Supplementary Material

Online Appendix D. Tables D1–D14.

Time explains regional richness patterns within clades more often than diversification rates or area

Hong Li[1,2] and John J. Wiens[2]*

[1]Jiangsu Key Laboratory for Biodiversity and Biotechnology, College of Life Sciences, Nanjing Normal University, Nanjing 210023, Jiangsu, China

[2]Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA

*Corresponding author: wiensj@email.arizona.edu

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Table D1. Results of Shapiro-Wilks tests for normality for the distribution of species richness among regions for each of the 15 clades. Both raw species richness and ln-transformed species richness were tested. Results in boldface indicate that normality was rejected. For the four clades in which normality was rejected for both raw and ln-richness, we also performed Spearman rank correlation tests (table D12).

Reference	Raw richness	ln-richness
Bengtson et al. (2015)	**W = 0.693,**	**W = 0.777,**
	***P* = 0.005**	***P* = 0.036**
Sun et al. (2014)	W = 0.846,	W = 0.959,
	P = 0.113	*P* = 0.812
Vitales et al. (2014)	W = 0.914,	W = 0.916,
	P = 0.490	*P* = 0.503
Toussaint and Condamine (2016)	W = 0.851,	W = 0.939,
	P = 0.161	*P* = 0.652
Frey and Vermeij (2008)	**W = 0.631,**	W = 0.933,
	***P* = 0.002**	*P* = 0.617
Ludt et al. (2015)	W = 0.684,	W = 0.684,
	P = 0.006	*P* = 0.006
Ma et al. (2016)	W = 0.906,	W = 0.929,
	P = 0.411	*P* = 0.569
Mariguela et al. (2016)	W = 0.866,	W = 0.837,
	P = 0.170	*P* = 0.093
Metallinou et al. (2015)	**W = 0.552,**	**W = 0.552,**

	***P* = 0.0001**	***P* = 0.0001**
Iverson et al. (2013)	W = 0.917, *P* = 0.298	W = 0.925, *P* = 0.361
Tolley et al. (2013)	**W = 0.668, *P* = 0.003**	**W = 0.738, *P* = 0.015**
Beckman and Witt (2015)	W = 0.948, *P* = 0.672	W = 0.891, *P* = 0.206
Buckner et al. (2015)	W = 0.926, *P* = 0.409	W = 0.871, *P* = 0.103
Day et al. (2013)	W = 0.855, *P* = 0.174	W = 0.897, *P* = 0.359
Martins and Melo (2016)	W = 0.808, *P* = 0.093	W = 0.965, *P* = 0.843

Table D2. Regression analyses of relationships between raw species richness of regions and four independent variables. AFC = age of first colonization; SAC = summed ages of colonization events; NCE = number of colonization events per region; NDR = mean net diversification rate. Results in boldface indicated the variable with the lowest AIC (Akaike information criterion). “Null” indicates cases in which regression analysis failed.

Reference	Species richness vs. AFC	Species richness vs. SAC	Species richness vs. NCE	Species richness vs. NDR
Bengtson et al. (2015)	**r^2 = 0.835,**	r^2 = 0.053,	r^2 = 0.396,	r^2 = 0.004,
	$F_{1,4}$ = 20.20,	$F_{1,4}$ = 0.23,	$F_{1,4}$ = 2.62,	$F_{1,4}$ = 0.02,
	P = 0.011	P = 0.660	P = 0.181	P = 0.908
	AIC = 41.013	AIC = 51.484	AIC = 48.793	AIC = 51.790
Sun et al. (2014)	**r^2 = 0.930,**	r^2 = 0.220,	r^2 = 0.065,	r^2 = 0.622,
	$F_{1,5}$ = 66.60,	$F_{1,5}$ = 1.41,	$F_{1,5}$ = 0.35,	$F_{1,5}$ = 8.22,
	P = 0.0004	P = 0.288	P = 0.581	P = 0.035
	AIC = 34.870	AIC = 51.761	AIC = 53.031	AIC = 46.698
Vitales et al. (2014)	**r^2 = 0.567,**	r^2 = 0.554,	r^2 = 0.052,	r^2 = 0.334,
	$F_{1,3}$ = 3.93,	$F_{1,3}$ = 3.72,	$F_{1,3}$ = 0.16,	$F_{1,3}$ = 1.51,
	P = 0.142	P = 0.149	P = 0.712	P = 0.307
	AIC = 27.227	AIC = 27.383	AIC = 31.148	AIC = 29.379
Toussaint and Condamine (2016)	**r^2 = 0.878,**	r^2 = 0.449,	r^2 = 0.027,	r^2 = 0.119,
	$F_{1,4}$ = 28.71,	$F_{1,4}$ = 3.25,	$F_{1,4}$ = 0.11,	$F_{1,4}$ = 0.54,
	P = 0.006	P = 0.146	P = 0.756	P = 0.503
	AIC = 31.736	AIC = 40.774	AIC = 44.181	AIC = 43.584
Frey and Vermeij (2008)	**r^2 = 0.795,**	r^2 = 0.460,	r^2 = 0.322,	r^2 = 0.731,
	$F_{1,3}$ = 11.62,	$F_{1,3}$ = 2.55,	$F_{1,3}$ = 1.42,	$F_{1,3}$ = 8.14,

