**Supplementary Information**

**Crop and landscape heterogeneity increase biodiversity in agricultural landscapes: A global review and meta-analysis**

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**Supplementary Methods**

## **Search strings used for the literature survey**

TS=("landscape heterogeneity" OR "landscape diversity" OR "landscape complexity" OR "crop heterogeneity" OR "crop diversity" OR "farmland heterogeneity" OR "farmland diversity" OR "compositional heterogeneity" OR "configurational heterogeneity") AND TS=("diversity" OR "biodiversity" OR "richness" OR "evenness" OR "abundance").

## **Testing for publication bias and model over-parameterisation**

We checked for publication bias by fitting a meta-analytic model with standard errors (SEs) of the observed effect sizes as a continuous moderator variable (Table S2) and examined the relationship between observed effect sizes and SEs (Nakagawa *et al.* 2022). No significant relationship between observed effect sizes and SEs was observed (Table S4), identifying no publication bias in our dataset. A visual inspection of a ‘funnel plot’ also suggested the absence of a publication bias (Figure S2). Over-parameterization was assessed using visual inspection of peaks within the ‘profile likelihood plots’, and it was not problematic for any analyses with only single peaks at the respective parameter estimates (Viechtbauer 2010).

**Testing for influential and outlier studies**

To check for influential studies, we aggregated all effect sizes belonging to the same study into a single combined effect size. We then fitted a random effects model with the ‘DerSimonian-Laird’ estimator, using the ‘rma’ function in the ‘metafor’ package (Viechtbauer 2010). Using ‘Baujat plot’ (Baujat *et al.* 2002), we confirmed that the influence of each study on the overall estimate was below 0.055, suggesting that there were no overly influential studies in our dataset (Figure S3). We also created a ‘Gosh plot’ (Olkin *et al.* 2012), to look for outliers among the studies. These analyses suggested all studies were intermixed (Figure S4), and there were no outliers (Viechtbauer 2010). Cook’s distances extracted from this model further confirmed there were no outlier studies (Cook’s distances < 0.2; Figure S5).

**Testing for potential confounding effects**

The estimated average effect of spatial heterogeneity on biodiversity through our models may be influenced by the proportion of cropped, semi-natural, or other anthropogenic land-cover types (e.g., roads, buildings, or open water) within the landscapes, leading to potential confounding effects. To assess the potential confounding effects of these variables on the estimated average effect of spatial heterogeneity on biodiversity, we conducted separate analyses treating them as continuous moderator variables (Table S2). However, no significant effects were observed (Table S5), indicating that the estimated average effect of crop and landscape heterogeneity components on biodiversity by our models were not distorted by the proportion of crop, semi-natural, or other anthropogenic land-cover types. Instead, the primary drivers of our results were found to be the heterogeneity of crop and non-crop cover types within the landscapes.

