Ecography

ECOG-03654

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Appendix 1

Table A1. Regression models relating dimensionality of biodiversity to latitude and area of latitudinal bands at multiple spatial scales.

Figure A1. Latitudinal gradients in dimensionality of biodiversity using partial regression plots.

Figure A2. Latitudinal gradients in dimensionality of biodiversity using mean absolute correlation among biodiversity measures.

Figure A3. Latitudinal gradients in dimensionality of biodiversity at multiple spatial scales using results from the Fixed Sites & Equiprobable Species null model.

Figure A4. Latitudinal gradients in dimensionality of biodiversity at multiple spatial scales using results from the Range Identity Randomization null model.

Figure A5. Relationship between environmental dimensionality and latitude at multiple spatial scales.

Table S1. Regression models relating dimensionality of biodiversity to latitude and area of latitudinal bands at multiple spatial scales. Dimensionality was measured by Camargo's evenness index calculated on the distribution of eigenvalues produced by a principal components analysis (PCA). The PCA was based on a PPM correlation matrix. Regressions were fitted for empirical dimensionality values, as well as for the mean null values and standardized effect sizes (SES) produced by two null models: the fixed sites & equiprobable species null model (FiSi & EqSp) and the range identity randomization null model (Range ID Rand.). At the smallest scale, latitudinal bands contain two rows (200 km wide). At the largest, they contain 12 rows of cells (1200 km wide). Significant coefficients are shown in bold italics.

Value	Null model	Scale (rows)	$_{Adj.}R^2$	Intercept		Latitude		Area (N of cells)	
				Coeff.	p	Coeff.	p	Coeff.	p
Empirical		2	0.455	0.362	<0.001	***–0.004***	***<0.001***	0.000	0.194
		3	0.463	0.372	<0.001	***–0.004***	***<0.001***	0.000	0.204
		4	0.515	0.372	<0.001	***–0.004***	***<0.001***	0.000	0.351
		6	0.317	0.327	<0.001	–0.003	0.075	0.000	0.957
		7	0.540	0.424	<0.001	***–0.004***	***0.005***	0.000	0.082
		12	0.429	0.270	0.008	–0.001	0.374	0.000	0.384
Mean null	FiSi & EqSp	2	0.595	0.402	<0.001	***–0.002***	***<0.001***	0.000	0.518
		3	0.562	0.415	<0.001	***–0.002***	***<0.001***	0.000	0.221
		4	0.529	0.413	<0.001	***–0.002***	***0.001***	0.000	0.382
		6	0.321	0.398	<0.001	–0.001	0.053	0.000	0.828
		7	0.595	0.425	<0.001	***–0.002***	***0.003***	0.000	0.098
		12	0.412	0.382	<0.001	–0.001	0.192	0.000	0.791

	Range ID Rand.	2	0.245	0.282	<0.001	***–0.001***	***0.004***	0.000	0.708
		3	0.324	0.295	<0.001	***–0.001***	***0.003***	0.000	0.453
		4	0.324	0.287	<0.001	***–0.001***	***0.027***	0.000	0.986
		6	0.183	0.277	<0.001	–0.001	0.277	0.000	0.603
		7	0.586	0.313	<0.001	***–0.001***	***0.004***	0.000	0.170
		12	0.542	0.265	<0.001	0.000	0.672	0.000	0.144
SES	FiSi & EqSp	2	0.320	2.209	0.211	***–0.172***	***<0.001***	***-0.091***	***<0.001***
		3	0.333	2.425	0.318	***–0.205***	***0.002***	***-0.070***	***0.001***
		4	0.336	2.217	0.453	***–0.235***	***0.004***	***-0.053***	***0.007***
		6	0.052	-1.745	0.706	–0.179	0.131	-0.024	0.213
		7	0.316	4.209	0.416	***–0.296***	***0.036***	***-0.041***	***0.036***
		12	-0.383	-8.965	0.360	–0.107	0.635	-0.003	0.880
	Range ID Rand.	2	0.374	2.143	0.002	***–0.072***	***<0.001***	-0.011	0.179
		3	0.357	2.195	0.013	***–0.073***	***0.001***	-0.008	0.232
		4	0.454	2.425	0.013	***–0.082***	***0.001***	-0.007	0.208
		6	0.258	1.511	0.260	–0.061	0.075	-0.001	0.821
		7	0.335	3.661	0.038	***–0.099***	***0.024***	-0.008	0.141
		12	0.064	0.447	0.841	–0.045	0.416	0.001	0.803

