

SUPPORTING MATERIALS GUIDE

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Table S1. Jackknifing the results from the Generalized Additive Model to demonstrate how insensitive the nonlinearity in amphibian declines through time was to individual data points.

Excluded year	LYO				YOD			
	<i>df</i>	Coefficient	St. error	Non-linear <i>p</i> -value	<i>df</i>	Coefficient	St. error	Non-linear <i>p</i> -value
None	3.998	0.011	0.003	0.021	3.997	0.019	0.004	0.006
1979	4.000	0.010	0.004	0.032	4.000	0.018	0.005	0.006
1980	4.003	0.011	0.004	0.022	4.003	0.018	0.005	0.009
1981	4.003	0.011	0.004	0.027	4.002	0.018	0.004	0.009
1982	4.002	0.012	0.004	0.021	3.998	0.018	0.004	0.010
1983	4.002	0.010	0.003	0.010	3.999	0.018	0.004	0.008
1984	4.002	0.012	0.003	0.010	3.998	0.019	0.004	0.002
1985	4.002	0.011	0.004	0.027	3.998	0.019	0.004	0.008
1986	4.002	0.011	0.003	0.016	3.998	0.018	0.003	0.000
1987	4.002	0.011	0.004	0.030	3.999	0.018	0.004	0.010
1988	4.002	0.011	0.003	0.036	4.000	0.018	0.004	0.010
1989	3.998	0.011	0.004	0.039	4.002	0.018	0.004	0.012
1990	3.998	0.011	0.004	0.024	4.003	0.019	0.004	0.001
1991	3.998	0.012	0.003	0.004	3.996	0.018	0.004	0.006
1992	3.998	0.010	0.003	0.051	3.998	0.017	0.004	0.012
1993	3.999	0.011	0.004	0.040	4.002	0.018	0.004	0.007
1994	4.000	0.011	0.004	0.033	3.996	0.018	0.004	0.007
1995	4.000	0.011	0.004	0.027	4.003	0.018	0.004	0.007
1996	4.002	0.011	0.004	0.014	3.999	0.018	0.004	0.003
1997	4.003	0.014	0.003	0.045	4.003	0.019	0.004	0.008
1998	4.004	0.011	0.003	0.005	4.003	0.022	0.004	0.046
1999	4.001	0.015	0.004	0.269	4.000	0.022	0.005	0.098

Table S2. Univariate relationships between climatic predictors (temporally detrended or not and with or without a one year lag) and the proportion of extant *Ateolopus* species that were last observed (LYO) or began declining (YOD) each year from 1980-1998 (temporally detrended or not). Shown are probability values and Pearson correlation coefficients. Significant relationships are bolded.

