

Appendix 4: Richness maps and additional results on richness – environment relationship

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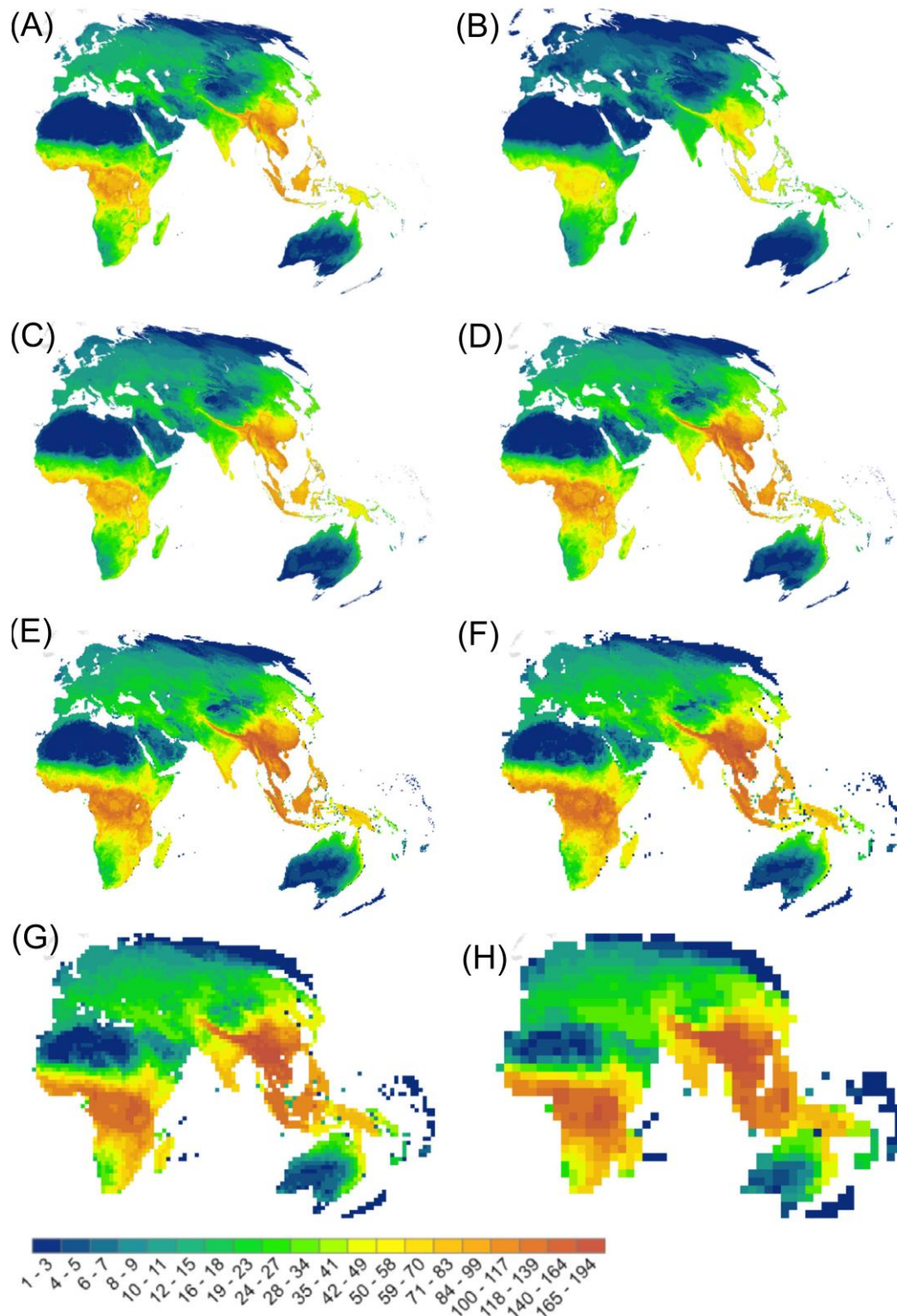
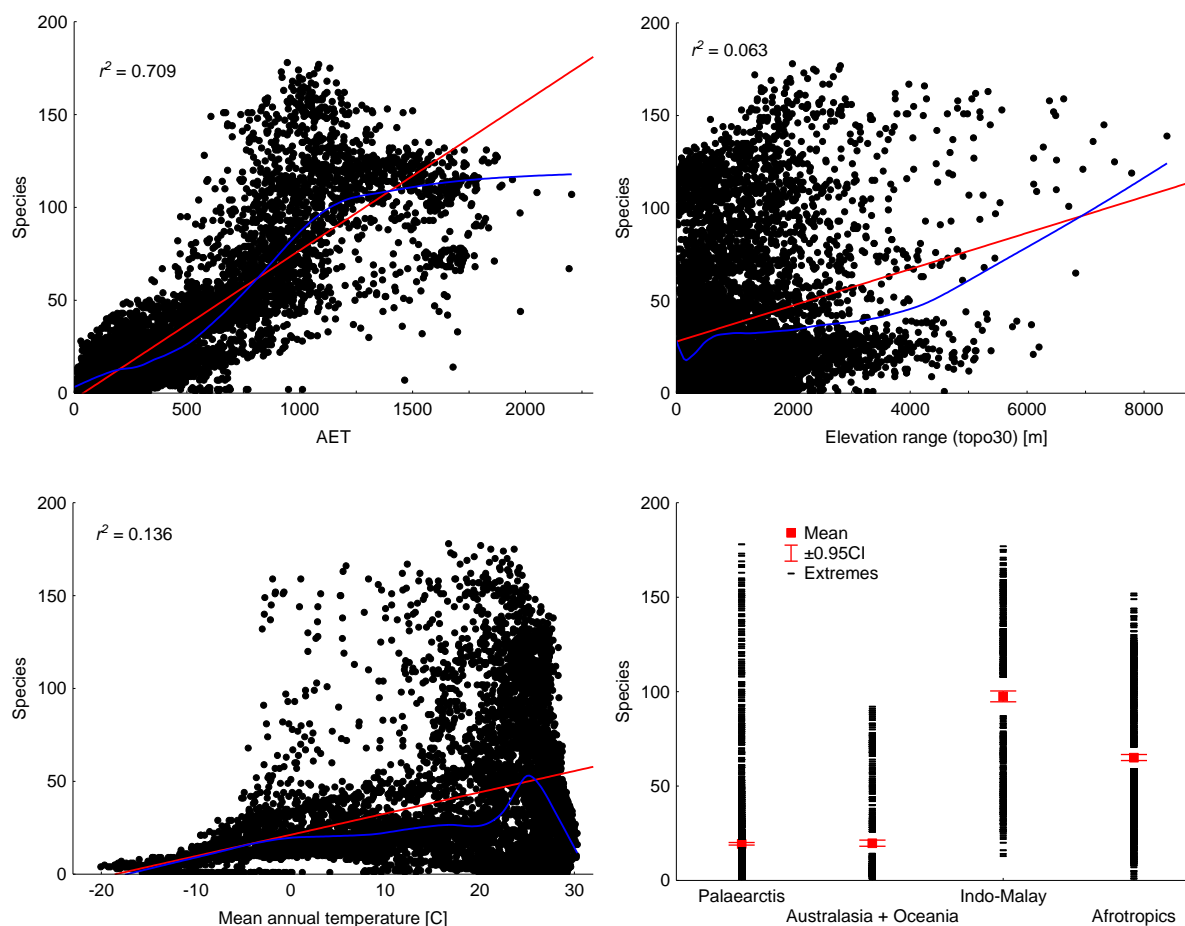
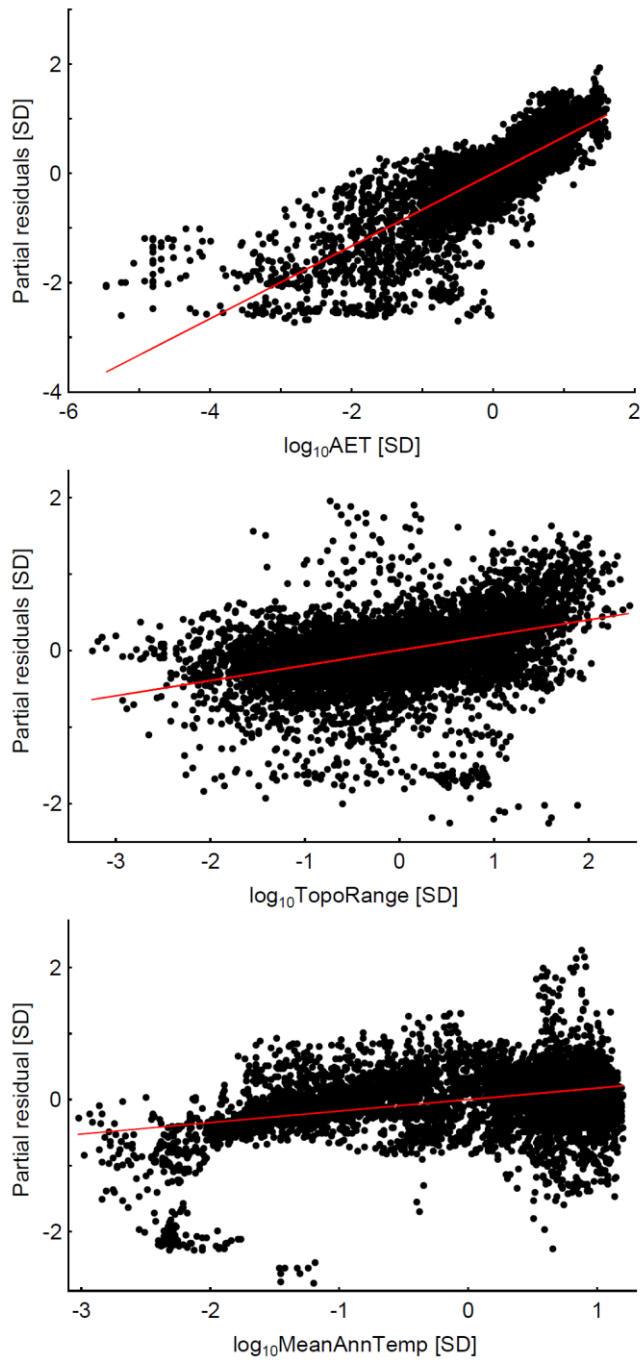