	$P = 0.042$ **AIC = 44.004**	$P = 0.209$ AIC = 48.847	$P = 0.319$ AIC = 49.981	$P = 0.065$ AIC = 45.366
Ludt et al. (2015)	$r^2 = 0.242$, $F_{1,3} = 0.96$, $P = 0.400$ AIC = 11.667	$r^2 = 0.242$, $F_{1,3} = 0.96$, $P = 0.400$ AIC = 11.667	Null	**$r^2 = 0.441$,** **$F_{1,3} = 2.37$,** **$P = 0.221$** **AIC = 10.140**
Ma et al. (2016)	**$r^2 = 0.927$,** **$F_{1,4} = 50.50$,** **$P = 0.002$** **AIC = 45.383**	$R^2 = 0.876$, $F_{1,4} = 28.15$, $P = 0.006$ AIC = 48.550	$r^2 = 0.557$, $F_{1,4} = 5.03$, $P = 0.088$ AIC = 56.171	$r^2 = 0.008$, $F_{1,4} = 0.03$, $P = 0.867$ AIC = 61.006
Mariguela et al. (2016)	$r^2 = 0.870$, $F_{1,5} = 33.32$, $P = 0.002$ AIC = 19.441	**$r^2 = 0.913$,** **$F_{1,5} = 52.76$,** **$P = 0.0008$** **AIC = 16.568**	$r^2 = 0.730$, $F_{1,5} = 13.49$, $P = 0.014$ AIC = 24.542	$r^2 = 0.577$, $F_{1,5} = 6.83$, $P = 0.048$ AIC = 27.671
Metallinou et al. (2015)	$r^2 = 0.098$, $F_{1,3} = 0.33$, $P = 0.608$ AIC = 21.495	**$r^2 = 0.580$,** **$F_{1,3} = 4.15$,** **$P = 0.135$** **AIC = 17.673**	Null	Null
Iverson et al. (2013)	$r^2 = 0.607$, $F_{1,9} = 13.91$, $P = 0.005$ AIC = 46.801	**$r^2 = 0.668$,** **$F_{1,9} = 18.07$,** **$P = 0.002$** **AIC = 44.963**	$r^2 = 0.019$, $F_{1,9} = 0.17$, $P = 0.688$ AIC = 58.869	$r^2 = 0.116$, $F_{1,9} = 1.18$, $P = 0.306$ AIC = 55.725
Tolley et al. (2013)	**$r^2 = 0.969$,** **$F_{1,4} = 126.10$,** **$P = 0.0004$**	$r^2 = 0.809$, $F_{1,4} = 16.98$, $P = 0.015$	$r^2 = 0.357$, $F_{1,4} = 2.22$, $P = 0.211$	$r^2 = 0.506$, $F_{1,4} = 4.09$, $P = 0.113$

	AIC = 46.079	AIC = 57.026	AIC = 64.323	AIC = 62.742
Beckman and Witt (2015)	$r^2 = 0.012$, $F_{1,7} = 0.09$, $P = 0.779$	$r^2 = 0.010$, $F_{1,7} = 0.07$, $P = 0.935$	**$r^2 = 0.576$, $F_{1,7} = 9.52$, $P = 0.018$**	$r^2 = 0.427$, $F_{1,7} = 5.22$, $P = 0.056$
	AIC = 42.911	AIC = 43.011	**AIC = 35.291**	AIC = 38.007
Buckner et al. (2015)	$r^2 = 0.791$, $F_{1,8} = 30.23$, $P = 0.0006$	**$r^2 = 0.824$, $F_{1,8} = 37.43$, $P = 0.0003$**	$r^2 = 0.651$, $F_{1,8} = 14.90$, $P = 0.005$	$r^2 = 0.017$, $F_{1,8} = 0.14$, $P = 0.719$
	AIC = 35.983	**AIC = 34.257**	AIC = 41.107	AIC = 51.452

Table D3. Regression analyses of relationships between ln-transformed species richness of regions and four independent variables. AFC = age of first colonization; SAC = summed ages of colonization events; NCE = number of colonization events per region; NDR = mean net diversification rate. Results in boldface indicated the variable with the lowest AIC (Akaike information criterion). “Null” indicates cases in which regression analysis failed.

Reference	Ln(richness) vs. AFC	Ln(richness) vs. SAC	Ln(richness) vs. NCE	Ln(richness) vs. NDR
Bengtson et al. (2015)	**r^2 = 0.926,**	r^2 = 0.085,	r^2 = 0.376,	r^2 = 0.007,
	$F_{1,4}$ = 49.71,	$F_{1,4}$ = 0.37,	$F_{1,4}$ = 2.41,	$F_{1,4}$ = 0.03,
	P = 0.002	P = 0.575	P = 0.196	P = 0.871
	AIC = -2.646	AIC = 12.404	AIC = 10.109	AIC = 12.893
Sun et al. (2014)	**r^2 = 0.631,**	r^2 = 0.394,	r^2 = 0.009,	r^2 = 0.622,
	$F_{1,5}$ = 8.55,	$F_{1,5}$ = 3.25,	$F_{1,5}$ = 0.04,	$F_{1,5}$ = 8.21,
	P = 0.033	P = 0.131	P = 0.842	P = 0.035
	AIC = 14.575	AIC = 18.046	AIC = 21.492	AIC = 14.753
Vitales et al. (2014)	r^2 = 0.477,	**r^2 = 0.485,**	r^2 = 0.003,	r^2 = 0.423,
	$F_{1,3}$ = 2.73,	**$F_{1,3}$ = 2.83,**	$F_{1,3}$ = 0.009,	$F_{1,3}$ = 2.20,
	P = 0.197	**P = 0.191**	P = 0.930	P = 0.235
	AIC = 14.807	**AIC = 14.725**	AIC = 18.031	AIC = 15.294
Toussaint and Condamine (2016)	**r^2 = 0.756,**	r^2 = 0.583,	r^2 = 0.003,	r^2 = 0.095,
	$F_{1,4}$ = 12.38,	$F_{1,4}$ = 5.60,	$F_{1,4}$ = 0.01,	$F_{1,4}$ = 0.42,
	P = 0.025	P = 0.077	P = 0.919	P = 0.552
	AIC = 6.509	AIC = 9.717	AIC = 14.950	AIC = 14.368
Frey and Vermeij (2008)	**r^2 = 0.959,**	r^2 = 0.809,	r^2 = 0.064,	r^2 = 0.939,
	$F_{1,3}$ = 69.55,	$F_{1,3}$ = 12.68,	$F_{1,3}$ = 0.20,	$F_{1,3}$ = 45.75,