Predictor	Temporally detrended predictors								Non-detrended predictors							
	Temporally detrended responses				Non-detrended responses				Temporally detrended responses				Non-detrended responses			
	LYO		YOD		LYO		YOD		LYO		YOD		LYO		YOD	
	p	r	p	r	p	r	p	r	p	r	p	r	p	r	p	r
Niño 3.4	0.667	0.106	0.890	0.034	0.845	0.048	0.971	-0.009	0.668	0.105	0.898	0.032	0.932	0.021	0.872	-0.040
EI Niño 1 or -1 ^a	0.010	-0.577	0.458	-0.181	0.273	-0.265	0.885	0.036	0.008	-0.586	0.432	-0.192	0.138	-0.353	0.806	-0.061
Southern oscillation index (SOI)	0.488	0.170	0.487	0.170	0.686	0.099	0.737	0.083	0.483	0.171	0.471	0.176	0.514	0.160	0.540	0.150
Stanardized SOI	0.487	0.170	0.486	0.170	0.693	0.097	0.743	0.081	0.482	0.172	0.470	0.176	0.520	0.157	0.545	0.148
Cloud cover	0.642	0.114	0.237	-0.285	0.649	0.112	0.459	-0.181	0.763	0.074	0.318	-0.242	0.464	-0.179	0.050	-0.455
Diurnal temperature range	0.707	0.092	0.444	0.187	0.094	0.396	0.087	0.403	0.779	0.069	0.512	0.160	0.579	0.136	0.656	0.109
Frost frequency	0.150	0.344	0.501	0.165	0.241	0.282	0.657	0.109	0.175	0.325	0.528	0.154	0.442	0.188	0.972	0.009
Precipitation	0.111	0.378	0.930	0.022	0.948	0.016	0.287	-0.258	0.088	0.402	0.909	0.028	0.553	0.145	0.623	-0.121
Temperature anomalies	0.190	-0.314	0.279	-0.262	0.127	-0.362	0.265	-0.269	0.385	-0.206	0.489	-0.164	0.589	-0.129	0.838	-0.049
Temperature maximum	0.363	-0.221	0.660	-0.108	0.513	-0.160	0.835	-0.051	0.406	-0.203	0.691	-0.098	0.858	-0.044	0.760	0.075
Temperature minimum	0.268	-0.267	0.396	-0.207	0.119	-0.370	0.270	-0.267	0.374	-0.216	0.490	-0.169	0.658	-0.109	0.962	0.012
Vapor pressure	0.359	-0.223	0.475	-0.174	0.079	-0.413	0.192	-0.313	0.484	-0.171	0.579	-0.136	0.661	-0.108	0.961	0.012
Wet day frequency	0.064	0.433	0.864	-0.042	0.628	0.119	0.313	-0.245	0.048	0.460	0.887	-0.035	0.179	0.322	0.924	-0.024
Bd growth score ^b	0.364	0.221	0.655	0.110	0.507	0.054	0.827	0.054	0.407	0.202	0.686	0.099	0.849	0.047	0.770	-0.072
Precip. x temp.	0.561	0.142	0.079	-0.413	0.566	0.141	0.450	-0.184	0.561	0.143	0.082	-0.410	0.526	0.155	0.499	-0.165
Cloud cover x temp.	0.617	0.123	0.888	0.035	0.424	0.195	0.762	0.074	0.630	0.118	0.895	0.032	0.542	0.149	0.923	0.024
Absolute value of monthly difference in temperature (AVMD)	0.026	-0.510	0.900	0.031	0.032	-0.492	0.792	-0.065	0.027	-0.505	0.896	0.032	0.047	-0.461	0.898	-0.032
Lag Niño 3.4	0.013	0.556	0.005	0.618	0.186	0.317	0.270	0.266	0.012	0.565	0.004	0.634	0.076	0.417	0.112	0.376
Lag EI Niño 1 or -1 ^a	0.002	0.656	0.000	0.767	0.020	0.529	0.019	0.532	0.002	0.657	0.000	0.767	0.021	0.526	0.020	0.529
Lag SOI	0.049	-0.458	0.021	-0.526	0.203	-0.306	0.253	-0.276	0.047	-0.460	0.019	-0.531	0.154	-0.340	0.191	-0.314
Lag standardized SOI	0.048	-0.458	0.021	-0.525	0.203	-0.306	0.256	-0.274	0.047	-0.461	0.020	-0.530	0.153	-0.341	0.192	-0.313
Lag cloud cover	0.096	-0.393	0.236	-0.286	0.426	-0.194	0.654	-0.110	0.151	-0.343	0.306	-0.248	0.058	-0.442	0.077	-0.415
Lag diurnal temperature range	0.197	0.309	0.003	0.637	0.014	0.554	0.001	0.705	0.229	0.290	0.005	0.617	0.184	0.318	0.064	0.434
Lag frost frequency	0.016	-0.544	0.386	-0.211	0.188	-0.316	0.873	-0.039	0.016	-0.543	0.381	-0.213	0.041	-0.473	0.348	-0.228
Lag precipitation	0.057	-0.443	0.856	-0.045	0.054	-0.449	0.566	-0.141	0.058	-0.443	0.855	-0.045	0.051	-0.455	0.548	-0.147
Lag temperature anomalies	0.017	0.541	0.240	0.283	0.386	0.211	0.931	-0.021	0.253	0.268	0.807	0.058	0.547	0.143	0.885	0.035
Lag temperature maximum	0.004	0.623	0.050	0.456	0.082	0.409	0.367	0.219	0.005	0.615	0.054	0.449	0.010	0.574	0.076	0.416
Lag temperature minimum	0.031	0.496	0.569	0.140	0.581	0.135	0.540	-0.150	0.036	0.483	0.558	0.144	0.069	0.426	0.402	0.204
Lag vapor pressure	0.108	0.381	0.823	-0.055	0.901	-0.031	0.152	-0.342	0.112	0.376	0.881	-0.037	0.211	0.301	0.806	0.060
Lag wet day frequency	0.045	-0.464	0.610	-0.125	0.102	-0.387	0.614	-0.124	0.049	-0.458	0.620	-0.121	0.209	-0.302	0.915	-0.026
Lag Bd growth score ^b	0.004	-0.624	0.051	-0.454	0.082	-0.409	0.371	-0.218	0.005	-0.617	0.054	-0.449	0.010	-0.576	0.076	-0.417
Lag precip. x temp.	0.377	-0.215	0.525	-0.155	0.359	-0.223	0.476	-0.174	0.385	-0.211	0.530	-0.154	0.729	-0.085	0.955	-0.014
Lag cloud cover x temp.	0.600	-0.129	0.615	0.123	0.915	0.026	0.491	0.168	0.580	-0.136	0.627	0.119	0.761	-0.075	0.830	0.053
Lag AVMD	0.016	0.544	0.369	-0.218	0.254	0.275	0.320	-0.241	0.016	0.545	0.380	-0.213	0.149	0.344	0.520	-0.158

^a Each year was assigned a value of a 1 if it was an El Niño year, a -1 if it was a La Niña year, and zero if it was neither an El Niño or La Niña year

^b Bd (*Batrachochytrium dendrobatidis*) growth score was calculated as described in Rohr et al. 2008 Proceedings of the National Academy of Sciences

Table S3. Univariate relationships between climatic predictors (temporally detrended or not and with or without a one year lag) and the proportion of extant *Atelopus* species that were last observed (LYO) each year from 1980-1998 (temporally detrended or not). In contrast to Table S2, only described species were included in these analyses. Shown are probability values and Pearson correlation coefficients. Significant relationships are bolded.

