Supplementary Information for 'Phenotypic plasticity in tropical butterflies is linked to climatic seasonality on a macroevolutionary scale'

Photographing museum specimens

Specimens were photographed using Nikon D300 SLR with an AF-S Micro NIKKOR 60mm f/2.8G ED lens set at a fixed focus distance of 7, 9 or 10 cm. Lighting used a Metz Ring Flash 15 MS-1 keeping all exposure settings, including flash output, constant for all images. All resultant RAW image files were developed in Adobe Photoshop CC 2018 with fixed settings. We balanced colours and contrasts using QPcolorsoft 501 software (2.0.1) and reference images of a QP Card 201 which were acquired using the same procedure as for specimens. Two examples below: *alboplaga* (left) and *anynana* (right)

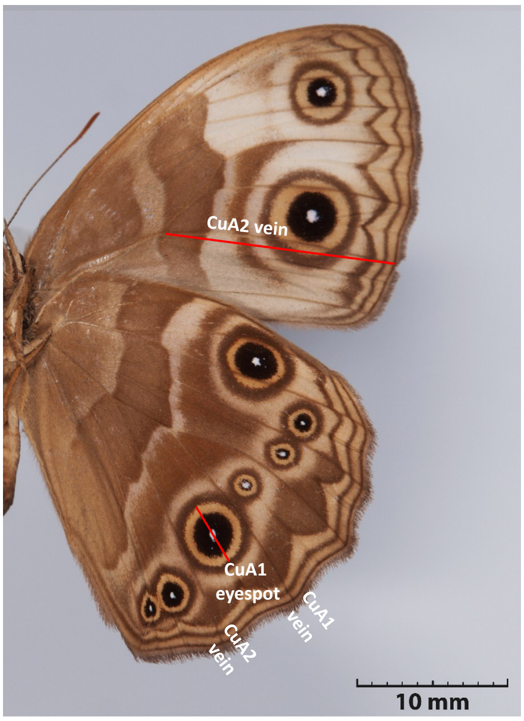

Figure S1: Illustration depicting measurement of the diameter of CuA1 eyespot (which was used calculate the degree of plasticity) and the length of CuA2 vein on the forewing as a proxy for the body size. Relative eyespot size was then calculated as the ratio of actual eyespot diameter and length of the CuA2 vein.

Table S1: Rarefaction levels used for different species to minimise the bias due to uneven collection efforts using the R package *spThin* ver. 0.2.0 (Aiello-Lammens et al. 2015) with the thinning parameter set to 5, 10, 20 and 50km with 25 replicates per species/thinning distance (see Methods for details).

Species	*N_full_data_set*	*N_selected_scale*	*Rarefaction_scale*	*Comments*
abnormis	48	29	20	
alboplaga	96	54	50	
amieti	6	6	5	
analis	20	17	10	
angulosa	212	154	50	
anisops	23	18	5	
anynana	238	136	50	
auricruda	178	94	50	
aurivilli	62	27	10	
brakefieldi	12	10	20	
brunnea	24	20	5	
buea	68	41	50	
campa	71	59	20	
campina	122	90	20	
cf_mesogena	19	13	50	
choveti	3	3	5	
collinsi	95	53	20	
cooksoni	52	38	20	
cottrelli	101	44	50	
danckelmani	35	18	10	
dekeyseri	49	24	20	
dentata	134	78	10	
dorothea	197	93	50	
dubia	55	41	20	
elishiae	8	8	10	
ena	98	78	20	
ephorus	42	20	20	
evadne	145	81	50	
feae	1	0	N/A	Single location
funebris	394	212	50	
golo	128	60	50	
graueri	45	30	50	
heathi	5	5	5	
hewitsonii	85	51	50	
howarthi	15	15	10	
hyperanthis	54	36	10	
iccius	33	31	20	
ignobilis	163	87	50	
istaris	12	10	10	
italus	105	88	20	
ivindo	6	6	10	
jacksoni	12	9	10	
jefferyi	157	76	20	
kenia	4	4	10	
lamani	4	4	10	

larseni	67	35	20	
madetes	132	57	50	
maesseni	50	35	20	
makomensis	46	39	10	
mandanes	63	36	50	
martius	93	54	20	
matuta	66	30	10	
medontias	113	73	50	
mesogena	67	27	50	
mesogenina	13	11	50	
milyas	86	71	50	
mollitia	111	59	50	
moyses	90	61	50	
neustetteri	8	6	10	
nobilis	16	16	20	
ottossoni	9	8	10	
pareensis	1	0	N/A	Single location
pavonis	73	56	20	
persimilis	19	11	10	
procora	163	69	50	
rhacotis	21	20	50	
rileyi	8	8	10	
safitza	1080	365	50	
sambulos	126	56	50	
sanaos	85	64	50	
sandace	222	126	50	
sangmelinae	73	38	20	
saussurei	104	71	20	
sciathis	22	20	10	
sealeae	1	0	N/A	Single location
sebetus	138	88	50	
sigiussidorum	14	14	10	
simulacris	43	20	10	
smithi	152	87	50	
sophrosyne	85	43	50	
subtilisurae	9	8	5	
sweadneri	49	36	50	
sylvicolus	20	14	20	
taenias	146	71	50	
tanzanicus	8	8	0	
technatis	28	27	20	
trilophus	24	21	20	
uniformis	102	57	50	
uzungwensis	11	6	5	
vandeweghi	2	2	0	
vulgaris	455	238	50	
wakaensis	5	5	20	
xeneas	118	62	50	
zinebi	84	43	20	

Table S2: Number of specimens measured per species (n=85) to quantify the eyespot size and wing length.

Species	No. of specimens	Species	No. of specimens
jacksoni	5	*jefferyi*	13
larseni	5	*makomensis*	13
ephorus	6	*milyas*	13
maesseni	6	*taenias*	13
nobilis	6	*matuta*	14
amieti	7	*persimilis*	14
howarthi	7	*procora*	14
rileyi	7	*cooksoni*	15
technatis	7	*cottrelli*	15
elishiae	8	*madetes*	15
ottossoni	8	*medontias*	15
wakaensis	8	*sebetus*	15
zinebi	8	*subtilisurae*	15
analis	9	*collinsi*	16
ivindo	9	*trilophus*	16
martius	9	*xeneas*	16
pavonis	9	*moyses*	17
sylvicolus	9	*neustetteri*	17
anisops	10	*brakefieldi*	18
hyperanthus	10	*graueri*	18
sciathis	10	*iccius*	18
sweadneri	10	*ignobilis*	18
tanzanicus	10	*italus*	18
abnormis	11	*smithi*	18
rhacotis	11	*cf_sangmelinae*	20
sandace	11	*mesogena*	21
sigiussidorum	11	*sophrosyne*	21
vulgaris	11	*auricruda*	22
danckelmani	12	*dorothea*	22
dubia	12	*uniformis*	23
ena	12	*anynana*	24
evadne	12	*sanaos*	24
funebris	12	*dentata*	26
mandanes	12	*angulosa*	28
mesogenina	12	*uzungwensis*	29
mollitia	12	*sambulos*	33
sangmelinae	12	*aurivilli*	40
brunnea	13	*safitza*	40
buea	13	*simulacris*	40
campa	13	*alboplaga*	43
golo	13	*saussurei*	46
istaris	13	*hewitsonii*	58
		campina	67

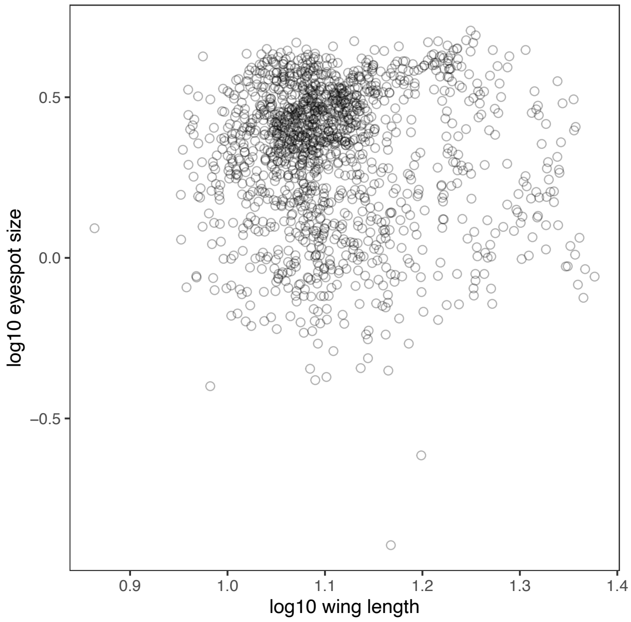

Figure S2: Scatterplot showing relationship between log10 raw eyespot size (in mm) and log10 wing length (in mm) for all species together. Fitting a linear regression indicated the relationship was non-significant (estimate= -0.0977; estimate 95% CI = -0.247, 0.051; p value=0.2).