Figure A1. Latitudinal gradients in dimensionality of biodiversity using *partial regression plots*, where relationships between dimensionality and latitude consider the effects of area of latitudinal bands. (A) Empirical dimensionality (Camargo's evenness) decreases from the Equator towards temperate regions (Table 1). The remainder of the top row presents results using the fixed sites & equiprobable species null model. The second row presents results using the range identity randomization null model. (B and E). The dimensionality expected by both null models also decreases significantly with latitude. (C and F) The latitudinal gradient remains when deviations of empirical from expected values are calculated (standardized effect sizes; Table 1, Fig. 3). (D and G) Finally, the regression coefficient of latitude is more negative than expected by the 1000 repetitions of either null model (gray areas contain the 95% most common values of null coefficients). In these analyses, latitudinal bands are formed by two rows of 100 × 100 km cells. Analyses using other spatial scales lead to similar conclusions (Supplementary material Appendix 1 Table A1, Fig. A3–A4).

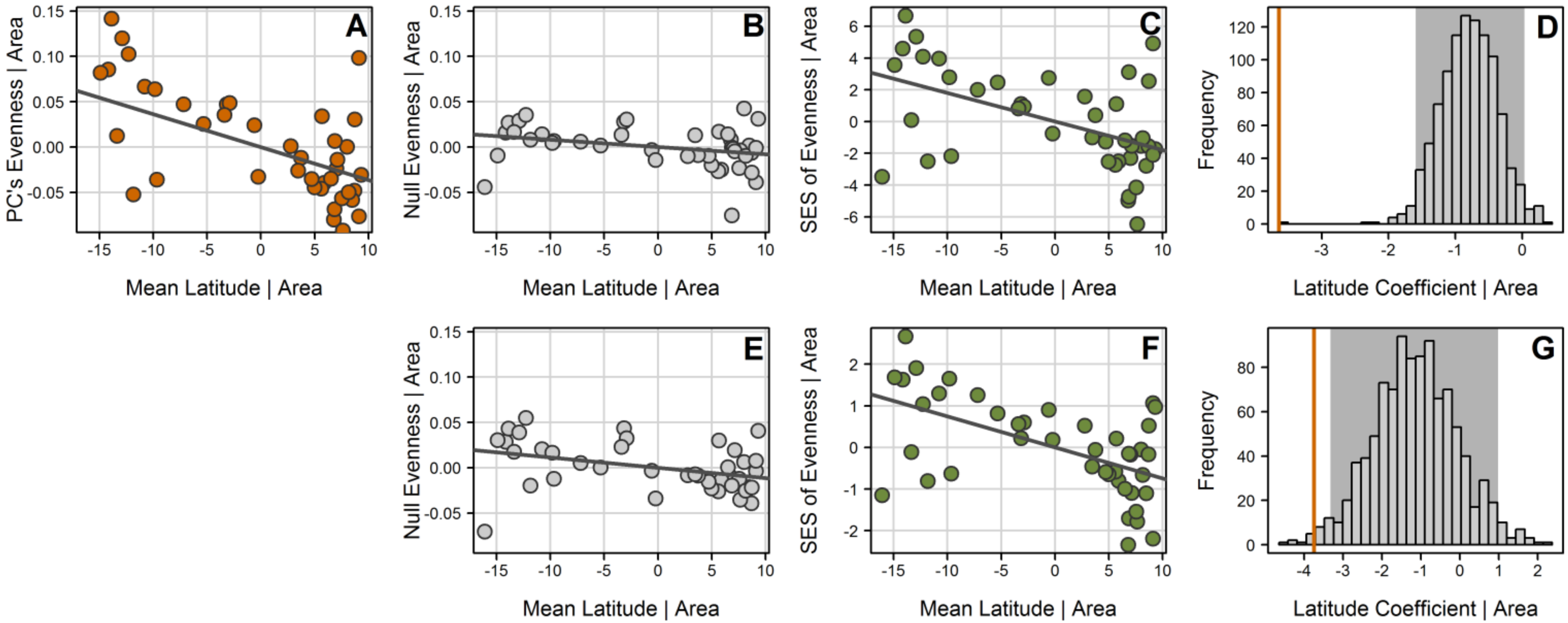

Figure A2. Latitudinal gradients in dimensionality of biodiversity using mean absolute correlation among biodiversity measures to quantify dimensionality. (A) Empirical correlations increase from the Equator towards temperate regions. The rest of the top row presents results using the fixed sites & equiprobable species null model. The second row presents results using the range identity randomization null model. (B and E) The correlations expected by both null models also increase significantly with latitude. (C and F) The latitudinal gradient remains when deviations of empirical from expected values are calculated (standardized effect sizes: SES). Note that these scatterplots show univariate relationships between dimensionality and latitude. (D and G) Finally, the regression coefficient of latitude (while controlling for area effects) is larger than expected by the 1000 repetitions of the fixed sites & equiprobable species null model, but only marginally different from the expectations of the range identity randomization null model (gray areas contain the 95% most common values of null coefficients). Analyses are based on latitudinal bands formed by two rows of 100 × 100 km cells.