Predictor	Temporally detrended predictors				Non-detrended predictors			
	Detrended LYO		Non-detrended LYO		Detrended LYO		Non-detrended LYO	
	p	r	p	r	p	r	p	r
Niño 3.4	0.549	0.147	0.861	0.043	0.536	0.151	0.957	0.013
El Niño 1 or -1 ^a	0.053	-0.450	0.568	-0.140	0.058	-0.442	0.324	-0.239
Southern oscillation index (SOI)	0.558	0.143	0.741	0.081	0.587	0.133	0.551	0.146
Standardized SOI	0.557	0.144	0.747	0.079	0.586	0.134	0.557	0.144
Cloud cover	0.516	0.159	0.616	0.123	0.739	0.082	0.302	-0.250
Diurnal temperature range	0.854	0.045	0.683	0.100	0.778	-0.069	0.854	-0.045
Frost frequency	0.458	0.181	0.561	0.142	0.514	0.160	0.908	0.028
Precipitation	0.401	0.204	0.598	-0.129	0.333	0.235	0.896	0.032
Temperature anomalies	0.637	-0.116	0.438	-0.189	0.730	-0.085	0.996	-0.001
Temperature maximum	0.797	-0.063	0.911	-0.028	0.866	-0.041	0.643	0.114
Temperature minimum	0.856	-0.045	0.481	-0.172	0.994	-0.002	0.612	0.125
Vapor pressure	0.979	-0.007	0.378	-0.214	0.884	0.036	0.594	0.131
Wet day frequency	0.410	0.201	0.748	-0.079	0.319	0.241	0.468	0.177
Bd growth score ^b	0.806	0.060	0.911	0.028	0.875	0.039	0.647	-0.113
Precip. x temp.	0.393	0.208	0.369	0.219	0.390	0.209	0.328	0.237
Cloud cover x temp.	0.578	0.136	0.470	0.177	0.604	0.127	0.630	0.118
Absolute value of monthly difference in temperature (AVMD)	0.108	-0.380	0.112	-0.377	0.115	-0.374	0.157	-0.338
Lag Niño 3.4	0.024	0.516	0.343	0.230	0.028	0.504	0.159	0.336
Lag El Niño 1 or -1 ^a	0.006	0.609	0.030	0.497	0.006	0.609	0.032	0.493
Lag SOI	0.054	-0.449	0.265	-0.269	0.057	-0.444	0.204	-0.305
Lag standardized SOI	0.051	-0.454	0.263	-0.271	0.054	-0.448	0.200	-0.308
Lag cloud cover	0.085	-0.405	0.354	-0.225	0.106	-0.383	0.014	-0.552
Lag diurnal temperature range	0.128	0.361	0.141	0.350	0.567	0.140	0.502	0.164
Lag frost frequency	0.019	-0.531	0.217	-0.297	0.015	-0.547	0.028	-0.504
Lag precipitation	0.146	-0.347	0.108	-0.381	0.145	-0.347	0.101	-0.388
Lag temperature anomalies	0.012	0.566	0.360	0.222	0.007	0.593	0.041	0.473
Lag temperature maximum	0.011	0.566	0.130	0.360	0.009	0.579	0.009	0.579
Lag temperature minimum	0.028	0.505	0.594	0.131	0.021	0.524	0.025	0.511
Lag vapor pressure	0.082	0.409	0.938	-0.019	0.061	0.437	0.082	0.409
Lag wet day frequency	0.083	-0.408	0.133	-0.358	0.096	-0.393	0.307	-0.248
Lag Bd growth score ^b	0.012	-0.564	0.134	-0.356	0.010	-0.578	0.010	-0.578
Lag precip. x temp.	0.427	-0.193	0.332	-0.236	0.476	-0.174	0.822	-0.055
Lag cloud cover x temp.	0.359	-0.223	0.870	-0.040	0.321	-0.241	0.483	-0.171
Lag AVMD	0.026	0.509	0.294	0.254	0.023	0.517	0.149	0.344

^a Each year was assigned a value of a 1 if it was an El Niño year, a -1 if it was a La Niña year, and zero if it was neither an El Niño or La Niña year

^b Bd (*Batrachochytrium dendrobatidis*) growth score was calculated as described in Rohr et al. 2008 Proceedings of the National Academy of Sciences

Table S4. Results of best subset model selection examining climatic predictors (not temporally detrended) of the proportion of *Atelopus* species observed for the last time (temporally detrended) each year from 1980-1998. Shown are standardized regression coefficients.

