

**Table 1** Best-fitted linear models, following backward selection, examining the effects of the moderators PC1<sub>precipitation</sub>, PC1<sub>temperature</sub>, elevation, TRI, leaf size and average temperature during the experiment on the standardized mean difference (Hedges' d) of total organisms (a), predators (b) and herbivores (c). Additional moderators for predators and herbivores included abundance of herbivores and of predators on experimental leaves, respectively. Intercept-only effect (no moderators included) was used as a null model. Probabilities were calculated using Wald-type tests (z-test). Empty cells (-) denote variables removed during backward selection procedure. Best-fitted models presented the smaller Akaike Information Criteria corrected for small sample sizes, AICc. Full versus reduced (final) models were discriminated using AICc. See Table S1 and Methods for variable definitions.

	Richness		Abundance		Biomass		Body size	
	z	P	z	P	z	P	z	P
<b>a) Total</b>								
Null model (intercept)	14.16	<0.001	12.77	<0.001	15.02	<0.001	8.86	<0.001
<i>Model comparison</i>								
AICc <sub>full model</sub>	122.04		159.74		79.08		73.02	
AICc <sub>reduced model</sub>	117.65		158.01		69.97		64.01	
<b>b) Predators</b>								
Null model (intercept)	11.9	<0.001	2.66	0.008	11.53	<0.001	6.14	<0.001
PC1 <sub>precipitation</sub>	-2.38	0.017	-3.04	0.002	-	-	-	-
PC1 <sub>temperature</sub>	-	-	-	-	-2.02	0.044	-	-
Leaf size	-	-	1.21	0.224	-	-	-	-
Herbivore abundance	-	-	1.93	0.054	-	-	-	-
<i>Model comparison</i>								
AICc <sub>full model</sub>	99.14		101.71		78.76		87.12	
AICc <sub>reduced model</sub>	93.15		91.36		65.4		73.49	
<b>c) Herbivores</b>								
Null model (intercept)	7.82	<0.001	1.38	0.168	0.78	0.435	2.88	0.004
Leaf size	-	-	0.48	0.629	1.89	0.059	-	-
Predator abundance	-	-	2.21	0.027	2.21	0.027	-	-
PC1 <sub>precipitation</sub>	-	-	2.47	0.013	-	-	-	-
PC1 <sub>temperature</sub>	-	-	-1.87	0.062	-	-	-	-
<i>Model comparison</i>								
AICc <sub>full model</sub>	107.6		112.34		67.23		84.06	
AICc <sub>reduced model</sub>	106.8		104.55		58.03		70.03	

## Figure legends

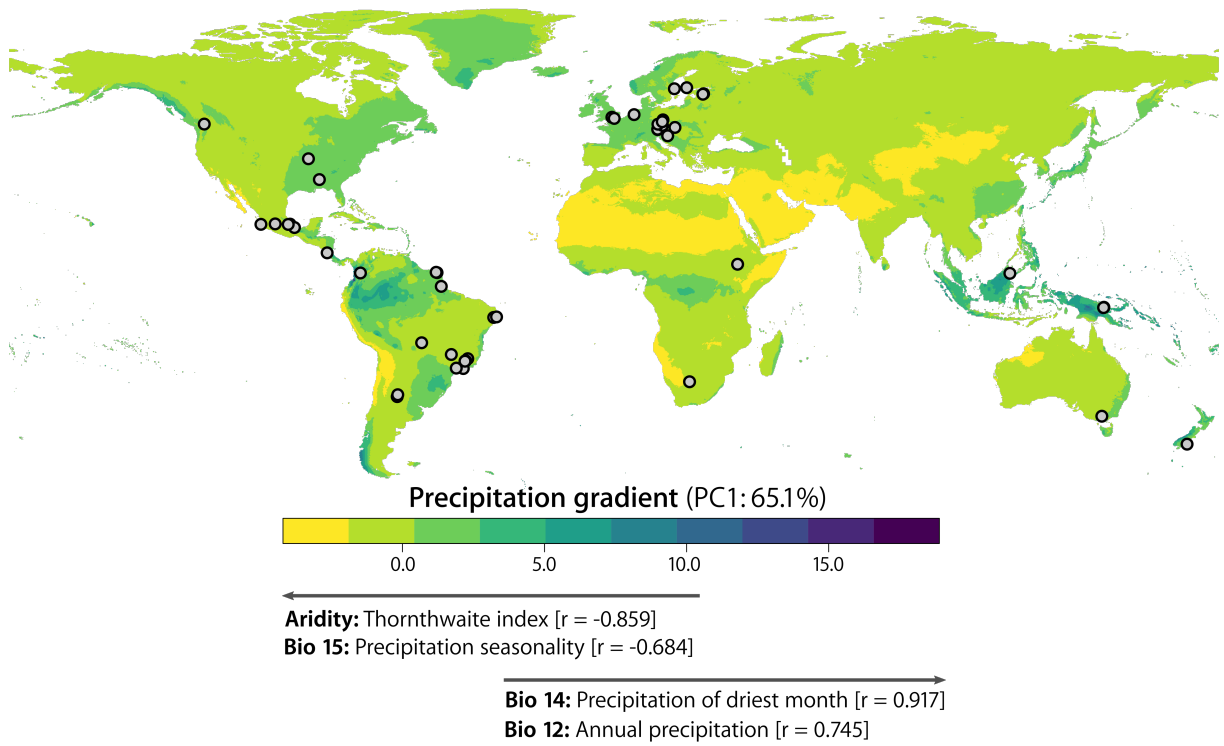
**Figure 1** Gradients of current precipitation (a) and temperature variability (b) projected across the globe. The colour gradients represent the first axis (PC1) of a principal component analysis of climatic variables. Negative values represented by light colours (greenish to yellow) denote unstable climatic conditions and arid regions, and positive values (dark, blue to purple colours) denote stable temperature and precipitation conditions. The main bioclimatic variables contributing to positive and negative values of the PC1 scores are presented below the colour gradient legends, along with their Pearson moment correlation coefficients,  $r$ , with PC1. Open circles indicate the study sites. See supplementary Table S1 for definitions of the bioclimatic variables.