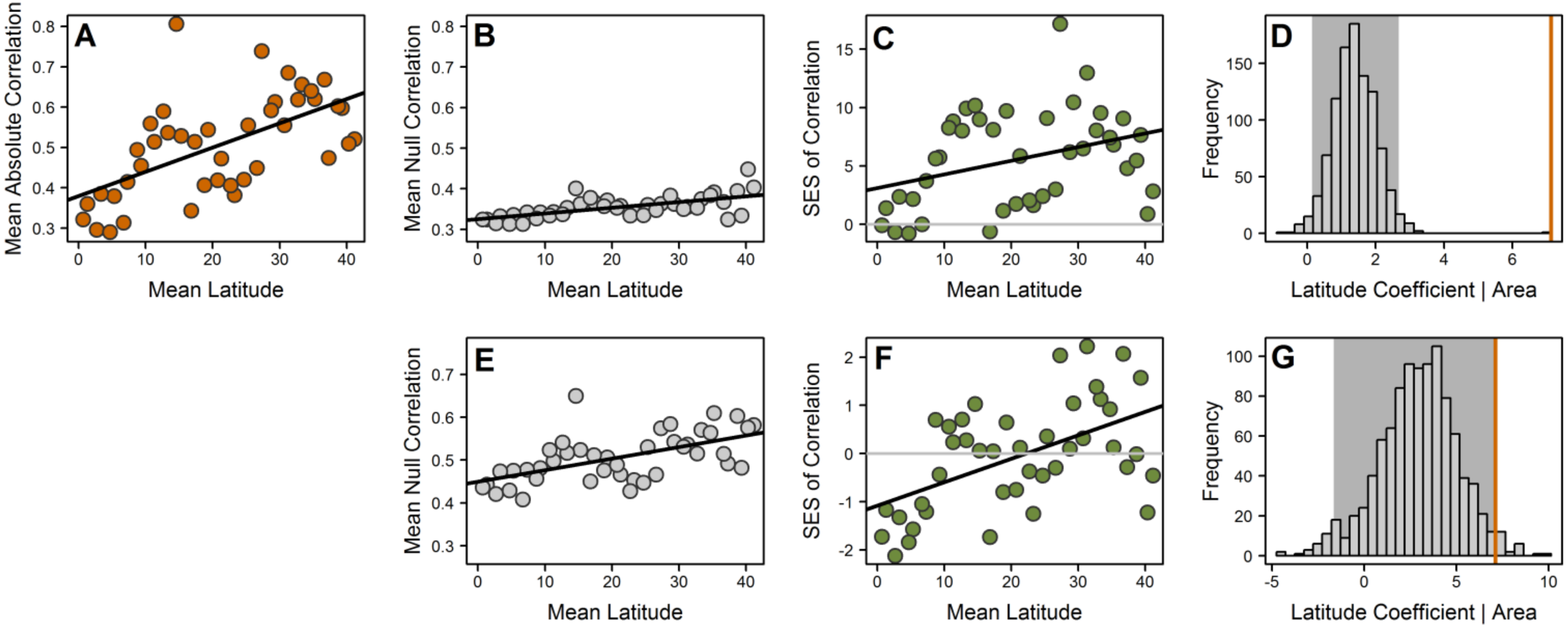

Figure A3. Latitudinal gradients in dimensionality of biodiversity at multiple spatial scales using results from the fixed sites & equiprobable species null model. Latitudinal bands were created by grouping rows of 100 × 100 km cells. At the smallest scale, latitudinal bands contain two rows (200 km wide). At the largest, they contain 12 rows of cells (1200 km wide). First column. Empirical dimensionality (Camargo's evenness) decreases from the Equator towards temperate regions (see also Table A1). Second column. The dimensionality expected by the null model also decreases with latitude. Third column. The latitudinal gradient remains when deviations of empirical from expected values are calculated (standardized effect sizes). Note that these scatterplots show univariate relationships between dimensionality and latitude, while our regression models also accounted for the potential effect of area of latitudinal bands (Table A1). Last column. Regression coefficients of latitude (while controlling for area effects) are more negative than expected by the 1000 repetitions of the null model (gray areas contain the 95% most common values of null coefficients). In these analyses, dimensionality is measured as Camargo's evenness calculated on the distribution of multivariate variation in biodiversity measured across principal components.