Model rank	Adjusted R ²	No. of predictors	No lag													One year lag																								
			Cloud cover	Diurnal temp. range	Frost frequency	Precipitation	Temp. anomalies	Temp. maximum	Temp. minimum	Vapor pressure	Wet day frequency	Bd growth score ^b	Precip. x temp.	Cloud cover x temp.	Absolute value of monthly difference in temp.	Cloud cover	Diurnal temp. range	Frost frequency	Precipitation	Temp. anomalies	Temp. maximum	Temp. minimum	Vapor pressure	Wet day frequency	Bd growth score ^b	Precip. x temp.	Cloud cover x temp.	Absolute value of monthly difference in temp.												
1	0.633	2.000																										0.694												0.868
2	0.628	3.000																																						0.808
3	0.627	3.000												0.142																									0.832	
4	0.625	3.000																																					0.830	
5	0.624	3.000																																					0.843	
6	0.624	3.000																																					0.855	
7	0.622	3.000																																					0.880	
8	0.618	3.000																																					0.991	
9	0.618	3.000																																					0.886	
10	0.617	3.000																																					0.939	
11	0.614	3.000																																					0.870	
12	0.612	3.000																																					0.835	
13	0.611	3.000																																					0.907	
14	0.610	3.000																																					0.879	
15	0.610	3.000																																					0.876	
16	0.610	3.000																																					0.876	
17	0.610	3.000																																					0.870	
18	0.609	3.000																																					0.842	
19	0.609	3.000																																					0.842	
20	0.609	3.000																																					0.854	
21	0.609	3.000																																					0.842	
22	0.609	3.000																																					0.848	
23	0.609	3.000																																					0.848	
24	0.609	3.000																																					0.874	
25	0.609	3.000																																					0.876	
26	0.609	3.000																																					0.858	
27	0.599	3.000																																					0.845	
28	0.594	3.000																																					0.804	
29	0.592	3.000																																					0.827	
30	0.582	3.000																																					0.895	
Weighted mean coefficient ^c			0.002	-0.005	-0.001	-0.004	0.002	0.001	0.004	0.005	-0.002	-0.001	0.005	-0.004	-0.005	-0.004	0.591	0.056	-0.001	0.001	0.129	-0.083	-0.058	-0.002	-0.073	0.001	0.001									0.863				

^a The maximum number of predictors allowed in any model was three

^b Bd growth score was calculated as described in Rohr et al. 2008 Proceedings of the National Academy of Sciences

^c Weighted mean coefficients were calculated by weighting each standardized coefficient by the adjusted R² of each model

Table S5. Results of best subset model selection examining climatic predictors (temporally detrended) of the proportion of *Ateolopus* species observed for the last time (temporally detrended) each year from 1980-1998. Shown are standardized regression coefficients.

Model rank	Adjusted R ²	No. of predictors	No lag													One year lag														
			Cloud cover	Diurnal temp. range	Frost frequency	Precipitation	Temp. anomalies	Temp. maximum	Temp. minimum	Vapor pressure	Wet day frequency	Bd growth score ^b	Precip. x temp.	Cloud cover x temp.	Absolute value of monthly difference in temp.	Cloud cover	Diurnal temp. range	Frost frequency	Precipitation	Temp. anomalies	Temp. maximum	Temp. minimum	Vapor pressure	Wet day frequency	Bd growth score ^b	Precip. x temp.	Cloud cover x temp.	Absolute value of monthly difference in temp.		
1	0.621	3.000												-0.282															0.640	
2	0.611	3.000													0.472														0.850	
3	0.608	3.000																									1.609	1.347	-1.263	0.904
4	0.600	3.000																									1.623	1.696		0.878
5	0.600	3.000																										0.860	-0.872	0.850
6	0.598	3.000																										-1.240	-1.338	0.818
7	0.595	3.000																										-0.875	-0.865	0.837
8	0.587	3.000	0.198																										0.616	0.703
9	0.586	3.000																											0.631	0.950
10	0.585	3.000				-0.254																							0.702	0.853
11	0.579	3.000																											0.558	0.734
12	0.573	3.000											-0.412	-0.538															0.587	0.696
13	0.570	2.000																											0.526	0.716
14	0.570	3.000													-0.169														0.601	0.664
15	0.565	3.000																											0.547	0.639
16	0.563	3.000																											0.637	0.650
17	0.562	3.000																											0.545	0.639
18	0.558	3.000																											0.538	0.639
19	0.557	3.000																											-0.134	0.696
20	0.557	3.000																											0.542	0.685
21	0.554	3.000																											0.640	0.823
22	0.554	3.000																											0.660	0.829
23	0.554	3.000																											0.168	0.829
24	0.551	3.000																											0.388	0.341
25	0.551	3.000																											0.631	0.769
26	0.549	3.000																											0.549	0.680
27	0.549	3.000																											0.574	0.740
28	0.549	3.000																											-0.392	0.335
29	0.547	3.000																											0.093	0.728
30	0.547	3.000																											0.646	0.711
Weighted mean coefficient ^c			0.006	0.002	0.003	-0.008	-0.003	0.000	-0.004	-0.005	-0.003	0.000	0.005	-0.034	-0.049	-0.015	0.361	0.111	-0.024	0.000	0.140	-0.087	-0.066	-0.023	-0.139	0.006	0.003	0.634		