	P = 0.004	P = 0.038	P = 0.682	P = 0.007
	AIC = 7.732	AIC = 15.392	AIC = 23.330	AIC = 9.720
Ludt et al. (2015)	r^2 = 0.242,	r^2 = 0.242,	Null	**r^2 = 0.442,**
	$F_{1,3}$ =0.96,	$F_{1,3}$ =0.96,		**$F_{1,3}$ =2.37,**
	P = 0.400	P = 0.400		**P = 0.221**
	AIC = 8.002	AIC = 8.002		**AIC = 6.475**
Ma et al. (2016)	**r^2 = 0.977,**	r^2 = 0.867,	r^2 = 0.681,	r^2 = 0.0007,
	$F_{1,4}$ = 170.80,	$F_{1,4}$ = 26.12,	$F_{1,4}$ = 8.53,	$F_{1,4}$ = 0.003,
	P = 0.0002	P = 0.007	P = 0.043	P = 0.960
	AIC = -4.762	AIC = 5.790	AIC = 11.053	AIC = 17.898
Mariguela et al. (2016)	r^2 = 0.679,	**r^2 = 0.758,**	R^2 = 0.806,	r^2 = 0.625,
	$F_{1,5}$ = 10.55,	**$F_{1,5}$ = 15.66,**	$F_{1,5}$ = 20.77,	$F_{1,5}$ = 8.31,
	P = 0.023	**P = 0.011**	P = 0.006	P = 0.034
	AIC = 12.905	**AIC = 10.917**	AIC = 9.368	AIC = 13.992
Metallinou et al. (2015)	r^2 = 0.098,	**r^2 = 0.580,**	Null	Null
	$F_{1,3}$ = 0.33,	**$F_{1,3}$ = 4.15,**		
	P = 0.608	**P = 0.135**		
	AIC = 11.665	**AIC = 9.953**		
Iverson et al. (2013)	r^2 = 0.377,	**r^2 = 0.473,**	r^2 = 0.136,	r^2 = 0.213,
	$F_{1,9}$ = 5.45,	**$F_{1,9}$ = 8.07,**	$F_{1,9}$ = 1.42,	$F_{1,9}$ = 2.44,
	P = 0.044	**P = 0.019**	P = 0.264	P = 0.153
	AIC = 24.039	**AIC = 22.209**	AIC = 27.636	AIC = 26.612
Tolley et al. (2013)	**r^2 = 0.938,**	r^2 = 0.804,	r^2 = 0.375,	r^2 = 0.678,
	$F_{1,4}$ = 60.11,	$F_{1,4}$ = 16.36,	$F_{1,4}$ = 2.40,	$F_{1,4}$ = 8.44,
	P = 0.001	P = 0.016	P = 0.196	P = 0.044

	AIC = 14.682	AIC = 21.565	AIC = 28.508	AIC = 24.521
Beckman and Witt (2015)	$r^2 < 0.001$, $F_{1,7} < 0.001$, $P = 0.993$	$r^2 = 0.025$, $F_{1,7} = 0.18$, $P = 0.685$	**$r^2 = 0.670$, $F_{1,7} = 14.23$, $P = 0.007$**	$r^2 = 0.283$, $F_{1,7} = 2.76$, $P = 0.141$
	AIC = 24.199	AIC = 23.972	**AIC = 14.213**	AIC = 21.209
Buckner et al. (2015)	**$r^2 = 0.746$, $F_{1,8} = 23.50$, $P = 0.001$**	$r^2 = 0.707$, $F_{1,8} = 19.29$, $P = 0.002$	$r^2 = 0.559$, $F_{1,8} = 10.13$, $P = 0.013$	$r^2 = 0.080$, $F_{1,8} = 0.70$, $P = 0.428$
	AIC = 13.756	AIC = 15.188	AIC = 19.280	AIC = 26.624

Table D4. Regression analyses of relationships between species richness (raw and ln-transformed) of regions and four independent variables, for the two less complete datasets. Independent variables are: AFC = age of first colonization; SAC = summed ages of colonization events; NCE = number of colonization events per region; NDR = mean net diversification rate. Results in boldface indicate the model with the lowest AIC (Akaike information criterion).

Reference	Species richness vs. AFC	Species richness vs. SAC	Species richness vs. NCE	Species richness vs. NDR
Martins and Melo (2016)	**r^2 = 0.966,**	r^2 = 0.872,	r^2 = 0.011,	r^2 = 0.006,
	$F_{1,3}$ = 86.17,	$F_{1,3}$ = 20.35,	$F_{1,3}$ = 0.03,	$F_{1,3}$ = 0.18,
	P = 0.003	P = 0.020	P = 0.866	P = 0.901
	AIC = 32.419	AIC = 39.120	AIC = 49.323	AIC = 49.348
Day et al. (2013)	r^2 = 0.876,	**r^2 = 0.912,**	r^2 = 0.038,	r^2 < 0.0001,
	$F_{1,4}$ = 28.22,	**$F_{1,4}$ = 41.25,**	$F_{1,4}$ = 0.16,	$F_{1,4}$ < 0.0001,
	P = 0.006	**P = 0.003**	P = 0.713	P = 0.999
	AIC = 38.870	**AIC = 36.832**	AIC = 51.157	AIC = 51.387

	Ln(richness) vs. AFC	Ln(richness) vs. SAC	Ln(richness) vs. NCE	Ln(richness) vs. NDR
Martins and Melo (2016)	r^2 = 0.718,	**r^2 = 0.879,**	r^2 = 0.069,	r^2 = 0.295,
	$F_{1,3}$ = 7.63,	**$F_{1,3}$ = 21.68,**	$F_{1,3}$ = 0.22,	$F_{1,3}$ = 1.26,
	P = 0.070	**P = 0.019**	P = 0.668	P = 0.344
	AIC = 16.526	**AIC = 12.314**	AIC = 22.491	AIC = 21.102
Day et al. (2013)	r^2 = 0.523,	**r^2 = 0.621,**	r^2 = 0.034,	r^2 = 0.151,
	$F_{1,4}$ = 4.55,	**$F_{1,4}$ = 6.54,**	$F_{1,4}$ = 0.14,	$F_{1,4}$ = 0.71,
	P = 0.100	**P = 0.063**	P = 0.727	P = 0.447
	AIC = 19.865	**AIC = 18.612**	AIC = 24.218	AIC = 23.444

Table D5. Multiple regression analyses of relationships between raw species richness and time, number of colonization events, and diversification rates. AFC = age of first colonization; SAC = summed ages of colonization; NCE = number of colonization events; NDR = net diversification rates. Results in boldface indicate the model with the lowest AIC (Akaike information criterion). Multiple regression analyses were only applied to some studies and only to some variables (depending on the results of the pairwise analyses, see Methods).