# **Supplementary Tables**

**Table S1.** Details about the studies included in this meta-analysis in chronological order: Land-cover type (landscape or crop heterogeneity), study country, production regions, major crop types, study taxa, and functional groups are included together with the spatial scales considered in each study. Correlation indicates the Pearson correlation coefficient between compositional and configurational heterogeneity component at each scale (correlations for multiple scales are in ascending order). The biodiversity (abundance [A], richness [R], Shannon diversity [S]) metrics measured in each study are indicated with ‘1’; ‘0’ represents that they were not measured. See Supplementary Data, for more details about the land-cover types (crops and non-crops) that have been used to measure the landscape and crop heterogeneity in each study. S. No. = Study Number. See page 86–99, for full references.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Study** | **Land-cover type** | **Country** | **Production region** | **Major crop** | **Order** | **Taxonomic identity** | **Functional group** | **Scale (km)** | **Correlation** | **A** | **R** | **S** |
| 1 | Holland & Fahrig 2000 | Landscape heterogeneity | Canada | East Canada | Perennial alfalfa | Coleoptera | Weevils | Pests | 1 | NA | 1 | 1 | 0 |
| 2 | Weibull et al. 2000 | Landscape heterogeneity | Sweden | East-central Sweden | Annual mixed crops | Lepidoptera | Butterflies | Pollinators | 0.4 × 0.4 | NA | 1 | 1 | 0 |
| 3 | Luoto et al. 2004 | Landscape heterogeneity | Finland | South-west Finland | Annual crops | NA | Birds | Predators | NA (25 ha) | NA | 0 | 0 | 1 |
| 4 | Gabriel et al. 2005 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | NA | Plants | Primary producers | 2 | NA | 0 | 1 | 0 |
| 5 | Schmidt & Tscharntke 2005 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Araneae | Spiders | Predators | 0.1, 0.25, 0.5, 1,  2,  3 | -0.12, 0.054, 0.17, 0.13, 0.12, 0.11 | 1 | 0 | 0 |
| 6 | Thies et al. 2005 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Hemiptera | Aphids | Pests | 0.1, 0.25, 0.5, 1,  2,  3 | 0.60,  0.44,  0.31,  0.17,  -0.36,  -0.44 | 1 | 0 | 0 |
| 7 | Marshall et al. 2006 | Landscape heterogeneity | UK | South England | Annual cereal crops | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5, 1,  2 | 0.13, 0.22, 0.23, 0.25, 0.19 | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
| 8 | Batáry et al. 2007 | Landscape heterogeneity | Hungary | East-central Hungary | Perennial grasslands | NA | Birds | Predators | 0.5 | NA | 1 | 1 | 0 |
| 9 | Clough et al. 2007 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Coleoptera | Rove beetles | Predators | 0.1, 0.25, 0.5,  1 | 0.57, 0.44, 0.46, 0.27 | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Carabid beetles | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
| 10 | Holzschuh et al. 2007 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5,  1 | 0.57, 0.50, 0.49, 0.28 | 1 | 1 | 1 |
| 11 | Concepción et al. 2008 | Landscape heterogeneity | Spain | Central Spain | Annual cereal crops | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5 | 0.53, 0.57, 0.35 | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
| 12 | Rundlöf et al. 2008 | Landscape heterogeneity | Sweden | South Sweden | Annual cereal crops | Hymenoptera | Bumblebees | Pollinators | 0.1, 0.25,  0.5, 1,  2,  3 | 0.60, 0.60, 0.58, 0.53, 0.16, 0.24 | 1 | 1 | 1 |
| 13 | Schmidt et al. 2008 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Araneae | Spiders | Predators | 0.1,  0.25,  0.5,  1,  2,  3 | 0.57, 0.58, 0.57, 0.57, 0.56, 0.57 | 1 | 1 | 1 |
| 14 | Carré et al. 2009 | Landscape heterogeneity | UK | South-east England | Annual field beans | Hymenoptera | Bees | Pollinators | 0.1, 0.25,  0.5, 1,  2,  3 | 0.26,  0.16, 0.44, 0.55, 0.57, 0.57 | 1 | 1 | 1 |
| 15 | Öberg 2009 | Landscape heterogeneity | Switzerland | East-central Switzerland | Annual cereal crops | Araneae | Spiders | Predators | 0.5 | NA | 1 | 1 | 0 |
| 16 | Schmidt-Entling & Döbeli 2009 | Landscape heterogeneity | Switzerland | North-west Switzerland | Annual wheat | Araneae | Spiders | Predators | 0.1,  0.25, 0.5,  1 | 0.30, 0.29,  -0.34,  -0.56 | 1 | 1 | 1 |
| 17 | Albrecht et al. 2010 | Landscape heterogeneity | Switzerland | North Switzerland | Perennial grassland with mixed crops | Hymenoptera | Bees | Pollinators | 0.1,  0.25, 0.5 | 0.56, 0.27, 0.10 | 1 | 1 | 1 |
| 18 | Anjum-Zubair et al. 2010 | Landscape heterogeneity | Switzerland | North-west Switzerland | Annual wheat | Coleoptera | Carabid beetles | Predators | 0.1,  0.25, 0.5,  1 | 0.30, 0.28,  -0.34,  -0.60 | 1 | 1 | 1 |
| 19 | Batáry et al. 2010 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | NA | Birds | Predators | 1.5 | NA | 1 | 1 | 0 |
| 20 | Diekötter et al. 2010 | Landscape heterogeneity | Germany | Central Germany | Annual wheat | Coleoptera | Carabid beetles | Predators | 0.1,  0.25,  0.5, 1,  2 | 0.58, 0.15, 0.14, 0.23,  -0.10 | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
| 21 | Flohre 2010 | Landscape heterogeneity | Germany | North Germany | Annual cereal crops | Coleoptera | Carabid beetles | Predators | 0.1,  0.25, 0.5, 1,  2 | 0.36, 0.24, 0.12, 0.014,  -0.42 | 1 | 0 | 0 |
| 22 | Holzschuh et al. 2010 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5, 1,  2,  3 | 0.11,  -0.10,  -0.17,  -0.31,  -0.29,  -0.25 | 1 | 1 | 1 |
|  | " | " | " | " | " | " | Wasps | Pollinators and Predators | " | " | 1 | 1 | 1 |
| 23 | Noma et al. 2010 | Landscape heterogeneity | USA | North-central USA | Annual soybean | Hemiptera | Aphids | Pests | 2 | NA | 1 | 0 | 0 |
| 24 | Baños-Picón 2011 | Landscape heterogeneity | Spain | North Spain | Perennial crops | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5,  1 | 0.59, 0.58, 0.57, 0.50 | 1 | 1 | 1 |
|  | " | " | " | " | " | " | Parasitoid wasps | Predators and Pollinators | " | " | 1 | 1 | 1 |
| 25 | Cerezo et al. 2011 | Landscape heterogeneity | Argentina | East-central Argentina | Annual soybean | NA | Birds | Predators | 1 | NA | 1 | 1 | 0 |
| 26 | Fischer et al. 2011 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Coleoptera | Carabid beetles | Predators | 0.1,  0.25,  0.5, 1,  2,  3 | 0.56, 0.59, 0.26, 0.020,  -0.48,  -0.40 | 1 | 1 | 1 |
| 27 | Gladbach et al. 2011 | Landscape heterogeneity | Germany | North-west Germany | Annual oilseed rape | Coleoptera | Pollen beetles | Pests | 0.1,  0.25,  0.5, 1,  2,  3 | 0.57, 0.23, 0.19,  -0.41,  -0.53,  -0.42 | 1 | 0 | 0 |
| 28 | Holzschuh et al. 2011 | Landscape heterogeneity | Germany | North-west Germany | Annual oilseed rape | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5,  1 | 0.59, 0.57,  0.50,  0.45 | 1 | 1 | 1 |
| 29 | Rusch et al. 2011, 2013b | Landscape heterogeneity | France | North-west France | Annual oilseed rape | Coleoptera | Pollen beetles | Pests | 0.1, 0.25, 0.5, 1,  2 | 0.59, 0.35, 0.16, 0.10,  -0.10 | 1 | 0 | 0 |
| 30 | Al Hassan et al. 2012, 2013 | Landscape heterogeneity | France | West France | Annual wheat and maize crops | Coleoptera | Carabid beetles | Predators | 0.1, 0.25, 0.5 | 0.58, 0.57, 0.59 | 1 | 1 | 1 |
|  | " | " | " | " | " | Hemiptera | Aphids | Pests | " | " | 1 | 1 | 1 |
| 31 | Batáry et al. 2012 | Landscape heterogeneity | Germany | North-west Germany | Annual mixed crops | Coleoptera | Carabid beetles | Predators | 0.1, 0.25, 0.5 | 0.35, 0.47, 0.38 |  |  |  |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 0 | 0 |
| 32 | Bassa et al. 2012 | Landscape heterogeneity | Spain | South-west Spain | Annual cereal crops | NA | Plants | Primary producers | 1 | NA | 0 | 0 | 0 |
| 33 | Concepción et al. 2012 | Landscape heterogeneity | Spain | Central Spain | Annual cereal crops | NA | Plants | Primary producers | 1 | NA | 0 | 0 | 0 |
| 34 | Holzschuh et al. 2012 | Landscape heterogeneity | Germany | North-west Germany | Perennial cherry | Hymenoptera | Bees | Pollinators | .1, 0.25, 0.5,  1 | 0.57, 0.45, 0.44, 0.10 | 1 | 1 | 1 |
| 35 | Baños-Picón et al. 2013 | Landscape heterogeneity | Spain | North-central Spain | Mixed arable fields | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5,  1 | 0.59, 0.57, 0.58, 0.60 | 1 | 1 | 1 |
| 36 | Ekroos et al. 2013 | Landscape heterogeneity | Finland | South-west Finland | Annual cereal crops | Lepidoptera | Butterflies | Pollinators | NA (25 ha) | NA | 0 | 1 | 0 |
|  | " | " | " | " | " | NA | Plants | Primary producers | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | NA | Birds | Predators | " | " | 0 | 1 | 0 |
| 37 | Fabian et al. 2013 | Landscape heterogeneity | Switzerland | North-west Switzerland | Annual mixed crops | Hemiptera | Aphids | Pests | 0.5 | NA | 1 | 0 | 0 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | Hymenoptera | Bees | Pollinators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Hymenoptera | Wasps | Predators and Pollinators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | NA | Plants | Primary producers | " | " | 0 | 1 | 0 |
| 38 | Jauker et al. 2013 | Landscape heterogeneity | Germany | North-west Germany | Perennial grasslands | Hymenoptera | Bees | Pollinators | NA (0.25 ha) | NA | 0 | 1 | 0 |
| 39 | Le Féon et al. 2013 | Landscape heterogeneity | France | North-west France | Mixed arable fields | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5 | 0.56, 0.58, 0.59 | 1 | 1 | 1 |
| 40 | Rusch et al. 2013a | Landscape heterogeneity | Sweden | South Sweden | Annual barley | Coleoptera | Rove beetles | Predators | 0.1,  0.25,  0.5,  1,  2,  3 | 0.38, 0.41, 0.33, 0.17, 0.030,  -0.020 | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Carabid beetles | Predators | " | " | 1 | 1 | 1 |
| 41 | Bartomeus et al. 2014 | Landscape heterogeneity | Germany | North-west Germany | Perennial strawberry | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5, 1,  2,  3 | 0.59, 0.60, 0.56, 0.21,  -0.19,  -0.37 | 1 | 1 | 1 |
| 42 | Duflot et al. 2014 | Landscape heterogeneity | France | North-west France | Annual and perennial mixed crops | Coleoptera | Carabid beetles | Predators | 0.1, 0.25, 0.5 | 0.46, 0.47, 0.020 | 1 | 1 | 1 |
| 43 | Garratt et al. 2014a, b | Landscape heterogeneity | UK | South-east England | Annual and perennial mixed crops | Hymenoptera | Bees | Pollinators | 0.1,  0.25, 0.5, 1, 2,  3 | 0.24, 0.27, 0.36, 0.29, 0.25, 0.26 | 1 | 1 | 1 |
| 44 | Palmu et al. 2014 | Crop heterogeneity | Sweden | South Sweden | Annual mixed crops | Coleoptera | Carabid beetles | Predators | 1 | NA | 0 | 1 | 0 |
| 45 | Rusch et al. 2014 | Crop heterogeneity | Sweden | South Sweden | Annual cereal crops | Coleoptera | Carabid beetles | Predators | 1 | NA | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | NA | 1 | 1 | 1 |
| 46 | Schneider et al. 2014 | Landscape heterogeneity | Spain | South-west Spain | Perennial grasslands | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5, 1,  2 | 0.19,  -0.044, 0.21, 0.48, 0.42 | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
| 47 | Dainese et al. 2015 | Crop heterogeneity | Italy | North-east Italy | Annual mixed crops | NA | Plants | Primary producers | 0.5 | NA | 0 | 1 | 0 |
|  | " | " | " | " | " | Lepidoptera | NA | Pollinators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Diptera | Tachinid flies | Pollinators and Predators | " | " | 0 | 1 | 0 |
| 48 | Fahrig et al. 2015 | Crop heterogeneity | Canada | East-central Canada | Annual mixed crops | NA | Birds | Predators | 1 × 1 | NA | 1 | 1 | 0 |
|  | " | " | " | " | " | NA | Plants | Primary producers | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Lepidoptera | Butterflies | Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | " | Bees | Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Coleoptera | Carabid beetles | Predators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 0 |
| 49 | Hiron et al. 2015 | Crop heterogeneity | Sweden | South Sweden | Annual mixed crops | NA | Birds | Predators | 5 × 5 | NA | 1 | 0 | 0 |
| 50 | Kleijn et al. 2015 | Landscape heterogeneity | The Netherlands | Central Netherlands | Perennial apple and pear | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5,  1 | 0.60, 0.56, 0.59, 0.55 | 1 | 1 | 1 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | 1 | 1 | 1 |
| 51 | Perović et al. 2015 | Landscape heterogeneity | Germany | North-East and central Germany | Perennial grasslands | Lepidoptera | Butterflies | Pollinators | 0.25,  0.5,  0.75,  1, 1.25,  1.5, 2,  2.5 | -0.036,  0.056,  -0.037,  -0.13,  -0.13,  -0.095,  -0.022,  -0.043 | 1 | 1 | 1 |
| 52 | Riedinger et al. 2015 | Landscape heterogeneity | Germany | South-east Germany | Annual oilseed rape | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5, 1,  2,  3 | 0.47, 0.23, 0.10, 0.30, 0.47, 0.24 | 1 | 1 | 1 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | 1 | 1 | 1 |
| 53 | Scheper et al. 2015 | Landscape heterogeneity | Germany | South-east Germany | Perennial mixed crops | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5,  1 | 0.48, 0.15, 0.31, 0.14 | 1 | 1 | 1 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | 1 | 1 | 1 |
| 54 | Schneider et al. 2015 | Landscape heterogeneity | Germany | South-centra Germany | Annual oilseed rape | Coleoptera | Pollen beetles | Pests | 0.1,  0.25,  0.5,  1,  2,  3 | 0.49, 0.24, 0.18, 0.29, 0.37, 0.15 | 1 | 0 | 0 |
| 55 | Street et al. 2015 | Landscape heterogeneity | Sweden | South Sweden | Annual cereal crops | NA | Plants | Primary producers | 2.5 × 2.5 | NA | 0 | 1 | 0 |
| 56 | Tschumi et al. 2015 | Landscape heterogeneity | Switzerland | North-central Switzerland | Annual wheat | Coleoptera | Carabid beetles | Predators | 0.1,  0.25,  0.5,  1 | 0.59,  0.40,  0.40,  0.14 | 1 | 1 | 1 |
|  | " | " | " | " | " | Hemiptera | True bugs | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Lady bugs | Predators | " | " | 1 | 1 | 1 |
| 57 | Balzan et al. 2016 | Landscape heterogeneity | Italy | Central Italy | Annual tomato | NA | NA | Predators | 0.1,  0.25,  0.5 | 0.47, 0.57, 0.46 | 1 | 1 | 1 |
| 58 | Duflot et al. 2016 | Landscape heterogeneity | France | North-west France | Annual mixed crops | Coleoptera | Carabid beetles | Predators | 0.1,  0.25,  0.5 | 0.51, 0.46, 0.030 | 1 | 1 | 1 |
| 59 | Holzschuh et al. 2016 | Landscape heterogeneity | The Netherlands | East Netherlands | Annual oilseed rape | Hymenoptera | Bees | Pollinators | 0.1, 0.25, 0.5, 1,  2,  3 | 0.60, 0.059,  -0.46, -0.30, 0.60, 0.60 | 1 | 1 | 1 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | " | " | " |
| 60 | Inclán et al. 2016 | Landscape heterogeneity | Italy | North-east Italy | Annual maize, wheat, and soybean | Diptera | Tachinid flies | Predators and Pollinators | 0.1, 0.25, 0.5, 1,  2,  3 | 0.60, 0.59, 0.57, 0.56, 0.50, 0.51 | 1 | 1 | 1 |
| 61 | Lindström et al. 2016 | Crop heterogeneity | Sweden | South Sweden | Annual oilseed rape | Hymenoptera | Bees | Pollinators | 1 | NA | 1 | 0 | 1 |
| 62 | Martin et al. 2016 | Landscape heterogeneity | South Korea | North-east South Korea | Annual mixed crops | Diptera | Hoverflies | Pollinators | 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9,  1 | NA | 1 | 1 | 0 |
|  | " | " | " | " | " | NA | Birds | Predators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Coleoptera | Rove beetles | Predators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Coleoptera | Carabid beetles | Predators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Hymenoptera | Wasps | Predators and Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 0 |
| 63 | Medeiros et al. 2016 | Landscape heterogeneity | Brazil | South Brazil | Annual wheat | NA | Plants | Primary producers | 2 | NA | 1 | 0 | 0 |
| 64 | Söderman et al. 2016 | Crop heterogeneity | Sweden | South Sweden | Annual mixed crops | Hymenoptera | Bumblebees | Pollinators | 0.1, 0.25, 0.5,  1 | NA |  |  |  |
|  | " | " | " | " | " | Hymenoptera | Solitary bees | Pollinators | " | " | " | " | " |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | " | " | " |
| 65 | Tamburini et al. 2016 | Landscape heterogeneity | Italy | North-east Italy | Annual barley and wheat | Coleoptera | Carabid beetles | Predators | 0.1,  0.25, 0.5,  1 | 0.58, 0.60, 0.57, 0.58 | 1 | 0 | 0 |
|  | " | " | " | " | " | Coleoptera | Rove beetles | Predators | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 0 | 0 |
| 66 | Baillod et al. 2017 | Crop heterogeneity | Germany | North-west Germany | Annual wheat | Araneae | Spiders | Predators | 0.5 | 0.42 | 1 | 0 | 0 |
|  | " | " | " | " | " | Hemiptera | Aphids | Pests | " | " | 1 | 0 | 0 |
| 67 | Chabert & Sarthou 2017 | Landscape heterogeneity | France | South France | Annual mixed crops | Hemiptera | Aphids | Pests | 1.5 | NA | 1 | 0 | 0 |
|  | " | " | " | " | " | Hymenoptera | Hoverflies | Pollinators | " | " | 1 | 0 | 0 |
| 68 | Collins & Fahrig 2017 | Crop heterogeneity | Canada | East-central Canada | Annual mixed crops | Anura | Amphibians | Predators | 1 | NA | 0 | 1 | 0 |
| 69 | Dainese et al. 2017 | Landscape heterogeneity | Italy | North-east Italy | Maize, wheat, soybean | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5,  1 | 0.58, 0.58, 0.59, 0.57 | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Carabid beetles | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Lady bugs | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Lepidoptera | Butterflies | Pollinators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Hymenoptera | Wasps | Predators and Pollinators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Rove beetles | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | 1 | 1 | 1 |
| 70 | Duflot et al. 2017 | Landscape heterogeneity | France | North-west France | Annual cereal crops | Coleoptera | Carabid beetles | Predators | 1 × 1 | NA | 0 | 1 | 0 |
| 71 | Gagic et al. 2017 | Crop heterogeneity | Sweden | South Sweden | Annual cereal crops | Coleoptera | Carabid beetles | Predators | 1 | NA | 1 | 1 | 1 |
| 72 | Janković et al. 2017 | Landscape heterogeneity | Serbia | Central Serbia | Annual wheats | Coleoptera | Lady bugs | Predators | 0.1,  0.25,  0.5 | 0.60,  0.21,  0.20 | 1 | 0 | 0 |
|  | " | " | " | " | " | Hemiptera | True bugs | Predators | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | Hymenoptera | Wasps | Predators and Pollinators | " | " | 1 | 0 | 0 |
| 73 | Josefsson et al. 2017 | Crop heterogeneity | Sweden | South Sweden | Mixed arable fields | NA | Birds | Predators | 1 | -0.091 | 1 | 1 | 0 |
| 74 | van Halder et al. 2017 | Landscape heterogeneity | France | East France | Perennial grasslands | NA | Plants | Primary producers | 5 × 5 | NA | 1 | 0 | 0 |
| 75 | Dominik et al. 2018 | Landscape heterogeneity | The Philippines | North Philippines | Annul Rice | NA | NA (mostly spiders) | Predators | 0.1,  0.2,  0.3 | NA | 1 | 0 | 0 |
|  | " | " | " | " | " | Hymenoptera | NA | Predators | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | NA | NA | Decomposers | " | " | 1 | 0 | 0 |
| 76 | Fischer et al. 2018 | Crop heterogeneity | Germany | East Germany | Annual wheat | Rodentia | Mice | Pests | 0.5 | 0.56 | 1 | 0 | 0 |
|  | " | " | " | " | " | " | Voles | Pests | " | " | 1 | 0 | 0 |
| 77 | “Armorique” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | France | North-west France | Annual mixed crops | Hymenoptera, Lepidoptera, Diptera, NA, Coleoptera, Araneae, and NA | Bees, Butterflies, Hover flies, Birds, Carabid beetles, Spiders, and Plants | Pollinators, Predators, Primary producers | 1 × 1 | -0.030 | 1 | 1 | 1 |
| 78 | “Camargue” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | France | South France | " | " | " | " | " | -0.20 | 1 | 1 | 1 |
| 79 | “Coteaux” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | France | South-east France | " | " | " | " | " | -0.26 | 1 | 1 | 1 |
| 80 | “East Anglia” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | United Kingdom | East England | " | " | " | " | " | -0.18 | 1 | 1 | 1 |
| 81 | “Eastern Ontario” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | Canada | East-central Canada | " | " | " | " | " | -0.35 | 1 | 1 | 1 |
| 82 | “Göttingen” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | Germany | North-west Germany | " | " | " | " | " | -0.17 | 1 | 1 | 1 |
| 83 | “Lieida” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | " | Spain | North-east Spain | " | " | " | " | " | -0.40 | 1 | 1 | 1 |
| 84 | “PVDS” dataset from Hass et al. 2018, or Sirami et al. 2019, or Alignier et al. 2020 | Crop heterogeneity | France | South-west France | " | " | " | " | " | -0.16 | 1 | 1 | 1 |
| 85 | Lee & Goodale 2018 | Crop heterogeneity | China | South China | Mixed arable fields | NA | Birds | Predators | 0.1 | NA | 1 | 1 | 0 |
| 86 | Monck-whipp et al. 2018 | Crop heterogeneity | Canada | East Canada | Mixed arable fields | Chiroptera | Bats | Predators | 3 × 3 | -0.60 | 0 | 1 | 0 |
|  | " | " | " | " | " | Coleoptera | NA | Predators | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | Diptera | NA | Predators | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | Hymenoptera | NA | Pollinators | " | " | 1 | 0 | 0 |
| 87 | Redlich et al. 2018 | Crop and landscape heterogeneity | Germany | South-central Germany | Annual wheat, barley, and triticale | NA | Birds | Predators | 0.1,  0.25, 0.5,  1,  2,  3 | -0.45,  -0.58,  -0.54,  -0.18,  -0.041,  -0.24 | 0 | 1 | 0 |
| 88 | Šálek et al. 2018 | Landscape heterogeneity | Czech Republic and Austria | East Czech Republic and Central Austria | Annual mixed crops | Araneae | Spiders | Predators | 0.5 × 0.5 | NA | 1 | 1 | 0 |
|  | " | " | " | " | " | Lepidoptera | Butterflies | Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | NA | Birds | Predators | " | " | 1 | 1 | 0 |
| 89 | Sutter et al. 2018 | Landscape heterogeneity | Switzerland | North-central Switzerland | Annual oilseed rape | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5,  1 | 0.60,  -0.010,  -0.28, 0.29 | 1 | 1 | 1 |
|  | " | " | " | " | " | Diptera | Hoverflies | Pollinators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Carabid beetles | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Hymenoptera | Wasps | Predators | " | " | 1 | 0 | 0 |
| 90 | Zhou et al. 2018 | Crop heterogeneity | China | South China | Annual mixed crops | NA | Plants | Primary producers | 0.1 | 0.15 | 0 | 1 | 1 |
| 91 | “Ande01” dataset from Martin et al. 2019 | Landscape heterogeneity | Sweden | South Sweden | Annual cereals | Hymenoptera | Bees | Pollinators | 0.1,  0.25,  0.5,  0.1,  0.2, 0.3 | 0.58, 0.54, 0.32, 0.24, 0.17, 0.034 | 1 | 1 | 1 |
|  | " | " | " | " | " | Hymenoptera | Hoverflies | Pollinators | " | " | 1 | 1 | 1 |
| 92 | “Herm01” dataset from Martin et al. 2019 | Landscape heterogeneity | Switzerland | North-east Switzerland | Perennial apple | Hymenoptera | Wasps | Pollinators and Predators | 0.1,  0.25,  0.5 | 0.21, 0.19,  -0.12 | 1 | 1 | 1 |
|  | " | " | " | " | " | " | Bees | Pollinators | " | " | 1 | 1 | 1 |
| 93 | “Jauk01” dataset from Martin et al. 2019 | Landscape heterogeneity | Germany | West-central Germany | Annual and perennial mixed crops | Diptera | Hoverflies | Pollinators | 0.1,  0.25,  0.5,  1 | 0.32, 0.45, 0.60, 0.60 | 1 | 1 | 1 |
| 94 | “Jauk02” dataset from dataset from Martin et al. 2019 | Landscape heterogeneity | Germany | West-central Germany | Perennial crops | Diptera | Hoverflies | Pollinators | 0.1,  0.25,  0.5,  1,  2 | 0.010,  0.27,  -0.18,  0.57,  0.56 | 1 | 1 | 1 |
| 95 | Rey et al. 2019 | Landscape heterogeneity | Spain | South Spain | Perennial olive groves | NA | Plants | Primary producers | 1 | NA | 1 | 1 | 0 |
| 96 | Serafini et al. 2019a | Landscape heterogeneity | Argentina | Central Argentina | Annual soybean | Rodentia | Small mammals | Pests | 0.2 | NA | 0 | 1 | 0 |
| 97 | Serafini et al. 2019b | Landscape heterogeneity | Argentina | Central Argentina | Annual mixed crops | Rodentia | Small mammals | Pests | 0.15, 0.2, 0.3, 0.4, 0.5, 0.6 | NA | 0 | 1 | 0 |
| 98 | Stjernman et al. 2019 | Crop heterogeneity | Sweden | South Sweden | Annual mixed crops | NA | Birds | Predators | 1 | NA | 1 | 1 | 1 |
| 99 | "Aguilera 2017" dataset from Aguilera et al. 2020 | Crop heterogeneity | Sweden | South Sweden | Annual oilseed rape | Coleoptera | Carabid beetles | Predators | 1 | NA | 1 | 1 | 0 |
|  |  |  | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 0 |
| 100 | "Tamburini 2017" dataset from Aguilera et al. 2020 | Crop heterogeneity | Sweden | South Sweden | Annual oilseed rape | Coleoptera | Carabid beetles | Predators | 1 | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 1 | 1 |
| 101 | Coutinho et al. 2020 | Landscape heterogeneity | Brazil | North-east Brazil | Annual mixed crops |  | Bees | Pollinators | 0.2, 0.4, 0.6, 0.8, 1 | NA | 1 | 1 | 0 |
|  | " | " | " | " | " | " | Wasps | Predators and Pollinators | " | " | 1 | 1 | 0 |
| 102 | Cursach et al. 2020 | Landscape heterogeneity | Spain | East Spain | Annual mixed crops | NA | Plants | Primary producers | 1, 2 | NA | 0 | 1 | 1 |
| 103 | Dorman et al. 2020 | Landscape heterogeneity | USA | South-east USA | Perennial cotton | Hemiptera | Plant bugs | Pests | 0.75, 1.5,  3 | NA | 1 | 0 | 0 |
| 104 | Geppert et al. 2020 | Landscape heterogeneity | Germany | North-west Germany | Annual wheat | Hymenoptera | Bees | Pollinators | 1 | NA | 1 | 1 | 0 |
|  | " | " | " | " | " | Hymenoptera | Bumblebee | Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Hymenoptera | Hoverflies | Pollinators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | NA | Plants | Predators and Pollinators | " | " | 1 | 1 | 0 |
| 105 | Li et al. 2020a | Landscape heterogeneity | China | East China | Annual mixed crops | Anura | Amphibians | Predators | 1 | NA | 1 | 0 | 0 |
| 106 | Li et al. 2020b | Crop heterogeneity | China | South-west China | Annual mixed crops | NA | Birds | Predators | 1 × 1 | 0.27 | 1 | 1 | 1 |
| 107 | Liao et al. 2020 | Landscape heterogeneity | China | South-west China | Annual mixed crops | NA | Birds | Predators | 0.1 × 0.1 | NA | 1 | 0 | 0 |
| 108 | Martínez‐Núñez et al. 2020 | Landscape heterogeneity | Spain | South Spain | Perennial olive groves | Hymenoptera | Bees | Pollinators | 1 | NA | 1 | 1 | 0 |
|  | " | " | " | " | " | NA | Birds | Predators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Hymenoptera | Ants | Predators | " | " | 1 | 1 | 0 |
|  | " | " | " | " | " | Lepidoptera | Moths | Pests | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | Diptera | Fruit flies | Pests | " | " | 1 | 0 | 0 |
| 109 | Monasterolo et al. 2020 | Landscape heterogeneity | Argentina | East Argentina | Annual mixed crops | NA | Plants | Primary producers | 0.5 | NA | 1 | 0 | 0 |
| 110 | Olimpi et al. 2020 | Crop heterogeneity | USA | West USA | Perennial strawberry | Hemiptera | NA | Pests | 0.5 | NA | 1 | 0 | 0 |
|  | " | " | " | " | " | Hemiptera (*Geocoris, Orius, Nabis spp*) | NA | Predators | " | " | 1 | 0 | 0 |
| 111 | Sattler et al. 2020 | Landscape heterogeneity | Vietnam | North Vietnam | Annual rice | NA | NA | NA | 0.3 | " | 0 | 1 | 0 |
| 112 | Barbaro et al. 2021 | Landscape heterogeneity | France, Spain, and Italy | South-west France, North-east Spain, and North-west Italy | Perennial vineyards | " | NA | Birds | 0.1 | 0.41 | 1 | 1 | 1 |
| 113 | Blary et al. 2021 | Landscape heterogeneity | France | North France | Annual mixed crops | Chiroptera | Bats | Predators | 0.25, 0.5, 0.75,  1, 1.5, 2,  4 | NA | 0 | 1 | 0 |
| 114 | Blubaugh et al. 2021 | Landscape heterogeneity | USA | North-west USA | Annual mixed crops | Lepidoptera | Butterflies | Pests | 1 | NA | 1 | 0 | 0 |
|  | " | " | " | " | " | " | Aphids | Pests | " | " | 1 | 0 | 0 |
|  | " | " | " | " | " | " | Wasps | Predators and Pollinators | " | " | 1 | 0 | 0 |
| 115 | Hambäck et al. 2021 | Landscape heterogeneity | Sweden | South Sweden | Perennial apple | Coleoptera | NA | Predators | 1 | NA | 0 | 1 | 0 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Heteroptera | NA | Predators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Hymenoptera | NA | Predators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Neuroptera | NA | Predators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Opiliones | NA | Predators | " | " | 0 | 1 | 0 |
|  | " | " | " | " | " | Diptera | NA | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Dermaptera | NA | Predators | " | " |  |  |  |
| 116 | Martínez-Núñez et al. 2021 | Landscape heterogeneity | Spain | South Spain | Perennial olive groves | Hymenoptera | Ants | Predators | 1 | NA | 1 | 1 | 0 |
| 117 | Priyadarshana et al. 2021 | Crop and landscape heterogeneity | China | South China | Annual mixed crops | Coleoptera | Dung beetles | Decomposers | 0.1,  0.5 | 0.22, NA | 1 | 1 | 1 |
|  | " | " | " | " | " | Odonata | Dragonfly/  Damselfly | Predators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Hymenoptera | Bees | Pollinators | " | " | 1 | 1 | 1 |
|  | " | " | " | " | " | Lepidoptera | Butterflies | Pollinators | " | " | 1 | 1 | 1 |
| 118 | Raderschall et al. 2021 | Crop heterogeneity | Sweden | South Sweden | Annual mixed crops | Hymenoptera | Bumblebees | Pollinators | 1.5 | NA | 1 | 0 | 0 |
|  | " | " | " | " | " | Hymenoptera | Bees | Pollinators | " | " | 1 | 1 | 1 |
| 119 | Redlich et al. 2021 | Crop heterogeneity | Germany | South-central Germany | Mixed arable fields | Coleoptera | Carabid beetles | Predators | 1 | 0.28 | 1 | 0 | 0 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 1 | 0 | 0 |
| 120 | Tarjuelo et al. 2021 | Landscape heterogeneity | Spain | North-east Spain | Annual cereal crops | " | NA | Birds | 0.5 | NA | 0 | 1 | 0 |
| 121 | Raderschall et al. 2022 | Crop heterogeneity | Sweden | South Sweden | Annual mixed crops | Coleoptera | Carabid beetles | Predators | " | NA | 0 | 1 | 1 |
|  | " | " | " | " | " | Coleoptera | Rove beetles | Predators | " | " | 0 | 1 | 1 |
|  | " | " | " | " | " | Araneae | Spiders | Predators | " | " | 0 | 1 | 1 |
| 122 | Priyadarshana et al. 2023 | Crop and landscape heterogeneity | " | " | " | Lepidoptera | Butterflies | Pests | " | 0.24,  NA | 1 | 1 | 1 |