^a The maximum number of predictors allowed in any model was three

^b Bd growth score was calculated as described in Rohr et al. 2008 Proceedings of the National Academy of Sciences

^c Weighted mean coefficients were calculated by weighting each standardized coefficient by the adjusted R² of each model

Table S6. Results of best subset model selection examining climatic predictors (not temporally detrended) of the proportion of *Atelopus* species that began declining (temporally detrended) each year from 1980-1998. Shown are standardized regression coefficients.

Model rank	Adjusted R^2	No. of predictors	No lag												One year lag														
			Cloud cover	Diurnal temp. range	Frost frequency	Precipitation	Temp. anomalies	Temp. maximum	Temp. minimum	Vapor pressure	Wet day frequency	Bd growth score ^b	Precip. x temp.	Cloud cover x temp.	Absolute value of monthly difference in temp.	Cloud cover	Diurnal temp. range	Frost frequency	Precipitation	Temp. anomalies	Temp. maximum	Temp. minimum	Vapor pressure	Wet day frequency	Bd growth score ^b	Precip. x temp.	Cloud cover x temp.	Absolute value of monthly difference in temp.	
1	0.625	3					-0.899					1.372																	1.069
2	0.586	3											2.127																1.098
3	0.579	3					-1.724					2.054																	0.948
4	0.564	3		-0.476										0.379															1.136
5	0.564	3						-0.564				1.063																1.177	
6	0.563	3										0.596																1.073	
7	0.561	3										1.068			0.566													1.172	
8	0.559	3	-0.323	-0.554																								1.042	
9	0.546	3											0.452							-1.486								1.172	
10	0.538	3											0.451					0.301										1.042	
11	0.534	3											0.449															1.177	
12	0.534	3											0.465															1.073	
13	0.531	3											0.448							0.297								1.177	
14	0.531	3											0.448						0.305									1.177	
15	0.531	3											0.449						1.783	-1.437								1.177	
16	0.527	3											0.401								-0.995							1.177	
17	0.525	3											0.538		1.015													1.177	
18	0.525	3		-0.431							0.383				1.176													1.177	
19	0.523	3											0.458		0.971						0.309							1.177	
20	0.522	3											0.484	-0.281	0.837													1.177	
21	0.511	3											0.397							1.212								1.177	
22	0.509	3		-0.544																	-0.963							1.177	
23	0.509	3																			-1.373							1.177	
24	0.507	3											0.559		1.034						-1.058							1.177	
25	0.504	3											0.463		0.841	-0.251												1.177	
26	0.503	3																		1.249								1.177	
27	0.502	3		-0.621	-0.271																-1.043							1.177	
28	0.500	3	-0.248											0.380		0.828												1.177	
29	0.499	3		-0.669												1.160												1.177	
30	0.499	3										0.466				1.062												1.177	
Weighted mean coefficient ^c			-0.019	-0.108	-0.008	0.000	-0.097	-0.020	0.017	0.254	0.000	0.012	0.000	-0.035	0.237	-0.009	0.772	-0.008	0.000	0.010	0.147	-0.088	-0.163	0.000	-0.198	-0.022	-0.011	0.010	

^a The maximum number of predictors allowed in any model was three

^b Bd growth score was calculated as described in Rohr et al. 2008 Proceedings of the National Academy of Sciences

^c Weighted mean coefficients were calculated by weighting each standardized coefficient by the adjusted R^2 of each model

Table S12. Relationships between climate variables and annual temperature, elevation, and monthly temperatures between 1980 and 1998, the time period where most *Atelopus* species went extinct. Temperature-related variables were not tested because they cannot explain the greater declines of *Atelopus* in warm years but cool seasons.

Climate variable	Annual temperature			Elevation			Monthly temperature		
	β	$F_{1,17}$	p	β	$F_{1,2330}^a$	p	β	$F_{1,10}$	p
Cloud cover	-0.551	7.39	0.015	-0.327	277.8	<0.001	0.575	4.95	0.050
Precipitation	-0.334	2.13	0.162	-0.522	873.59	<0.001	-0.044	0.02	0.891
Vapor pressure	0.889	63.98	<0.001	-0.935	16180	<0.001	0.820	20.50	0.001
Wet day frequency	-0.346	2.31	0.147	-0.482	704.26	<0.001	0.151	0.23	0.639

^a Based on the 2330 0.5°-by-0.5° grid cells in the region historically occupied by *Atelopus*.