**Figure 2** Effect sizes (Hedges'  $d$ ) of ecosystem engineering on richness, abundance, biomass (standing stock) and body size of predators, herbivores and all organisms, including predators, herbivores, detritivores, omnivores and parasitoids. Error bars represent 95% confidence intervals. Effects are considered significantly different from 0 if 95% confidence intervals do not cross 0.

**Figure 3** Effects of precipitation stability ( $PC1_{\text{precipitation}}$ ) on effect size (Hedges'  $d$ ) of predator (a) richness and (b) abundance. Effects of temperature stability ( $PC1_{\text{temperature}}$ ) on Hedges'  $d$  of (C) predator biomass (standing stock). Effects of (D)  $PC1_{\text{precipitation}}$  and (E-F) predator abundance upon leaves on Hedges'  $d$  of herbivore abundance and biomass. Each dot represents a site.

**Figure 4** Difference in Hedges'  $d$  values between the future (2070) and current effect size for predator richness (a) and biomass (b) at site scale. A value of zero (0) denotes no shift; whereas positive values imply in increased effect size, negative values imply in decreased effect size. Predicted values for richness and biomass were based on precipitation of the driest month (bio14) and temperature annual range (bio7), respectively, assuming the RCP8.5 (MIROC5) global climate model (see Methods).

