

Supplementary Material

Erosion of phylogenetic diversity in Neotropical bat assemblages: findings from a whole-ecosystem fragmentation experiment

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This supplementary material contains:

Table S1. Random effects and residuals of the candidate models assessing the effect of Interior–Edge–Matrix gradient and fragment size on phylogenetic richness and structure.

Table S2. Parameter estimates of the best-fit candidate models ($\Delta_i < 2$) explaining the effects of Interior–Edge–Matrix gradient of continuous forest and different-sized fragments on phylogenetic richness and divergence.

Table S3. Multiple pairwise comparisons of linear models testing for differences in phylogenetic richness across the Interior–Edge–Matrix gradient of continuous forest and different-sized fragments.

Table S4. Mantel tests between beta diversity metrics and geographic distance.

Fig. S1 Phylogenetic relationship of phyllostomid bats and their occurrence in continuous forest and 100 ha, 10 ha and 1 ha fragments across a gradient of interior, edge, and matrix sites.

Table S1. Random effects and residuals of the candidate models assessing the effect of IEM gradient (Gradient) and fragment size (Size) on phylogenetic richness (PD and SES_{PD}) and structure (MPD and SES_{MPD}) fitted with linear mixed effects models incorporating sampling locations as random effects.

Response variable	Model	Random Effects		Residual		Deviance
		Variance	Std. Dev	Variance	Std. Dev	
PD	(1 Location)	959.8	30.98	7023.5	83.81	459.8
	Gradient + (1 Location)	6.23·10⁻¹²	2.50·10⁻⁶	4735.00	68.81	440.7
	Size + (1 Location)	4.01·10⁻¹²	2·10⁻⁶	4758.00	68.98	440.9
	Gradient + Size + (1 Location)	50.81	7.13	2309.46	48.06	413.5
	Gradient * Size + (1 Location)	194.80	13.96	1468.60	38.32	398.7
SES_{PD}	(1 Location)	0.01	0.11	0.97	0.98	109.9
	Gradient + (1 Location)	0.01	0.09	0.78	0.89	101.6
	Size + (1 Location)	4.51·10⁻¹⁹	2.13·10⁻⁸	0.91	0.95	107.0
	Gradient + Size + (1 Location)	2.40·10⁻¹⁶	1.55·10⁻⁸	0.72	0.85	98.0
	Gradient * Size + (1 Location)	0.01	0.12	0.59	0.77	91.1
MPD	(1 Location)	0.06	0.25	6.16	2.50	182.0
	Gradient + (1 Location)	5.86·10⁻¹⁸	2.42·10⁻⁹	5.41	2.33	176.5
	Size + (1 Location)	0	0	5.14	2.27	174.6
	Gradient + Size (1 Location)	0	0	4.47	2.12	169.1
	Gradient * Size + (1 Location)	0.01	0.12	3.21	1.79	156.3
SES_{MPD}	(1 Location)	0	0	1.03	1.01	111.7
	Gradient + (1 Location)	0	0	0.93	0.96	107.8
	Size + (1 Location)	0	0	0.96	0.98	109.1
	Gradient + Size + (1 Location)	0	0	0.86	0.93	104.9
	Gradient * Size + (1 Location)	0	0	0.61	0.78	91.5

Table S2. Parameter estimates of the best-fit candidate models ($\Delta_i < 2$) explaining the effects of Interior (I) – Edge (E) – Matrix (M) gradient of continuous forest (CF) and different-sized fragments (F100 = 100 ha, F10 = 10 ha, and F1 = 1 ha) on phylogenetic richness (PD and SES_{PD}) and divergence (MPD and SES_{MPD}). Estimates with $P < 0.05$ are marked in bold.

Model			Coefficient	Std. Error	t value	Pr (> t)
PD ~ gradient + size	Intercept		351.75	15.36	22.90	<0.001
	gradient	I	Reference			
		E	-105.50	20.95	-5.04	<0.001
		M	-98.88	20.95	-4.72	<0.001
	size	CF	Reference			
		F100	-13.72	25.94	-0.53	0.60
		F10	2.99	22.76	0.13	0.90
		F1	-117.69	22.76	-5.17	<0.001
SES_{PD} ~ gradient	Intercept		-0.99	0.23	-4.40	<0.001
	Gradient	I	Reference			
		E	-0.42	0.36	-1.16	0.25
		M	-1.05	0.36	-2.93	0.006
MPD ~ gradient	Intercept		52.20	0.59	88.94	<0.001
	gradient	I	Reference			
		E	-0.48	0.94	-0.51	0.61
		M	-2.15	0.94	-2.29	0.03
MPD ~ null	Intercept		51.46	0.41	127.20	<0.001
MPD ~ size	Intercept		52.14	0.62	84.34	<0.001
	size	CF	Reference			
		F100	-1.81	1.16	-1.57	0.13
		F10	0.35	1.01	0.35	0.73
		F1	-2.09	1.01	-2.07	0.04
MPD ~ gradient + size	Intercept		52.58	0.67	78.65	<0.001
	gradient	I	Reference			
		E	-0.27	0.91	-0.30	0.77
		M	-1.94	0.91	-2.13	0.04
	size	CF	Reference			
		F100	-1.52	1.13	-1.34	0.19