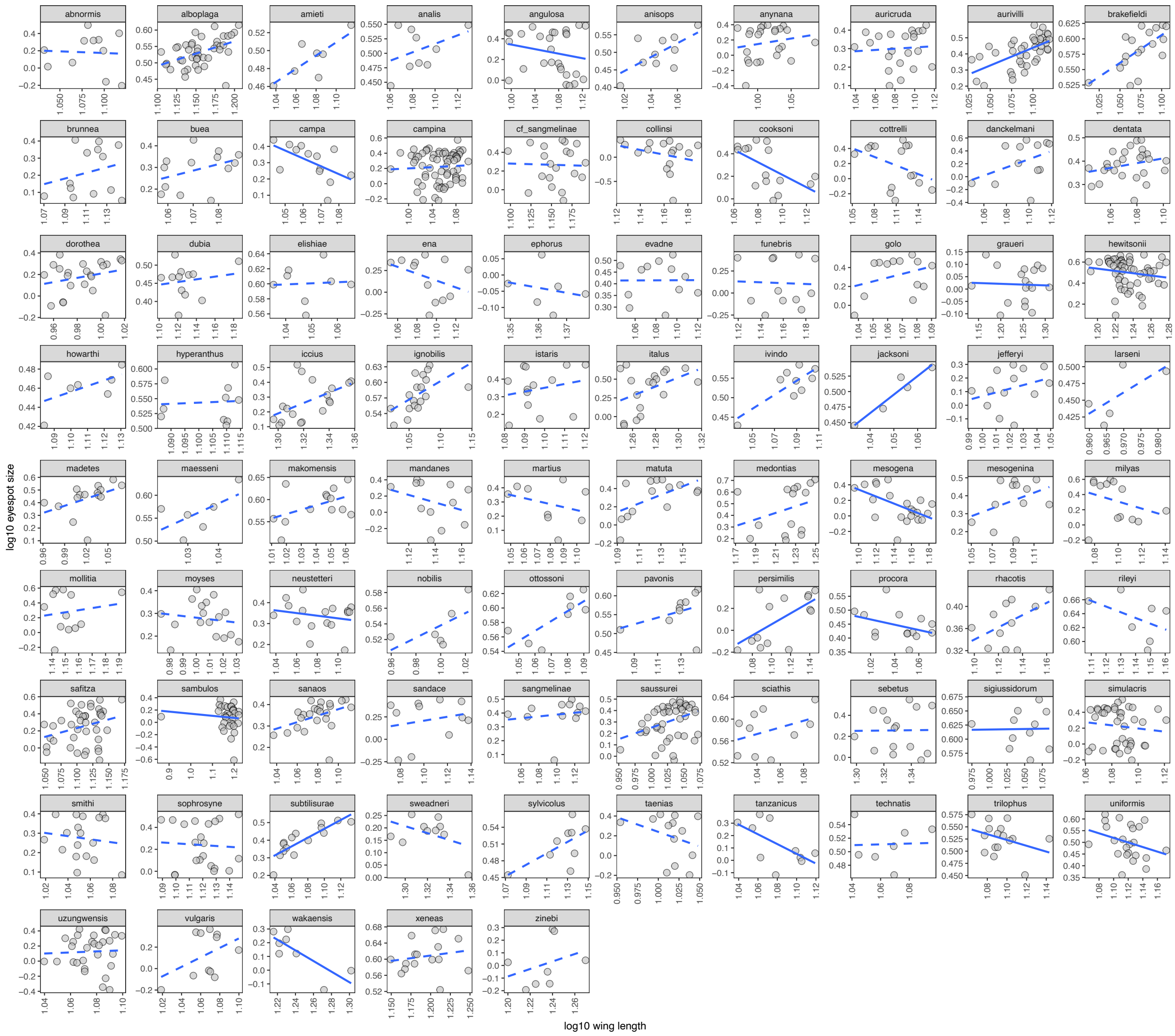

Figure S3: Linear regressions (log10 raw eyespot size ~ log10 wing length) fitted separately for each species with linetype depicting the significance of the linear regression at α=0.05 (dotted line when α>0.05 and solid line when α<0.05).

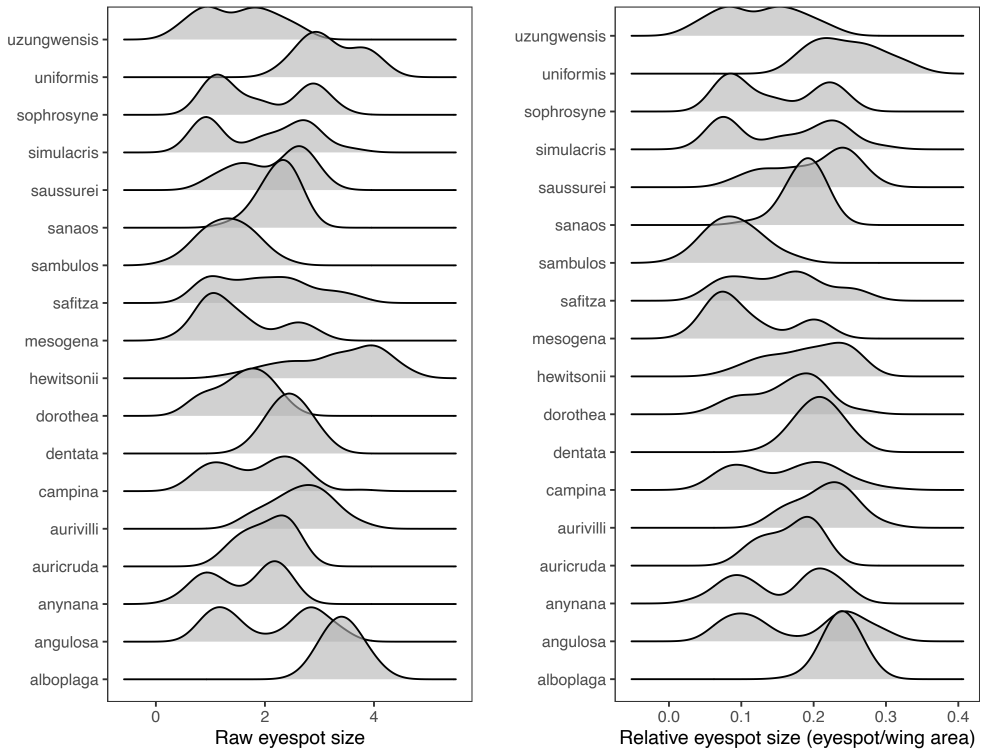

Figure S4: Ridge plots showing density distribution for raw eyespot size (in mm) on the left and relative eyespot size (calculated as the ratio of eyespot size and wing length) on the right. Only species for which >20 specimens were measured are included.