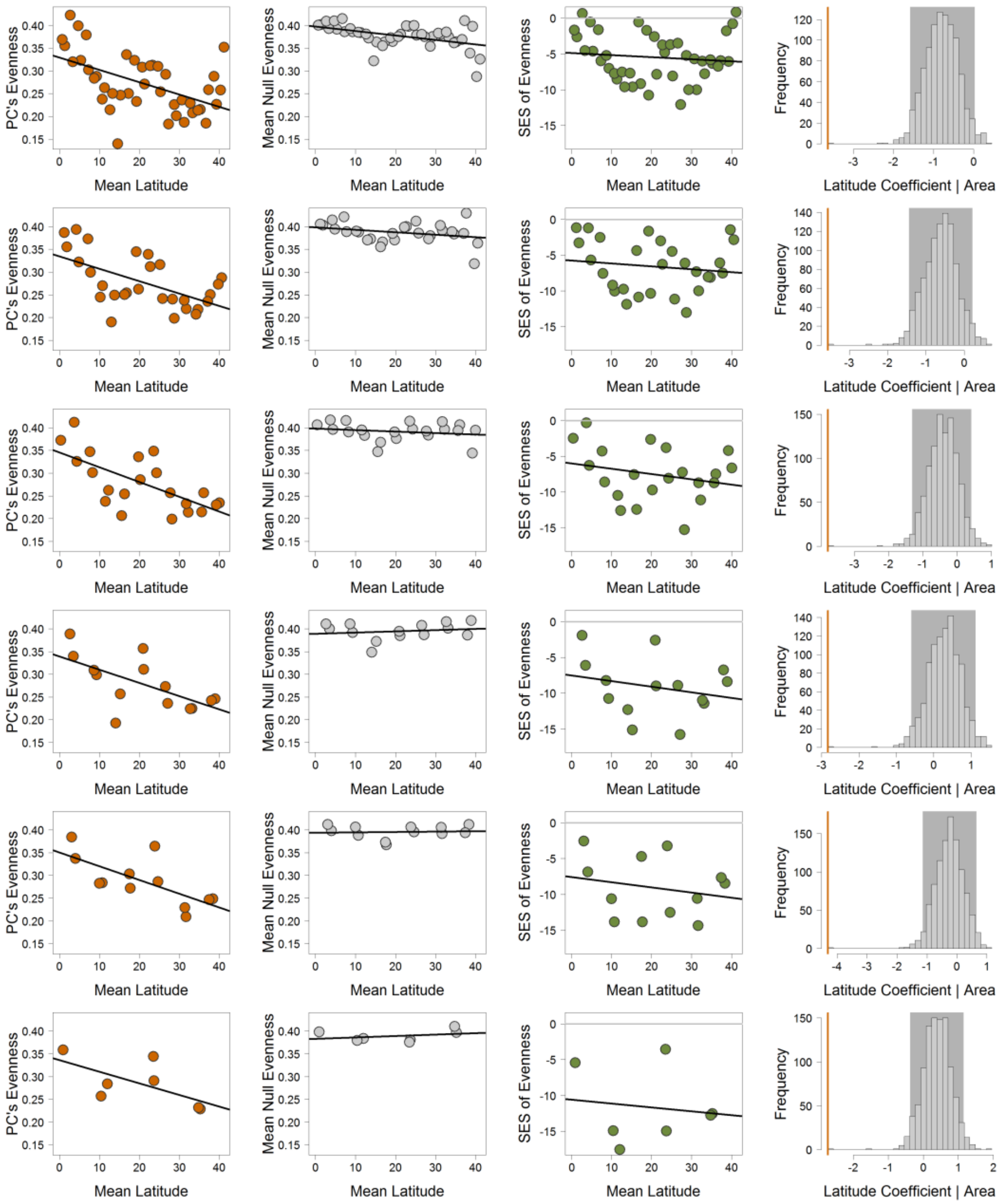

Figure A4. Latitudinal gradients in dimensionality of biodiversity at multiple spatial scales using results from the range identity randomization null model. Latitudinal bands were created by grouping rows of 100 × 100 km cells. At the smallest scale, latitudinal bands contain two rows (200 km wide). At the largest, they contain 12 rows of cells (1200 km wide). First column. Empirical dimensionality (Camargo’s evenness) decreases from the Equator towards temperate regions (see also Table A1). Second column. The dimensionality expected by the null model also decreases with latitude. Third column. The latitudinal gradient remains when deviations of empirical from expected values are calculated (standardized effect sizes). Note that these scatterplots show univariate relationships between dimensionality and latitude, while our regression models also accounted for the potential effect of area of latitudinal bands (Table A1). Last column. Regression coefficients of latitude (while controlling for area effects) are usually more negative than expected by the 1000 repetitions of the null model (gray areas contain the 95% most common values of null coefficients). In these analyses, dimensionality is measured as Camargo’s evenness calculated on the distribution of multivariate biodiversity variation across principal components.