NAs = Not Available.

**Table S2.** Moderator variables used in this meta-analysis.

|  |  |  |
| --- | --- | --- |
| **Moderator variables** | **Data type** | **Each level in moderator variables** |
| Spatial heterogeneity type | Categorical | (i). Spatial compositional heterogeneity (i.e., crop and landscape compositional heterogeneity together)  (ii). Spatial configurational heterogeneity (i.e., crop and landscape configurational heterogeneity together) |
| Land-cover type | Categorical | (i). Crop heterogeneity  (ii). Landscape heterogeneity |
| Heterogeneity component | Categorical | (i). Crop compositional heterogeneity  (ii). Landscape compositional heterogeneity  (iii). Crop configurational heterogeneity  (iv). Landscape configurational heterogeneity |
| Climatic region | Categorical | (i). Tropical/subtropical agroecosystems  (ii). Temperate agroecosystems |
| Cropping system | Categorical | (i). Annual crops  (ii). Perennial crops |
| Spatial scale | Categorical | (i). Small (i.e., < 0.5km radius area)  (ii) Intermediate (i.e., ≥ 0.5km, but < 1 km radius area)  (ii). Large (i.e., ≥ 1km radius area) |
| \*Standard errors of the observed effect sizes | Continuous | NA |
| \*Proportion of cropped area | Continuous | NA |
| \*Proportion of semi-natural area | Continuous | NA |
| \*Proportion of other land-cover area | Continuous | NA |

\* These moderator variables were used only for the sensitivity analyses.NAs = Not Applicable

**Table S3.** A summary of the fitted models. The models were run for each biodiversity metric (i.e., total abundance, species richness, and Shannon diversity) of invertebrates and vertebrates (as a single “animal” group and as two separate groups), and plants, as well as for pollinators, predators and pests, and for six taxonomic orders, including birds and five invertebrate orders (Hymenoptera, Lepidoptera, Diptera, Coleoptera, Araneae). Fisher’s z is the transformed Pearson’s correlation coefficient between crop/landscape heterogeneity components and biodiversity metrics, and V is the sampling error variance. StudyID is an identifier for each study that accounted for any between-study variance, and EffectSizeID is an identifier for each effect size that accounted for any within-study variance.

|  |  |  |
| --- | --- | --- |
| **Models** | **Model structures** | **Model descriptions** |
| 1 | Fisher’s z, V, random = ~1 | (StudyID / EffectSizeID) | This model does not have a moderator, so it averages the effects of all crop and landscape heterogeneity components (i.e., spatial heterogeneity) on biodiversity. |
| 2 | Fisher’s z ~ Spatial heterogeneity type, V, random = ~1 | (StudyID / EffectSizeID) | ‘Spatial heterogeneity type’ is the moderator in this model, so it separately averages the effects of spatial compositional heterogeneity (i.e., crop and landscape compositional heterogeneity) and spatial configurational heterogeneity (i.e., crop and landscape configurational heterogeneity) on biodiversity. |
| 3 | Fisher’s z ~ Land-cover type, V, random = ~1 | (StudyID / EffectSizeID) | ‘Land-cover type’ is the moderator in this model, so it separately averages the effects of crop heterogeneity components (i.e., crop compositional and configurational heterogeneity) and landscape heterogeneity components (i.e., landscape compositional and configurational heterogeneity) on biodiversity. |
| 4 | Fisher’s z ~ Heterogeneity component, V, random = ~1 | (StudyID / EffectSizeID) | ‘Heterogeneity component’ is the moderator in this model, so it separately estimates the effects of crop compositional heterogeneity, crop configurational heterogeneity, landscape compositional heterogeneity and landscape configurational heterogeneity on biodiversity. |
| 5 | \*Fisher’s z ~ Climatic region, V, random = ~1 | (StudyID / EffectSizeID) | ‘Climatic region’ is the moderator in this model, so it separately estimates the effects of spatial heterogeneity on biodiversity in tropical/subtropical and temperate agroecosystems. |
| 6 | \*Fisher’s z ~ Cropping system, V, random = ~1 | (StudyID / EffectSizeID) | ‘Cropping system’ is the moderator in this model, so it separately estimates the effects of spatial heterogeneity on biodiversity in perennial and annual crops. |
| 7 | \*Fisher’s z ~ Spatial scale, V, random = ~1 | (StudyID / EffectSizeID) | ‘Spatial scale’ is the moderator in this model, so it separately estimates the effects of spatial heterogeneity on biodiversity for small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales. |

\*Due to the data limitation, biodiversity in these models represents by the invertebrates and vertebrates as a single group (i.e., animals, without pests species).

**Table S4.** Statistical testing for publication bias in the dataset. *µ* = the average true Pearson’s correlation coefficient between observed effect sizes and corresponding standard errors. CIs = Confident Intervals. QM = Omnibus test of standard errors. N = Number of studies. K = Number of effect sizes (Number of correlations).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***µ*** | **Z-value** | **2.5% CIs** | **97.5% CIs** | **N** | **K** | **QM** | ***P*-value for QM** |
| 0.10 | 0.63 | -0.21 | 0.41 | 122 | 3203 | 0.40 | 0.53 |

**Table S5.** The effect of the proportion of cropped, semi-natural, and other land-cover types on the relationships between spatial heterogeneity and biodiversity. *µ* = Change in the average true Pearson’s correlation coefficient between spatial heterogeneity and biodiversity for a one-unit increase in crop area and semi-natural area. CIs = Confident Intervals. QM = Omnibus test of moderators, *τ2* = the amount of variance in the true effects, N = Number of studies. K = Number of effect sizes (i.e., Number of correlations). *I2* = Amount of the total variance due to variance in the true effects.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Moderator variable** | **Taxonomic group** | **Biodiversity metrics** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Crop area | Invertebrates and Vertebrates | Richness | 0.0010 | -0.00040 | 0.0024 | 1.44 | 2.092 | 0.15 | 0.034 | 81 | 859 | 65.63 |
| " | " | Shannon diversity | 0.00090 | -0.00050 | 0.0023 | 1.25 | 1.56 | 0.21 | 0.018 | 56 | 730 | 49.88 |
| " | " | Abundance | 0.00090 | -0.00040 | 0.0022 | 1.33 | 1.76 | 0.18 | 0.028 | 82 | 989 | 59.25 |
| " | Plants | Richness | -0.0020 | -0.0099 | 0.0059 | -0.52 | 0.27 | 0.61 | 0.026 | 19 | 48 | 66.70 |
| " | " | Shannon diversity | -0.00010 | -0.0032 | 0.0029 | -0.069 | 0.0048 | 0.95 | 0.00 | 10 | 36 | ~ 0 |
| " | " | Abundance | -0.0035 | -0.0077 | 0.00070 | -1.72 | 2.97 | 0.10 | 0.010 | 10 | 27 | 49.81 |
| Semi-natural area | Invertebrates and Vertebrates | Richness | -0.00030 | -0.0044 | 0.0038 | -0.13 | 0.016 | 0.90 | 0.034 | 69 | 800 | 64.87 |
| " | " | Shannon diversity | -0.0012 | -0.0048 | 0.0023 | -0.69 | 0.47 | 0.49 | 0.017 | 56 | 730 | 49.37 |
| " | " | Abundance | 0.0018 | -0.0020 | -0.0055 | 0.93 | 0.87 | 0.35 | 0.029 | 72 | 909 | 59.93 |
| " | Plants | Richness | -0.00050 | -0.0085 | 0.0075 | -0.13 | 0.016 | 0.90 | 0.020 | 14 | 41 | 61.16 |
| " | " | Shannon diversity | 0.00030 | -0.0030 | 0.0036 | 0.19 | 0.038 | 0.85 | 0.00 | 10 | 36 | ~ 0 |
| " | " | Abundance | 0.0061 | -0.0080 | 0.020 | 0.89 | 0.79 | 0.38 | 0.014 | 10 | 27 | 58.59 |
| Other land-cover area | Invertebrates and Vertebrates | Richness | -0.0015 | -0.0032 | 0.00010 | -1.85 | 3.42 | 0.065 | 0.035 | 69 | 800 | 65.66 |
|  | " | Shannon diversity | -0.00090 | -0.0024 | 0.00070 | -1.092 | 1.19 | 0.28 | 0.018 | 56 | 730 | 49.84 |
|  | " | Abundance | -0.0018 | -0.0034 | -0.00030 | -2.27 | 5.17 | 0.023 | 0.030 | 72 | 909 | 60.42 |
|  | Plants | Richness | 0.0093 | -0.014 | 0.033 | 0.81 | 0.65 | 0.42 | 0.022 | 14 | 41 | 64.44 |
|  | " | Shannon diversity | -0.0058 | -0.024 | 0.012 | -0.66 | 0.43 | 0.51 | 0.00 | 10 | 36 | ~ 0 |
|  | " | Abundance | 0.0044 | -0.00060 | 0.0094 | 1.81 | 3.27 | 0.082 | 0.0091 | 10 | 27 | 47.28 |