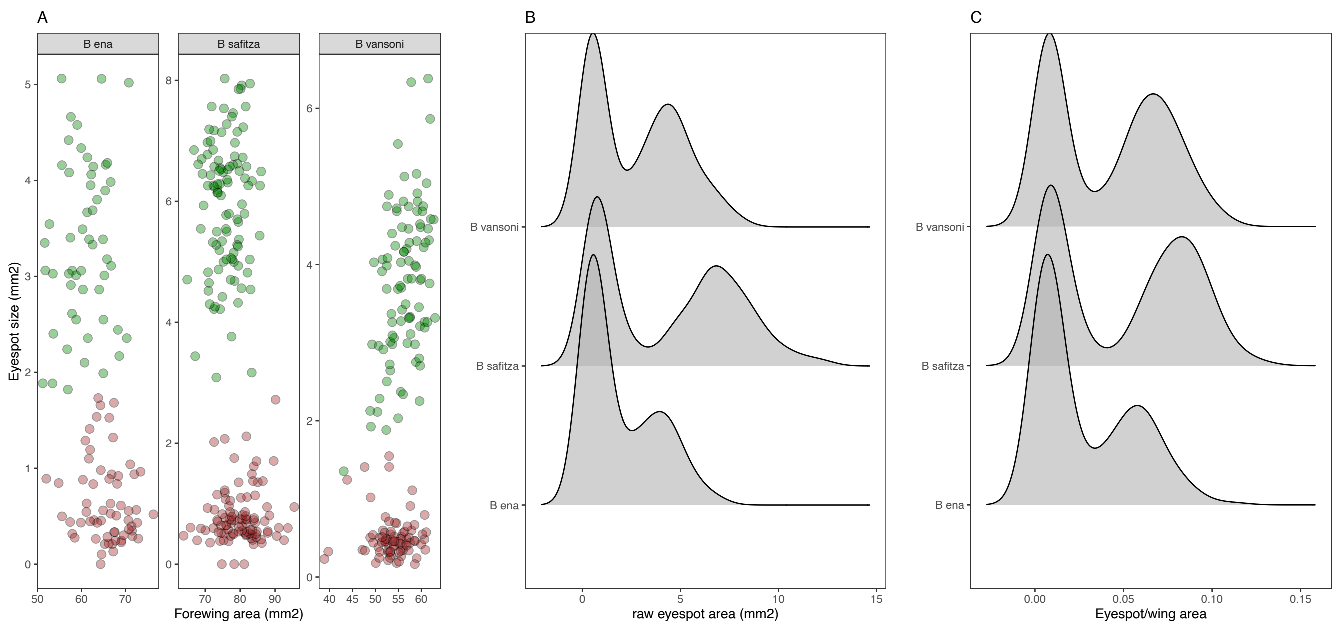

Figure S5: Exploring the relationship between the eyespot size (in mm2) and wing area (in mm2) (panel A) and the density distribution of raw and relative eyespot size (panel B and C, respectively) using the field collected samples of three species. The data was obtained from Halali et al. (2021). Colors in the panel A are as follows: brown = dry season forms; green = wet season forms. Note that data on only males is shown here.

PHYLOGENETIC COMPARATIVE ANALYSES

Table S3: Phylogenetic signal measured using Pagel's lambda (function *phylosig* from the R package *phytools*) for eyespot range (which indicates the degree of plasticity in the eyespot size) and all environmental variables.

Variable	*PNO quantile*	*Pagel's lambda*	*P value*
Eyespot range	-	0.4392	<0.001
Mean diurnal range	80	0.6856	<0.001
Mean temp. coldest quarter	20	0.8265	<0.001
Annual precipitation	20	0.8130	<0.001
Precipitation seasonality	80	0.7900	<0.001
Precipitation of driest quarter	20	0.2856	<0.001
Temperature range (Bio10-Bio11)	80	0.9238	<0.001
Seasonal temp. difference (Bio8-Bio9)	50	0.8675	<0.001
Absolute seasonal temp. difference (Bio8-Bio9)	80	0.8439	<0.001

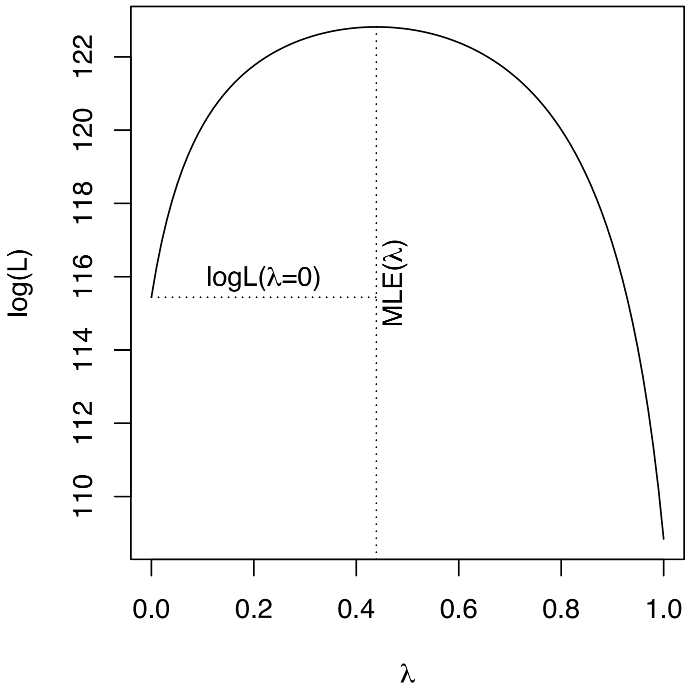

Figure S6: Likelihood profile showing the maximum likelihood estimate of Pagel's lambda for the eyespot range.

Table S4: AICc score and weights for several homogenous-rate evolutionary models (function *fitContinuous* from the R package *geiger*) fitted to eyespot range (which indicates the degree of plasticity). Best model was chosen based on the AICc and AICc weights (highlighted in bold). The table also indicates number of iterations with the same best fit and frequency of the best fit (higher the value, higher the confidence that the model has found the same maximum likelihood estimate).

Models	*AICc*	*AICc weights*	*Number of iterations with the same best fit*	*frequency of the best fit*
Brownian	-213.54	0.0001	100	1
Ornstein-Uhlenbeck	**-231.59**	**0.9124**	**34**	**0.34**
Early burst	-211.39	<0.001	1	0.01
BM with trend	-221.84	0.0070	7	0.07
White noise	-226.73	0.0804	100	1

Table S5: Likelihood and AIC values for several PGLS models (eyespot range ~ environmental variable) with Brownian Motion, Ornstein-Uhlenbeck, Pagel's lambda correlation structures and another model where Pagel's lambda was fixed to zero (which is equivalent to the OLS regression). Best fitting model was chosen based on the AIC score. When AIC scores were similar, log likelihood test was carried out to test if models differed significantly (these models are indicated with *). If not, then the simplest model was chosen (OLS in the case of Annual precipitation indicated with *). Model in bold indicates the best fitting model.