### a) Precipitation



### b) Temperature

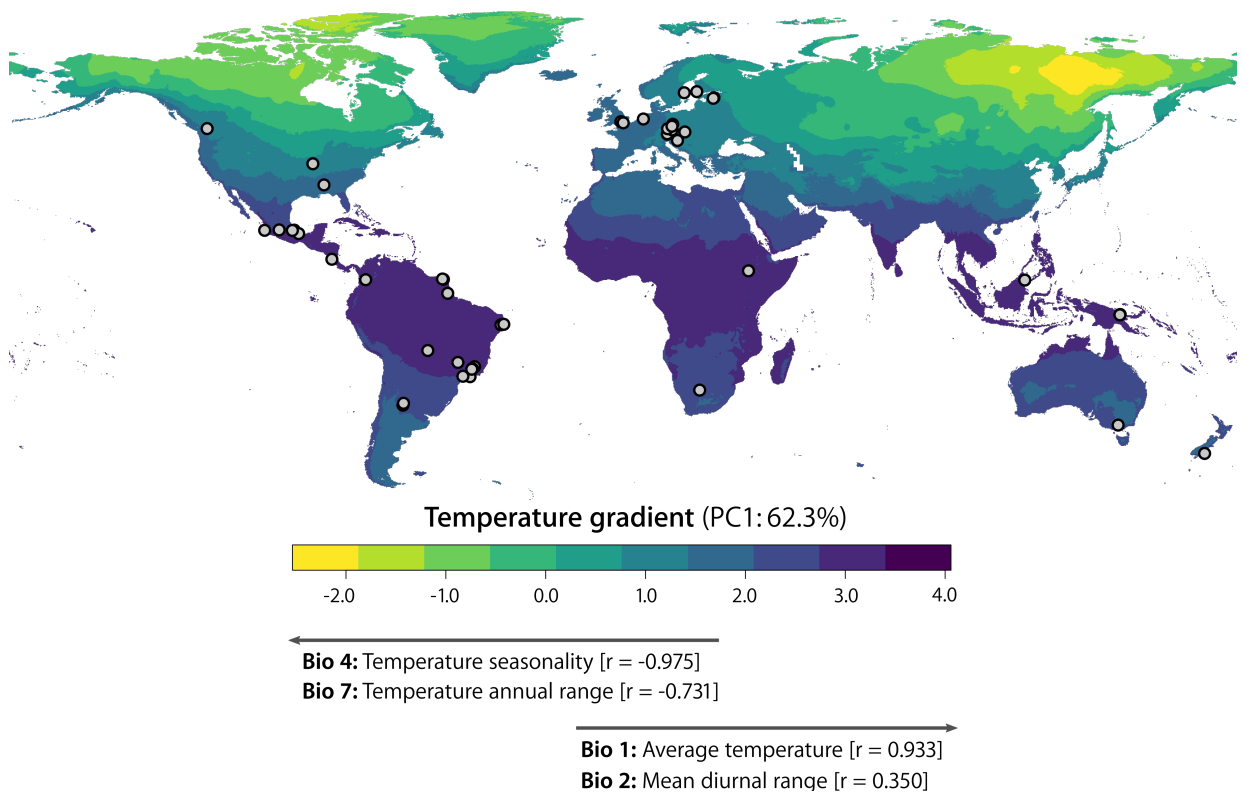