**Table S6.** Statistics related to Figure 2 (i.e., for invertebrates). *µ* = The average true Pearson’s correlation coefficient between crop/landscape heterogeneity and biodiversity. CIs = Confident Intervals. QM = Omnibus test of moderators, *τ2* = the amount of variance in the true effects, N = Number of studies (Number of correlations). K = Number of effect sizes. *I2* = Amount of the total variance due to variance in the true effects.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5%**  **Cis** | **97.5% Cis** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.1044\*\*\* | 0.067 | 0.14 | 5.49 | 1855.024 | < 0.0001 | 0.029 | 70 | 876 | 59.66 |
| " | Spatial compositional heterogeneity | 0.11\*\*\* | 0.053 | 0.16 | 4.017 | 30.12 | < 0.0001 | 0.029 | 65 | 438 | 59.67 |
| Spatial configurational heterogeneity | 0.10\*\*\* | 0.054 | 0.15 | 4.11 | 61 | 438 |
| " | Crop heterogeneity | 0.15\*\* | 0.052 | 0.25 | 3.060 | 31.63 | < 0.0001 | 0.030 | 18 | 175 | 61.00 |
| Landscape heterogeneity | 0.089\*\*\* | 0.041 | 0.14 | 3.65 | 53 | 701 |
| " | Crop compositional heterogeneity | 0.15\* | 0.010 | 0.28 | 2.14 | 32.14 | < 0.0001 | 0.031 | 16 | 66 | 61.10 |
| Crop configurational heterogeneity | 0.16\*\*\* | 0.070 | 0.24 | 3.56 | 16 | 109 |
| Landscape compositional heterogeneity | 0.093\*\* | 0.030 | 0.16 | 2.91 | 50 | 372 |
| Landscape configurational heterogeneity | 0.083\* | 0.010 | 0.16 | 2.27 | 45 | 329 |
| Shannon diversity | Spatial heterogeneity | 0.11\*\*\* | 0.083 | 0.14 | 7.69 | 1375.70 | < 0 .0001 | 0.017 | 54 | 709 | 48.98 |
| " | Spatial compositional heterogeneity | 0.13\*\*\* | 0.088 | 0.16 | 6.77 | 63.71 | < 0.0001 | 0.017 | 54 | 350 | 48.83 |
| Spatial configurational heterogeneity | 0.099\*\*\* | 0.065 | 0.13 | 5.83 | 50 | 359 |
| " | Crop heterogeneity | 0.14\* | 0.024 | 0.26 | 2.42 | 53.60 | < 0.0001 | 0.019 | 16 | 152 | 50.65 |
| Landscape heterogeneity | 0.10\*\*\* | 0.063 | 0.14 | 5.17 | 40 | 557 |
| " | Crop compositional heterogeneity | 0.15# | -0.018 | 0.31 | 1.79 | 58.33 | < 0.0001 | 0.019 | 16 | 62 | 51.29 |
| Crop configurational heterogeneity | 0.15\*\* | 0.047 | 0.26 | 2.91 | 12 | 90 |
| Landscape compositional heterogeneity | 0.12\*\*\* | 0.068 | 0.17 | 4.60 | 40 | 288 |
| Landscape configurational heterogeneity | 0.079\*\*\* | 0.035 | 0.12 | 3.56 | 38 | 269 |
| Abundance | Spatial heterogeneity | 0.033\* | 0.00050 | 0.066 | 2.021 | 2176.32 | < 0.0001 | 0.028 | 78 | 1051 | 58.30 |
| " | Spatial compositional heterogeneity | 0.028 | -0.017 | 0.074 | 1.23 | 4.64 | 0.098 | 0.028 | 75 | 527 | 58.36 |
| Spatial configurational heterogeneity | 0.038 | -0.0092 | 0.085 | 1.60 | 66 | 524 |
| " | Crop heterogeneity | 0.059# | -0.00060 | 0.12 | 1.97 | 5.32 | 0.070 | 0.029 | 23 | 180 | 58.61 |
| Landscape heterogeneity | 0.024 | -0.015 | 0.063 | 1.24 | 57 | 871 |
| " | Crop compositional heterogeneity | 0.054 | -0.014 | 0.12 | 1.59 | 5.74 | 0.22 | 0.029 | 22 | 72 | 58.67 |
| Crop configurational heterogeneity | 0.061# | -0.0021 | 0.12 | 1.93 | 16 | 108 |
| Landscape compositional heterogeneity | 0.020 | -0.033 | 0.074 | 0.76 | 55 | 455 |
| Landscape configurational heterogeneity | 0.029 | -0.034 | 0.092 | 0.92 | 50 | 416 |

#*P*-value < 0.07, \**P-*value < 0.05, \*\**P-*value < 0.01, and \*\*\**P-*value < 0.001

**Table S7.** Statistics related to the Figure 3 (i.e., for vertebrates). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% Cis** | **97.5% Cis** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.20\*\*\* | 0.12 | 0.27 | 5.51 | 355.73 | < 0.0001 | 0.036 | 28 | 129 | 69.57 |
| " | Spatial compositional heterogeneity | 0.20\*\*\* | 0.13 | 0.28 | 5.50 | 30.46 | < 0.0001 | 0.036 | 25 | 62 | 69.52 |
| Spatial configurational heterogeneity | 0.19\*\*\* | 0.098 | 0.29 | 4.20 | 24 | 67 |
| " | Crop heterogeneity | 0.083\* | 0.0062 | 0.16 | 2.22 | 56.35 | < 0.0001 | 0.029 | 16 | 61 | 64.61 |
| Landscape heterogeneity | 0.36\*\*\* | 0.19 | 0.52 | 4.41 | 13 | 68 |
| " | Crop compositional heterogeneity | 0.094 | -0.021 | 0.21 | 1.69 | 56.46 | < 0.0001 | 0.029 | 16 | 30 | 64.64 |
| Crop configurational heterogeneity | 0.074 | -0.027 | 0.17 | 1.51 | 14 | 31 |
| Landscape compositional heterogeneity | 0.36\*\*\* | 0.18 | 0.54 | 4.064 | 10 | 32 |
| Landscape configurational heterogeneity | 0.36\*\*\* | 0.18 | 0.54 | 4.082 | 10 | 36 |
| Shannon diversity | Spatial heterogeneity | 0.086\* | 0.018 | 0.15 | 2.82 | 64.38 | 0.0025 | 0.0097 | 11 | 37 | 46.23 |
| " | Spatial compositional heterogeneity | 0.095\* | 0.0046 | 0.18 | 2.38 | 7.95 | 0.018 | 0.010 | 11 | 15 | 46.78 |
| Spatial configurational heterogeneity | 0.081 | -0.037 | 0.20 | 1.55 | 10 | 22 |
| " | Crop heterogeneity | 0.088\* | 0.0050 | 0.17 | 2.40 | 6.85 | 0.033 | 0.011 | 10 | 33 | 48.91 |
| Landscape heterogeneity | NA | NA | NA | NA | 1 | 4 |
| " | Crop compositional heterogeneity | 0.072 | -0.042 | 0.19 | 1.49 | 10.80 | 0.029 | 0.010 | 10 | 13 | 45.84 |
| Crop configurational heterogeneity | 0.098 | -0.053 | 0.25 | 1.53 | 9 | 20 |
| Landscape compositional heterogeneity | NA | NA | NA | NA | 1 | 2 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 1 | 2 |
| Abundance | Spatial heterogeneity | 0.11\*\* | 0.041 | 0.18 | 3.33 | 269.63 | < 0.0001 | 0.024 | 22 | 110 | 56.93 |
| " | Spatial compositional heterogeneity | 0.13\*\* | 0.043 | 0.22 | 3.12 | 12.070 | 0.0024 | 0.025 | 20 | 39 | 57.25 |
| Spatial configurational heterogeneity | 0.093\* | 0.0047 | 0.18 | 2.20 | 20 | 71 |
| " | Crop heterogeneity | 0.079\* | 0.0051 | 0.15 | 2.095 | 14.038 | 0.0010 | 0.022 | 14 | 53 | 54.96 |
| Landscape heterogeneity | 0.17\*\* | 0.063 | 0.28 | 3.11 | 8 | 57 |
| " | Crop compositional heterogeneity | 0.11\* | 0.025 | 0.20 | 2.70 | 15.40 | 0.0039 | 0.023 | 14 | 23 | 55.45 |
| Crop configurational heterogeneity | 0.056 | -0.053 | 0.17 | 1.078 | 13 | 30 |
| Landscape compositional heterogeneity | 0.17 | -0.050 | 0.40 | 1.63 | 6 | 16 |
| Landscape configurational heterogeneity | 0.17\* | 0.034 | 0.30 | 2.63 | 7 | 41 |

NAs = Not Available, for those studies that had data from less than five studies.

**Table S8.** Statistics related to the Figure 4 (i.e., for pollinators). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.12\*\*\* | 0.091 | 0.15 | 7.95 | 800.046 | < 0.0001 | 0.014 | 47 | 512 | 42.43 |
| “ | Spatial compositional heterogeneity | 0.12\*\*\* | 0.065 | 0.17 | 4.46 | 800.038 | < 0.0001 | 0.015 | 43 | 249 | 42.52 |
| Spatial configurational heterogeneity | 0.13\*\*\* | 0.081 | 0.17 | 5.61 | 42 | 263 |
| “ | Crop heterogeneity | 0.13\*\* | 0.035 | 0.23 | 2.75 | 59.69 | < 0.0001 | 0.015 | 12 | 88 | 43.28 |
| Landscape heterogeneity | 0.12\*\*\* | 0.075 | 0.16 | 5.39 | 36 | 424 |
| “ | Crop compositional heterogeneity | 0.075\* | 0.0019 | 0.15 | 2.070 | 68.48 | < 0.0001 | 0.015 | 10 | 28 | 42.69 |
| Crop configurational heterogeneity | 0.17\* | 0.032 | 0.30 | 2.49 | 12 | 60 |
| Landscape compositional heterogeneity | 0.13\*\*\* | 0.057 | 0.20 | 3.65 | 34 | 221 |
| Landscape configurational heterogeneity | 0.11\*\*\* | 0.047 | 0.16 | 3.64 | 30 | 203 |
| Shannon diversity | Spatial heterogeneity | 0.12\*\*\* | 0.086 | 0.16 | 6.94 | 608.54 | < 0.0001 | 0.013 | 36 | 411 | 41.28 |
| “ | Spatial compositional heterogeneity | 0.12\*\*\* | 0.061 | 0.17 | 4.27 | 47.93 | < 0.0001 | 0.013 | 35 | 197 | 41.27 |
| Spatial configurational heterogeneity | 0.13\*\*\* | 0.078 | 0.18 | 5.24 | 35 | 214 |
| “ | Crop heterogeneity | 0.14\* | 0.018 | 0.26 | 2.34 | 44.10 | < 0.0001 | 0.014 | 11 | 73 | 43.047 |
| Landscape heterogeneity | 0.12\*\*\* | 0.066 | 0.17 | 4.69 | 27 | 338 |
| “ | Crop compositional heterogeneity | 0.089# | -0.012 | 0.19 | 1.80 | 57.47 | < 0.0001 | 0.015 | 11 | 27 | 44.41 |
| Crop configurational heterogeneity | 0.21\* | 0.029 | 0.38 | 2.37 | 9 | 46 |
| Landscape compositional heterogeneity | 0.12\*\* | 0.050 | 0.20 | 3.41 | 26 | 170 |
| Landscape configurational heterogeneity | 0.093\*\* | 0.035 | 0.15 | 3.26 | 26 | 168 |
| Abundance | Spatial heterogeneity | 0.082\*\*\* | 0.044 | 0.12 | 4.31 | 949.55 | < 0.0001 | 0.021 | 51 | 560 | 50.97 |
| “ | Spatial compositional heterogeneity | 0.068\*\* | 0.018 | 0.12 | 2.72 | 20.98 | < 0.0001 | 0.021 | 48 | 278 | 51.037 |
| Spatial configurational heterogeneity | 0.094\*\*\* | 0.045 | 0.14 | 3.85 | 44 | 282 |
| “ | Crop heterogeneity | 0.11\* | 0.021 | 0.21 | 2.46 | 18.75 | < 0.0001 | 0.022 | 16 | 95 | 52.35 |
| Landscape heterogeneity | 0.069\* | 0.016 | 0.12 | 2.64 | 37 | 465 |
| “ | Crop compositional heterogeneity | 0.079\* | 0.012 | 0.15 | 2.36 | 23.0033 | 0.0001 | 0.022 | 15 | 35 | 52.49 |
| Crop configurational heterogeneity | 0.14\* | 0.0080 | 0.28 | 2.13 | 12 | 60 |
| Landscape compositional heterogeneity | 0.062# | -0.0033 | 0.13 | 1.91 | 35 | 243 |
| Landscape configurational heterogeneity | 0.074\* | 0.012 | 0.14 | 2.39 | 32 | 222 |

**Table S9.** Statistics related to the Figure 5 (i.e., for predators). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% Cis** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.12\*\*\* | 0.072 | 0.17 | 4.93 | 1440.21 | < 0.0001 | 0.041 | 62 | 555 | 67.61 |
| " | Spatial compositional heterogeneity | 0.11\*\* | 0.047 | 0.19 | 3.34 | 24.67 | < 0.0001 | 0.041 | 56 | 277 | 67.64 |
| Spatial configurational heterogeneity | 0.13\*\* | 0.054 | 0.20 | 3.45 | 53 | 278 |
| " | Crop heterogeneity | 0.096 | -0.027 | 0.22 | 1.57 | 25.19 | < 0.0001 | 0.041 | 24 | 142 | 67.60 |
| Landscape heterogeneity | 0.14\*\* | 0.043 | 0.23 | 2.91 | 40 | 413 |
| " | Crop compositional heterogeneity | 0.11 | -0.052 | 0.26 | 1.34 | 27.31 | < 0.0001 | 0.041 | 23 | 65 | 67.46 |
| Crop configurational heterogeneity | 0.084 | -0.020 | 0.19 | 1.62 | 20 | 77 |
| Landscape compositional heterogeneity | 0.13\* | 0.013 | 0.24 | 2.24 | 35 | 212 |
| Landscape configurational heterogeneity | 0.15\* | 0.028 | 0.27 | 2.47 | 33 | 201 |
| Shannon diversity | Spatial heterogeneity | 0.091\*\*\* | 0.058 | 0.12 | 5.53 | 727.63 | < 0.0001 | 0.017 | 38 | 355 | 49.35 |
| " | Spatial compositional heterogeneity | 0.12\*\*\* | 0.074 | 0.16 | 5.48 | 38.21 | < 0.0001 | 0.017 | 38 | 172 | 48.39 |
| Spatial configurational heterogeneity | 0.067\*\* | 0.026 | 0.11 | 3.28 | 34 | 183 |
| " | Crop heterogeneity | 0.088\* | 0.0077 | 0.17 | 2.22 | 29.97 | < 0.0001 | 0.018 | 16 | 106 | 49.58 |
| Landscape heterogeneity | 0.093\*\*\* | 0.058 | 0.13 | 5.41 | 23 | 249 |
| " | Crop compositional heterogeneity | 0.11 | -0.023 | 0.23 | 1.66 | 37.71 | < 0.0001 | 0.017 | 16 | 45 | 48.92 |
| Crop configurational heterogeneity | 0.077\* | 0.00060 | 0.15 | 2.048 | 13 | 61 |
| Landscape compositional heterogeneity | 0.12\*\*\* | 0.076 | 0.17 | 5.39 | 23 | 127 |
| Landscape configurational heterogeneity | 0.061\* | 0.0074 | 0.11 | 2.31 | 21 | 122 |
| Abundance | Spatial heterogeneity | 0.025 | -0.0078 | 0.058 | 1.52 | 1533.99 | < 0.0001 | 0.028 | 64 | 685 | 57.10 |
| " | Spatial compositional heterogeneity | 0.024 | -0.030 | 0.077 | 0.88 | 2.32 | 0.31 | 0.028 | 61 | 329 | 57.15 |
| Spatial configurational heterogeneity | 0.026 | -0.036 | 0.088 | 0.85 | 54 | 356 |
| " | Crop heterogeneity | 0.046 | -0.018 | 0.11 | 1.44 | 3.087 | 0.21 | 0.028 | 33 | 132 | 57.21 |
| Landscape heterogeneity | 0.015 | -0.029 | 0.058 | 0.68 | 42 | 553 |
| " | Crop compositional heterogeneity | 0.073 | -0.020 | 0.17 | 1.57 | 6.26 | 0.18 | 0.028 | 23 | 57 | 57.26 |
| Crop configurational heterogeneity | 0.023 | -0.045 | 0.090 | 0.67 | 19 | 75 |
| Landscape compositional heterogeneity | 0.0061 | -0.059 | 0.071 | 0.19 | 39 | 272 |
| Landscape configurational heterogeneity | 0.025 | -0.060 | 0.11 | 0.58 | 35 | 281 |