Reference	Richness vs. (AFC+NCE)	Richness vs. (AFC+NDR)	Richness vs. (SAC+NCE)	Richness vs. (SAC+NDR)	Richness vs. (NCE+NDR)	Richness vs. (AFC+NDR+ NCE)	Richness vs. (SAC+NDR+ NCE)
Sun et al. (2014)		**r^2 = 0.933, $F_{2,4}$ = 27.94, P = 0.004 AIC = 36.560**					
Vitales et al. (2014)	r^2 = 0.571, $F_{2,2}$ = 1.33, P = 0.429 AIC = 29.179	r^2 = 0.933, $F_{2,2}$ = 13.96, P = 0.067 AIC = 19.886	r^2 = 0.571, $F_{2,2}$ = 1.33, P = 0.429 AIC = 29.179	**r^2 = 0.937, $F_{2,2}$ = 14.92, P = 0.063 AIC = 19.578**	r^2 = 0.348, $F_{2,2}$ = 0.53, P = 0.652 AIC = 31.276	r^2 = 0.937, $F_{3,1}$ = 4.98, P = 0.316 AIC = 21.574	r^2 = 0.937, $F_{3,1}$ = 4.98, P = 0.316 AIC = 21.574
Frey and Vermeij (2008)		r^2 = 0.796, $F_{1,3}$ = 3.89, P = 0.205 AIC = 45.986				**r^2 = 0.908, $F_{1,3}$ = 3.30, P = 0.380 AIC = 43.977**	r^2 = 0.875, $F_{3,1}$ = 2.33, P = 0.441 AIC = 45.527
Ludt et al. (2015)	r^2 = 0.242, $F_{1,3}$ = 0.96, P = 0.400 AIC = 11.667	**r^2 = 0.970, $F_{2,2}$ = 31.79, P = 0.031 AIC = -2.397**	r^2 = 0.242, $F_{1,3}$ = 0.96, P = 0.400 AIC = 11.667	**r^2 = 0.970, $F_{2,2}$ = 31.79, P = 0.031 AIC = -2.397**	r^2 = 0.442, $F_{1,3}$ = 2.37, P = 0.221 AIC = 10.140	r^2 = 0.970, $F_{2,2}$ = 31.79, P = 0.031 AIC = -2.397	r^2 = 0.970, $F_{2,2}$ = 31.79, P = 0.031 AIC = -2.397

Ma et al. (2016)	$\boldsymbol{r^2 = 0.939}$, $\boldsymbol{F_{2,3} = 22.94}$, $\boldsymbol{P = 0.015}$ **AIC = 46.311**		$r^2 = 0.884$, $F_{2,3} = 11.40$, $P = 0.040$ AIC = 50.145			$r^2 = 0.943$, $F_{3,2} = 11.07$, $P = 0.084$ AIC = 47.846	$r^2 = 0.948$, $F_{3,2} = 12.05$, $P = 0.078$ AIC = 47.366
Mariguela et al. (2016)	$r^2 = 0.923$, $F_{2,4} = 23.83$, $P = 0.006$ AIC = 17.788	$r^2 = 0.951$, $F_{2,4} = 39.12$, $P = 0.002$ AIC = 14.533	$r^2 = 0.947$, $F_{2,4} = 35.91$, $P = 0.003$ AIC = 15.103	$r^2 = 0.925$, $F_{2,4} = 61.65$, $P = 0.001$ AIC = 12.778	$r^2 = 0.898$, $F_{2,4} = 17.64$, $P = 0.010$ AIC = 19.705	$r^2 = 0.995$, $F_{3,3} = 208.10$, $P = 0.0006$ AIC = 0.298	$\boldsymbol{r^2 = 0.997}$, $\boldsymbol{F_{3,3} = 382.00}$, $\boldsymbol{P = 0.0002}$ **AIC = -3.940**
Beckman and Witt (2015)					$r^2 = 0.836$, $F_{2,6} = 15.32$ $P = 0.004$ AIC = 28.735	$\boldsymbol{r^2 = 0.942}$, $\boldsymbol{F_{3,5} = 26.95}$, $\boldsymbol{P = 0.002}$ **AIC = 21.431**	$r^2 = 0.942$, $F_{3,5} = 26.88$, $P = 0.002$ AIC = 21.453
Buckner et al. (2015)	$r^2 = 0.791$, $F_{2,7} = 13.23$, $P = 0.004$ AIC = 37.980		$r^2 = 0.875$, $F_{2,7} = 24.45$, $P = 0.0007$ AIC = 32.848			$r^2 = 0.843$, $F_{3,6} = 10.73$, $P = 0.008$ AIC = 37.113	$\boldsymbol{r^2 = 0.941}$, $\boldsymbol{F_{3,6} = 32.08}$, $\boldsymbol{P = 0.0004}$ **AIC = 27.269**

Table D6. Multiple regression analyses of relationships between ln-transformed species richness and time, number of colonization events, and diversification rates. AFC = Age of first colonization; SAC = summed ages of colonization; NCE = number of colonization events; NDR = net diversification rates. Results in boldface indicate the model with the lowest AIC (Akaike information criterion). Multiple regression analyses were only applied to some studies and only to some variables (depending on the results of the pairwise analyses, see Methods).