Table S13. The effect of elevation categories on the relationship between diurnal temperature range (response) and regional average monthly temperatures (predictor). Data were collected from 1980 to 1998, the time period where most *Atelopus* species went extinct.

Elevation category	β	$F_{1,10}$	p
0-199 m	-0.007	0.00	0.983
200-1000 m	0.171	0.30	0.594
1001-2399 m	-0.148	0.22	0.646
>2400 m	-0.768	14.42	0.004

Table S14. Classification of years as El Niño (1), La Niña (-1), or neither (0).

Year	Classification
1979	0
1980	0
1981	0
1982	0
1983	1
1984	0
1985	-1
1986	1
1987	1
1988	0
1989	-1
1990	0
1991	1
1992	0
1993	0
1994	1
1995	1
1996	-1
1997	1
1998	-1

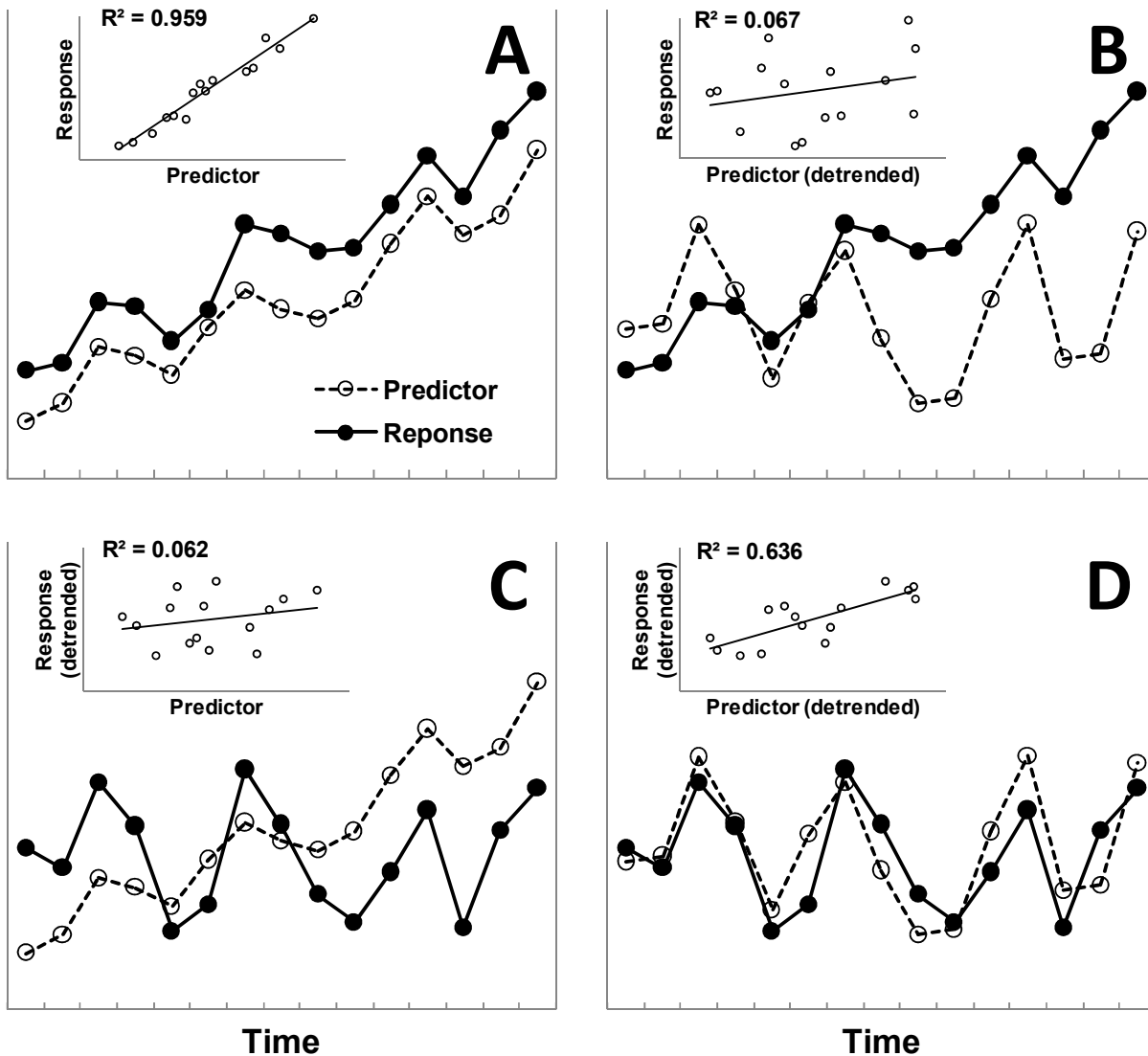


Fig. S1. Effects of detrending on temporally correlated variables. These graphs illustrate a hypothetical case with a temporally confounded relationship between a response variable and a predictor. In this case, both variables have a long-term temporal trend as well as short-term fluctuations (A). Detrending only one variable at a time (B, C) masks the relationship between them, leading to lower R^2 