**Table S10.** Statistics related to the Figure 6 (i.e., for plants). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.16\* | 0.0056 | 0.31 | 2.16 | 152.25 | < 0.0001 | 0.091 | 21 | 51 | 87.078 |
| " | Spatial compositional heterogeneity | 0.16# | -0.0082 | 0.33 | 1.99 | 4.73 | < 0.0001 | 0.090 | 16 | 22 | 86.93 |
| Spatial configurational heterogeneity | 0.15# | -0.0058 | 0.31 | 2.016 | 16 | 29 |
| " | Crop heterogeneity | 0.048 | -0.031 | 0.13 | 1.27 | 9.30 | 0.0096 | 0.074 | 11 | 38 | 84.66 |
| Landscape heterogeneity | 0.33# | -0.026 | 0.69 | 1.94 | 10 | 13 |
| " | Crop compositional heterogeneity | 0.054 | -0.066 | 0.18 | 0.95 | 9.24 | 0.055 | 0.079 | 10 | 14 | 85.54 |
| Crop configurational heterogeneity | 0.046 | -0.044 | 0.13 | 1.077 | 11 | 24 |
| Landscape compositional heterogeneity | 0.30 | -0.100 | 0.70 | 1.58 | 6 | 8 |
| Landscape configurational heterogeneity | 0.38 | -0.12 | 0.89 | 1.60 | 5 | 5 |
| Shannon diversity | Spatial heterogeneity | 0.0045 | -0.026 | 0.035 | 0.34 | 34.12 | 0.51 | 0 | 10 | 36 | ~ 0 |
| " | Spatial compositional heterogeneity | 0.00070 | -0.064 | 0.065 | 0.026 | 0.094 | 0.46 | 0 | 10 | 15 | ~ 0 |
| Spatial configurational heterogeneity | 0.0068 | -0.048 | 0.062 | 0.29 | 9 | 21 |
| " | Crop heterogeneity | 0.0053 | -0.028 | 0.038 | 0.37 | 0.23 | 0.89 | 0 | 9 | 34 | ~ 0 |
| Landscape heterogeneity | NA | NA | NA | NA | 1 | 2 |
| " | Crop compositional heterogeneity | 0.0026 | -0.070 | 0.075 | 0.084 | 0.24 | 0.97 | 0 | 9 | 13 | ~ 0 |
| Crop configurational heterogeneity | 0.0068 | -0.053 | 0.067 | 0.27 | 9 | 21 |
| Landscape compositional heterogeneity | NA | NA | NA | NA | 1 | 2 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 0 | 0 |
| Abundance | Spatial heterogeneity | 0.032 | -0.067 | 0.13 | 0.71 | 58.15 | 0.00070 | 0.017 | 12 | 29 | 60.70 |
| " | Spatial compositional heterogeneity | 0.038 | -0.10 | 0.18 | 0.60 | 0.57 | 0.75 | 0.016 | 11 | 11 | 59.99 |
| Spatial configurational heterogeneity | 0.027 | -0.072 | 0.13 | 0.60 | 10 | 18 |
| " | Crop heterogeneity | -0.010 | -0.11 | 0.088 | -0.23 | 3.99 | 0.14 | 0.014 | 8 | 24 | 55.95 |
| Landscape heterogeneity | 0.19 | -0.066 | 0.44 | 1.65 | 4 | 5 |
| " | Crop compositional heterogeneity | -0.0079 | -0.18 | 0.17 | -0.11 | 3.96 | 0.41 | 0.014 | 8 | 8 | 57.39 |
| Crop configurational heterogeneity | -0.011 | -0.12 | 0.093 | -0.25 | 8 | 16 |
| Landscape compositional heterogeneity | NA | NA | NA | NA | 3 | 3 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 2 | 2 |

NAs = Not Available, for those studies that had data from less than five studies.

**Table S11.** Statistics related to the Figure 7 (i.e., for pests). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| " | Spatial compositional heterogeneity (all were landscape het studies, so this was not measured) | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Spatial configurational heterogeneity (all were landscape het studies, so this was not measured) | NA | NA | NA | NA | NA | NA |
| " | Crop heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Landscape heterogeneity | NA | NA | NA | NA | 4 | 16 |
| " | Crop compositional heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Crop configurational heterogeneity | NA | NA | NA | NA | NA | NA |
| Landscape compositional heterogeneity | NA | NA | NA | NA | 3 | 12 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 2 | 4 |
| Shannon diversity | Spatial heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| " | Spatial compositional heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Spatial configurational heterogeneity | NA | NA | NA | NA | NA | NA |
| " | Crop heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Landscape heterogeneity | NA | NA | NA | NA | NA | NA |
| " | Crop compositional heterogeneity | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Crop configurational heterogeneity | NA | NA | NA | NA | NA | NA |
| Landscape compositional heterogeneity | NA | NA | NA | NA | NA | NA |
| Landscape configurational heterogeneity | NA | NA | NA | NA | NA | NA |
| Abundance | Spatial heterogeneity | 0.043 | -0.011 | 0.097 | 1.66 | 222.93 | 0.00020 | 0.014 | 23 | 153 | 38.53 |
| " | Spatial compositional heterogeneity | 0.051 | -0.032 | 0.13 | 1.27 | 3.057 | 0.22 | 0.015 | 22 | 82 | 38.88 |
| Spatial configurational heterogeneity | 0.033 | -0.0096 | 0.076 | 1.61 | 16 | 71 |
| " | Crop heterogeneity | -0.0056 | -0.095 | 0.084 | -0.13 | 4.44 | 0.11 | 0.013 | 7 | 26 | 36.67 |
| Landscape heterogeneity | 0.060\* | 0.0077 | 0.11 | 2.39 | 17 | 127 |
| " | Crop compositional heterogeneity | -0.040 | -0.19 | 0.11 | -0.55 | 8.22 | 0.084 | 0.013 | 7 | 12 | 36.51 |
| Crop configurational heterogeneity | 0.038 | -0.082 | 0.16 | 0.67 | 5 | 14 |
| Landscape compositional heterogeneity | 0.079# | -0.0014 | 0.16 | 2.055 | 16 | 70 |
| Landscape configurational heterogeneity | 0.028 | -0.015 | 0.072 | 1.36 | 11 | 57 |

NAs = Not Available, for those studies that had data from less than five studies.

**Table S12.** Statistics related to the Figure S6 (i.e., for birds). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.20\*\*\* | 0.12 | 0.28 | 5.00 | 345.36 | < 0.0001 | 0.043 | 25 | 111 | 71.69 |
| " | Spatial compositional heterogeneity | 0.20\*\*\* | 0.12 | 0.29 | 4.96 | 25.018 | < 0.0001 | 0.043 | 22 | 53 | 71.63 |
| Spatial configurational heterogeneity | 0.19\*\* | 0.082 | 0.30 | 3.63 | 21 | 58 |
| Richness | Crop heterogeneity | 0.076# | -0.0031 | 0.15 | 1.99 | 53.69 | < 0.0001 | 0.032 | 14 | 57 | 65.34 |
| Landscape heterogeneity | 0.37\*\*\* | 0.20 | 0.55 | 4.37 | 12 | 54 |
| " | Crop compositional heterogeneity | 0.086 | -0.036 | 0.21 | 1.46 | 53.59 | < 0.0001 | 0.033 | 14 | 28 | 65.43 |
| Crop configurational heterogeneity | 0.068 | -0.036 | 0.17 | 1.36 | 12 | 29 |
| Landscape compositional heterogeneity | 0.38\*\*\* | 0.18 | 0.58 | 3.88 | 9 | 25 |
| Landscape configurational heterogeneity | 0.38\*\* | 0.17 | 0.57 | 3.78 | 9 | 29 |
| Shannon diversity | Spatial heterogeneity | 0.086\* | 0.018 | 0.15 | 2.82 | 64.38 | 0.0025 | 0.010 | 11 | 37 | 46.23 |
| " | Spatial compositional heterogeneity | 0.095\* | 0.0046 | 0.18 | 2.38 | 7.95 | 0.0018 | 0.010 | 11 | 15 | 46.78 |
| Spatial configurational heterogeneity | 0.081 | -0.037 | 0.20 | 1.55 | 10 | 22 |
| " | Crop heterogeneity | 0.088\* | 0.0050 | 0.17 | 2.40 | 6.85 | 0.033 | 0.011 | 10 | 33 | 48.91 |
| Landscape heterogeneity | NA | NA | NA | NA | 1 | 4 |
| " | Crop compositional heterogeneity | 0.072 | -0.042 | 0.19 | 1.49 | 10.80 | 0.029 | 0.010 | 10 | 13 | 45.84 |
| Crop configurational heterogeneity | 0.098 | -0.053 | 0.25 | 1.53 | 9 | 20 |
| Landscape compositional heterogeneity | NA | NA | NA | NA | 1 | 2 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 1 | 2 |
| Abundance | Spatial heterogeneity | 0.11\*\* | 0.040 | 0.18 | 3.29 | 269.48 | < 0.0001 | 0.025 | 21 | 108 | 57.83 |
| " | Spatial compositional heterogeneity | 0.13\*\* | 0.044 | 0.22 | 3.11 | 11.86 | 0.0027 | 0.025 | 19 | 38 | 58.15 |
| Spatial configurational heterogeneity | 0.092\* | 0.0031 | 0.18 | 2.17 | 19 | 70 |
| Abundance | Crop heterogeneity | 0.079\* | 0.018 | 0.14 | 2.68 | 13.97 | 0.00090 | 0.023 | 14 | 53 | 55.72 |
| Landscape heterogeneity | 0.18\* | 0.014 | 0.34 | 2.28 | 7 | 55 |
| " | Crop compositional heterogeneity | 0.11\* | 0.024 | 0.20 | 2.69 | 15.37 | 0.0040 | 0.024 | 14 | 23 | 56.20 |
| Crop configurational heterogeneity | 0.056 | -0.054 | 0.17 | 1.071 | 13 | 30 |
| Landscape compositional heterogeneity | 0.18 | -0.052 | 0.42 | 1.64 | 5 | 15 |
| Landscape configurational heterogeneity | 0.17\* | 0.027 | 0.32 | 2.51 | 6 | 40 |

NAs = Not Available, for those studies that had data from less than five studies.

**Table S13.** Statistics related to the Figure S7 (i.e., for Hymenoptera). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.15\*\*\* | 0.11 | 0.19 | 8.34 | 434.42 | < 0.0001 | 0.013 | 38 | 322 | 36.079 |
| " | Spatial compositional heterogeneity | 0.13\*\*\* | 0.067 | 0.20 | 4.095 | 69.46 | < 0.0001 | 0.013 | 36 | 164 | 36.086 |
| Spatial configurational heterogeneity | 0.17\*\*\* | 0.11 | 0.23 | 5.81 | 34 | 158 |
| " | Crop heterogeneity | 0.19\* | 0.044 | 0.34 | 2.64 | 62.91 | < 0.0001 | 0.014 | 8 | 27 | 37.57 |
| Landscape heterogeneity | 0.14\*\*\* | 0.094 | 0.19 | 6.19 | 31 | 295 |
| " | Crop compositional heterogeneity | 0.075# | -0.0045 | 0.15 | 1.92 | 68.80 | < 0.0001 | 0.015 | 7 | 8 | 38.33 |
| Crop configurational heterogeneity | 0.28\* | 0.037 | 0.53 | 2.34 | 8 | 19 |
| Landscape compositional heterogeneity | 0.13\*\* | 0.049 | 0.20 | 3.32 | 30 | 156 |
| Landscape configurational heterogeneity | 0.14\*\*\* | 0.073 | 0.20 | 4.35 | 26 | 139 |
| Shannon diversity | Spatial heterogeneity | 0.14\*\*\* | 0.1054 | 0.18 | 8.099 | 308.86 | 0.011 | 0.0093 | 29 | 255 | 29.99 |
| " | Spatial compositional heterogeneity | 0.13\*\*\* | 0.073 | 0.19 | 4.66 | 64.52 | < 0.0001 | 0.0093 | 29 | 128 | 29.75 |
| Spatial configurational heterogeneity | 0.15\*\*\* | 0.094 | 0.21 | 5.40 | 28 | 127 |
| " | Crop heterogeneity | 0.18\* | 0.010 | 0.36 | 2.17 | 56.77 | < 0.0001 | 0.010 | 8 | 21 | 31.89 |
| Landscape heterogeneity | 0.13\*\*\* | 0.088 | 0.17 | 6.21 |  | 23 | 234 |
| " | Crop compositional heterogeneity | 0.10\* | 0.0051 | 0.20 | 2.17 | 58.88 | < 0.0001 | 0.011 | 8 | 9 | 33.60 |
| Crop configurational heterogeneity | 0.29# | -0.00020 | 0.58 | 2.058 | 6 | 12 |
| Landscape compositional heterogeneity | 0.12\*\* | 0.051 | 0.19 | 3.52 | 23 | 119 |
| Landscape configurational heterogeneity | 0.12\*\*\* | 0.067 | 0.18 | 4.62 | 22 | 115 |
| Abundance | Spatial heterogeneity | 0.11\*\*\* | 0.077 | 0.14 | 6.66 | 486.20 | < 0.0001 | 0.013 | 43 | 359 | 36.47 |
| " | Spatial compositional heterogeneity | 0.091\*\*\* | 0.040 | 0.14 | 3.62 | 46.65 | < 0.0001 | 0.013 | 41 | 184 | 36.16 |
| Spatial configurational heterogeneity | 0.13\*\*\* | 0.072 | 0.19 | 4.55 | 38 | 175 |
| " | Crop heterogeneity | 0.13\* | 0.015 | 0.25 | 2.27 | 42.59 | < 0.0001 | 0.013 | 13 | 35 | 36.97 |
| Landscape heterogeneity | 0.10\*\*\* | 0.063 | 0.14 | 5.16 | 32 | 324 |
| " | Crop compositional heterogeneity | 0.041 | -0.049 | 0.13 | 0.92 | 49.65 | < 0.0001 | 0.013 | 12 | 14 | 36.49 |
| Crop configurational heterogeneity | 0.21\* | 0.015 | 0.40 | 2.18 | 10 | 21 |
| Landscape compositional heterogeneity | 0.091\*\* | 0.031 | 0.15 | 3.067 | 31 | 170 |
| Landscape configurational heterogeneity | 0.11\*\* | 0.048 | 0.18 | 3.55 | 28 | 154 |

**Table S14.** Statistics related to the Figure S8 (i.e., for Lepidoptera). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.11\*\* | 0.034 | 0.19 | 3.049 | 124.33 | < 0.0001 | 0.018 | 15 | 59 | 61.96 |
| “ | Spatial compositional heterogeneity | 0.12\*\* | 0.040 | 0.20 | 3.22 | 9.48 | 0.0087 | 0.018 | 14 | 29 | 62.061 |
| Spatial configurational heterogeneity | 0.11# | -0.018 | 0.23 | 1.85 | 13 | 30 |
| “ | Crop heterogeneity | 0.12\* | 0.031 | 0.23 | 2.85 | 9.56 | 0.0084 | 0.019 | 11 | 32 | 64.19 |
| Landscape heterogeneity | 0.073 | -0.041 | 0.19 | 1.38 | 5 | 27 |
| “ | Crop compositional heterogeneity | 0.12\*\* | 0.055 | 0.19 | 3.99 | 13.14 | 0.011 | 0.019 | 10 | 11 | 63.95 |
| Crop configurational heterogeneity | 0.140# | -0.017 | 0.30 | 1.96 | 11 | 21 |
| Landscape compositional heterogeneity | 0.083 | -0.055 | 0.22 | 1.33 | 5 | 18 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 2 | 9 |
| Shannon diversity | Spatial heterogeneity | 0.078\* | 0.0049 | 0.15 | 2.41 | 75.71 | 0.0050 | 0.0085 | 10 | 48 | 46.74 |
| “ | Spatial compositional heterogeneity | 0.087\* | 0.017 | 0.16 | 2.88 | 74.50 | 0.048 | 0.0086 | 10 | 22 | 47.12 |
| Spatial configurational heterogeneity | 0.073 | -0.053 | 0.20 | 1.34 | 10 | 26 |
| “ | Crop heterogeneity | 0.091# | -0.00030 | 0.18 | 2.30 | 6.80 | 0.033 | 0.0096 | 9 | 28 | 49.93 |
| Landscape heterogeneity | NA | NA | NA | NA | 2 | 20 |
| “ | Crop compositional heterogeneity | 0.085\* | 0.015 | 0.15 | 2.97 | 10.47 | 0.033 | 0.010 | 9 | 10 | 51.13 |
| Crop configurational heterogeneity | 0.10 | -0.075 | 0.28 | 1.42 | 9 | 18 |
| Landscape compositional heterogeneity | NA | NA | NA | NA | 2 | 12 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 1 | 8 |
| Abundance | Spatial heterogeneity | 0.068 | -0.019 | 0.15 | 1.64 | 223.76 | < 0.0001 | 0.029 | 18 | 73 | 71.53 |
| “ | Spatial compositional heterogeneity | 0.039 | -0.056 | 0.13 | 0.86 | 5.37 | 0.068 | 0.029 | 18 | 38 | 70.80 |
| Spatial configurational heterogeneity | 0.095 | -0.021 | 0.21 | 1.74 | 16 | 35 |
| “ | Crop heterogeneity | 0.076 | -0.029 | 0.18 | 1.54 | 2.79 | 0.25 | 0.030 | 12 | 34 | 72.12 |
| Landscape heterogeneity | 0.053 | -0.050 | 0.16 | 1.099 | 8 | 39 |
| “ | Crop compositional heterogeneity | 0.025 | -0.11 | 0.16 | 0.39 | 6.037 | 0.20 | 0.030 | 12 | 13 | 71.76 |
| Crop configurational heterogeneity | 0.11 | -0.037 | 0.25 | 1.60 | 12 | 21 |
| Landscape compositional heterogeneity | 0.046 | -0.060 | 0.15 | 0.93 | 8 | 25 |
| Landscape configurational heterogeneity | NA | NA | NA | NA | 4 | 14 |

NAs = Not Available, for those studies that had data from less than five studies.