Figure S4 Spatial variation in sphingid moth richness, mapped at different grain sizes. Most maps are derived from stacking distribution estimates after thresholding (i.e., converting SDMs to predictions of presence or absence), while data in the upper right corner shows sums of habitat suitability as derived from Maxent models. All maps are in Mollweide World equal area projection and employ the same colouring scheme. **[A]** Grain size: 5 km, Σ (thresholded predictions); **[B]** 5 km, Σ (Maxent logistic output); **[C]** 15 km, Σ (thresholded predictions); **[D]** 25 km, Σ (thresholded); **[E]** 50 km, Σ (thresholded); **[F]** 100 km, Σ (thresholded); **[G]** 200 km, Σ (thresholded); **[H]** 400 km, Σ (thresholded). Note that analyses of correlations with the environment (ES4.1-4.4) are based on a grain size of 1 degree (see map in Fig. 4 of main text).

S4.1 Univariate relationships of sphingid species richness with environmental variables (1° grain size). Linear regression (red) and their r^2 , and lowess-fits (blue) are shown. Note that untransformed variables are shown here, whereas multivariate models are based on log-transformed and standardized data.



S4.2 Partial effects of environmental variables on sphingid moth richness (standardized data [SD], no coastal cells, OLS model from main text). In addition, the model also included biogeographic effects (realm membership; not shown).



S4.3 Multivariate models predicting sphingid species richness (1° grain size, min. 20% land, standardized variables). See main text for models utilizing land-only cells.

N = 7519	OLS: $R^2_{\text{adj}} = 0.761$; AIC = 10588			SAR: $R^2_{\text{pseudo}} = 0.968$; AIC = -4072		
	Coefficient \pm SE	t	p	Coefficient \pm SE	z	p
<i>Intercept</i>	0.000 \pm 0.010	-0.03	<0.001	0.959 \pm 0.860	1.12	0.265
AET	0.678 \pm 0.007	93.37	<0.001	0.196 \pm 0.008	24.14	<0.001
Temperature	0.218 \pm 0.008	28.14	<0.001	-0.020 \pm 0.015	-1.33	0.183
TopoRange	0.170 \pm 0.006	28.51	<0.001	0.073 \pm 0.004	19.45	<0.001
<i>Palaearctis</i>	0*			0*		
<i>Afrotropics</i>	0.230 \pm 0.020	11.35	<0.001	0.281 \pm 0.024	11.68	<0.001
<i>IndoMalay</i>	0.290 \pm 0.026	11.12	<0.001	-0.004 \pm 0.029	-0.13	0.893
<i>Australasia</i>	-0.800 \pm 0.023	-34.86	<0.001	-0.234 \pm 0.121	-1.94	0.052

*) by default

S4.4.1 Multivariate model predicting richness for two major tribes (1° grain size, land-only cells (SAR neighbourhood: 1500 km, see S4.3.2 for all cells ≥20% land).