Figure 1

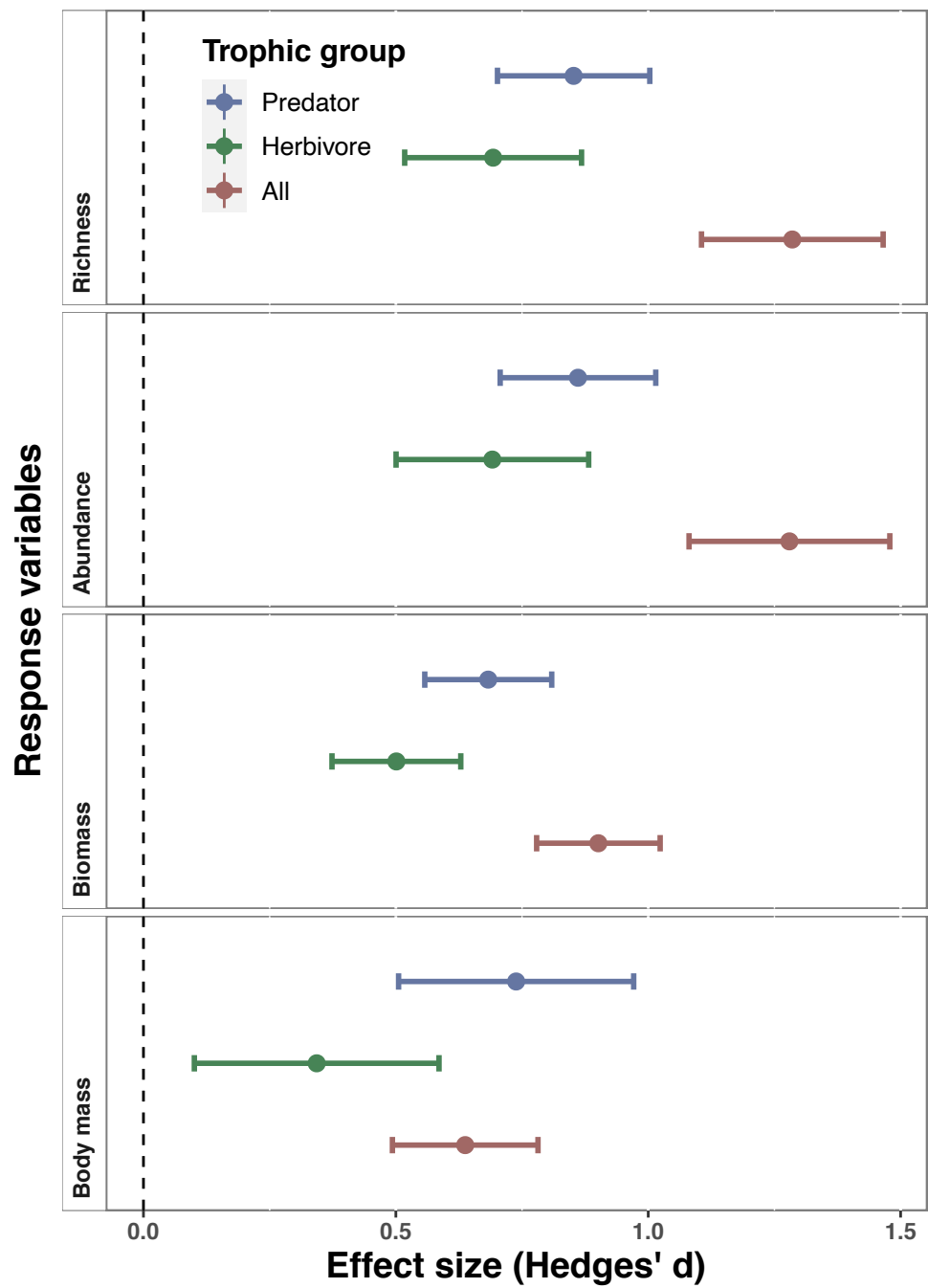


Figure 2