**Table S15.** Statistics related to the Figure S9 (i.e., for Diptera). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.057# | -0.0024 | 0.12 | 1.99 | 209.57 | 0.00020 | 0.014 | 23 | 143 | 42.064 |
| " | Spatial compositional heterogeneity | 0.052 | -0.041 | 0.15 | 1.16 | 4.037 | 0.13 | 0.014 | 20 | 65 | 41.91 |
| Spatial configurational heterogeneity | 0.060\* | 0.0016 | 0.12 | 2.14 | 22 | 78 |
| " | Crop heterogeneity | 0.042 | -0.046 | 0.13 | 1.00 | 4.060 | 0.13 | 0.015 | 11 | 31 | 42.69 |
| Landscape heterogeneity | 0.070# | -0.010 | 0.15 | 1.81 | 12 | 112 |
| " | Crop compositional heterogeneity | -0.033 | -0.16 | 0.091 | -0.55 | 13.021 | 0.011 | 0.014 | 9 | 9 | 41.22 |
| Crop configurational heterogeneity | 0.074 | -0.024 | 0.17 | 1.57 | 11 | 22 |
| Landscape compositional heterogeneity | 0.091 | -0.034 | 0.22 | 1.52 | 11 | 56 |
| Landscape configurational heterogeneity | 0.049 | -0.027 | 0.13 | 1.35 | 11 | 56 |
| Shannon diversity | Spatial heterogeneity | 0.082\* | 0.0085 | 0.15 | 2.36 | 201.048 | < 0.0001 | 0.020 | 18 | 115 | 51.46 |
| " | Spatial compositional heterogeneity | 0.066 | -0.049 | 0.18 | 1.22 | 6.45 | 0.040 | 0.019 | 18 | 54 | 50.86 |
| Spatial configurational heterogeneity | 0.093\* | 0.021 | 0.17 | 2.75 | 61 | 17 |
| " | Crop heterogeneity | 0.032 | -0.058 | 0.12 | 0.75 | 7.67 | 0.022 | 0.018 | 8 | 24 | 49.79 |
| Landscape heterogeneity | 0.12\* | 0.016 | 0.23 | 2.44 | 10 | 91 |
| " | Crop compositional heterogeneity | -0.10# | -0.23 | 0.020 | -1.81 | 32.82 | < 0.0001 | 0.016 | 8 | 8 | 46.086 |
| Crop configurational heterogeneity | 0.10# | -0.018 | 0.22 | 1.82 | 8 | 16 |
| Landscape compositional heterogeneity | 0.15# | -0.0089 | 0.30 | 2.022 | 10 | 46 |
| Landscape configurational heterogeneity | 0.095# | -0.0026 | 1.90 | 2.088 | 9 | 45 |
| Abundance | Spatial heterogeneity | 0.012 | -0.065 | 0.090 | 0.33 | 332.67 | < 0.0001 | 0.031 | 26 | 162 | 59.77 |
| " | Spatial compositional heterogeneity | 0.011 | -0.085 | 0.11 | 0.23 | 0.12 | 0.94 | 0.031 | 24 | 76 | 59.68 |
| Spatial configurational heterogeneity | 0.014 | -0.065 | 0.092 | 0.36 | 24 | 86 |
| " | Crop heterogeneity | 0.018 | -0.070 | 0.11 | 0.42 | 0.12 | 1.00 | 0.032 | 12 | 32 | 60.92 |
| Landscape heterogeneity | 0.0063 | -0.12 | 0.14 | 0.10 | 14 | 130 |
| " | Crop compositional heterogeneity | 0.016 | -0.087 | 0.12 | 0.32 | 0.13 | 0.94 | 0.032 | 11 | 11 | 60.69 |
| Crop configurational heterogeneity | 0.020 | -0.078 | 0.12 | 0.41 | 11 | 21 |
| Landscape compositional heterogeneity | 0.0051 | -0.15 | 0.16 | 0.068 | 13 | 65 |
| Landscape configurational heterogeneity | 0.0075 | -0.12 | 0.14 | 0.12 | 13 | 65 |

**Table S16.** Statistics related to the Figure S10 (i.e., for Coleoptera). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-**  **value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.029 | -0.029 | 0.087 | 1.023 | 498.42 | < 0.0001 | 0.026 | 30 | 207 | 58.88 |
| " | Spatial compositional heterogeneity | 0.026 | -0.088 | 0.14 | 0.47 | 1.072 | 0.59 | 0.027 | 28 | 104 | 59.039 |
| Spatial configurational heterogeneity | 0.031 | -0.059 | 0.12 | 0.71 | 27 | 103 |
| " | Crop heterogeneity | 0.043 | -0.022 | 0.11 | 1.36 | 1.31 | 0.52 | 0.027 | 16 | 46 | 58.94 |
| Landscape heterogeneity | 0.018 | -0.056 | 0.092 | 0.50 | 15 | 161 |
| " | Crop compositional heterogeneity | 0.089 | -0.058 | 0.24 | 1.24 | 5.61 | 0.23 | 0.026 | 16 | 21 | 58.48 |
| Crop configurational heterogeneity | 0.00040 | -0.13 | 0.13 | 0.0064 | 14 | 25 |
| Landscape compositional heterogeneity | 0.0045 | -0.12 | 0.13 | 0.077 | 13 | 83 |
| Landscape configurational heterogeneity | 0.040 | -0.10 | 0.18 | 0.58 | 13 | 78 |
| Shannon diversity | Spatial heterogeneity | 0.068\*\* | 0.018 | 0.12 | 2.83 | 433.39 | < 0.0001 | 0.026 | 24 | 160 | 60.53 |
| " | Spatial compositional heterogeneity | 0.11\*\* | 0.036 | 0.19 | 3.022 | 15.98 | 0.00030 | 0.024 | 24 | 81 | 58.43 |
| Spatial configurational heterogeneity | 0.025 | -0.032 | 0.083 | 0.91 | 22 | 79 |
| " | Crop heterogeneity | 0.079 | -0.018 | 0.18 | 1.69 | 7.71 | 0.021 | 0.026 | 14 | 42 | 60.88 |
| Landscape heterogeneity | 0.061\* | 0.013 | 0.11 | 2.64 | 11 | 118 |
| " | Crop compositional heterogeneity | 0.16 | -0.079 | 0.39 | 1.39 | 16.54 | 0.0024 | 0.024 | 14 | 19 | 58.38 |
| Crop configurational heterogeneity | 0.028 | -0.063 | 0.12 | 0.64 | 12 | 23 |
| Landscape compositional heterogeneity | 0.095\*\* | 0.028 | 0.16 | 2.94 | 11 | 62 |
| Landscape configurational heterogeneity | 0.020 | -0.060 | 0.099 | 0.52 | 10 | 56 |
| Abundance | Spatial heterogeneity | -0.046\* | -0.091 | -0.0018 | -2.11 | 696.65 | < 0.0001 | 0.028 | 36 | 316 | 57.10 |
| " | Spatial compositional heterogeneity | -0.049 | -0.15 | 0.047 | -1.035 | 4.49 | 0.11 | 0.028 | 35 | 157 | 57.24 |
| Spatial configurational heterogeneity | -0.044 | -0.11 | 0.024 | -1.31 | 34 | 159 |
| " | Crop heterogeneity | -0.057# | -0.12 | 0.0071 | -1.81 | 4.42 | 0.11 | 0.029 | 16 | 44 | 57.49 |
| Landscape heterogeneity | -0.042 | -0.10 | 0.020 | -1.39 | 21 | 272 |
| " | Crop compositional heterogeneity | -0.050 | -0.12 | 0.018 | -1.50 | 4.61 | 0.33 | 0.029 | 16 | 19 | 57.73 |
| Crop configurational heterogeneity | -0.063 | -0.16 | 0.038 | -1.26 | 14 | 25 |
| Landscape compositional heterogeneity | -0.047 | -0.16 | 0.070 | -0.82 | 20 | 138 |
| Landscape configurational heterogeneity | -0.037 | -0.13 | 0.058 | -0.79 | 20 | 134 |

**Table S17.** Statistics related to the Figure S11 (i.e., for Araneae). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Heterogeneity measures** | ***µ*** | **2.5% CIs** | **97.5% CIs** | ***t*-value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.067 | -0.028 | 0.16 | 1.46 | 327.16 | < 0.0001 | 0.040 | 25 | 116 | 62.64 |
| " | Spatial compositional heterogeneity | 0.084# | -0.015 | 0.18 | 1.76 | 3.29 | 0.19 | 0.040 | 24 | 55 | 62.44 |
| Spatial configurational heterogeneity | 0.052 | -0.065 | 0.17 | 0.92 | 22 | 61 |
| " | Crop heterogeneity | 0.018 | -0.074 | 0.11 | 0.40 | 3.67 | 0.16 | 0.039 | 14 | 35 | 61.52 |
| Landscape heterogeneity | 0.13 | -0.046 | 0.30 | 1.52 | 11 | 81 |
| " | Crop compositional heterogeneity | 0.0038 | -0.092 | 0.10 | 0.082 | 8.31 | 0.081 | 0.039 | 14 | 15 | 61.67 |
| Crop configurational heterogeneity | 0.029 | -0.10 | 0.16 | 0.46 | 12 | 20 |
| Landscape compositional heterogeneity | 0.17# | -0.0027 | 0.34 | 2.047 | 10 | 40 |
| Landscape configurational heterogeneity | 0.082 | -0.14 | 0.30 | 0.77 | 10 | 41 |
| Shannon diversity | Spatial heterogeneity | 0.085\* | 0.0040 | 0.17 | 2.19 | 181.31 | < 0.0001 | 0.023 | 21 | 109 | 49.12 |
| " | Spatial compositional heterogeneity | 0.11\* | 0.022 | 0.19 | 2.62 | 6.43 | 0.040 | 0.023 | 21 | 52 | 49.062 |
| Spatial configurational heterogeneity | 0.068 | -0.038 | 0.17 | 1.34 | 19 | 57 |
| " | Crop heterogeneity | 0.014 | -0.098 | 0.13 | 0.26 | 11.013 | 0.0041 | 0.018 | 13 | 33 | 42.32 |
| Landscape heterogeneity | 0.17\*\*\* | 0.086 | 0.26 | 4.17 | 8 | 76 |
| " | Crop compositional heterogeneity | 0.014 | -0.10 | 0.13 | 0.25 | 13.68 | 0.0084 | 0.018 | 13 | 14 | 42.59 |
| Crop configurational heterogeneity | 0.014 | -0.14 | 0.17 | 0.19 | 11 | 19 |
| Landscape compositional heterogeneity | 0.21\*\*\* | 0.12 | 0.30 | 4.83 | 8 | 38 |
| Landscape configurational heterogeneity | 0.14# | -0.00040 | 0.28 | 2.10 | 8 | 38 |
| Abundance | Spatial heterogeneity | 0.029 | -0.023 | 0.080 | 1.14 | 220.033 | 0.0059 | 0.012 | 31 | 171 | 33.74 |
| " | Spatial compositional heterogeneity | 0.039 | -0.019 | 0.098 | 1.38 | 1.98 | 0.38 | 0.012 | 30 | 82 | 33.60 |
| Spatial configurational heterogeneity | 0.020 | -0.045 | 0.085 | 0.62 | 28 | 89 |
| " | Crop heterogeneity | 0.015 | -0.035 | 0.065 | 0.63 | 1.45 | 0.48 | 0.013 | 15 | 36 | 34.57 |
| Landscape heterogeneity | 0.040 | -0.048 | 0.13 | 0.93 | 16 | 135 |
| " | Crop compositional heterogeneity | 0.038 | -0.032 | 0.11 | 1.12 | 2.55 | 0.63 | 0.013 | 15 | 15 | 34.33 |
| Crop configurational heterogeneity | -0.00090 | -0.085 | 0.083 | -0.023 | 13 | 21 |
| Landscape compositional heterogeneity | 0.043 | -0.054 | 0.14 | 0.90 | 15 | 67 |
| Landscape configurational heterogeneity | 0.037 | -0.067 | 0.14 | 0.73 | 15 | 68 |

**Table S18.** Comparison between the effects of different spatial heterogeneity components on vertebrate biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.0091 | 0.042 | 0.28 | 0.83 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.27\* | 0.10 | -4.43 | 0.012 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.020 | 0.068 | -0.29 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.26 | 0.12 | 2.18 | 0.11 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.26# | 0.12 | 2.27 | 0.091 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.28\* | 0.11 | 2.54 | 0.046 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.28\* | 0.11 | 2.61 | 0.038 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.00026 | 0.049 | 0.005 | 1.00 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.014 | 0.072 | 0.30 | 0.85 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.026 | 0.048 | 0.54 | 0.95 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.039 | 0.052 | 1.037 | 0.46 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.090 | 0.079 | -1.36 | 0.26 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.055 | 0.074 | -0.75 | 0.86 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.063 | 0.11 | 0.55 | 0.94 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.056 | 0.076 | 0.74 | 0.86 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.12 | 0.12 | 0.99 | 0.72 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.11 | 0.082 | 1.35 | 0.49 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.0069 | 0.068 | -0.10 | 1.00 |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S19.** Comparison between the effects of different spatial heterogeneity components on bird biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.012 | 0.052 | 0.29 | 0.83 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.30\*\* | 0.11 | -4.56 | 0.0093 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.018 | 0.072 | -0.25 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.29 | 0.13 | 2.22 | 0.11 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.29# | 0.12 | 2.29 | 0.091 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.31\* | 0.12 | 2.59 | 0.042 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.30\* | 0.12 | 2.61 | 0.041 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.0070 | 0.079 | -0.088 | 1.00 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.014 | 0.072 | 0.30 | 0.85 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.026 | 0.048 | 0.54 | 0.95 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.040 | 0.052 | 1.075 | 0.45 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.097 | 0.083 | -1.42 | 0.26 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.055 | 0.074 | -0.75 | 0.86 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.073 | 0.12 | 0.61 | 0.92 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.061 | 0.080 | 0.76 | 0.85 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.13 | 0.12 | 1.034 | 0.69 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.12 | 0.086 | 1.35 | 0.49 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.012 | 0.069 | -0.17 | 1.00 |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S20.** Comparison between the effects of different spatial heterogeneity components on invertebrate biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.0012 | 0.034 | 0.094 | 0.97 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.061 | 0.059 | 1.95 | 0.31 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.011 | 0.044 | 0.24 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.053 | 0.080 | -0.67 | 0.89 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.063 | 0.085 | -0.74 | 0.86 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.064 | 0.054 | -1.18 | 0.59 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.074 | 0.063 | -1.18 | 0.60 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.010 | 0.047 | -0.22 | 1.00 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.026 | 0.020 | 1.90 | 0.20 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.039 | 0.069 | 1.39 | 0.58 |
| " | Heterogeneity components | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.0043 | 0.050 | 0.086 | 1.00 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.027 | 0.098 | -0.28 | 0.99 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.069 | 0.094 | -0.73 | 0.85 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.031 | 0.065 | -0.48 | 0.95 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.073 | 0.062 | -1.17 | 0.58 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.041 | 0.024 | -1.70 | 0.27 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0096 | 0.033 | -0.76 | 0.77 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.035 | 0.035 | 1.18 | 0.32 |
| " | Heterogeneity components | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.0068 | 0.026 | 0.26 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.034 | 0.041 | -0.82 | 0.84 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.025 | 0.049 | -0.51 | 0.95 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.041 | 0.038 | -1.066 | 0.70 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.032 | 0.047 | -0.69 | 0.90 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.0087 | 0.043 | 0.20 | 1.00 |