Reference	Ln(richness) vs. (AFC+NCE)	Ln(richness) vs. (AFC+NDR)	Ln(richness) vs. (SAC+NCE)	Ln(richness) vs. (SAC+NDR)	Ln(richness) vs. (NCE+NDR)	Ln(richness) vs. (AFC+NDR+ NCE)	Ln(richness) vs. (SAC+NDR+ NCE)
Sun et al. (2014)		$r^2 = 0.703$, $F_{2,4} = 4.73$, $P = 0.088$ AIC = 15.057				$\mathbf{r^2 = 0.965}$, $\mathbf{F_{3,3} = 27.80}$, $\mathbf{P = 0.011}$ **AIC = 2.030**	
Vitales et al. (2014)	$r^2 = 0.487$ $F_{2,2} = 0.95$, $P = 0.513$ AIC = 16.713	$r^2 = 0.933$, $F_{2,2} = 13.87$, $P = 0.067$ AIC = 6.551	$r^2 = 0.487$ $F_{2,2} = 0.95$, $P = 0.513$ AIC = 16.713	$\mathbf{r^2 = 0.961}$, $\mathbf{F_{2,2} = 24.34}$, $\mathbf{P = 0.039}$ **AIC = 3.884**	$r^2 = 0.429$, $F_{2,2} = 0.75$, $P = 0.571$ AIC = 17.246	$r^2 = 0.993$, $F_{3,1} = 47.86$, $P = 0.106$ AIC = -2.823	$r^2 = 0.993$, $F_{3,1} = 47.86$, $P = 0.106$ AIC = -2.823
Frey and Vermeij (2008)		$\mathbf{r^2 = 0.974}$, $\mathbf{F_{2,2} = 37.96}$, $\mathbf{P = 0.026}$ **AIC = 7.347**		$r^2 = 0.941$, $F_{2,2} = 15.99$, $P = 0.059$ AIC = 11.495		$r^2 = 0.974$, $F_{3,1} = 12.69$, $P = 0.203$ AIC = 9.332	$r^2 = 0.948$, $F_{3,1} = 6.04$, $P = 0.289$ AIC = 12.908
Ludt et al. (2015)	$r^2 = 0.242$, $F_{1,3} = 0.96$, $P = 0.400$	$\mathbf{r^2 = 0.970}$, $\mathbf{F_{2,2} = 31.79}$, $\mathbf{P = 0.031}$	$r^2 = 0.242$, $F_{1,3} = 0.96$, $P = 0.400$	$\mathbf{r^2 = 0.970}$, $\mathbf{F_{2,2} = 31.79}$, $\mathbf{P = 0.031}$	$r^2 = 0.442$, $F_{1,3} = 2.37$, $P = 0.221$	$\mathbf{r^2 = 0.970}$, $\mathbf{F_{2,2} = 31.79}$, $\mathbf{P = 0.031}$	$\mathbf{r^2 = 0.970}$, $\mathbf{F_{2,2} = 31.79}$, $\mathbf{P = 0.031}$

	AIC = 8.002	**AIC = -6.062**	AIC = 8.002	**AIC = -6.062**	AIC = 6.475	**AIC = -6.062**	**AIC = -6.062**
Ma et al. (2016)	r^2 = 0.982, $F_{2,3}$ = 79.81, P = 0.003 AIC = -4.055		r^2 = 0.903, $F_{2,3}$ = 14.02, P = 0.030 AIC = 5.884			**r^2 = 0.988, $F_{3,2}$ = 53.90, P = 0.018 AIC = -4.527**	r^2 = 0.958, $F_{3,2}$ = 15.06, P = 0.063 AIC = 2.936
Mariguela et al. (2016)	r^2 = 0.856, $F_{2,4}$ = 11.90, P = 0.021 AIC = 9.279	r^2 = 0.836, $F_{2,4}$ = 10.18, P = 0.027 AIC = 10.204	r^2 = 0.780, $F_{2,4}$ = 17.68, P = 0.008 AIC = 52.884	r^2 = 0.864, $F_{2,4}$ = 12.68, P = 0.019 AIC = 8.896	r^2 = 0.984, $F_{2,4}$ = 124.90, P = 0.0002 AIC = -6.205	r^2 = 0.990, $F_{1,5}$ = 98.72, P = 0.002 AIC = -7.368	**r^2 = 0.994, $F_{1,5}$ = 172.30, P = 0.0007 AIC = -11.238**
Tolley et al. (2013)		**r^2 = 0.985, $F_{2,3}$ = 96.43, P = 0.002 AIC = 8.256**		r^2 = 0.916, $F_{2,3}$ = 16.35, P = 0.024 AIC = 18.470		r^2 = 0.985, $F_{3,2}$ = 43.60, P = 0.023 AIC = 10.153	r^2 = 0.985, $F_{3,2}$ = 43.60, P = 0.023 AIC = 10.153
Beckman and Witt (2015)	r^2 = 0.707, $F_{2,6}$ = 7.25, P = 0.025 AIC = 15.144	r^2 = 0.366, $F_{2,6}$ = 1.73, P = 0.255 AIC = 22.094	r^2 = 0.697, $F_{2,6}$ = 6.90, P = 0.028 AIC = 15.453	r^2 = 0.501, $F_{2,6}$ = 3.01, P = 0.124 AIC = 19.946	r^2 = 0.810, $F_{1,7}$ = 12.75, P = 0.007 AIC = 11.276	**r^2 = 0.971, $F_{1,7}$ = 55.47, P = 0.0003 AIC = -3.612**	r^2 = 0.964, $F_{1,7}$ = 44.85, P = 0.0005 AIC = -1.761
Buckner et al. (2015)	r^2 = 0.752, $F_{2,7}$ = 10.59, P = 0.008 AIC = 15.532		r^2 = 0.735, $F_{2,7}$ = 9.70, P = 0.010 AIC = 16.184			r^2 = 0.911, $F_{3,6}$ = 20.52, P = 0.001 AIC = 7.249	**r^2 = 0.928, $F_{3,6}$ = 25.67, P = 0.0008 AIC = 5.188**

Table D7. Contributions of each independent variable to the multiple regression models of raw species richness. Only the best-fitting multiple regression model for raw richness for each clade is shown. Only clades for which multiple regression analyses were performed are shown. Note that the multiple regression model is not necessarily the best-fitting model for each dataset. The overall best-fitting model for each clade (including single vs. multiple regression models and raw vs. ln-transformed richness) is shown in Table 2. SPRC = standardized partial regression coefficients, showing how much of the adjusted r^2 of the best-fitting model is explained by each variable (when the other variables are held constant). AFC = age of first colonization; SAC = summed ages of colonization; NCE = number of colonization events; NDR = net diversification rates.

References	Multiple regression model	Contribution of each independent variable in best-fitting model		
Sun et al. (2014)	Richness vs. (AFC+NDR)	Richness vs. AFC	Richness vs. NDR	
	r^2 = 0.933	SPRC = 0.819	SPRC = 0.081	
	Adjusted r^2 = 0.900	P = 0.012	P = 0.692	
	P = 0.004			
Vitales et al. (2014)	Richness vs. (SAC+NDR)	Richness vs. SAC	Richness vs. NDR	
	r^2 = 0.937	SPRC = 0.509	SPRC = 0.362	
	Adjusted r^2 = 0.871	P = 0.045	P = 0.084	
	P = 0.063			
Frey and Vermeij (2008)	Richness vs. (AFC+NDR+NCE)	Richness vs. AFC	Richness vs. NDR	Richness vs. NCE
	r^2 = 0.908	SPRC = 0.326	SPRC = 0.114	SPRC = 0.193
	Adjusted r^2 = 0.633	P = 0.653	P = 0.865	P = 0.467