Predictor (environmental variable)	*PNO quantile*	*Correlation structure*	*Log Likelihood*	*No. of parameters*	*AIC*
Mean diurnal temperature	80	BM	108.9272	3	-211.8544
		OU	123.6202	4	-239.2404
		Lambda	**125.6956**	**4**	**-243.3911**
		OLS	123.6202	3	-241.2404
Mean Temp. of coldest quarter	20	BM	109.0513	3	-212.1023
		OU	122.866	4	-237.7326
		Lambda	**125.1958**	**4**	**-242.3916**
		OLS	122.8663	3	-239.7326
Annual precipitation	20	BM	109.3248	3	-212.6496
		OU	126.3630	4	-244.7261
		Lambda*	**126.9699**	**4**	**-245.9398**
		OLS*	**126.3630**	**3**	**-246.7261**
Precipitation seasonality	80	BM	108.8563	3	-211.7126
		OU	123.8847	4	-239.7694
		Lambda	**126.4714**	**4**	**-244.9428**
		OLS	123.8847	3	-241.7694

Precipitation of driest quarter	20	BM	109.2531	3	-212.5062
		OU	119.1835	4	-230.3669
		Lambda	**123.4809**	**4**	**-238.9618**
		OLS	119.1835	3	-232.3669
Temp. range (Bio10-Bio11)	80	BM	109.1478	3	-212.2955
		OU	123.4364	4	-238.8728
		Lambda	**126.9113**	**4**	**-245.8227**
		OLS	123.4364	3	-240.8728
Seasonal temp. difference (Bio8-Bio9)	50	BM	110.6895	3	-215.3790
		OU	125.1340	4	-242.2679
		Lambda	**128.1511**	**4**	**-248.3023**
		OLS	125.1340	3	-244.2679
Absolute seasonal temperature difference (Bio8-Bio9)	80	BM	109.4747	3	-212.9494
		OU	124.3859	4	-240.7719
		Lambda	**127.0303**	**4**	**-246.0606**
		OLS	124.3859	3	-242.7719

Table S6: Estimates and P values (α=0.05) obtained from best fitting regression (eyespot range ~ environmental variables) models (see Table S5).

Regression type	*Environmental variable*	*PNO quantile*	*Term*	*Estimate*	*Std. error*	*P value*	*Conf low*	*Conf high*
PGLS	Mean diurnal temp. range	80	*Intercept*	0.1289	0.011	0	0.1073	0.1504
			Slope	0.0179	0.0067	0.0089	0.0048	0.031
PGLS	Mean temp. coldest quarter	20	*Intercept*	0.1299	0.0111	0	0.1081	0.1516
			Slope	-0.0172	0.007	0.0158	-0.031	-0.0035
OLS	Annual precipitation	20	*Intercept*	0.1328	0.006	0	0.121	0.1446
			Slope	-0.0298	0.006	0	-0.0416	-0.018
PGLS	Precipitation Seasonality	80	*Intercept*	0.1283	0.0103	0	0.1082	0.1484
			Slope	0.0201	0.0065	0.0027	0.0074	0.0328
PGLS	Precipitation of driest quarter	20	*Intercept*	0.1289	0.0128	0	0.1037	0.1541
			Slope	-0.0082	0.0065	0.2116	-0.0209	0.0046
PGLS	Temp. range (Bio10-Bio11)	80	*Intercept*	0.1283	0.0108	0	0.107	0.1496
			Slope	0.0199	0.0064	0.0024	0.0074	0.0324
PGLS	Seasonal temp difference (Bio8-Bio9)	50	*Intercept*	0.1294	0.0107	0	0.1086	0.1503
			Slope	0.0224	0.0063	0.0007	0.01	0.0348
PGLS	Absolute seasonal difference (Bio8-Bio9)	80	*Intercept*	0.130	0.0107	0	0.109	0.151
			Slope	0.0204	0.0064	0.0021	0.0078	0.033

SENSITIVITY ANALYSES - alternative measures of eyespot size plasticity

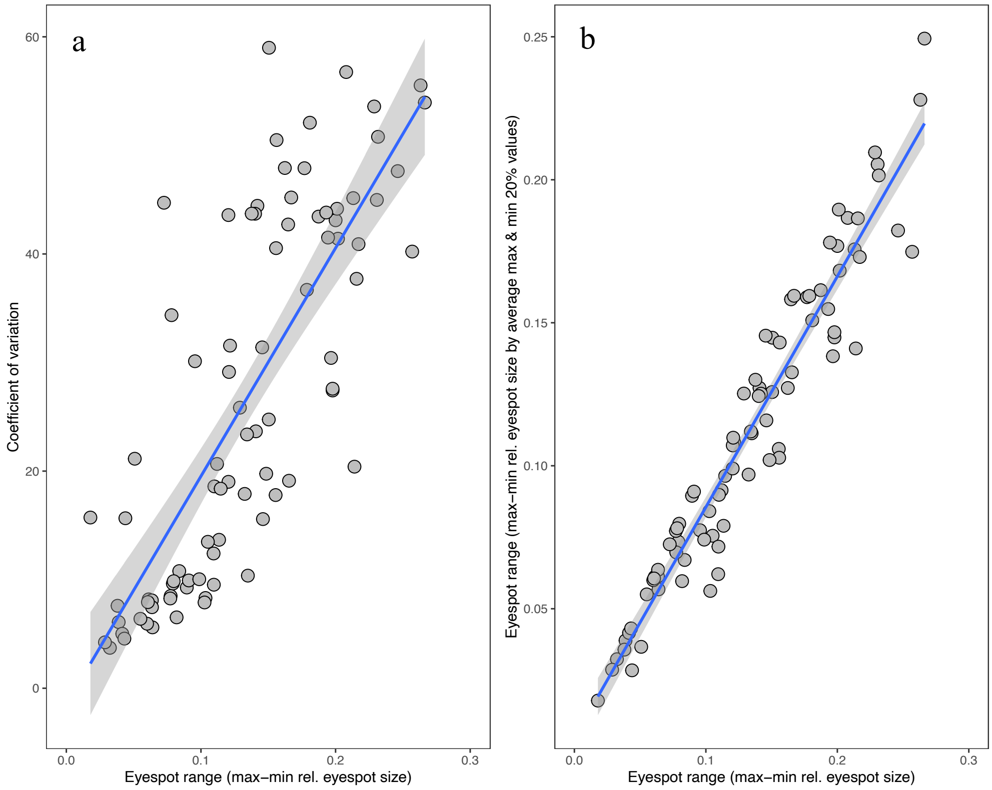

Figure S7: Correlation between eyespot range (originally measured as the range of largest minus smallest relative eyespot size) with the coefficient of variation of the eyespot size and eyespot range derived after taking the average of the 20% largest and smallest eyespots. Adjusted R^2 values for both regressions are as follows: Coefficient of variation ~ eyespot range (as calculated originally) (R^2=0.61); Eyespot range (calculated from 20% values) ~ eyespot range (as calculated originally) (R^2=0.93).

SENSITIVITY ANALYSES – effect of different PNO quantiles and sample size on PGLS estimates

Table S7: AIC values for several PGLS models (eyespot range ~ environmental variable) with Brownian Motion, Ornstein-Uhlenbeck and Pagel's lambda correlation structures and a OLS model (Pagel's lambda=0). Best fitting model was chosen based on the AIC score. Note that numbers at the end of the environmental variables indicate the PNO quantile that were used.

Environmental variable	Brownian	Ornstein-Uhlenbeck	Pagel's lambda	OLS
Mean diurnal range_75	-212.01	-240.22	-244.06	-242.22
Mean diurnal range_80	-211.85	-239.24	-243.39	-241.24
Mean diurnal range_85	-211.80	-238.06	-242.65	-240.06
Mean temp. Coldest quarter_15	-212.05	-236.37	-241.53	-238.37
Mean temp. Coldest quarter_20	-212.10	-237.73	-242.39	-239.73
Mean temp. Coldest quarter_25	-212.39	-239.61	-243.66	-241.61
Annual precipitation_15	-212.43	-243.95	-245.45	-245.95
Annual precipitation_20	-212.65	-244.73	-245.94	-246.73
Annual precipitation_25	-212.75	-245.64	-246.53	-247.64
Precipitation seasonality_75	-211.69	-240.03	-245.34	-242.03
Precipitation seasonality_80	-211.71	-239.77	-244.94	-241.77
Precipitation seasonality_85	-212.16	-238.11	-243.29	-240.11
Precipitation of driest quarter_15	-212.56	-229.00	-238.59	-231.00
Precipitation of driest quarter_20	-212.51	-230.37	-238.96	-232.37
Precipitation of driest quarter_25	-212.41	-232.92	-239.81	-234.92
Temp. range (bio8-bio9)_45	-215.09	-243.19	-248.98	-245.19
Temp. range (bio8-bio9)_50	-215.38	-242.27	-248.30	-244.27
Temp. range (bio8-bio9)_55	-215.54	-245.59	-250.69	-247.59
Temp. range absolute (bio8-bio9)_75	-212.07	-238.84	-244.32	-240.84
Temp. range absolute (bio8-bio9)_80	-212.07	-238.84	-244.32	-240.84
Temp. range absolute (bio8-bio9)_85	-212.07	-238.84	-244.32	-240.84
Temp. Range (bio10-bio11)_75	-212.21	-237.91	-245.23	-239.91
Temp. Range (bio10-bio11)_80	-212.30	-238.87	-245.82	-240.87
Temp. Range (bio10-bio11)_85	-212.21	-239.12	-245.92	-241.12

