Online Supplementary Materials for Lemmon and Lemmon, 2008

Table S1.—The effect of uncertainty in temporal scale on estimates of dispersal distance and ancestral location. A chronogram first was constructed given one of three sets of divergence times (ML = Maximum Likelihood, lower bound of the 95% confidence interval, and upper bound of the 95% confidence interval; see Lemmon et al. 2007a for details). Given each chronogram, dispersal distance within each clade (in meters) and the location of the ancestor of each clade (latitude and longitude) were estimated. The rightmost column presents the percent error in the estimate, calculated as | lower – upper | / ML. Note that only a trivial amount of error in the estimated ancestral locations results from uncertainty in the temporal scale.

	Lower 95%	**ML**	**Upper 95%**	**Percent Error**
Clade (node number)	Assumed Node Dates			
Trilling (1)	9.15	11.62	14.38	45.01
Nigrita/Fouquettei (4)	3.50	4.97	6.72	64.79
Triseriata/Feriarum/Kalmi (6)	2.61	3.76	5.21	69.15
Eastern (3)	6.07	8.04	10.41	53.98
Triseriata/Feriarum (7)	1.87	2.87	4.13	78.75
Brachyphona/Brimleyi (5)	3.37	4.95	6.68	66.87
Slow Trilling (2)	7.34	9.72	12.42	52.26
Maculata/Clarkii (8)	1.79	2.70	4.15	87.41
	Estimated Dispersal Distance			
Brimleyi	90.24	73.81	63.09	36.79
Brachyphona	113.00	92.59	79.25	36.44
Maculata/Clarkii	458.21	373.62	300.32	42.26
Nigrita	160.39	132.77	114.17	34.81
Fouquettei	232.62	194.28	166.47	34.05
Kalmi	68.07	56.20	47.31	36.94
Triseriata	169.42	135.52	112.06	42.32
Feriarum	181.20	145.82	121.68	40.82
Feriarum coastal	215.51	173.58	144.42	40.96
Feriarum inland	141.55	114.03	94.91	40.90
	Estimated Latitude			
Brimleyi	34.93	34.93	34.93	0.00
Brachyphona	35.87	35.87	35.86	0.01
Maculata/Clarkii	37.83	37.72	38.57	1.97
Nigrita	31.37	31.38	31.38	0.05
Fouquettei	33.66	31.29	33.34	1.00
Kalmi	38.11	38.11	38.11	0.00
Triseriata	40.78	40.78	40.78	0.01
Feriarum	33.94	33.94	34.30	1.06

Feriarum coastal	35.36	35.36	34.65	2.02
Feriarum inland	33.57	33.57	33.57	0.00
		Estimated Longitude		
Brimleyi	-79.31	-79.31	-79.31	0.00
Brachyphona	-84.62	-84.62	-84.62	0.00
Maculata/Clarkii	-96.41	-96.45	-98.83	2.51
Nigrita	-84.61	-84.57	-84.57	0.05
Fouquettei	-93.43	-93.27	-92.96	0.50
Kalmi	-75.37	-75.37	-75.38	0.01
Triseriata	-82.93	-82.93	-82.93	0.00
Feriarum	-83.51	-83.46	-84.33	0.99
Feriarum coastal	-81.17	-81.18	-81.23	0.07
Feriarum inland	-86.42	-86.42	-86.42	0.00