**Table S21.** Comparison between the effects of different spatial heterogeneity components on pollinator biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0079 | 0.038 | -0.49 | 0.83 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.012 | 0.060 | 0.38 | 0.85 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.093 | 0.050 | 1.87 | 0.21 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.052 | 0.056 | 0.92 | 0.76 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.031 | 0.053 | 0.58 | 0.93 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.041 | 0.087 | -0.47 | 0.96 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.062 | 0.082 | -0.76 | 0.85 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.021 | 0.043 | -0.49 | 0.95 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.011 | 0.037 | -0.66 | 0.77 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.022 | 0.073 | 0.66 | 0.77 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.12 | 0.055 | 2.11 | 0.12 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.034 | 0.069 | 0.49 | 0.95 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.0044 | 0.066 | 0.066 | 1.00 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.082 | 0.11 | -0.78 | 0.83 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.11 | 0.10 | -1.10 | 0.62 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.030 | 0.033 | -0.90 | 0.76 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.026 | 0.031 | -1.66 | 0.41 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.046 | 0.059 | 1.30 | 0.44 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.063 | 0.053 | 1.19 | 0.58 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.017 | 0.047 | -0.35 | 0.98 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.0052 | 0.048 | -0.11 | 1.00 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.079 | 0.081 | -0.98 | 0.73 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.068 | 0.080 | -0.85 | 0.80 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.012 | 0.035 | 0.33 | 0.99 |

**Table S22.** Comparison between the effects of different spatial heterogeneity components on plant biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.0095 | 0.050 | 0.24 | 0.85 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.28 | 0.17 | -2.038 | 0.12 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.0088 | 0.054 | -0.16 | 1.00 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.24 | 0.20 | 1.24 | 0.57 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.33 | 0.25 | 1.33 | 0.51 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.25 | 0.19 | 1.31 | 0.52 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.34 | 0.24 | 1.39 | 0.47 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.082 | 0.22 | 0.38 | 0.98 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0061 | 0.043 | -0.17 | 0.89 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.0042 | 0.047 | 0.090 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.012 | 0.052 | 0.28 | 0.83 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.0032 | 0.061 | -0.052 | 1.00 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S23.** Comparison between the effects of different spatial heterogeneity components on pest abundance.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | NA | NA | NA | NA |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | NA | NA | NA | NA |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.018 | 0.040 | 0.58 | 0.66 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.065 | 0.041 | -1.24 | 0.12 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.078 | 0.095 | 0.82 | 0.83 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.12 | 0.065 | 1.82 | 0.24 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.068 | 0.067 | 1.014 | 0.72 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.040 | 0.067 | 0.60 | 0.92 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.010 | 0.061 | -0.17 | 1.00 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.051 | 0.038 | -1.34 | 0.50 |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

## **Table S24.** Comparison between the effects of different spatial heterogeneity components on Hymenoptera biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.036 | 0.049 | -1.76 | 0.47 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.051 | 0.082 | 1.21 | 0.54 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.21# | 0.092 | 2.25 | 0.081 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.052 | 0.057 | 0.91 | 0.72 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.063 | 0.057 | 1.10 | 0.60 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.16 | 0.14 | -1.13 | 0.58 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.14 | 0.13 | -1.074 | 0.62 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.011 | 0.049 | 0.23 | 0.99 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.022 | 0.043 | -1.0055 | 0.62 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.052 | 0.094 | 1.25 | 0.58 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.19 | 0.1040 | 1.82 | 0.19 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.022 | 0.060 | 0.36 | 0.97 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.020 | 0.058 | 0.35 | 0.97 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.17 | 0.16 | -1.072 | 0.59 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.17 | 0.15 | -1.12 | 0.56 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.0016 | 0.036 | -0.043 | 1.00 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.040 | 0.041 | -2.024 | 0.34 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.031 | 0.068 | 0.82 | 0.65 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.16 | 0.083 | 1.98 | 0.18 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.050 | 0.054 | 0.92 | 0.77 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.071 | 0.057 | 1.24 | 0.57 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.11 | 0.11 | -1.065 | 0.68 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.093 | 0.11 | -0.89 | 0.79 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.021 | 0.044 | 0.48 | 0.96 |

**Table S25.** Comparison between the effects of different spatial heterogeneity components on Diptera biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0075 | 0.042 | -0.31 | 0.86 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.028 | 0.058 | -0.48 | 0.64 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.11 | 0.056 | 1.90 | 0.22 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.12 | 0.084 | 1.47 | 0.44 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.082 | 0.069 | 1.17 | 0.63 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.017 | 0.076 | 0.23 | 1.00 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.025 | 0.059 | -0.42 | 0.97 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.042 | 0.056 | -0.75 | 0.87 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.028 | 0.051 | -0.99 | 0.59 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.091 | 0.066 | -1.34 | 0.19 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.20\* | 0.067 | 3.020 | 0.012 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.25\* | 0.092 | 2.71 | 0.032 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.20\* | 0.073 | 2.71 | 0.031 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.048 | 0.091 | 0.53 | 0.95 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.0037 | 0.071 | -0.052 | 1.00 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.051 | 0.057 | -0.91 | 0.79 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0031 | 0.034 | -0.13 | 0.93 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.012 | 0.076 | 0.15 | 0.88 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.0039 | 0.036 | 0.11 | 1.00 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.010 | 0.090 | -0.12 | 1.00 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.0081 | 0.080 | -0.10 | 1.00 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.014 | 0.089 | -0.16 | 1.00 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.012 | 0.079 | -0.15 | 1.00 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.0023 | 0.050 | 0.046 | 1.00 |

**Table S26.** Comparison between the effects of different spatial heterogeneity components on predator biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.011 | 0.052 | -0.64 | 0.84 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.041 | 0.097 | -0.92 | 0.68 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.021 | 0.051 | -0.41 | 0.97 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.021 | 0.12 | 0.18 | 1.00 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.046 | 0.12 | 0.39 | 0.98 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.042 | 0.091 | 0.46 | 0.96 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.067 | 0.094 | 0.71 | 0.87 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.025 | 0.070 | 0.36 | 0.98 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.050# | 0.026 | 2.50 | 0.064 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.0044 | 0.046 | -0.13 | 0.92 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.028 | 0.057 | -0.49 | 0.96 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.016 | 0.073 | 0.22 | 1.00 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.044 | 0.072 | -0.62 | 0.92 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.044 | 0.046 | 0.97 | 0.75 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.016 | 0.047 | -0.35 | 0.98 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.061 | 0.033 | -1.85 | 0.23 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0023 | 0.047 | -0.14 | 0.96 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.031 | 0.041 | 0.91 | 0.46 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.050 | 0.049 | -1.027 | 0.73 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.066 | 0.059 | -1.12 | 0.67 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.048 | 0.065 | -0.73 | 0.88 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.017 | 0.048 | -0.35 | 0.99 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.0021 | 0.055 | 0.039 | 1.00 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.019 | 0.061 | 0.31 | 0.99 |

**Table S27.** Comparison between the effects of different spatial heterogeneity components on Coleoptera biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0050 | 0.082 | -0.19 | 0.95 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.025 | 0.037 | 0.53 | 0.51 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.089 | 0.11 | -0.77 | 0.85 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.085 | 0.067 | -1.26 | 0.56 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.049 | 0.092 | -0.54 | 0.94 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.0041 | 0.086 | 0.048 | 1.00 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.039 | 0.099 | 0.40 | 0.98 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.035 | 0.10 | 0.35 | 0.98 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.088# | 0.046 | 2.69 | 0.069 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.018 | 0.049 | 0.39 | 0.72 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.13 | 0.13 | -1.0060 | 0.73 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.062 | 0.12 | -0.53 | 0.95 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.14 | 0.12 | -1.15 | 0.64 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.067 | 0.050 | 1.36 | 0.50 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | -0.0079 | 0.057 | -0.14 | 1.00 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.075 | 0.051 | -1.49 | 0.42 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.0053 | 0.068 | -0.22 | 0.94 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.015 | 0.045 | -0.33 | 0.75 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.013 | 0.056 | -0.24 | 1.00 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.0025 | 0.057 | 0.044 | 1.00 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.013 | 0.058 | 0.22 | 1.00 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.016 | 0.078 | 0.20 | 1.00 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.026 | 0.074 | 0.36 | 0.98 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | 0.010 | 0.084 | 0.13 | 1.00 |

**Table S28.** Comparison between the effects of different spatial heterogeneity components on Araneae biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.032 | 0.047 | 1.077 | 0.51 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.11 | 0.095 | -1.20 | 0.26 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.025 | 0.063 | 0.40 | 0.98 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.17 | 0.095 | 1.75 | 0.27 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.079 | 0.12 | 0.68 | 0.90 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.14 | 0.10 | 1.35 | 0.50 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.054 | 0.12 | 0.43 | 0.97 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.087 | 0.069 | -1.27 | 0.55 |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.039 | 0.048 | 1.25 | 0.43 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.16\* | 0.068 | -2.25 | 0.030 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.000042 | 0.076 | 0.0010 | 1.00 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.19\* | 0.071 | 2.73 | 0.031 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | 0.12 | 0.086 | 1.43 | 0.47 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.19 | 0.086 | 2.23 | 0.11 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.12 | 0.099 | 1.24 | 0.59 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.070 | 0.068 | -1.028 | 0.73 |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.020 | 0.033 | 0.82 | 0.55 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | -0.024 | 0.049 | -0.47 | 0.62 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | -0.039 | 0.058 | -0.68 | 0.90 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.0041 | 0.058 | 0.071 | 1.00 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | -0.0015 | 0.061 | -0.025 | 1.00 |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | 0.043 | 0.062 | 0.70 | 0.90 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | 0.038 | 0.065 | 0.58 | 0.94 |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | -0.0056 | 0.042 | -0.14 | 1.00 |

**Table S29.** Comparison between the effects of different spatial heterogeneity components on Lepidoptera biodiversity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Moderator variables** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.015 | 0.063 | 0.44 | 0.82 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.056 | 0.058 | 1.014 | 0.35 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.019 | 0.071 | 0.26 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | -0.039 | 0.050 | -0.78 | 0.84 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.058 | 0.093 | -0.62 | 0.91 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Shannon diversity | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | 0.014 | 0.032 | 0.42 | 0.68 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | NA | NA | NA | NA |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.018 | 0.078 | 0.23 | 0.99 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |
| Abundance | Spatial heterogeneity type | Spatial compositional heterogeneity – Spatial configurational heterogeneity | -0.057 | 0.055 | -1.62 | 0.31 |
| " | Land-cover type | Crop heterogeneity – Landscape heterogeneity | 0.023 | 0.050 | 0.41 | 0.66 |
| " | Heterogeneity component | Crop configurational heterogeneity – Crop compositional heterogeneity | 0.083 | 0.083 | 1.00 | 0.73 |
| Landscape compositional heterogeneity – Crop compositional heterogeneity | 0.021 | 0.064 | 0.32 | 0.99 |
| Landscape configurational heterogeneity – Crop compositional heterogeneity | NA | NA | NA | NA |
| Landscape compositional heterogeneity – Crop configurational heterogeneity | -0.063 | 0.070 | -0.90 | 0.79 |
| Landscape configurational heterogeneity – Crop configurational heterogeneity | NA | NA | NA | NA |
| Landscape configurational heterogeneity – Landscape compositional heterogeneity | NA | NA | NA | NA |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S30.** Statistics related to Figure S12 (i.e., for animals). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity measures** | **Heterogeneity measures** | ***µ*** | **2.5% Cis** | **97.5% CIs** | ***t*-**  **value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | 0.13\*\*\* | 0.093 | 0.17 | 7.0083 | 2257.083 | < 0.0001 | 0.033 | 85 | 1005 | 63.88 |
| " | Spatial compositional heterogeneity | 0.13\*\*\* | 0.082 | 0.18 | 5.35 | 49.094 | < 0.0001 | 0.033 | 77 | 500 | 63.88 |
| Spatial configurational heterogeneity | 0.13\*\*\* | 0.080 | 0.18 | 5.19 | 73 | 505 |
| " | Crop heterogeneity | 0.14\* | 0.032 | 0.25 | 2.56 | 48.35 | < 0.0001 | 0.034 | 25 | 236 | 64.26 |
| Landscape heterogeneity | 0.13\*\*\* | 0.067 | 0.18 | 4.28 | 62 | 769 |
| " | Crop compositional heterogeneity | 0.14\* | 0.0023 | 0.28 | 2.023 | 48.50 | < 0.0001 | 0.034 | 23 | 96 | 64.30 |
| Crop configurational heterogeneity | 0.15\*\* | 0.046 | 0.25 | 2.91 | 21 | 140 |
| Landscape compositional heterogeneity | 0.13\*\*\* | 0.057 | 0.20 | 3.60 | 56 | 404 |
| Landscape configurational heterogeneity | 0.12\*\* | 0.044 | 0.20 | 3.095 | 52 | 365 |
| Shannon diversity | Spatial heterogeneity | 0.11\*\*\* | 0.085 | 0.14 | 8.26 | 1440.52 | < 0.0001 | 0.017 | 57 | 746 | 48.61 |
| " | Spatial compositional heterogeneity | 0.13\*\*\* | 0.090 | 0.16 | 7.23 | 72.98 | < 0.0001 | 0.017 | 57 | 365 | 48.45 |
| Spatial configurational heterogeneity | 0.10\*\*\* | 0.067 | 0.13 | 6.14 | 52 | 381 |
| " | Crop heterogeneity | 0.14\* | 0.033 | 0.24 | 2.63 | 62.45 | < 0.0001 | 0.018 | 18 | 185 | 49.96 |
| Landscape heterogeneity | 0.10\*\*\* | 0.066 | 0.14 | 5.42 | 41 | 561 |
| " | Crop compositional heterogeneity | 0.14# | -0.0050 | 0.29 | 1.94 | 67.91 | < 0.0001 | 0.018 | 18 | 75 | 50.49 |
| Crop configurational heterogeneity | 0.15\*\* | 0.052 | 0.25 | 3.075 | 13 | 110 |
| Landscape compositional heterogeneity | 0.12\*\*\* | 0.071 | 0.17 | 4.76 | 41 | 290 |
| Landscape configurational heterogeneity | 0.079\*\*\* | 0.036 | 0.12 | 3.69 | 39 | 271 |
| Abundance | Spatial heterogeneity | 0.040\*\* | 0.010 | 0.071 | 2.65 | 2466.55 | < 0.0001 | 0.028 | 88 | 1161 | 58.80 |
| " | Spatial compositional heterogeneity | 0.038# | -0.0033 | 0.078 | 1.83 | 7.23 | 0.026 | 0.029 | 83 | 566 | 58.83 |
| Spatial configurational heterogeneity | 0.043# | -0.00030 | 0.087 | 1.97 | 74 | 595 |
| " | Crop heterogeneity | 0.063\* | 0.011 | 0.11 | 2.41 | 8.077 | 0.018 | 0.029 | 28 | 233 | 59.093 |
| Landscape heterogeneity | 0.032# | -0.0060 | 0.069 | 1.67 | 62 | 928 |
| " | Crop compositional heterogeneity | 0.066\* | 0.0078 | 0.12 | 2.25 | 8.61 | 0.072 | 0.029 | 27 | 95 | 59.12 |
| Crop configurational heterogeneity | 0.058# | -0.00010 | 0.12 | 1.99 | 20 | 138 |
| Landscape compositional heterogeneity | 0.028 | -0.023 | 0.078 | 1.094 | 58 | 471 |
| Landscape configurational heterogeneity | 0.037 | -0.022 | 0.096 | 1.24 | 54 | 457 |