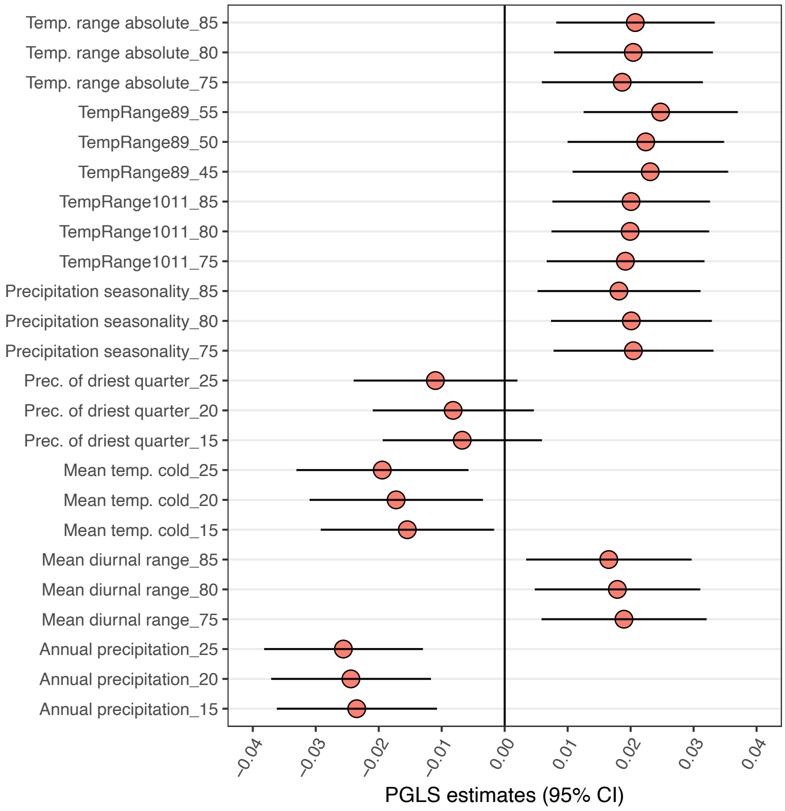

Figure S8: Figure showing the PGLS estimates and their 95% confidence intervals (CI) for several environmental variables and their different quantiles. PGLS were deemed significant when the 95% CI do not include zero. When compared for model fit among the Brownian, Ornstein-Uhlenbeck, Pagel's lambda and OLS (i.e. Pagel's lambda = 0), the Pagel's lambda correlation structure had the best fit (see Table S7). Thus, the estimates presented in this figure are from the PGLS with Pagel's lambda correlation structure.

Table S8: AIC values for several PGLS models (eyespot range ~ environmental variable) with Brownian Motion, Ornstein-Uhlenbeck and OLS (Pagel's lambda=0) correlation structure. In this dataset only species for which >=15 specimens measured were included resulting in a total of 36 species. Best fitting model was chosen based on the AIC score. Note that numbers at the end of the environmental variables indicate the PNO quantile that were used. Also, Pagel's lambda correlation structure could not be fitted because of convergence of issues with the model.

Environmental variable	Brownian	Ornstein-Uhlenbeck	OLS
Mean diurnal range_75	-88.90	-110.12	-112.12
Mean diurnal range_80	-88.87	-109.56	-111.56
Mean diurnal range_85	-88.86	-108.92	-110.92
Mean temp. Coldest quarter_15	-90.06	-105.63	-107.63
Mean temp. Coldest quarter_20	-89.59	-106.18	-108.18
Mean temp. Coldest quarter_25	-89.22	-106.90	-108.90
Annual precipitation_15	-88.98	-112.30	-114.30
Annual precipitation_20	-88.91	-112.37	-114.37
Annual precipitation_25	-88.92	-112.17	-114.17
Precipitation seasonality_75	-90.32	-119.48	-121.48
Precipitation seasonality_80	-89.63	-118.38	-120.38
Precipitation seasonality_85	-89.05	-116.85	-118.85
Precipitation of driest quarter_15	-89.45	-109.87	-111.87
Precipitation of driest quarter_20	-89.12	-110.65	-112.65
Precipitation of driest quarter_25	-88.89	-113.18	-115.18
Temp. range (bio8-bio9)_45	-88.92	-110.70	-112.70
Temp. range (bio8-bio9)_50	-88.87	-111.55	-113.55
Temp. range (bio8-bio9)_55	-88.95	-112.14	-114.14
Temp. range absolute (bio8-bio9)_75	-89.13	-112.62	-114.62
Temp. range absolute (bio8-bio9)_80	-89.13	-112.62	-114.62
Temp. range absolute (bio8-bio9)_85	-89.13	-112.62	-114.62
Temp. Range (bio10-bio11)_75	-93.97	-117.78	-119.78
Temp. Range (bio10-bio11)_80	-93.44	-118.09	-120.09
Temp. Range (bio10-bio11)_85	-93.47	-117.69	-119.69

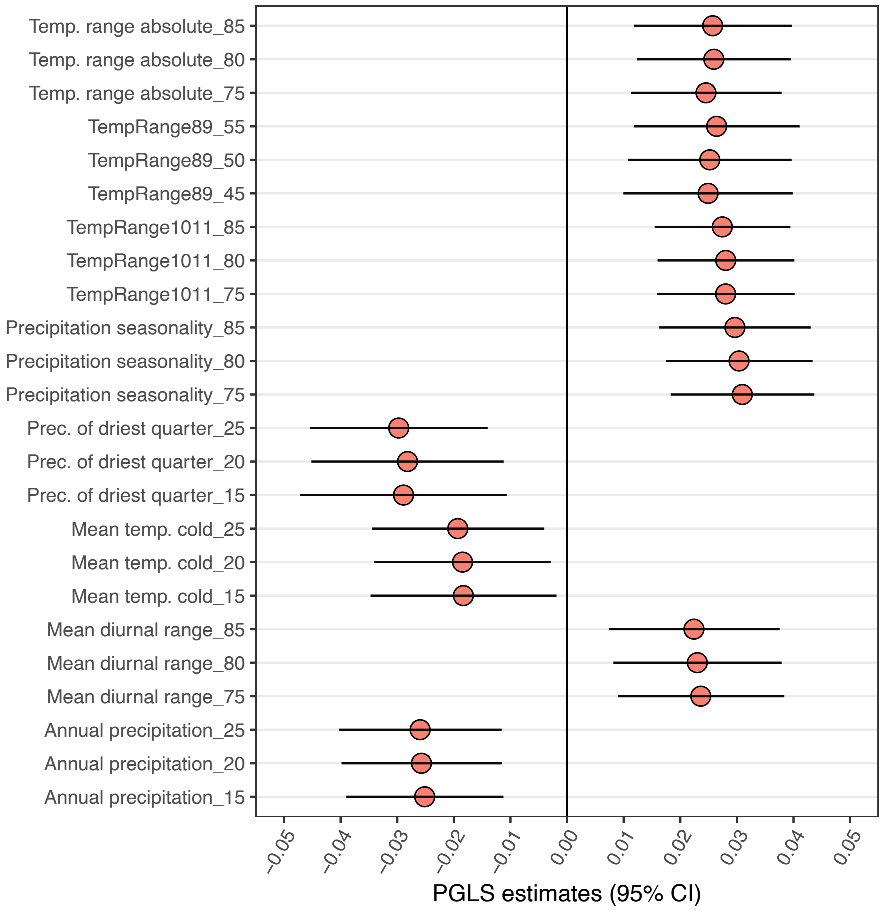

Figure S9: Figure showing the PGLS estimates and their 95% confidence intervals (CI) for several environmental variables (and their different quantiles) on a pruned dataset. Here, only those species were retained for which >=15 individuals were measured for getting eyespot and wing length data. PGLS were deemed significant when the 95% CI do not include 0. Note that we could not fit Pagel's lambda correlation structure due to convergence issues. When compared for model fit among the Brownian, Ornstein-Uhlenbeck and OLS (i.e. Pagel's lambda = 0), the OLS model has the best fit (see Table S8). Thus, the estimates presented in this graph are from the OLS model.

