

Supplementary Information

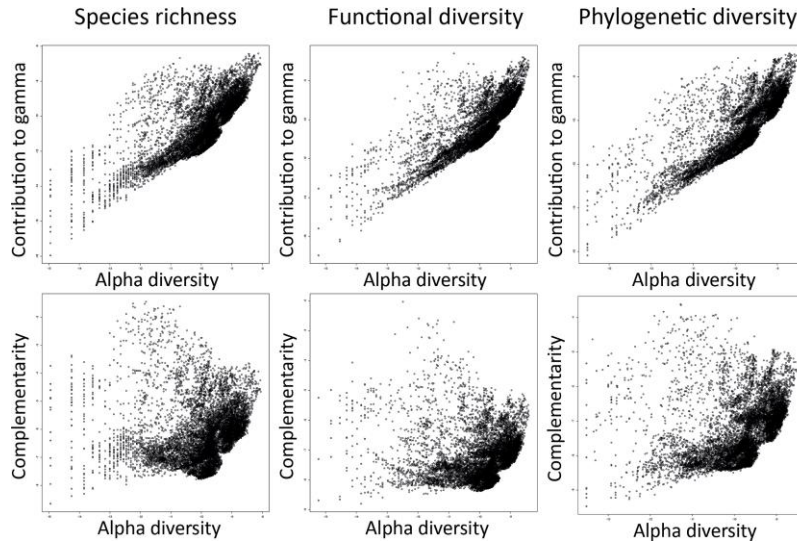


Fig. S1. Relationship between alpha diversity (log-transformed) and contribution to gamma diversity (log-transformed) and complementarity (log-transformed) for three facets of diversity (taxonomic, functional, and phylogenetic diversity). Results from a linear regression model. $n = 14,640$ grid cells. Contribution to gamma diversity is strongly correlated with alpha diversity (species richness, $R^2 = 0.59$, $p < 2.2 \times 10^{-16}$; functional diversity, $R^2 = 0.67$, $p < 2.2 \times 10^{-16}$; phylogenetic diversity, $R^2 = 0.65$, $p < 2.2 \times 10^{-16}$); complementarity is not correlated with alpha diversity (species richness, $R^2 = 0.002$, $P = 7.5 \times 10^{-7}$; functional diversity, $R^2 = 0.0001$, $p = 0.24$; phylogenetic diversity, $R^2 = 0.07$, $p = 2.2 \times 10^{-16}$).