Macroglossini	OLS: $R^2_{adj} = 0.777$; AIC = 2277.3			SAR: $R^2_{pseudo} = 0.885$; AIC = 2277.3		
N = 6312	Coefficient $_{\pm SE}$	t	p	Coefficient $_{\pm SE}$	z	p
Intercept	-0.021 $_{\pm 0.010}$	-2.02	0.044	1.240 $_{\pm 2.473}$	0.50	0.616
AET	0.573 $_{\pm 0.008}$	74.55	<0.001	0.337 $_{\pm 0.007}$	45.60	<0.001
Temperature	0.287 $_{\pm 0.008}$	34.16	<0.001	0.135 $_{\pm 0.015}$	8.84	<0.001
TopoRange	0.257 $_{\pm 0.006}$	40.31	<0.001	0.135 $_{\pm 0.005}$	26.60	<0.001
<i>Palaeartic</i>	0*			0*		
<i>Afrotropics</i>	0.291 $_{\pm 0.022}$	13.48	<0.001	0.606 $_{\pm 0.028}$	21.54	<0.001
<i>Indomalaya</i>	0.527 $_{\pm 0.028}$	18.59	<0.001	0.072 $_{\pm 0.030}$	2.35	0.019
<i>Australasia</i>	-0.799 $_{\pm 0.025}$	-32.31	<0.001	33.554 $_{\pm 8.314}$	4.036	<0.001
Smerinthini	OLS: $R^2_{adj} = 0.795$; AIC = 8074.3			SAR: $R^2_{pseudo} = 0.808$; AIC = 2801.4		
N = 6312	Coefficient $_{\pm SE}$	t	p	Coefficient $_{\pm SE}$	z	p
Intercept	0.036 $_{\pm 0.010}$	3.57	<0.001	-5.582 $_{\pm 2.150}$	-2.60	0.009
AET	0.615 $_{\pm 0.007}$	81.58	<0.001	0.389 $_{\pm 0.008}$	50.49	<0.001
Temperature	0.057 $_{\pm 0.008}$	6.95	<0.001	0.120 $_{\pm 0.016}$	7.54	<0.001
TopoRange	0.070 $_{\pm 0.006}$	11.13	<0.001	0.081 $_{\pm 0.005}$	15.33	<0.001
<i>Palaeartic</i>	0*			0*		
<i>Afrotropics</i>	0.522 $_{\pm 0.021}$	24.59	<0.001	0.591 $_{\pm 0.029}$	20.14	<0.001
<i>Indomalaya</i>	0.386 $_{\pm 0.028}$	13.90	<0.001	0.001 $_{\pm 0.032}$	0.04	0.969
<i>Australasia</i>	-1.431 $_{\pm 0.024}$	-59.03	<0.001	0.489 $_{\pm 7.227}$	0.07	0.946

*) by default

S4.4.2 Multivariate model for two major tribes (1° grain size, min. 20% land, standardized variables; SAR neighbourhood 500 km). See main text for models utilizing land-only cells.

Macroglossini	OLS: $R^2_{adj} = 0.771$; AIC = 10273			SAR: $R^2_{pseudo} = 0.905$; AIC = -5272.6		
N = 7764	Coefficient $_{\pm SE}$	t	p	Coefficient $_{\pm SE}$	z	p
Intercept	-0.055 $_{\pm 0.009}$	-5.787	<0.001	1.900 $_{\pm 1.316}$	1.44	0.149
AET	0.573 $_{\pm 0.007}$	80.577	<0.001	0.138 $_{\pm 0.007}$	18.42	<0.001
Temperature	0.294 $_{\pm 0.008}$	38.850	<0.001	-0.019 $_{\pm 0.014}$	-1.36	0.173
TopoRange	0.226 $_{\pm 0.006}$	38.698	<0.001	0.070 $_{\pm 0.003}$	20.12	<0.001
<i>Palaeartictis</i>	0*			0*		
<i>Afrotropics</i>	0.314 $_{\pm 0.020}$	15.842	<0.001	0.244 $_{\pm 0.022}$	10.99	<0.001
<i>Indomalaya</i>	0.547 $_{\pm 0.026}$	21.459	<0.001	0.020 $_{\pm 0.027}$	0.75	0.454
<i>Australasia</i>	-0.689 $_{\pm 0.022}$	-30.691	<0.001	-0.248 $_{\pm 0.112}$	-2.22	0.026
Smerinthini	OLS: $R^2_{adj} = 0.775$; AIC = 10130			SAR: $R^2_{pseudo} = 0.797$; AIC = -2992		
N = 7764	Coefficient $_{\pm SE}$	t	p	Coefficient $_{\pm SE}$	z	p
Intercept	-0.001 $_{\pm 0.009}$	-0.157	0.876	-0.823 $_{\pm 0.749}$	-1.10	0.272
AET	0.621 $_{\pm 0.007}$	88.055	<0.001	0.168 $_{\pm 0.009}$	19.28	<0.001
Temperature	0.073 $_{\pm 0.008}$	9.749	<0.001	0.032 $_{\pm 0.016}$	1.95	0.051
TopoRange	0.048 $_{\pm 0.006}$	8.228	<0.001	0.061 $_{\pm 0.004}$	15.07	<0.001
<i>Palaeartictis</i>	0*			0*		
<i>Afrotropics</i>	0.506 $_{\pm 0.020}$	25.766	<0.001	0.279 $_{\pm 0.026}$	10.81	<0.001
<i>Indomalaya</i>	0.299 $_{\pm 0.025}$	11.844	<0.001	-0.044 $_{\pm 0.031}$	-1.40	0.162
<i>Australasia</i>	-1.441 $_{\pm 0.022}$	-64.743	<0.001	-0.428 $_{\pm 0.130}$	-3.30	<0.001

*) by default