SENSITIVITY ANALYSES - detecting influential species

Table S9: Detecting influential *Bicyclus* species and their effect on phylogenetic signal (Pagel's lambda) using the R package *sensiPhy*.

Species removed	*lambda*	*DF*	*Change (%)*	*P value*
sylvicolus	0.5998	0.1606	36.6	<0.001
italus	0.5731	0.134	30.5	<0.001
danckelmani	0.3683	-0.0709	16.1	0.0004
simulacris	0.374	-0.0651	14.8	0.0004

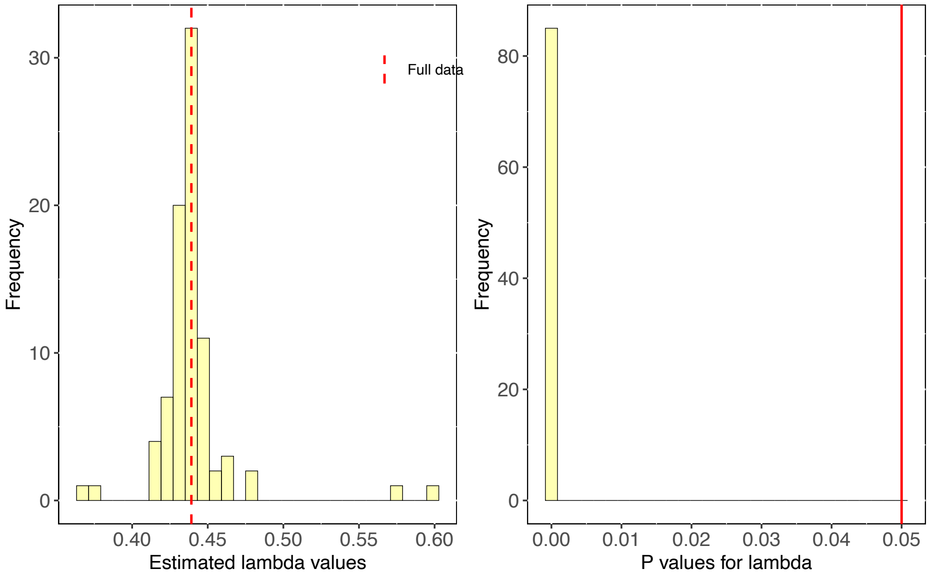

Figure S10: Distribution of Pagel's lambda and P values by sequentially removing species from the dataset which is then using for identifying the influential species. The red vertical dotted line on the left figure indicates Pagel's lambda obtained from the original data.

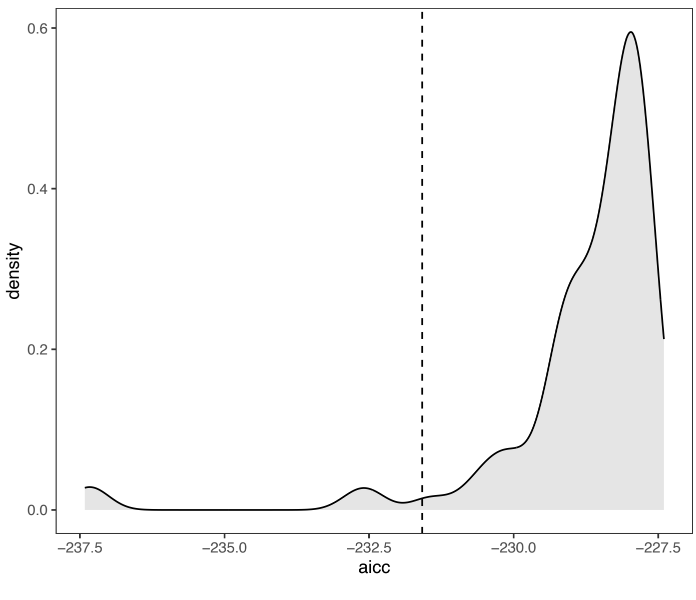

Figure S11: Distribution of AICc values for the Ornstein-Ulhenbeck model by sequentially removing species from the dataset which is then using for identifying influential species (see Table). Dashed line indicates the AICc value obtained when full dataset is used for fitting the Ornstein-Uhlenbeck model (see Table).

Table S10: Detecting influential species and their effect on estimate and P values in the phylogenetic regression (eyespot range ~ environmental variables) using Pagel's lambda correlation structure. Non-significant regressions (α=0.05) are highlighted in bold.

Environmental variable	*PNO quantile*	*Species removed*	*Estimate*	*DIFestimate*	*Change %*	*P value*
Mean diurnal range	80	**sylvicolus**	**0.0126**	**-0.0053**	**29.5**	**0.069**
		milyas	0.0145	-0.0034	18.9	0.0323
		pavonis	0.0203	0.0024	13.3	0.0039
		rhacotis	0.0157	-0.0022	12.1	0.0213
Mean temp. coldest quarter	20	**sylvicolus**	**-0.0117**	**0.0055**	**32.1**	**0.1128**
		abnormis	-0.0198	-0.0025	14.7	0.0056
		madetes	-0.0193	-0.002	11.8	0.0067
		campina	-0.0152	0.002	11.7	0.034
		rhacotis	-0.0153	0.0019	11.1	0.0315
Annual Precipitation	20	milyas	-0.02	0.0044	18.1	0.0031
		pavonis	-0.0284	-0.004	16.4	0
		sylvicolus	-0.021	0.0035	14.2	0.0021
		italus	-0.0214	0.003	12.4	0.0015
		mollitia	-0.0268	-0.0024	9.9	0.0001
		golo	-0.0268	-0.0024	9.7	0.0001
Precipitation seasonality	80	pavonis	0.0233	0.0032	16	0.0007
		milyas	0.017	-0.0031	15.6	0.0105
		sylvicolus	0.0174	-0.0027	13.7	0.0095
		campina	0.0184	-0.0017	8.2	0.0059
		matuta	0.0217	0.0016	8.1	0.0013
Temperature range (Bio10-Bio11)	80	italus	0.0178	-0.0021	10.5	0.0058
		matuta	0.0218	0.0019	9.5	0.0011
		ena	0.0218	0.0019	9.5	0.002
		pavonis	0.0217	0.0018	8.9	0.0012
		milyas	0.0182	-0.0017	8.5	0.0045
		campina	0.0182	-0.0017	8.4	0.0057
		sylvicolus	0.0184	-0.0016	7.8	0.005
		aurivilli	0.0214	0.0015	7.3	0.0015
		mollitia	0.0212	0.0013	6.7	0.0012
Seasonal temperature difference (Bio8-Bio9)	50	sylvicolus	0.019	-0.0034	15.3	0.0045
		ena	0.0248	0.0025	11	0.0004
		campina	0.0204	-0.0019	8.7	0.0022
		milyas	0.024	0.0016	7.1	0.0001
		danckelmani	0.021	-0.0014	6.4	0.0016
		ivindo	0.0238	0.0014	6.1	0.0003
Absolute seasonal temperature difference (Bio8-Bio9)	80	sylvicolus	0.0166	-0038	18.8	0.0134
		ena	0.0227	0.0023	11.0	0.0015
		milyas	0.0223	0.0019	9.1	0.0005
		campina	0.0186	-0.0019	9.1	0.0054
		abnormis	0.0222	0.0018	8.6	0.0008
		italus	0.0188	-0.0016	8.1	0.0039