	P = 0.380			
Ludt et al. (2015)	Richness vs. (AFC+NDR) r^2 = 0.970 Adjusted r^2 = 0.939 P = 0.031	Richness vs. AFC SPRC = 0.432 P = 0.028	Richness vs. NDR SPRC = 0.507 P = 0.020	
Ma et al. (2016)	Richness vs. (AFC+NCE) r^2 = 0.939 Adjusted r^2 = 0.898 P = 0.015	Richness vs. AFC SPRC = 0.762 P = 0.023	Richness vs. NCE SPRC = 0.135 P = 0.499	
Mariguela et al. (2016)	Richness vs. (SAC+NDR+NCE) r^2 = 0.997 Adjusted r^2 = 0.995 P = 0.0002	Richness vs. SAC SPRC = 0.487 P = 0.002	Richness vs. NDR SPRC = 0.249 P = 0.005	Richness vs. NCE SPRC = 0.259 P = 0.008
Beckman and Witt (2015)	Richness vs. (AFC+NDR+NCE) r^2 = 0.942 Adjusted r^2 = 0.846 P = 0.002	Richness vs. AFC SPRC = 0.197 P = 0.048	Richness vs. NDR SPRC = 0.313 P = 0.009	Richness vs. NCE SPRC = 0.336 P = 0.004
Buckner et al. (2015)	Richness vs. (SAC+NDR+NCE) r^2 = 0.941 Adjusted r^2 = 0.912	Richness vs. SAC SPRC = 0.548 P = 0.002	Richness vs. NDR SPRC = 0.095 P = 0.026	Richness vs. NCE SPRC = 0.270 P = 0.040

$P = 0.0004$ r^2

Table D8. Contribution of each independent variable to the best-fitting multiple regression models of ln-transformed species richness. Only the best-fitting multiple regression model for ln-transformed richness for each clade is shown. Only clades for which multiple regression analyses were performed are shown. Note that the multiple regression model is not necessarily the best-fitting model for each dataset. The overall best-fitting model for each clade (including single vs. multiple regression models and raw vs. ln-transformed richness) is shown in Table 2. SPRC = standardized partial regression coefficients, showing how much of the adjusted r^2 of the best-fitting model is explained by each variable (when the other variables are held constant). AFC = age of first colonization; SAC = summed ages of colonization; NCE = number of colonization events; NDR = net diversification rates.

References	Multiple regression model	Contribution of each independent variable in best-fitting model		
Sun et al. (2014)	Ln(richness) vs. (AFC+NDR+NCE) r^2 = 0.965 Adjusted r^2 = 0.931 P = 0.011	Ln(richness) vs. AFC SPRC = 0.364 P = 0.033	Ln(richness) vs. NDR SPRC = 0.258 P = 0.070	Ln(richness) vs. NCE SPRC = 0.309 P = 0.018
Vitales et al. (2014)	Ln(richness) vs. (SAC+NDR) r^2 = 0.988 Adjusted r^2 = 0.975 P = 0.012	Ln(richness) vs. SAC SPRC = 0.511 P = 0.010	Ln(richness) vs. NDR SPRC = 0.464 P = 0.013	
Frey & Vermeij (2008)	Ln(richness) vs. (AFC+NDR) r^2 = 0.974 Adjusted r^2 = 0.898	Ln(richness) vs. AFC SPRC = 0.539 P = 0.450	Ln(richness) vs. NDR SPRC = 0.350 P = 0.582	Ln(richness) vs. NCE SPRC = 0.008 P = 0.965

	$P = 0.026$			
Ludt et al. (2015)	Ln(richness) vs. (AFC+NDR)	Ln(richness) vs. AFC	Ln(richness) vs. NDR	
	$r^2 = 0.970$	SPRC = 0.432	SPRC = 0.507	
	Adjusted $r^2 = 0.939$	$P = 0.028$	$P = 0.020$	
	$P = 0.031$			
Ma et al. (2016)	Ln(richness) vs. (AFC+NDR+NCE)	Ln(richness) vs. AFC	Ln(richness) vs. NDR	Ln(richness) vs. NCE
	$r^2 = 0.988$	SPRC = 0.641	SPRC = 0.137	SPRC = 0.192
	Adjusted $r^2 = 0.970$	$P = 0.062$	$P = 0.318$	$P = 0.419$
	$P = 0.018$			
Mariguela et al. (2016)	Ln(richness) vs. (SAC+NDR+NCE)	Ln(richness) vs. SAC	Ln(richness) vs. NDR	Ln(richness) vs. NCE
	$r^2 = 0.994$	SPRC = 0.150	SPRC = 0.356	SPRC = 0.482
	Adjusted $r^2 = 0.989$	$P = 0.107$	$P = 0.005$	$P = 0.004$
	$P = 0.0007$			
Tolley et al. (2013)	Ln(richness) vs. (AFC+NDR)	Ln(richness) vs. AFC	Ln(richness) vs. NDR	
	$r^2 = 0.985$	SPRC = 0.700	SPRC = 0.274	
	Adjusted $r^2 = 0.975$	$P = 0.004$	$P = 0.056$	
	$P = 0.002$			
Beckman and Witt (2015)	Ln(richness) vs. (AFC+NDR+NCE)	Ln(richness) vs. AFC	Ln(richness) vs. NDR	Ln(richness) vs. NCE
	$r^2 = 0.971$	SPRC = 0.242	SPRC = 0.290	SPRC = 0.406
	Adjusted $r^2 = 0.938$	$P = 0.048$	$P = 0.009$	$P = 0.004$

	P = 0.0003			
Buckner et al. (2015)	Ln(richness) vs. (SAC+NDR+NCE) r^2 = 0.928 Adjusted r^2 = 0.892 P = 0.0008	Ln(richness) vs. SAC SPRC = 0.498 P = 0.003	Ln(richness) vs. NDR SPRC = 0.127 P = 0.007	Ln(richness) vs. NCE SPRC = 0.267 P = 0.040

Table D9. Relationships between variables among clades. Clade age, total species richness of the clade, completeness of the taxon sampling in the phylogeny, and the number of regions per study are given in table 1. The variance in species richness among regions that is explained by time (AFC or SAC) is taken directly from table 2 for those clades in which AFC or SAC is the only variable in the best-fitting model. For those five clades in which other variables are included in the best model besides time, we multiplied the standardized partial regression coefficient for the time-related variable (table 3) by the overall percentage of the variance explained by the best model (table 2) to obtain the amount of variance explained by time. The specific values obtained were 0.491 (Vitales et al. 2014), 0.419 (Ludt et al. 2015), 0.486 (Mariguela et al. 2016), 0.234 (Beckman and Witt 2015), and 0.516 (Buckner et al. 2015). For mean area of regions, we estimated the mean area of all of the regions in each study, and then log10 transformed the mean. Values for area are given in appendix C.

