Supporting Information

Harnik 10.1073/pnas.1100572108

SI Text

Summary of Literature Sources Used in This Study. The datasets analyzed in this study were assembled through field work by the author, use of existing collections at the Academy of Natural Sciences, Florida Museum of Natural History, National Museum of Natural History, and Paleontological Research Institution, and literature compilation. These sources are the literature sources used for these analyses. Further reading is coded as follows: [A] denotes references that provided abundance data, [B] denotes references that provided body size data and/or plates from which measurements were made, and [O] denotes references that provided occurrence data.

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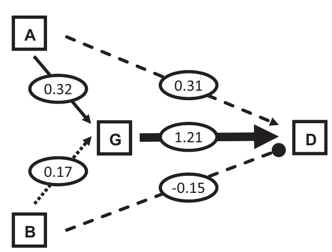

Fig. S1. A clade-independent structural equation model of direct and indirect effects fit to the pooled data for all bivalve species. Variables are abundance (A), body size (B), geographic range size (G), and species duration (D). Values presented are model coefficients. Line thickness indicates effect size, and line type denotes statistical significance; solid lines are significant at α = 0.05, and dashed lines are hypothesized effects that are nonsignificant at α = 0.05. Arrows indicate positive effects, and the filled circle indicates negative effects.

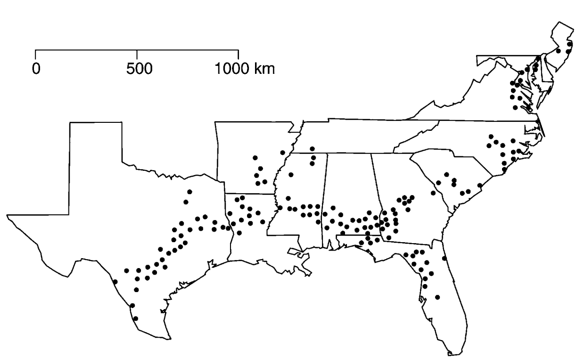

Fig. S2. Map illustrating the distribution of fossil occurrences over the Paleogene of the Gulf and Atlantic Coastal Plains of the eastern United States. Points are the centroids of each county containing one or more fossil occurrences in the database.

Table S1. Nonparametric Spearman rank order correlation tests of the associations between biological factors and species duration

	Spearman ρ
Abundance vs. duration	**0.27**
Body size vs. duration	0.09
Geographic range vs. duration	**0.39**

Significance at $\alpha < 0.05$ is indicated by bold type. When examined separately, both abundance and geographic range size are significantly correlated with duration.

Table S2. Multigroup structural equation models that differ in the extent to which coefficients vary among bivalve superfamilies (denoted with an X) or are assumed to be equal

	Paths vary among clades									
	Direct			Indirect		Model selection			Goodness of fit		
Model rank	A	B	G	A	B	AIC	ΔAIC	AW	χ^2	df	*P*
1		X			X	53.073	0	0.377	11.073	9	0.271
2		X				53.192	0.119	0.355	15.192	11	0.174
3	X	X			X	55.629	2.556	0.105	9.629	7	0.211
4		X		X	X	56.404	3.331	0.071	10.404	7	0.167
5						57.356	4.283	0.044	23.356	13	0.038
6	X	X		X	X	58.959	5.886	0.020	8.959	5	0.111
7	X	X	X			59.575	6.502	0.015	13.575	7	0.059
8				X	X	60.568	7.495	0.009	18.568	9	0.029
9	X	X	X	X	X	62.787	9.714	0.003	8.787	3	0.032
10	X			X		63.640	10.567	0.002	21.640	9	0.010

Paths linked directly to duration are direct effects. Paths linked to duration by geographic range are indirect effects. A, abundance; B, body size; G, geographic range size; D, duration. Models were ranked using Akaike's information criterion (AIC), with the relative support for each model summarized by the Akaike weights (AW); ΔAIC is the AIC difference between each model and the best model. The model χ^2 provides a measure of goodness of fit. Multigroup models in which the direct effects of body size vary among superfamilies have the greatest support.

Table S3. Direct effects of geographic range on duration when geographic extent is measured relative to the maximum distance between fossiliferous localities over the Paleogene (Paleogene) or over the individual durations of species (Duration)

	Coefficient	*P*
Extent (Paleogene)	2.16	<0.001
Extent (Duration)	1.28	<0.001

Both measures of geographic extent have a significant effect on species duration, but uncorrected measures (Paleogene) show a stronger association because of the pooling of species from intervals characterized by differing degrees of sampling.

Table S4. Direct effects of geographic range on duration when either extent or occupancy is used to estimate species geographic range size

	Coefficient	AIC	AW
Extent	**1.28**	565.33	0.82
A + B + E	**E, 1.21**	568.34	0.18
Occupancy	0.57*	578.00	<<0.01
A + B + O	O, 0.33	579.74	<<0.01

A, abundance; B, body size; E, geographic extent; O, occupancy. Significance at $\alpha < 0.05$ is indicated by bold type. Model selection was assessed using Akaike's information criterion (AIC). The relative support for each model is summarized using the Akaike weights (AW).
**P* values between 0.05 and 0.1.

Table S5. Direct effects of biological factors on duration when taxa with narrow geographic distributions or estimated abundances are either included or excluded from the dataset

	Coefficients when single county and museum-only species with estimated abundances are included	Coefficients when single county species are excluded	Coefficients when museum-only species with estimated abundances are excluded
Abundance	**0.70**	0.49	0.67*
Body size	0.17	0.05	0.09
Geographic range	**1.28**	**1.09**	**1.15**
A + B + G	**G, 1.21**	**G, 1.06**	**G, 1.08**

Significance at $\alpha < 0.05$ is indicated by bold type. Model results indicate that geographic range has a significant direct effect on species duration, regardless of whether single county or rare species with estimated abundances are included or excluded. The apparent direct effect of abundance on duration weakens when single county or rare species with estimated abundances are excluded from the dataset.
**P* values between 0.05 and 0.1.

Other Supporting Information Files

Dataset S1 (PDF)