	F10	0.65	0.99	0.66	0.52
	F1	-1.79	0.99	-1.81	0.08
SES_{MPD} ~ null	Intercept	-1.38	0.16	-8.41	<0.001
SES_{MPD} ~ gradient	Intercept	-1.19	0.24	-4.90	<0.001
	gradient	I	Reference		
		E	0.02	0.39	0.04
		M	-0.69	0.39	-1.77
					0.09

Table S3. Results of multiple pairwise comparisons of linear models testing for differences in phylogenetic richness (Faith's PD) across the Interior - Edge - Matrix gradient of continuous forest (CF) and different-sized fragments (1 ha, 10 ha, and 100 ha). Significant (adjusted P < 0.05) differences are highlighted in bold.

Assemblages	Estimate	Std. Error	t value	Pr(> t)
CF edge - CF interior	-90.637	32.588	-2.781	0.237
CF matrix - CF interior	-111.918	32.588	-3.434	0.065
100 ha interior - CF interior	32.323	38.212	0.846	0.999
100 ha edge - CF interior	-145.078	38.212	-3.797	0.028
100 ha matrix - CF interior	-131.676	38.212	-3.446	0.063
10 ha interior - CF interior	28.380	32.588	0.871	0.999
10 ha edge - CF interior	-137.590	32.588	-4.222	0.010
10 ha matrix - CF interior	-85.103	32.588	-2.612	0.314
1 ha interior - CF interior	-171.701	32.588	-5.269	0.001
1 ha edge - CF interior	-184.389	32.588	-5.658	0.000
1 ha matrix - CF interior	-200.257	32.588	-6.145	0.000
CF matrix - CF edge	-21.281	39.912	-0.533	1.000
100 ha interior - CF edge	122.959	44.622	2.756	0.247
100 ha edge - CF edge	-54.441	44.622	-1.220	0.981
100 ha matrix - CF edge	-41.039	44.622	-0.920	0.998
10 ha interior - CF edge	119.017	39.912	2.982	0.164
10 ha edge - CF edge	-46.953	39.912	-1.176	0.986
10 ha matrix - CF edge	5.534	39.912	0.139	1.000
1 ha interior - CF edge	-81.064	39.912	-2.031	0.662
1 ha edge - CF edge	-93.752	39.912	-2.349	0.461
1 ha matrix - CF edge	-109.620	39.912	-2.747	0.251
100 ha interior - CF matrix	144.241	44.622	3.232	0.100
100 ha edge - CF matrix	-33.160	44.622	-0.743	1.000
100 ha matrix - CF matrix	-19.758	44.622	-0.443	1.000
10 ha interior - CF matrix	140.298	39.912	3.515	0.054
10 ha edge - CF matrix	-25.672	39.912	-0.643	1.000
10 ha matrix - CF matrix	26.815	39.912	0.672	1.000
1 ha interior - CF matrix	-59.783	39.912	-1.498	0.926
1 ha edge - CF matrix	-72.471	39.912	-1.816	0.789
1 ha matrix - CF matrix	-88.339	39.912	-2.213	0.547
100 ha edge - 100 ha interior	-177.401	48.881	-3.629	0.042
100 ha matrix - 100 ha interior	-163.998	48.881	-3.355	0.078
10 ha interior - 100 ha interior	-3.943	44.622	-0.088	1.000
10 ha edge - 100 ha interior	-169.912	44.622	-3.808	0.028
10 ha matrix - 100 ha interior	-117.426	44.622	-2.632	0.304
1 ha interior - 100 ha interior	-204.023	44.622	-4.572	0.004
1 ha edge - 100 ha interior	-216.712	44.622	-4.857	0.002
1 ha matrix - 100 ha interior	-232.579	44.622	-5.212	0.001
100 ha matrix - 100 ha edge	13.402	48.881	0.274	1.000