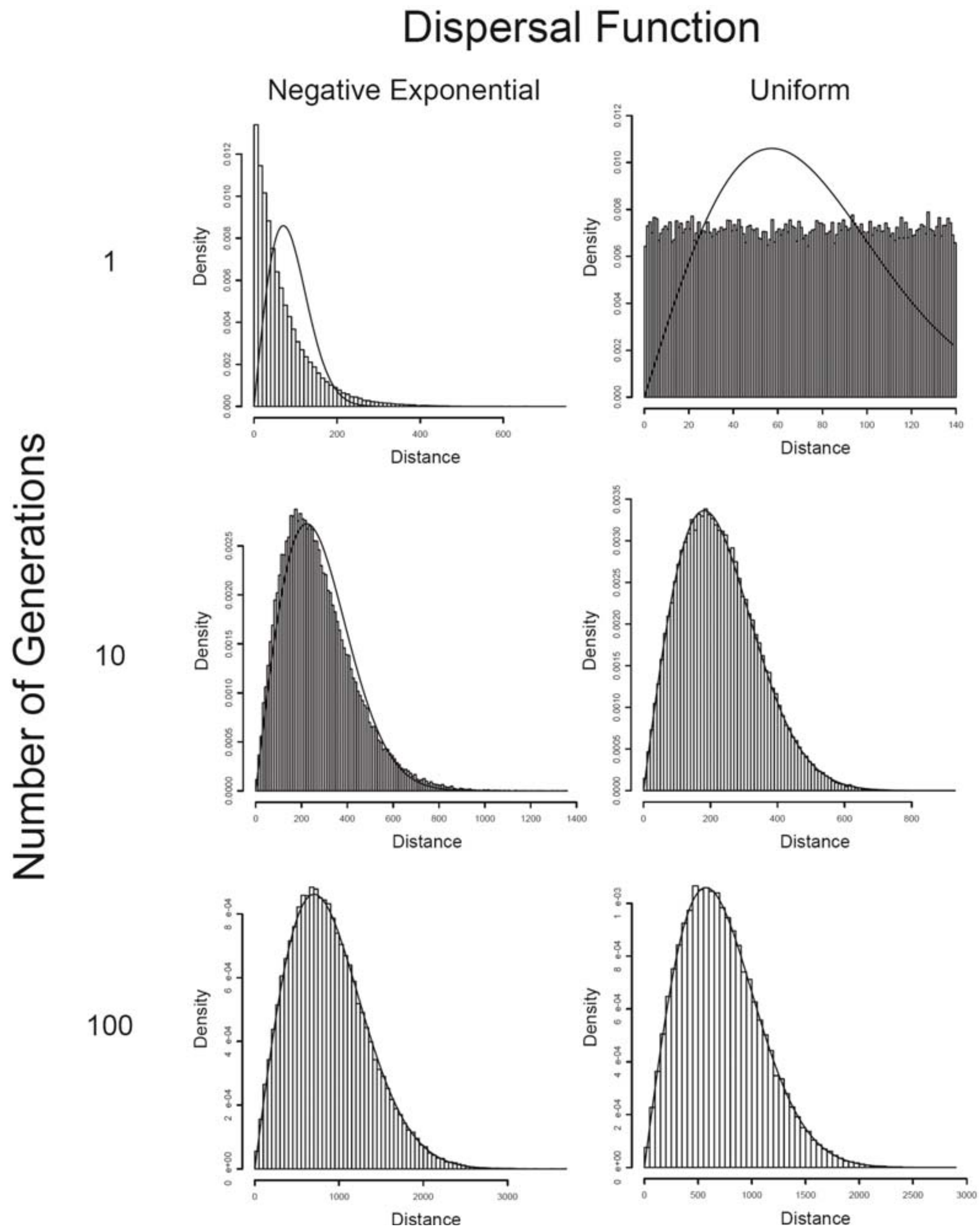

Figure S1. Accuracy of the normal approximation as a function of generations separating ancestor and descendant. Simulated individuals dispersed each generation according to a direction drawn randomly from a uniform (0,2π) distribution, and distance drawn randomly from either a negative exponential (left column) or uniform (right column) dispersal kernel. The mean of each dispersal kernel ($\bar{\delta}$) was arbitrarily set equal to 70 (result is independent of value chosen). After 1, 10, or 100 generations the straight-line distance between each individual and the original ancestor was noted. The histograms illustrate the distribution of those distances for each scenario. Lines indicate the density assumed by our model given in Equation (2) of the manuscript, where b is equal to the number of generations, and $\psi = \sigma_x$ is computed for each dispersal kernel based on the fact that $\bar{\delta} = 70$. Note that the assumed model fits well after only 100 generations.