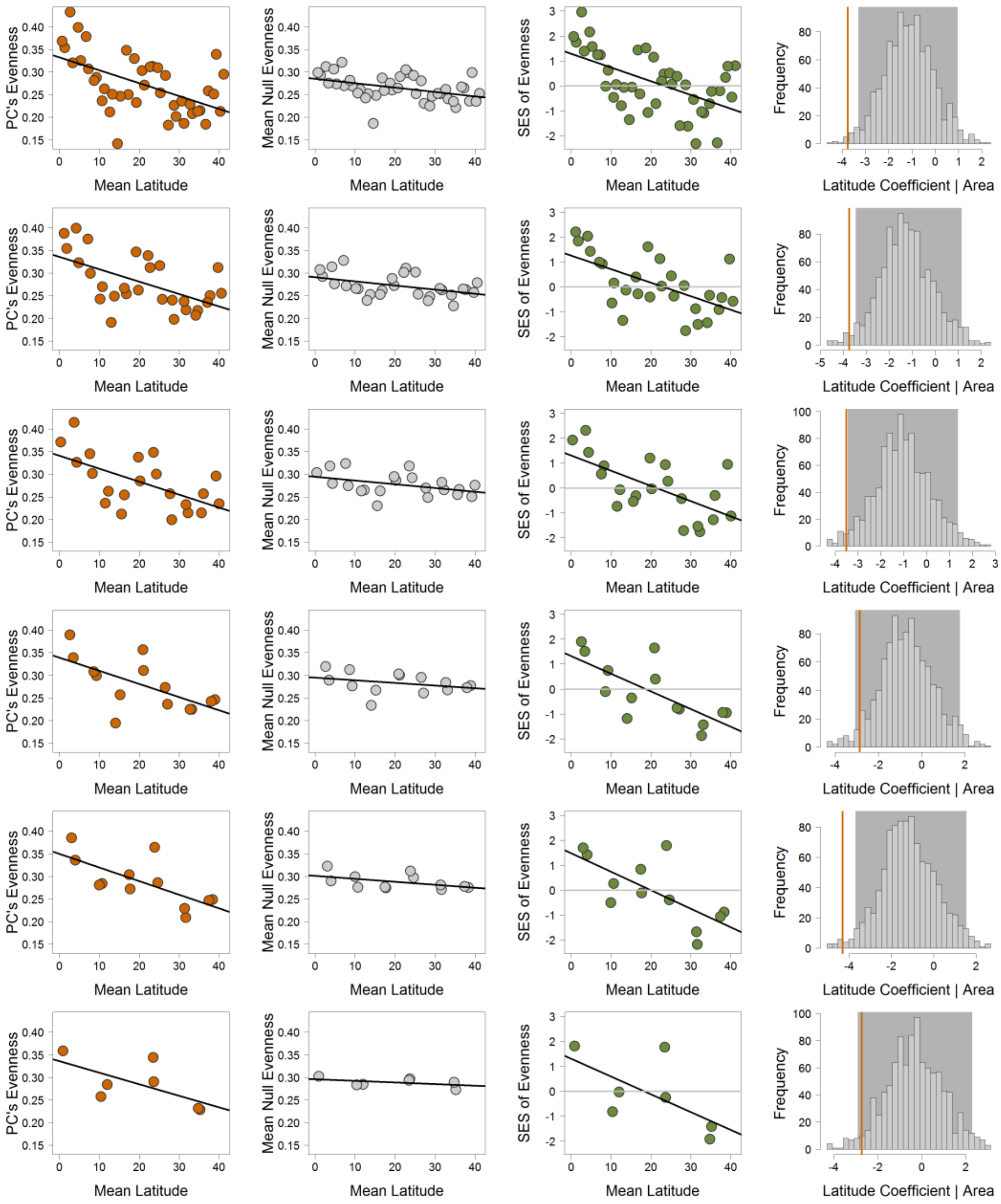

Figure A5. Relationship between environmental dimensionality and latitude at multiple spatial scales. Environmental dimensionality was quantified by Camargo's evenness calculated on the eigenvalues of a PCA. The PCA was based on a correlation matrix between nine variables representing environmental energy, heterogeneity and seasonality (see Tello and Stevens 2010 for details). Environmental dimensionality was calculated for multiple latitudinal bands, and regressed against mean latitude and number of cells per band. Analyses were repeated for multiple spatial scales. Scale was defined by the width of latitudinal bands, which were created by grouping rows of 100 × 100 km cells. At the smallest scale, latitudinal bands contain two rows (200 km wide). At the largest, they contain 12 rows of cells (1200 km wide). At all scales, environmental dimensionality was not related to latitude ($p > 0.07$). Moreover, adding environmental dimensionality to the regression models describing latitudinal gradients in biodiversity dimensionality (Tables 1, A1) did not improve the models, nor produced significant regression coefficients for environmental dimensionality ($p > 0.140$) .