values. (D) Detrending both variables isolates the short-term fluctuations (“intradecadal” in the main text), revealing a strong correlation between the predictors at this time scale. This is stronger evidence for a causal relationship than the correlation between non-detrended variables (which is largely driven by similar long-term temporal trends), because far fewer alternate predictor variables should correlate with the response variable at the shorter time scale. Note that the predictor might still have been causal even if it had lacked the same long-term temporal trend as the response variable, if some other variable were responsible for the long-term trend in the response.

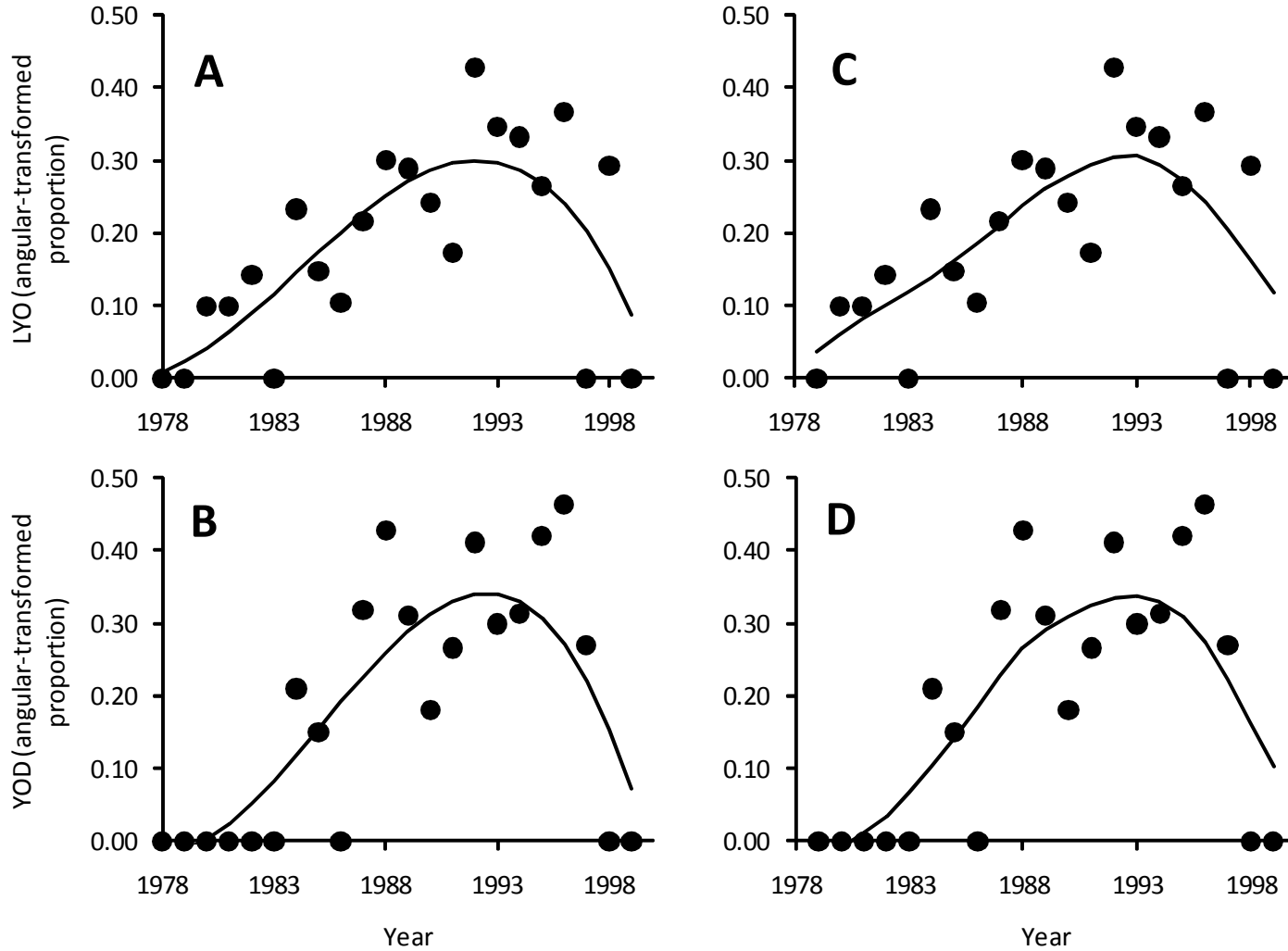


Figure S2. Time series of annual proportion of *Atelopus* species that were observed for the last time (LYO, A and C) and that began to decline (YOD, B and D). Best fit lines were calculated using polynomial regression in panels A and B and the Generalized Additive Model (GAM, i.e. cubic splines) in panels C and D. Note the concordance of the fits using polynomial regression and GAM.