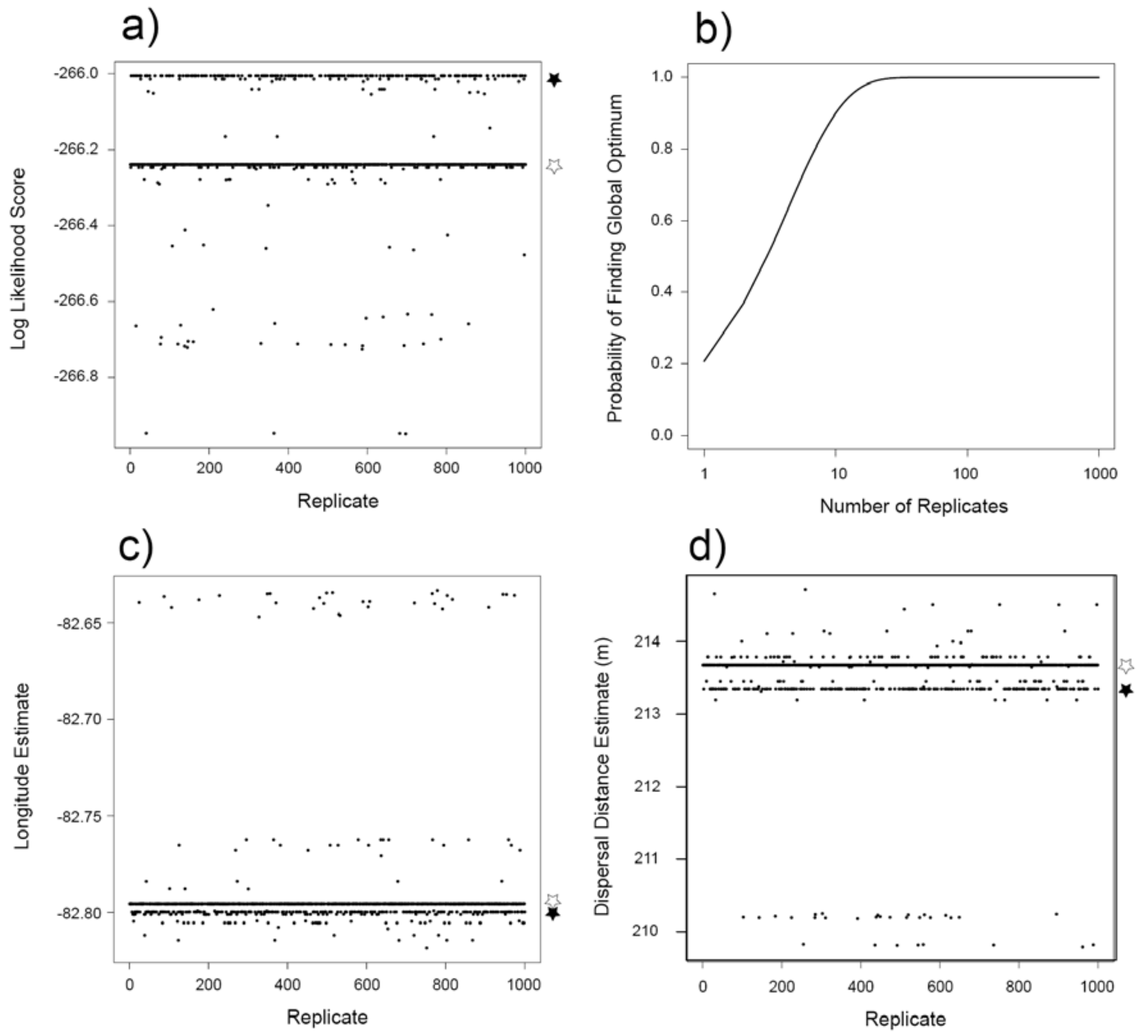

Figure S2. Reduced propensity to entrapment in local optima through replicate analyses with different starting parameters. The ancestral locations and dispersal parameters were estimated 1000 times (with different random starting values for each replicate) for the coastal *P. feriarum* clade. A plot of the log likelihood score for each replicate (a), reveals a local optimum (white star) that is reached in approximately 80% of the replicates. Nevertheless, the global optimum (black star) can be reached reliably (at least once) given a sufficient number of replicates are performed (b). Effects of entrapment at the local optimum on the estimate of longitude (c) of the ancestor of coastal *P. feriarum* and the dispersal parameter for the northern coastal clade (d) are presented. Analyses were conducted as described in the section entitled *Variation in Dispersal Distance* in the manuscript (the within coastal *P. feriarum* test).

Figure S3. Chronogram of the trilling chorus frogs. This chronogram was generated by rate-smoothing the tree estimated by Lemmon et al. (2007b) while constraining the eight labeled nodes to the dates estimated by Lemmon et al. (2007a). Further details are given in the main manuscript in the section entitled *Rate Smoothing the Gene Tree*.