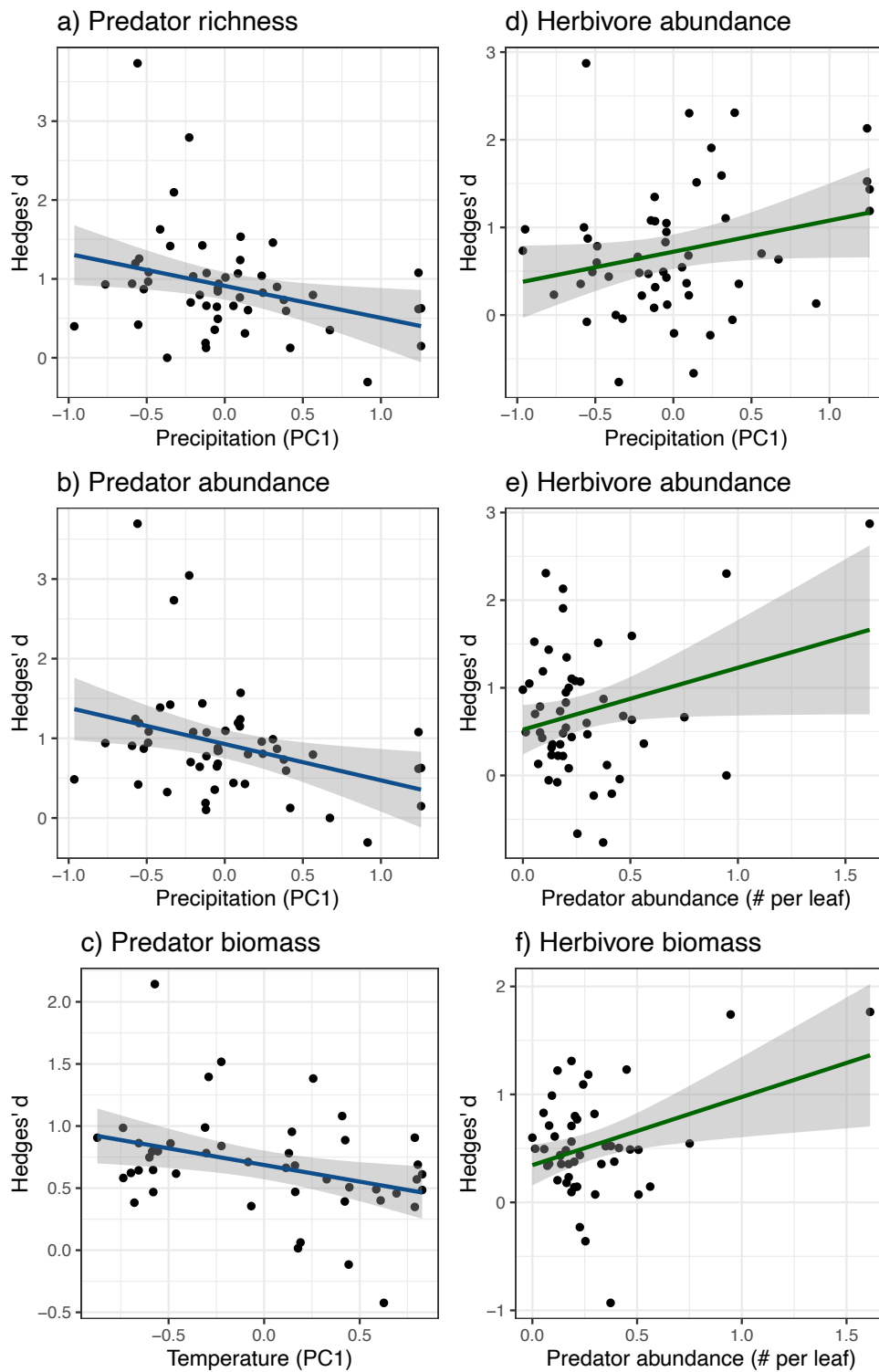


Figure 3

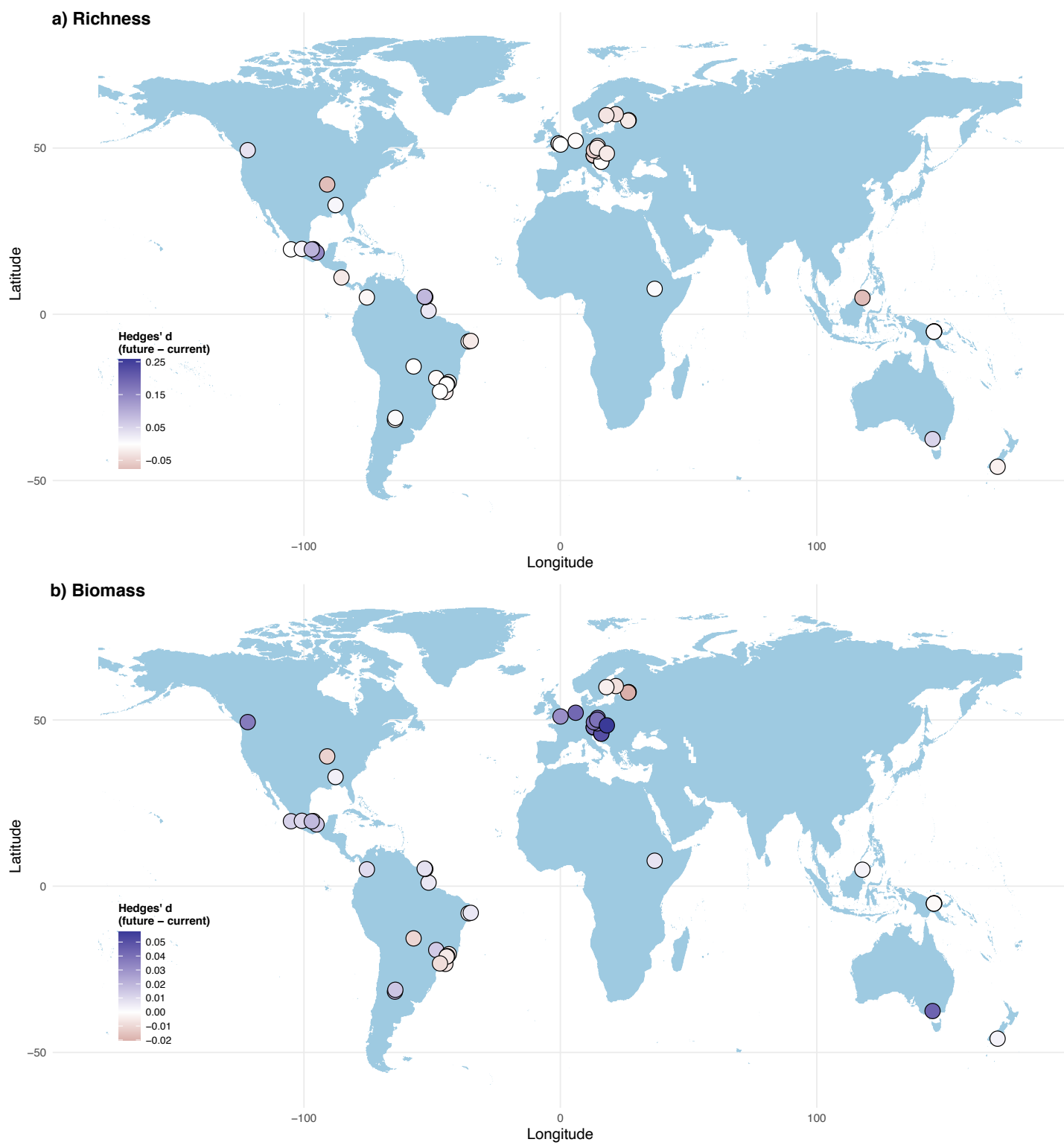


Figure 4