SENSITIVITY ANALYSES - effect of sample size

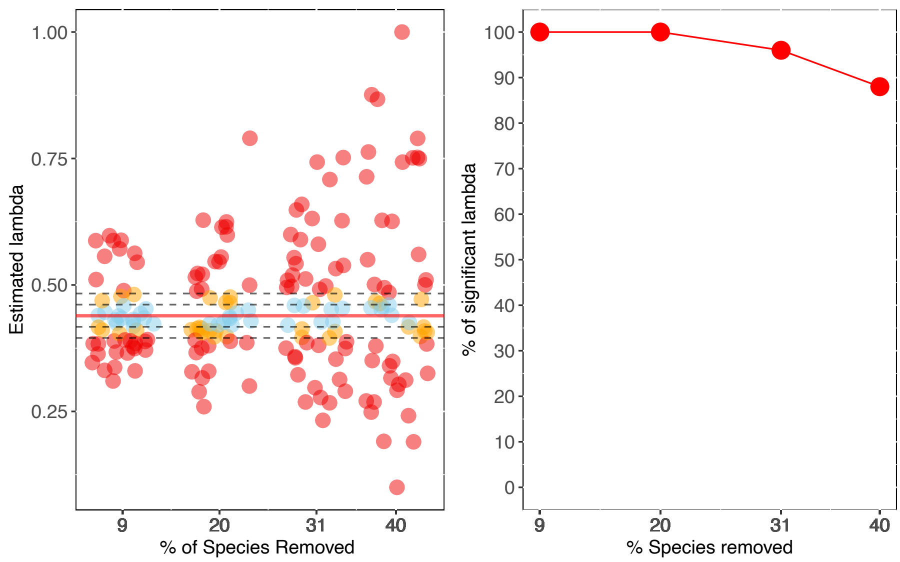

Figure S12: Effect of sample size (by removing 10, 20, 30 & 40% species and simulating each removal 100 times) on Pagel's lambda estimates (left) and percent of significant lambda values (i.e. significantly different from zero). The red horizontal line indicated the Pagel's lambda value obtained from the original data. Note that the simulations are random, and the values can change albeit from run to run.

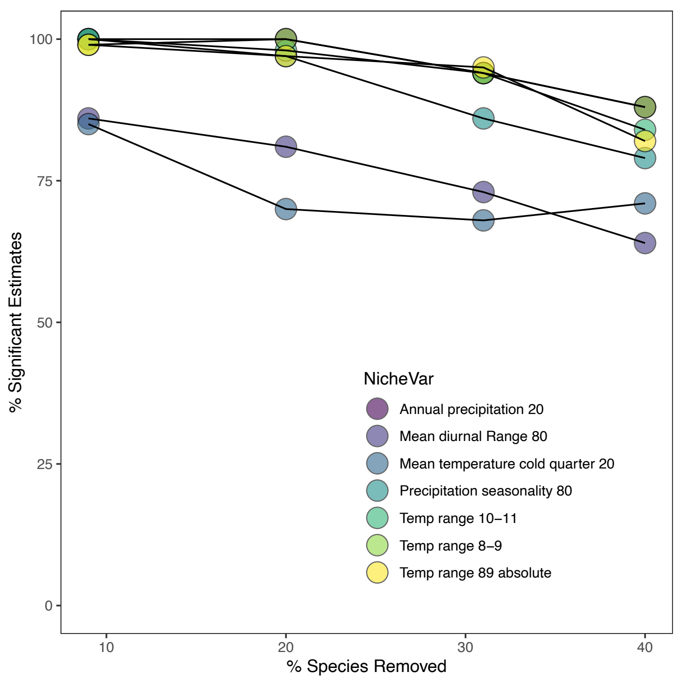

Figure S13: Estimating the effect of sample size on significance of regression estimates by removing 10, 20, 30 and 40% species from the dataset. Note that this sensitivity analyses was not performed on regression with 'precipitation of driest quarter' as a predictor which was non-significant in the original regression (see Table). Also, OLS was the best fitting model with 'annual precipitation' as the predictor (see Table) but we run phylogenetic regressions here as the estimates for OLS and PGLS were similar and removal of species albeit had slightly higher phylogenetic signal in the residuals. Note that the simulations are random and the values can change albeit from run to run.

SENSITIVITY ANALYSES- Effect of phylogenetic uncertainty on the phylogenetic signal, estimates and significance of PGLS regressions

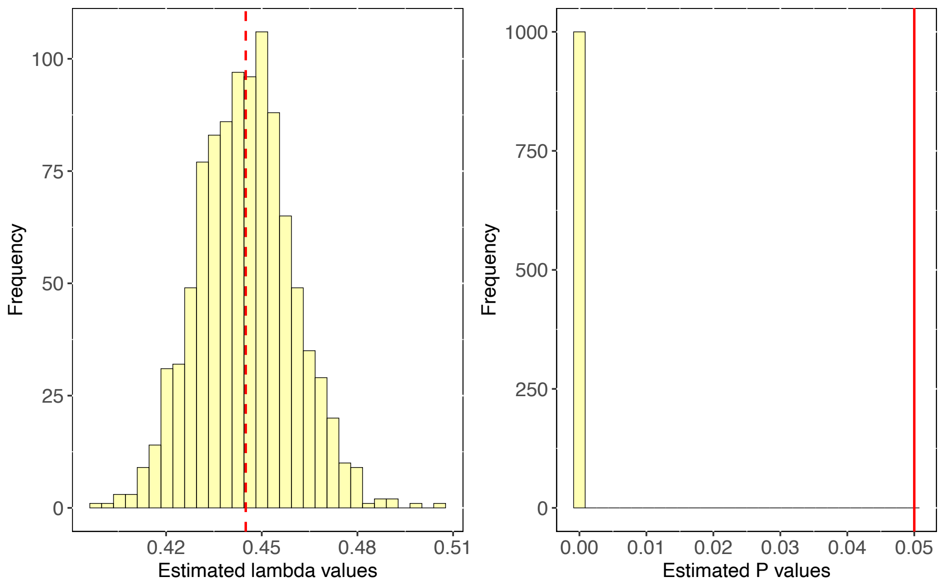

Figure S14: Estimating the effect of phylogenetic uncertainty (by randomly choosing 500 trees from posterior distribution) on Pagel's lambda value (left) and P values (α=0.05, right). Note that choosing the tree from the posterior distribution is random and hence the values can change albeit from run to run.