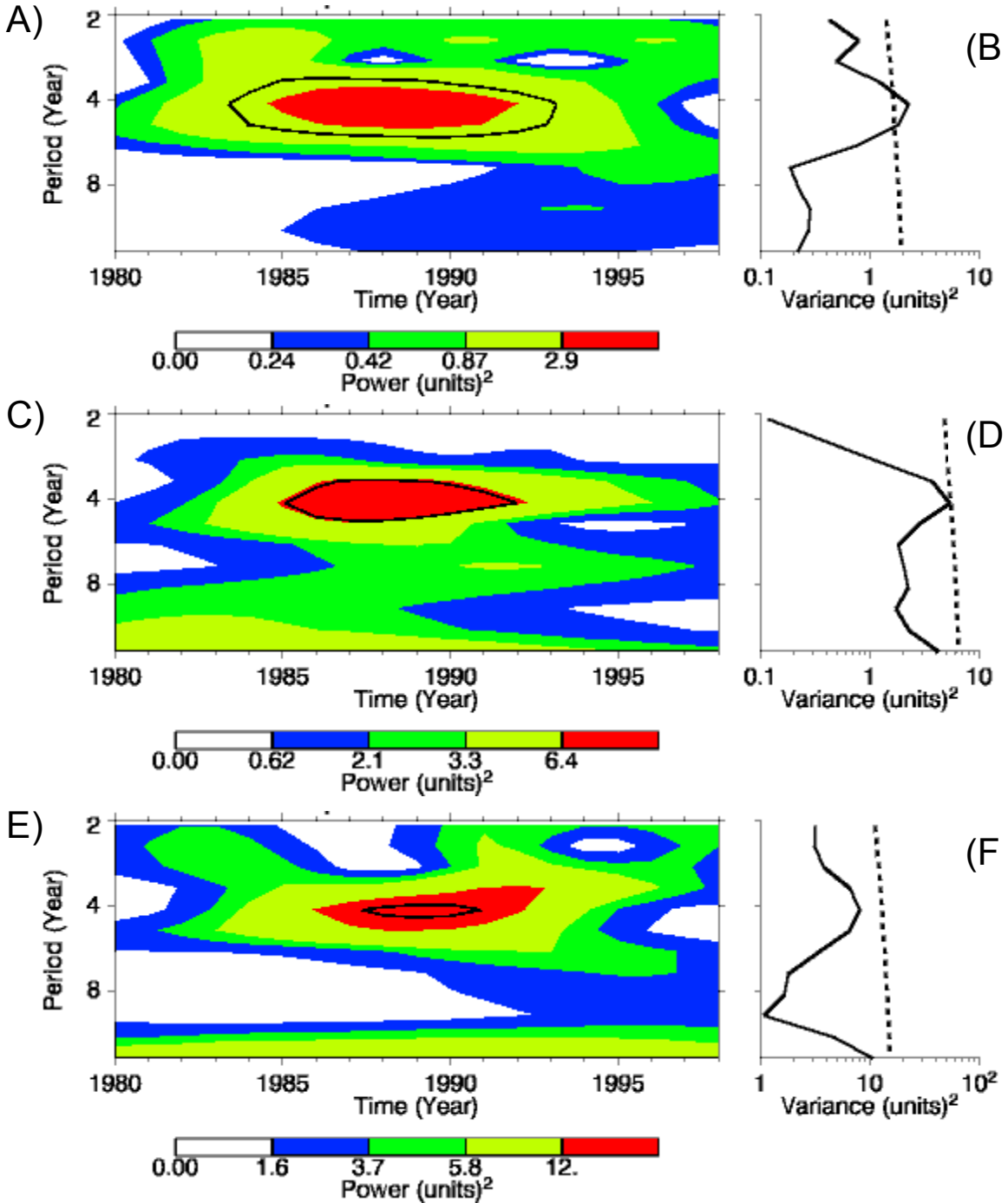


Fig. S3. The wavelet power spectra (A, C, E) and associated global wavelet power spectra (B, D, F) for a five month running average of El Niño 3.4 (A, B) and the number of *Atelopus* declines (C, D) and extinctions (E, F), using a Morlet 6.0 wavelet, a starting scale of two years, a scale width of 0.25 years, and padding with zeros. For the wavelet power spectra (A, C, E), the contour levels are chosen so that 75%, 50%, 25%, and 5% of the wavelet power is above each level, respectively, and the black contour is the 10% significance level, using a white-noise background spectrum. For the global wavelet power spectra (B, D, F), the black line represents

the global spectrum and the dashed line is the significance for the global spectrum, assuming the same significance level and background spectrum as in the associated wavelet power spectrum (A, C, E, respectively). These wavelet analyses were conducted using the software at <http://paos.colorado.edu/research/wavelets/>