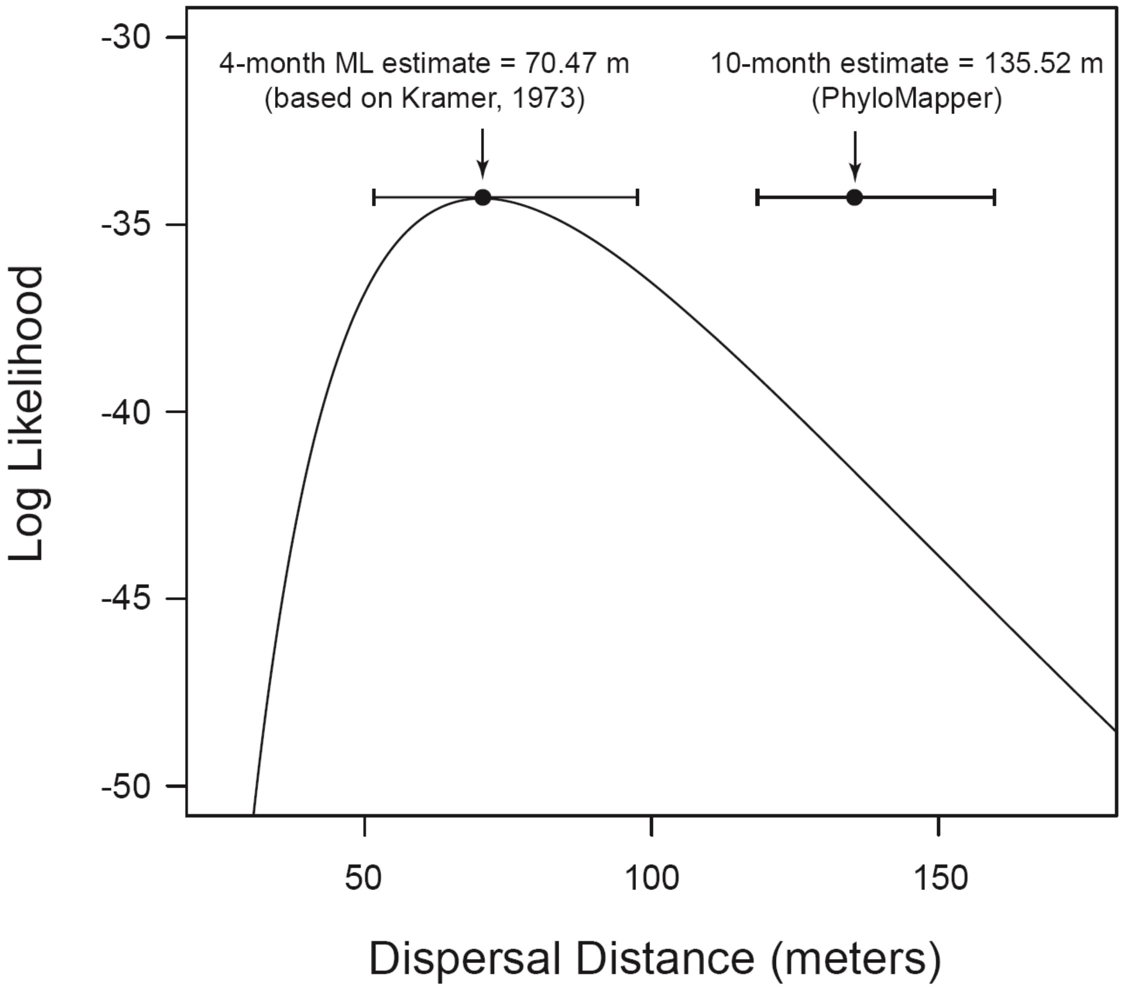

Figure S4. Estimates of dispersal distance ($\hat{\delta}$) for *Pseudacris triseriata*. The likelihood curve was estimated based on Kramer (1973), who found that 15 of 62 adults dispersed further than 100 meters. The maximum likelihood estimate and 95% confidence interval (based on a likelihood-ratio test) are given. This estimate should be treated with some caution since Kramer only followed adults during the four months after adults mated, instead of following individuals from metamorphosis to adulthood (~ 10 months). Confidence intervals for the PhyloMapper estimate were generated by accounting for error in the temporal scale estimate (see Table S1). Note that both estimates rely on the assumption that dispersal distance follows a negative exponential kernel.