Independent variable	Dependent variable	r^2	*P*
clade age	richness	0.189	0.1052
richness	completeness	0.193	0.1014
richness	variance explained by time	0.536	0.0019
completeness	variance explained by time	0.168	0.1290
clade age	variance explained by time	0.399	0.0115
mean area of regions	variance explained by time	0.162	0.1367
number of regions	variance explained by time	0.151	0.1520

Table D10. Testing the impacts of richness, clade age, taxon sampling, and global distributions on the overall results. We used unpaired t-tests to evaluate whether those clades in which richness patterns were explained primarily by time (i.e. best-fitting model includes only time-related variables AFC or SAC: 10 of 15 clades; table 2) tended to be older, more species rich, or more completely sampled (data in table 1). We also tested whether the geographic scope of the study (global vs. not; table 1) was associated with differences in clade age, species richness, taxon sampling, and the amount of variance in richness explained by time (see table D9).

Best model includes only time			
Species richness			
Only time mean= 82.30	Not mean = 21.00	Mean difference = -61.300	*P* = 0.0404
Clade age (ma)			
Only time mean = 60.16	Not mean = 9.40	Mean difference = -50.760	*P* = 0.0065
Taxon sampling (percent)			
Only time mean= 84.88	Not mean = 91.96	Mean difference = -7.080	*P* = 0.2571

Global distribution			
Richness (species)			
Global mean = 82.00	Not global mean = 48.44	Mean difference = 33.556	*P* = 0.2711
Clade age (Ma)			
Global mean = 62.75	Not global mean = 30.23	Mean difference = 32.517	*P* = 0.0967
Taxon sampling (percent)			
Global mean = 88.250	Not mean = 86.567	Mean difference =1.683	*P* = 0.7846
Variance explained by time			
Global mean = 0.855	Not mean = 0.642	Mean difference = 0.213	*P* = 0.1110

Table D11. Regression analyses of relationships between the four independent variables. AFC = age of first colonization; SAC = summed ages of colonization events; NCE = number of colonization events per region; NDR = net diversification rate. "Null" indicates that the analysis failed for that pair of variables.

Reference	AFC vs. NCE	AFC vs. NDR	SAC vs. NCE	SAC vs. NDR	NCE vs. NDR
Bengtson et al. (2015)	$r^2 = 0.314$, $P = 0.247$	$r^2 = 0.022$, $P = 0.778$	$r^2 = 0.286$, $P = 0.275$	$r^2 = 0.479$, $P = 0.128$	$r^2 = 0.576$, $P = 0.\ 080$
Sun et al. (2014)	$r^2 = 0.195$, $P = 0.321$	$\mathbf{r^2 = 0.612}$, $\mathbf{P = 0.038}$	$r^2 = 0.067$, $P = 0.574$	$r^2 = 0.254$, $P = 0.249$	$r^2 = 0.143$, $P = 0.403$
Vitales et al. (2014)	$r^2 = 0.048$, $P = 0.723$	$r^2 = 0.005$, $P = 0.909$	$r^2 = 0.016$, $P = 0.837$	$r^2 = 0.007$, $P = 0.893$	$r^2 = 0.015$, $P = 0.846$
Toussaint and Condamine (2016)	$r^2 = 0.143$, $P = 0.460$	$r^2 = 0.218$, $P = 0.351$	$r^2 = 0.006$, $P = 0.884$	$r^2 = 0.102$, $P = 0.534$	$r^2 = 0.511$, $P = 0.110$
Frey and Vermeij (2008)	$r^2 = 0.079$, $P = 0.648$	$\mathbf{r^2 = 0.901}$, $\mathbf{P = 0.014}$	$r^2 = 0.003$, $P = 0.930$	$\mathbf{r^2 = 0.820}$, $\mathbf{P = 0.034}$	$r^2 = 0.054$, $P = 0.707$
Ludt et al. (2015)	Null	$r^2 = 0.091$, $P = 0.622$	Null	$r^2 = 0.091$, $P = 0.622$	Null
Ma et al. (2016)	$\mathbf{r^2 = 0.701}$,	$r^2 = 0.002$,	$\mathbf{r^2 = 0.720}$,	$r^2 = 0.030$,	$r^2 = 0.219$,

	P = 0.037	P = 0.939	**P = 0.033**	P = 0.744	P = 0.349
Mariguela et al. (2016)	**r^2 = 0.568, P = 0.050**	r^2 = 0.314, P = 0.190	**r^2 = 0.595, P = 0.042**	r^2 = 0.375, P = 0.144	r^2 = 0.215, P = 0.295
Metallinou et al. (2015)	r^2 = 0.098, P = 0.608	r^2 = 0.098, P = 0.608	Null	r^2 = 0.580, P = 0.135	r^2 = 0.153, P = 0.515
Iverson et al. (2013)	r^2 = 0.018, P = 0.696	r^2 = 0.015, P = 0.717	r^2 < 0.001, P = 0.960	r^2 = 0.004, P = 0.858	r^2 = 0.022, P = 0.664
Tolley et al. (2013)	r^2 = 0.431, P = 0.157	r^2 = 0.473, P = 0.131	**r^2 = 0.772, P = 0.021**	r^2 = 0.394, P = 0.182	r^2 = 0.172, P = 0.413
Beckman and Witt (2015)	r^2 = 0.050, P = 0.562	r^2 = 0.216, P = 0.208	r^2 = 4.26e-05, P = 0.987	r^2 = 0.214, P = 0.210	r^2 = 0.044, P = 0.589
Buckner et al. (2015)	**r^2 = 0.815, P = 0.0003**	r^2 = 0.011, P = 0.773	**r^2 = 0.904, P < 0.0001**	r^2 = 0.011, P = 0.777	r^2 = 7.739e-05, P = 0.981
Day et al. (2013)	r^2 = 0.204, P = 0.368	r^2 = 0.106, P = 0.530	r^2 = 0.084, P = 0.576	r^2 = 0.057, P = 0.647	r^2 = 0.473, P = 0.131
Martins and Melo (2016)	r^2 = 0.036, P = 0.760	r^2 = 0.008, P = 0.887	r^2 = 0.022, P = 0.811	r^2 = 0.049, P = 0.722	r^2 = 0.187, P = 0.467

