

1 **Supporting Information S2. a)** A comparison of the level of support for possible explanatory
 2 models that describe the evolution of the minimum frequency in vocalisations of mammals.
 3 Excludes species for which interpolated data was used in the making of the phylogeny. The
 4 results are produced from phylogenetic generalised least squares (PGLS) analysis. T is terrestrial,
 5 S is semi-aquatic and A is aquatic.

Model	$\Delta AICc$	Weighted AICc	95% CI of slope parameter (Lower, Upper)	PGLS λ	λ 95% CI (Lower, Upper)	Effect size (r)
$\beta_0 + \beta_{\text{mass}} + \beta_{\text{environment}}$	0.00	0.6424	-0.50, -0.30	0.55	0.55, 0.56	0.54
$\beta_0 + \beta_{\text{mass}} + \beta_{\text{environment}} + \beta_{\text{sociality}}$	2.11	0.2237	-0.50, -0.29	0.55	0.55, 0.56	0.54
		0.0767	-0.21, 0.26 T			
$\beta_0 + \beta_{\text{mass}} * \beta_{\text{environment}}$	4.25		-0.44, 0.49 S -0.62, -0.22 A	0.53	0.53, 0.54	0.54
$\beta_0 + \beta_{\text{mass}}$	4.84	0.0571	-0.41, -0.19	0.79	0.79, 0.79	0.40
β_0	26.35	0.0000	-	0.89	0.88, 0.89	-

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14 **b)** A comparison of the level of support for possible explanatory models that describe the
 15 evolution of the maximum frequency in vocalisations of mammals. Excludes species for which
 16 interpolated data was used in the making of the phylogeny. The results are produced from
 17 phylogenetic generalised least squares (PGLS) analysis. T is terrestrial, S is semi-aquatic and A
 18 is aquatic.

Model	$\Delta AICc$	Weighted AICc	95% CI of slope parameter (Lower, Upper)	PGLS λ	λ 95% CI (Lower, Upper)	Effect size (r)
			-0.38, -0.06 T			
$\beta_0 + \beta_{\text{mass}} * \beta_{\text{environment}}$	0.00	0.7781	-0.46, 0.30 S	0.32	0.32, 0.32	0.56
			-0.25, 0.03 A			
$\beta_0 + \beta_{\text{mass}} + \beta_{\text{environment}}$	3.11	0.1643	-0.33, -0.19	0.43	0.43, 0.43	0.49
$\beta_0 + \beta_{\text{mass}} + \beta_{\text{environment}} + \beta_{\text{sociality}}$	5.21	0.0575	-0.33, -0.19	0.43	0.43, 0.44	0.49
$\beta_0 + \beta_{\text{mass}}$	19.01	0.0001	-0.22, -0.06	0.71	0.70, 0.71	0.26
β_0	27.96	0.0000	-	0.78	0.78, 0.78	-