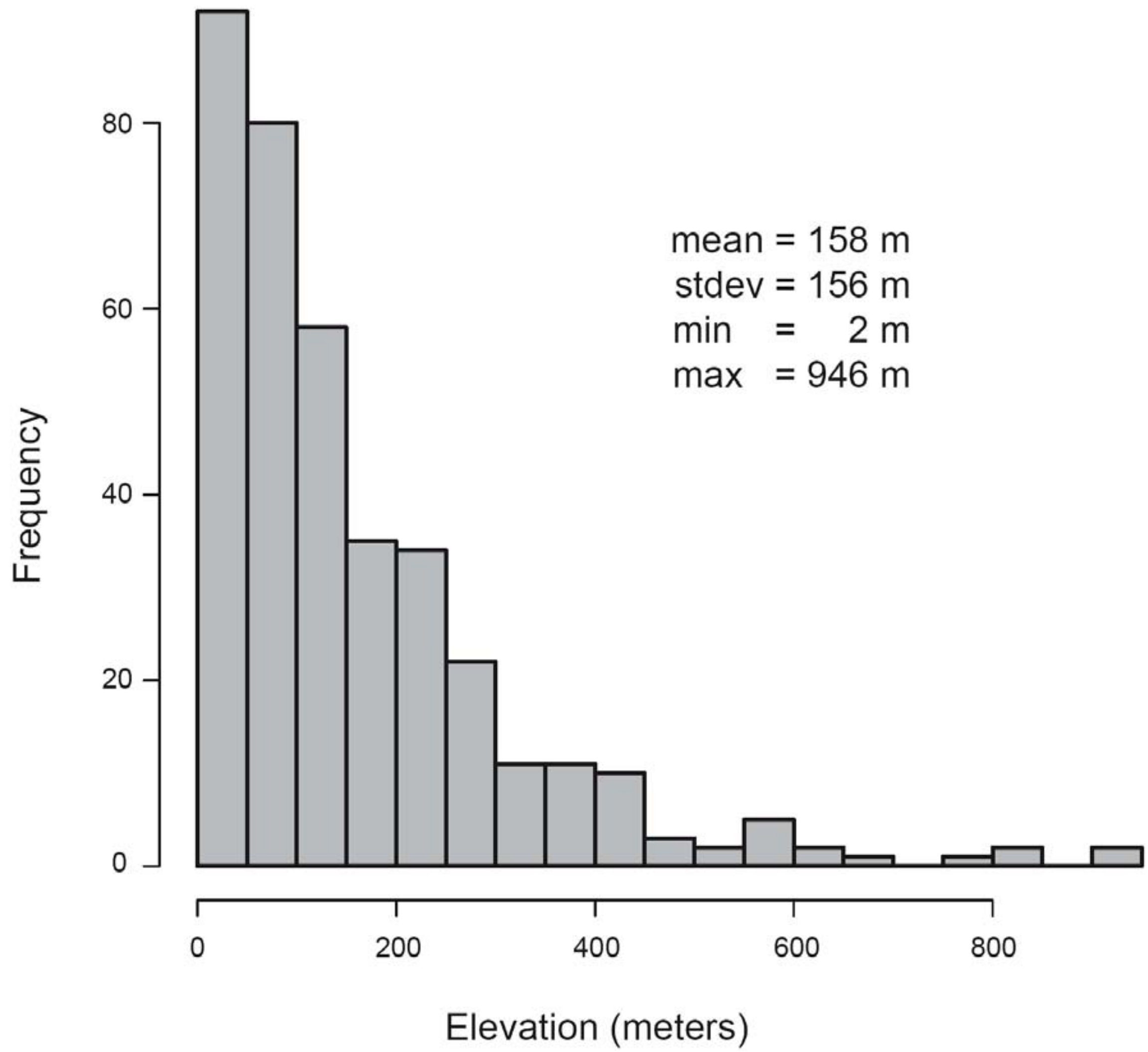

Figure S5. Elevational limits of *Pseudacris feriarum*. Here we plot the elevation of museum record localities where *P. feriarum* were found. Elevations were determined from geographic coordinates obtained from the HerpNet database (http://www.herpnet.org/). The highest point in the Appalachians (Mt. Michell, North Carolina) is 2037 meters.

LITERATURE CITED

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