Table D12. Spearman's rank correlation analyses of relationships between ln-transformed species richness of regions and four independent variables. AFC = age of first colonization; SAC = summed ages of colonization events; NCE = number of colonization events per region; NDR = mean net diversification rate. Compare to the results based on least-squares regression in table 2. For Bengston et al. (2015), the non-parametric results here confirm that AFC shows the strongest correlation with richness. For Ludt et al. (2015), the results confirm that richness is correlated most strongly with NDR (but also shows a high correlation with time). For Tolley et al. (2013) the non-parametric results differ somewhat, suggesting a stronger correlation with NDR than with AFC (but also showing a high correlation with time), whereas the regression results show a strong relationship with AFC alone. For Metallinou et al. (2015), the non-parametric results also differ somewhat showing stronger correlations between NCE and NDR than with AFC or SAC alone, whereas the parametric regression results show the strongest relationship with SAC and weaker relationships with all other variables.

Reference	Ln(richness) vs. AFC	Ln(richness) vs. SAC	Ln(richness) vs. NCE	Ln(richness) vs. NDR
Bengtson et al. (2015)	**rho = 0.971**	**rho = 0.314**	rho = -0.514	rho = 0.000
	***P* = 0.0299**	***P* =0.0298**	*P* =0.2502	*P* =0.9999
Ludt et al. (2015)	rho = 0.750	rho = 0.750	rho = 0.625	rho = 0.975
	P = 0.4533	*P* = 0.4533	*P* = 0.2113	*P* = 0.0512
Tolley et al. (2013)	rho = 0.771	rho = 0.771	rho = 0.600	**rho = 0.943**
	P =0.0845	*P* =0.0845	*P* =0.1797	***P* =0.0350**
Metallinou et al. (2015)	rho = 0.500	rho = 0.750	**rho = 1.000**	**rho = 1.000**
	P =0.3173	*P* =0.1336	***P* =0.0455**	***P* =0.0455**

Table D13. Regression analyses of relationships between species richness of regions and net diversification rates (NDR) based on mean rates across colonization events. In the main analyses, NDR is weighted based on the number of species associated with each colonization event. Significant relationships are boldfaced. Compare to tables D2 and D3. Overall, relationships that were significant using weighted NDR were also significant using unweighted NDR, whereas relationships that were not significant using weighted NDR were also not significant using unweighted NDR. Nevertheless, we strongly prefer use of weighted NDR (see Methods).

Reference	Richness vs. mean NDR	ln-richness vs. mean NDR
Bengtson et al. (2015)	$r^2 = 0.496$, $P = 0.118$	$r^2 = 0.483$, $P = 0.126$
Sun et al. (2014)	**$r^2 = 0.737$, $P = 0.013$**	**$r^2 = 0.654$, $P = 0.028$**
Vitales et al. (2014)	$r^2 = 0.340$, $P = 0.302$	$r^2 = 0.395$, $P = 0.257$
Toussaint and Condamine (2016)	$r^2 = 0.133$, $P = 0.477$	$r^2 = 0.062$, $P = 0.633$
Frey and Vermeij (2008)	$r^2 = 0.723$, $P = 0.068$	**$r^2 = 0.937$, $P = 0.007$**
Ludt et al. (2015)	$r^2 = 0.442$,	$r^2 = 0.442$,

	$P = 0.221$	$P = 0.221$
Ma et al. (2016)	$r^2 = 0.096$, $P = 0.551$	$r^2 = 0.054$, $P = 0.658$
Mariguela et al. (2016)	**$r^2 = 0.661$, $P = 0.026$**	**$r^2 = 0.668$, $P = 0.025$**
Metallinou et al. (2015)	Null	Null
Iverson et al. (2013)	$r^2 = 0.263$, $P = 0.107$	$r^2 = 0.350$, $P = 0.055$
Tolley et al. (2013)	$r^2 = 0.486$, $P = 0.124$	**$r^2 = 0.657$, $P = 0.050$**
Beckman and Witt (2015)	$r^2 = 0.274$, $P = 0.148$	$r^2 = 0.225$, $P = 0.197$
Buckner et al. (2015)	$r^2 = 0.027$, $P = 0.650$	$r^2 = 0.102$, $P = 0.368$
Day et al. (2013)	$r^2 = 0.069$, $P = 0.616$	$r^2 = 0.358$, $P = 0.210$

Martins and Melo (2016)	$r^2 = 0.011$, $P = 0.867$	$r^2 = 0.262$, $P = 0.378$

Table D14. Regression analyses of relationships between species richness and area of regions for the 15 clades analyzed here. Significant relationships are boldfaced. Asterisks indicate negative relationships between richness and area; otherwise all relationships positive.

Study	Raw richness vs. area		Log10-richness vs. log10-area	
	r^2	*P*	r^2	*P*
Tolley et al. (2013)	0.007	0.8707	0.205	0.3672
Toussaint and Condamine (2016)	0.361	0.1222	0.445	0.1480
Beckman and Witt (2015)	0.0004	0.9611	0.077	0.4712
Buckner et al.	0.293*	0.1060	0.313*	0.0927
Sun et al. (2014)	0.191*	0.3275	0.276*	0.2261
Frey and Vermeij (2008)	**0.974**	**0.0018**	0.684	0.0840
Day et al. (2013)	0.001	0.9606	0.067	0.6214
Vitales et al. (2014)	0.320	0.3200	0.353	0.2909
Bengston et al. (2015)	0.320	0.2419	0.295	0.2658
Ludt et al. (2015)	0.170	0.4901	0.270	0.3697
Martins and Melo (2016)	0.072	0.6636	0.486	0.1910
Iverson et al. (2013)	0.015*	0.7224	0.016*	0.7144
Mariguela et al. (2016)	**0.799**	**0.0067**	**0.828**	**0.0044**
Ma et al. (2016)	0.335	0.2286	0.476	0.1294
Metallinou et al. (2015)	0.016	0.8377	0.001	0.9711