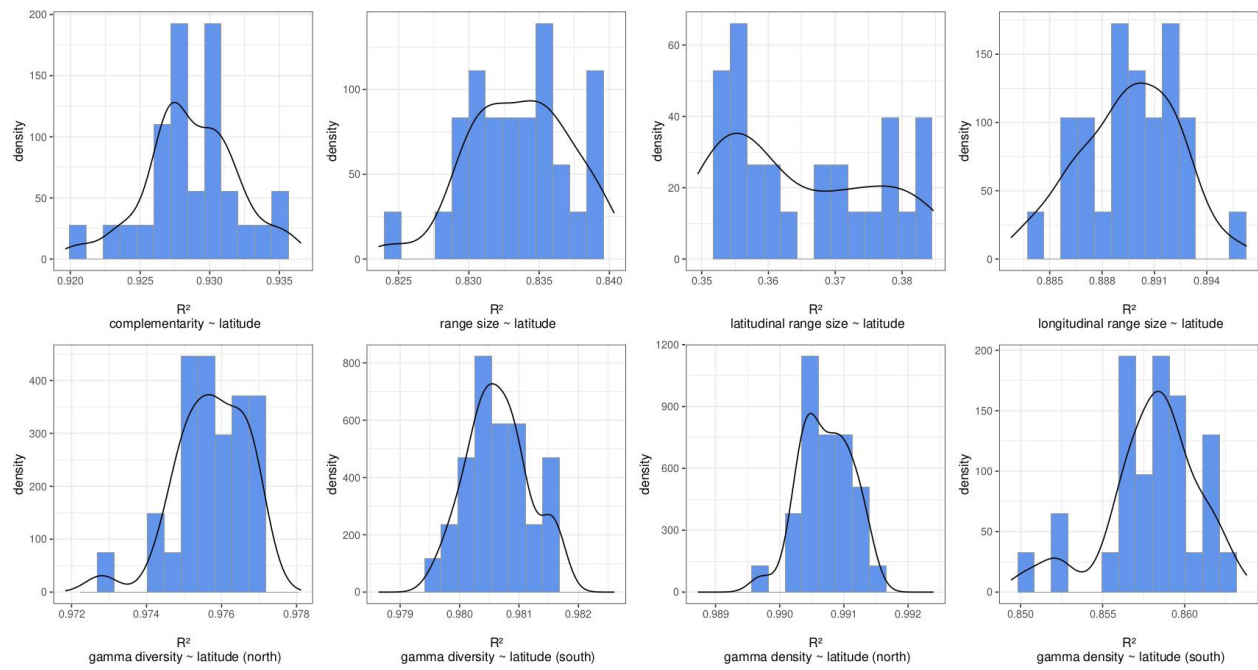


Fig. S2. Distributions of R^2 values for all main analyses that involve bird phylogenies, calculated using 30 different phylogenetic trees.

Table S1. Linear regression of median log complementarity against latitude for three facets of diversity (taxonomic, functional, phylogenetic diversity). n = 26 latitudinal bands.

Taxonomic complementarity				
	Estimate	t	R ²	p-value
Latitude	-0.09 ± 0.006	-15.8	0.91	3.6 * 10 ⁻¹⁴
Functional complementarity				
	Estimate	t	R ²	p-value
Latitude	-0.08 ± 0.005	-15.6	0.91	4.6 * 10 ⁻¹⁴
Phylogenetic complementarity				
	Estimate	T	R ²	p-value
Latitude	-0.08 ± 0.005	-18.3	0.93	1.3 * 10 ⁻¹⁵

These models estimate the relationship between median complementarity (log-transformed) and latitude. The analysis was conducted across 14,640 grid cells, summarized in latitudinal bands of 5° (n = 26 latitudinal bands). The p-values are computed using two-sided tests.

Table S2. Linear regression of median range size (absolute range size, latitudinal range size, longitudinal range size) against latitude for units that represent avian taxonomic, functional, and phylogenetic diversity (species, functional-trait combinations, phylogenetic lineages, respectively). n = 25 latitudinal bands.

Species

Latitude				
	Estimate	t	R ²	p-value
Absolute range size	0.16 ± 0.02	8.16	0.74	3.1 * 10 ⁻⁸
Latitudinal range size	0.05 ± 0.01	5.18	0.54	3.0 * 10 ⁻⁵
Longitudinal range size	0.12 ± 0.02	7.82	0.72	6.3 * 10 ⁻⁸

Functional-trait combinations

Latitude				
	Estimate	t	R ²	p-value
Absolute range size	0.19 ± 0.02	9.17	0.79	3.9 * 10 ⁻⁹
Latitudinal range size	0.06 ± 0.02	3.83	0.39	8.5 * 10 ⁻⁴
Longitudinal range size	0.15 ± 0.01	18.7	0.94	2.1 * 10 ⁻¹⁵

Phylogenetic lineages

Latitude				
	Estimate	t	R ²	p-value
Absolute range size	0.15 ± 0.01	10.6	0.83	2.4 * 10 ⁻¹⁰
Latitudinal range size	0.04 ± 0.01	3.49	0.35	0.002
Longitudinal range size	0.12 ± 0.01	13.7	0.89	1.6 * 10 ⁻¹²

These models estimate the relationship between different measures of median range size and latitude. All p-values are computed using two-sided tests.