10 ha interior - 100 ha edge	173.458	44.622	3.887	0.023
10 ha edge - 100 ha edge	7.489	44.622	0.168	1.000
10 ha matrix - 100 ha edge	59.975	44.622	1.344	0.963
1 ha interior - 100 ha edge	-26.622	44.622	-0.597	1.000
1 ha edge - 100 ha edge	-39.311	44.622	-0.881	0.999
1 ha matrix - 100 ha edge	-55.178	44.622	-1.237	0.979
10 ha interior - 100 ha matrix	160.056	44.622	3.587	0.046
10 ha edge - 100 ha matrix	-5.914	44.622	-0.133	1.000
10 ha matrix - 100 ha matrix	46.573	44.622	1.044	0.994
1 ha interior - 100 ha matrix	-40.025	44.622	-0.897	0.998
1 ha edge - 100 ha matrix	-52.713	44.622	-1.181	0.985
1 ha matrix - 100 ha matrix	-68.581	44.622	-1.537	0.913
10 ha edge - 10 ha interior	-165.970	39.912	-4.158	0.012
10 ha matrix - 10 ha interior	-113.483	39.912	-2.843	0.211
1 ha interior - 10 ha interior	-200.080	39.912	-5.013	0.001
1 ha edge - 10 ha interior	-212.769	39.912	-5.331	0.001
1 ha matrix - 10 ha interior	-228.636	39.912	-5.729	0.000
10 ha matrix - 10 ha edge	52.487	39.912	1.315	0.968
1 ha interior - 10 ha edge	-34.111	39.912	-0.855	0.999
1 ha edge - 10 ha edge	-46.799	39.912	-1.173	0.986
1 ha matrix - 10 ha edge	-62.667	39.912	-1.570	0.902
1 ha interior - 10 ha matrix	-86.598	39.912	-2.170	0.575
1 ha edge - 10 ha matrix	-99.286	39.912	-2.488	0.380
1 ha matrix - 10 ha matrix	-115.154	39.912	-2.885	0.196
1 ha edge - 1 ha interior	-12.688	39.912	-0.318	1.000
1 ha matrix - 1 ha interior	-28.556	39.912	-0.715	1.000
1 ha matrix - 1 ha edge	-15.868	39.912	-0.398	1.000

Table S4. Results of simple Mantel tests between beta diversity metrics ($P\beta$ and COMDIST) and geographic distance between sites at the Biological Dynamics of Forest Fragments Project, Brazil. Pearson's product-moment correlation and Spearman's rank correlation were used to test for linear and non-linear relationships, respectively.

Metric	Pearson's product-moment		Spearman's rank	
	correlation		correlation rho	
	r	P	r	P
$P\beta$	β_{total}	0.134	0.013	0.117
	β_{repl}	0.031	0.299	0.024
	β_{rich}	0.059	0.138	0.049
COMDIST		0.055	0.230	0.021
				0.368

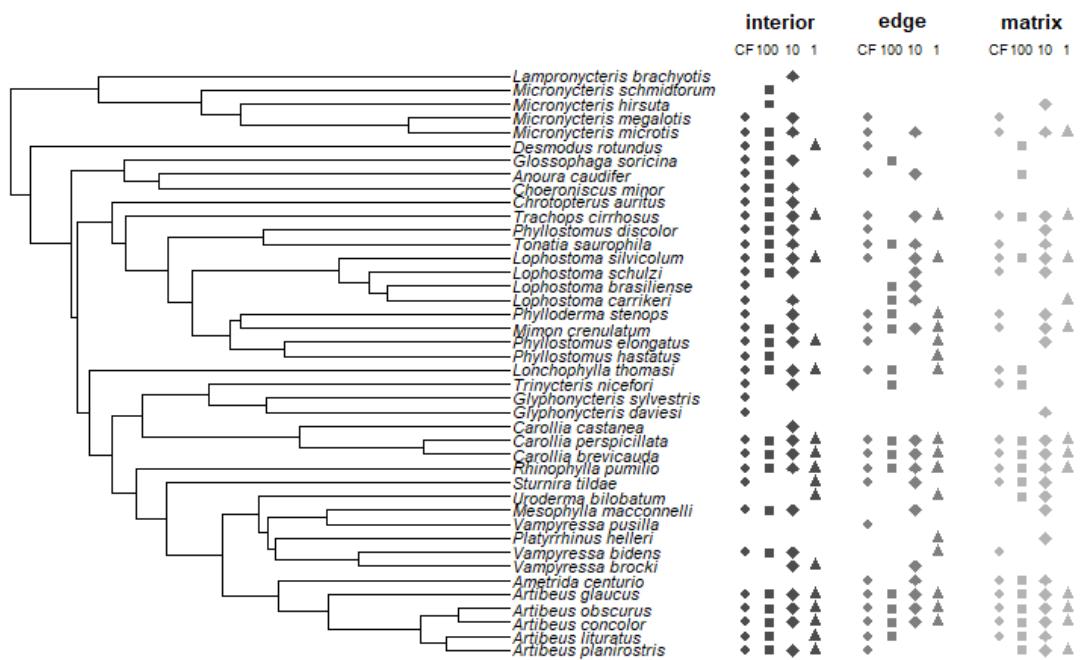


Fig. S1 Phylogenetic relationship of phyllostomid bats at the BDFFP and their occurrence in continuous forest (CF, circle), 100 ha fragments (square), 10 ha fragments (diamond) and 1 ha fragments (triangle) across a gradient of interior, edge, and matrix [sites](#).