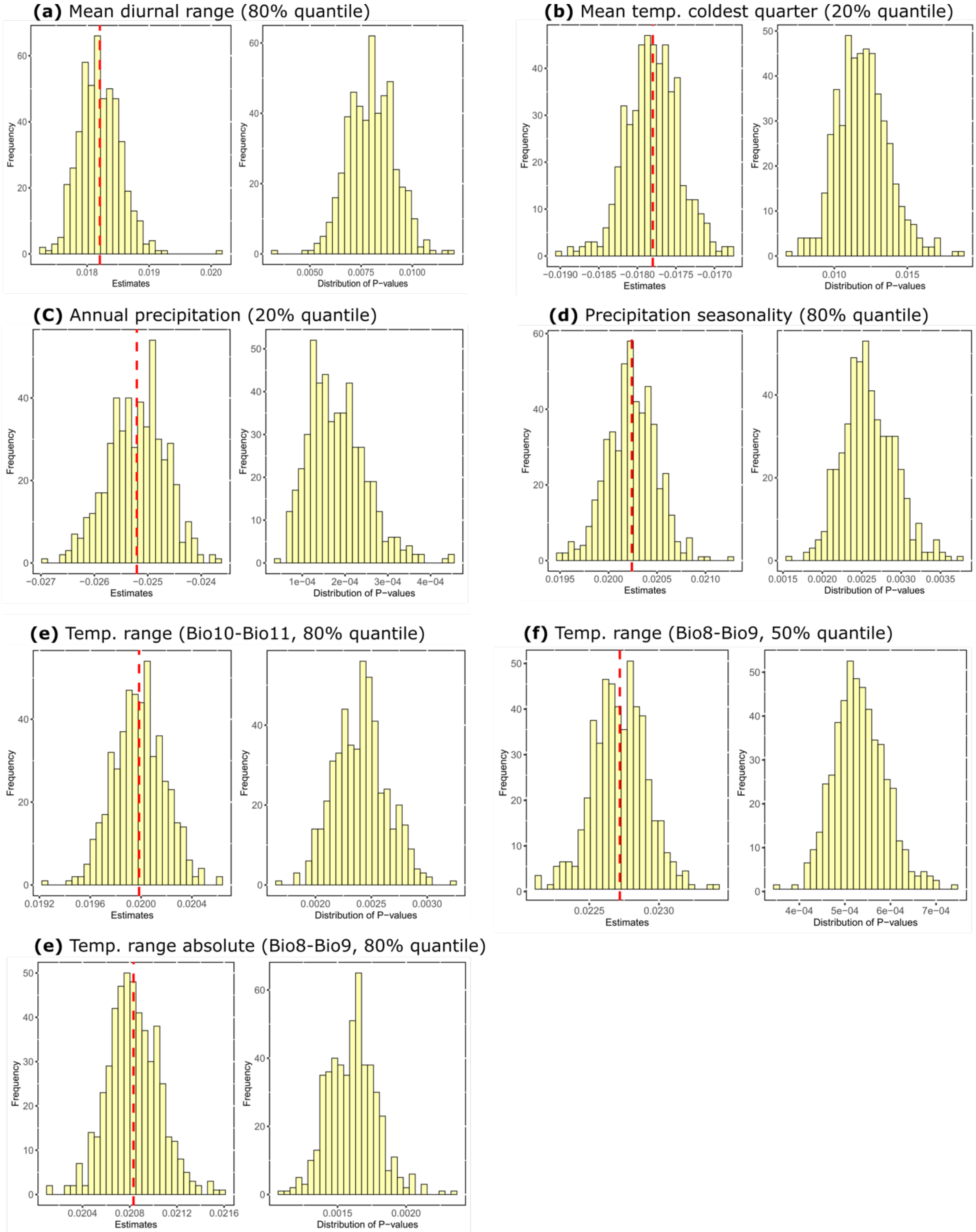

Figure S15: Effect of phylogenetic uncertainty by randomly choosing 500 trees from posterior distribution on the estimate value (left) and significance of regressions (based on P values at α=0.05, right). Each figure corresponds to each environmental variable. Note that this sensitivity analyses was not performed on regression with 'precipitation of driest quarter' as a predictor which was non-significant in the original regression. Also, OLS was the best fitting model when 'annual precipitation' when all species were included but we fit phylogenetic regressions here as the estimates for OLS and PGLS were similar. Note that choosing the tree from the posterior distribution is random and hence the value can change albeit from run to run.

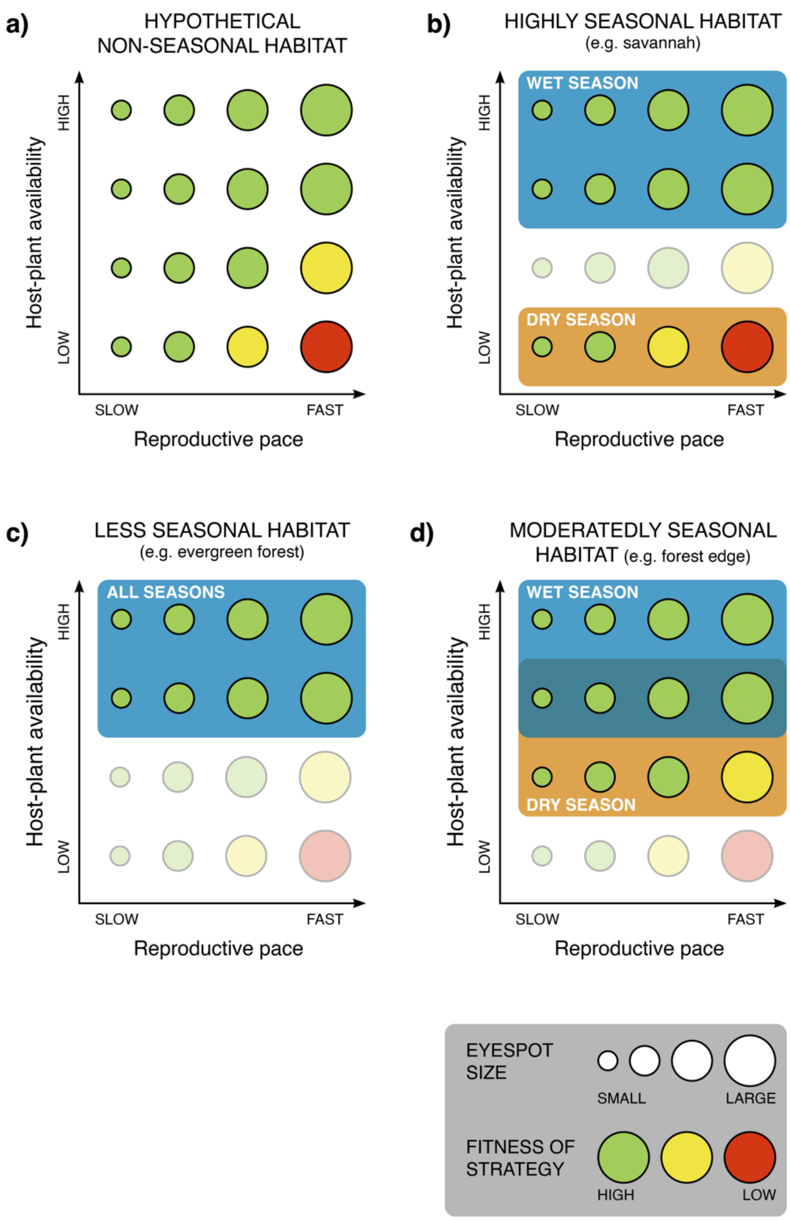

Figure S16: A conceptual framework on how eyespot size plasticity evolves in different types of habitats depending on the life-history strategy of a species. In every given situation, any life-history strategy (with its corresponding activity level) is closely linked to an optimal eyespot size, and in some cases, seasonal changes impose time-constraints (see main text); (a) a hypothetical habitat that is completely stable/aseasonal, but with varied degrees of availability of different host plants. This means that any type of strategy on the slow-to-fast continuum is possible and all eyespot sizes can co-exist; the lower right corner is, however, still unlikely to be successfully occupied as fast strategies inherently require high availabilities of host plants; (b) Highly seasonal habitats impose strong time-constraints in the wet season and low host plant availability in the dry season. This means contrasting life-history strategies are needed between the two seasons, and if ancestral plasticity is to some degree present, polyphenism is likely to evolve in such habitats; (c) Natural habitats with low seasonality are expected to have stable high food plant availability enabling multiple eyespot sizes to be favoured within the same habitat; (d) Edges of forest habitats and natural drier forests show a degree of seasonality where both fixed and plastic patterns can be effective.