470744
5164.381	17	0.08162617	0.26272627	0.025563286	0.14418803
8607.302	15	0.08214320	0.36963696	-0.049189300	0.17354866
12050.223	10	0.17946457	0.05520552	0.105097672	0.25746336
15493.144	29	0.09324677	0.26842684	0.001695467	0.18171924
18936.065	35	-0.01467861	0.84728473	-0.066143620	0.05887103
22378.986	41	-0.15109170	0.07270727	-0.250150775	-0.06912970
25821.907	13	-0.16662821	0.03100310	-0.227068839	-0.05182719
29264.828	8	-0.13153832	0.12341234	-0.186495914	-0.06440265

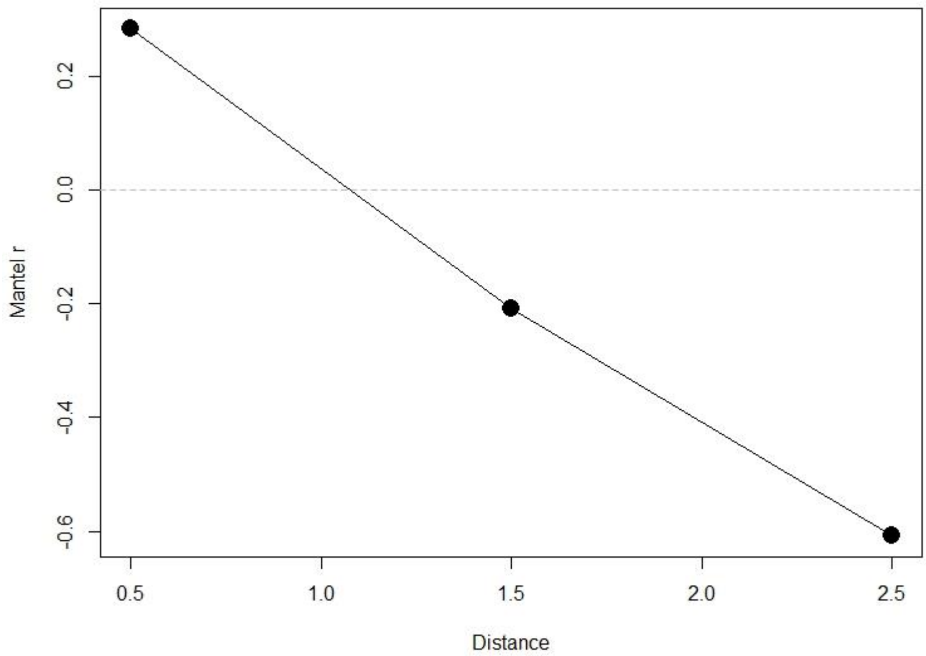

Fig A5. Mantel correlogram of the correlation between mosaic-level dissimilarities in bird assemblage composition and mosaic type. Unfilled circles show non-significant (p >0.05 uncorrected) correlations. The distance matrix for mosaic type was constructed by coding eucalypt mosaics as 1; aggregated mosaics as 2; dispersed mosaics as 3 and pine mosaics as 4 and then calculating the Euclidean distance among mosaic pairs.

Table A9. Results of a Mantel test of the correlation between mosaic-level dissimilarities in bird assemblage composition and mosaic type. (p-values shown are uncorrected)

Lag	ngroup	mantel	pval	llim	ulim
0.5	75	0.2835678	0.00140014	0.2446652	0.3172781
1.5	50	-0.2094469	0.00080008	-0.2967246	-0.1204967
2.5	25	-0.6088532	0.00010001	-0.6695812	-0.5373407

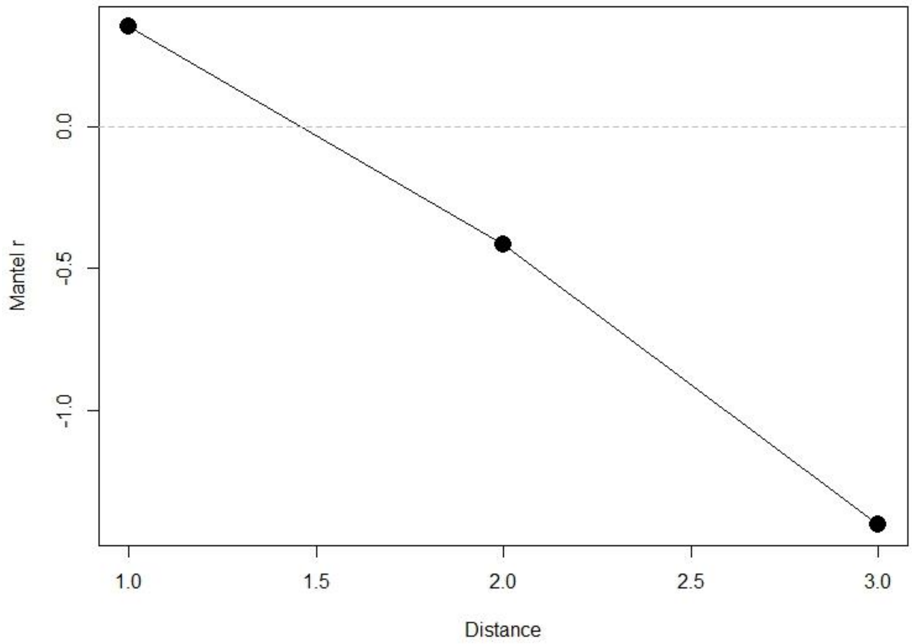

Fig A6. Mantel correlogram of the correlation between mosaic-level dissimilarities in bird assemblage composition and mosaic type after accounting for the geographic distance between pairs of mosaics. Unfilled circles show non-significant (p >0.05 uncorrected) correlations. The distance matrix for mosaic type was constructed by coding eucalypt mosaics as 1; aggregated mosaics as 2; dispersed mosaics as 3 and pine mosaics as 4 and then calculating the Euclidean distance among mosaic pairs.

Table A10. Results of a partial mantel test of the correlation between mosaic-level dissimilarities in bird assemblage composition and mosaic type after accounting for geographic distance among mosaic pairs. (p-values shown are uncorrected)

Lag	N group	Piece r	P val
1	75	0.3549547	0.00200020
2	50	-0.4147704	0.00020002
3	25	-1.4072562	0.00010001

References for supplementary materials

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