**Table S31.** Statistics related to Figure S13 (i.e., for tropical and temperate agroecosystems). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Climatic region** | ***µ*** | **2.5%**  **CIs** | **97.5%**  **CIs** | ***t*-**  **value** | **QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Temperate agroecosystems | 0.12\*\*\* | 0.085 | 0.16 | 6.25 | 50.36\*\*\* | 0.033 | 78 | 936 | 63.74 |
| Tropical agroecosystems | 0.19\*\*\* | 0.12 | 0.26 | 5.55 | 7 | 69 |
| Shannon diversity | Temperate agroecosystems | 0.11\*\*\* | 0.080 | 0.14 | 7.87 | 73.41\*\*\* | 0.016 | 55 | 702 | 47.91 |
| Tropical agroecosystems | 0.21\*\*\* | 0.15 | 0.26 | 7.62 | 2 | 44 |
| Abundance | Temperate agroecosystems | 0.039\* | 0.0062 | 0.071 | 2.37 | 7.11\* | 0.029 | 81 | 1091 | 58.92 |
| Tropical agroecosystems | 0.061# | -0.00030 | 0.12 | 1.98 | 7 | 70 |

**Table S32.** Comparison between the effects of spatial heterogeneity on animal biodiversity in tropical and temperate agroecosystems.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Tropical agroecosystems – Temperate agroecosystems | 0.069 | 0.068 | 1.013 | 0.31 |
| Shannon diversity | Tropical agroecosystems – Temperate agroecosystems | NA | NA | NA | NA |
| Abundance | Tropical agroecosystems – Temperate agroecosystems | 0.023 | 0.058 | 0.39 | 0.69 |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S33.** Statistics related to Figure S15 (i.e., for perennial and annual cropping systems). Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Cropping system** | ***µ*** | **2.5%**  **CIs** | **97.5%**  **CIs** | ***t*-**  **value** | **QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Annual crops | 0.15\*\*\* | 0.10 | 0.19 | 6.36 | 50.37\*\*\* | 0.034 | 65 | 817 | 64.64 |
| Perennial crops | 0.090\*\* | 0.032 | 0.15 | 3.093 | 16 | 154 |
| Shannon diversity | Annual crops | 0.11\*\*\* | 0.077 | 0.14 | 6.88 | 65.074\*\*\* | 0.017 | 41 | 575 | 48.70 |
| Perennial crops | 0.12\*\*\* | 0.066 | 0.17 | 4.48 |  |  | 12 | 137 |  |
| Abundance | Annual crops | 0.042\* | 0.0097 | 0.074 | 2.59 | 12.015\*\* | 0.026 | 68 | 959 | 56.42 |
| Perennial crops | 0.075\* | 0.019 | 0.13 | 2.64 |  | 16 | 168 |

**Table S34.** Comparison between the effects of spatial heterogeneity on animal biodiversity in perennial and annual cropping systems.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Perennial crops – Annual crops | -0.056 | 0.049 | - 1.14 | 0.25 |
| Shannon diversity | Perennial crops – Annual crops | 0.011 | 0.034 | 0.32 | 0.75 |
| Abundance | Perennial crops – Annual crops | 0.034 | 0.037 | 0.90 | 0.36 |

**Table S35.** The effect of spatial heterogeneity on invertebrate biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales. Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Scales** | ***µ*** | **2.5%**  **CIs** | **97.5%**  **CIs** | ***t*-**  **value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | < 0.5km | 0.13\*\*\* | 0.086 | 0.18 | 5.84 | 38.56 | < .0001 | 0.028 | 46 | 318 | 59.38 |
| " | " | ≥ 0.5km, but < 1km | 0.098\*\*\* | 0.060 | 0.14 | 5.10 | 56 | 315 |
| " | " | ≥ 1km | 0.081\*\* | 0.033 | 0.13 | 3.35 | 43 | 243 |
| Shannon diversity | " | < 0.5km | 0.14\*\*\* | 0.10 | 0.17 | 8.21 | 68.62 | < .0001 | 0.017 | 39 | 257 | 48.18 |
| " | " | ≥ 0.5km, but < 1km | 0.10\*\*\* | 0.066 | 0.13 | 5.88 | 47 | 238 |
|  | " | ≥ 1km | 0.092\*\*\* | 0.060 | 0.12 | 5.78 | 37 | 214 |
| Abundance | " | < 0.5km | 0.044\* | 0.00080 | 0.087 | 2.031 | 5.64 | 0.13 | 0.028 | 51 | 409 | 58.31 |
| " | " | ≥ 0.5km, but < 1km | 0.031# | -0.0034 | 0.065 | 1.79 | 61 | 363 |
| " | " | ≥ 1km | 0.023 | -0.021 | 0.066 | 1.041 | 51 | 279 |
| Richness | Spatial compositional heterogeneity | < 0.5km | 0.16\*\*\* | 0.11 | 0.22 | 5.81 | 39.71 | < .0001 | 0.032 | 45 | 169 | 61.82 |
| " | " | ≥ 0.5km, but < 1km | 0.10\*\*\* | 0.055 | 0.15 | 4.30 | 52 | 142 |
| " | " | ≥ 1km | 0.088\*\* | 0.020 | 0.16 | 2.58 | 41 | 127 |
| Shannon diversity | " | < 0.5km | 0.16\*\*\* | 0.12 | 0.21 | 6.98 | 51.57 | < .0001 | 0.023 | 39 | 133 | 55.61 |
| " | " | ≥ 0.5km, but < 1km | 0.11\*\*\* | 0.065 | 0.15 | 4.93 | 47 | 105 |
| " | " | ≥ 1km | 0.12\*\*\* | 0.064 | 0.17 | 4.42 | 37 | 112 |
| Abundance | " | < 0.5km | 0.057\* | 0.0067 | 0.11 | 2.26 | 7.89 | 0.048 | 0.032 | 50 | 216 | 61.87 |
| " | " | ≥ 0.5km, but < 1km | 0.029 | -0.017 | 0.075 | 1.25 | 59 | 168 |
| " | " | ≥ 1000m | 0.00060 | -0.057 | 0.058 | 0.021 | 49 | 143 |
| Richness | Spatial configurational heterogeneity | < 0.5km | 0.088\*\*\* | 0.039 | 0.14 | 3.61 | 14.45 | 0.0024 | 0.026 | 42 | 149 | 57.70 |
| " | " | ≥ 0.5km, but < 1km | 0.081\*\* | 0.029 | 0.13 | 3.12 | 52 | 173 |
| " | " | ≥ 1km | 0.072\* | 0.017 | 0.13 | 2.62 | 39 | 116 |
| Shannon diversity | " | < 0.5km | 0.11\*\*\* | 0.068 | 0.15 | 5.27 | 26.20 | < .0001 | 0.017 | 39 | 124 | 47.73 |
| " | " | ≥ 0.5km, but < 1km | 0.082\*\*\* | 0.037 | 0.13 | 3.71 | 46 | 133 |
| " | " | ≥ 1km | 0.066\* | 0.012 | 0.12 | 2.45 | 33 | 102 |
| Abundance | " | < 0.5km | 0.027 | -0.023 | 0.077 | 1.092 | 3.43 | 0.33 | 0.025 | 48 | 193 | 55.34 |
| " | " | ≥ 0.5km, but < 1km | 0.032 | -0.011 | 0.074 | 1.50 | 57 | 195 |
| " | " | ≥ 1km | 0.043# | -0.0026 | 0.088 | 1.89 | 43 | 136 |

**Table S36.** The effect of spatial heterogeneity on pollinators biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales. Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Scale** | ***µ*** | **2.5%**  **CIs** | **97.5%**  **CIs** | ***t*-**  **value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | < 0.5km | 0.17\*\*\* | 0.13 | 0.20 | 9.19 | 80.58 | < .0001 | 0.014 | 33 | 187 | 40.89 |
| " | " | ≥ 0.5km, but < 1km | 0.11\*\*\* | 0.074 | 0.14 | 6.48 | 42 | 187 |
| " | " | ≥ 1km | 0.089\*\*\* | 0.044 | 0.13 | 4.010 | 27 | 138 |
| Shannon diversity | " | < 0.5km | 0.16\*\*\* | 0.12 | 0.20 | 7.62 | 61.98 | < .0001 | 0.012 | 27 | 148 | 39.30 |
| " | " | ≥ 0.5km, but < 1km | 0.10\*\*\* | 0.064 | 0.14 | 5.40 | 35 | 139 |
|  | " | ≥ 1km | 0.098\*\*\* | 0.059 | 0.14 | 5.17 | 23 | 124 |
| Abundance | " | < 0.5km | 0.11\*\*\* | 0.064 | 0.15 | 4.90 | 25.18 | < .0001 | 0.020 | 35 | 210 | 50.46 |
| " | " | ≥ 0.5km, but < 1km | 0.076\*\*\* | 0.035 | 0.12 | 3.71 | 41 | 195 |
| " | " | ≥ 1km | 0.054\* | 0.00020 | 0.11 | 2.019 | 33 | 155 |
| Richness | Spatial compositional heterogeneity | < 0.5km | 0.17\*\*\* | 0.11 | 0.24 | 5.19 | 48.88 | < .0001 | 0.017 | 31 | 98 | 46.10 |
| " | " | ≥ 0.5km, but < 1km | 0.13\*\*\* | 0.073 | 0.18 | 4.79 | 39 | 85 |
| " | " | ≥ 1km | 0.048 | -0.035 | 0.13 | 1.17 | 24 | 66 |
| Shannon diversity | " | < 0.5km | 0.15\*\*\* | 0.079 | 0.22 | 4.33 | 27.27 | < .0001 | 0.018 | 26 | 75 | 48.38 |
| " | " | ≥ 0.5km, but < 1km | 0.12\*\*\* | 0.059 | 0.18 | 4.035 | 34 | 60 |
| " | " | ≥ 1km | 0.074# | -0.0010 | 0.15 | 2.010 | 22 | 62 |
| Abundance | " | < 0.5km | 0.11 | 0.054 | 0.17 | 3.83 | 20.79 | 0.0001 | 0.027 | 33 | 111 | 56.79 |
| " | " | ≥ 0.5km, but < 1km | 0.085 | 0.025 | 0.15 | 2.83 | 39 | 89 |
| " | " | ≥ 1km | 0.015 | -0.062 | 0.091 | 0.39 | 30 | 78 |
| Richness | Spatial configurational heterogeneity | < 0.5km | 0.14\*\*\* | 0.088 | 0.20 | 5.31 | 38.67 | < .0001 | 0.013 | 30 | 89 | 40.83 |
| " | " | ≥ 0.5km, but < 1km | 0.10\*\*\* | 0.052 | 0.15 | 4.17 | 38 | 102 |
| " | " | ≥ 1km | 0.11\*\*\* | 0.056 | 0.17 | 3.99 | 25 | 72 |
| Shannon diversity | " | < 0.5km | 0.16\*\*\* | 0.096 | 0.22 | 5.16 | 40.052 | < .0001 | 0.011 | 27 | 73 | 37.00 |
| " | " | ≥ 0.5km, but < 1km | 0.10\*\*\* | 0.054 | 0.15 | 4.30 | 34 | 79 |
| " | " | ≥ 1km | 0.11\*\*\* | 0.056 | 0.17 | 4.00 | 21 | 62 |
| Abundance | " | < 0.5km | 0.10\*\*\* | 0.046 | 0.16 | 3.72 | 17.15 | 0.0007 | 0.018 | 32 | 99 | 47.93 |
| " | " | ≥ 0.5km, but < 1km | 0.076\*\* | 0.025 | 0.13 | 3.015 | 39 | 106 |
| " | " | ≥ 1km | 0.089\*\* | 0.037 | 0.14 | 3.45 | 27 | 77 |

**Table S37.** The effect of spatial heterogeneity on predator biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales. Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Scale** | ***µ*** | **2.5%**  **CIs** | **97.5%**  **CIs** | ***t*-**  **value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | < 0.5km | 0.12\*\*\* | 0.055 | 0.18 | 3.76 | 24.38 | < .0001 | 0.041 | 29 | 182 | 67.71 |
| " | " | ≥ 0.5km, but < 1km | 0.13\*\*\* | 0.073 | 0.18 | 4.68 | 43 | 212 |
| " | " | ≥ 1km | 0.12\*\*\* | 0.058 | 0.18 | 3.98 | 33 | 161 |
| Shannon diversity | " | < 0.5km | 0.11\*\*\* | 0.067 | 0.16 | 4.89 | 34.53 | < .0001 | 0.017 | 22 | 118 | 48.57 |
| " | " | ≥ 0.5km, but < 1km | 0.075\*\*\* | 0.034 | 0.12 | 3.69 | 30 | 136 |
|  | " | ≥ 1km | 0.088\*\*\* | 0.047 | 0.13 | 4.38 | 21 | 101 |
| Abundance | " | < 0.5km | 0.016 | -0.037 | 0.070 | 0.61 | 2.74 | 0.43 | 0.028 | 33 | 246 | 57.24 |
| " | " | ≥ 0.5km, but < 1km | 0.029 | -0.0079 | 0.065 | 1.57 | 44 | 272 |
| " | " | ≥ 1km | 0.030 | -0.021 | 0.081 | 1.18 | 36 | 167 |
| Richness | Spatial compositional heterogeneity | < 0.5km | 0.15\*\*\* | 0.076 | 0.23 | 3.93 | 25.23 | < .0001 | 0.040 | 29 | 93 | 66.22 |
| " | " | ≥ 0.5km, but < 1km | 0.11\*\* | 0.044 | 0.17 | 3.42 | 38 | 94 |
| " | " | ≥ 1km | 0.13\*\* | 0.053 | 0.20 | 3.45 | 32 | 90 |
| Shannon diversity | " | < 0.5km | 0.17\*\*\* | 0.090 | 0.24 | 4.44 | 38.33 | < .0001 | 0.019 | 22 | 60 | 49.91 |
| " | " | ≥ 0.5km, but < 1km | 0.078\*\*\* | 0.035 | 0.12 | 3.69 | 30 | 57 |
| " | " | ≥ 1km | 0.13\*\*\* | 0.068 | 0.19 | 4.30 | 21 | 55 |
| Abundance | " | < 0.5km | 0.037 | -0.029 | 0.10 | 1.12 | 2.38 | 0.50 | 0.030 | 33 | 126 | 59.23 |
| " | " | ≥ 0.5km, but < 1km | 0.030 | -0.015 | 0.075 | 1.35 | 42 | 116 |
| " | " | ≥ 1km | 0.018 | -0.049 | 0.085 | 0.53 | 35 | 87 |
| Richness | Spatial configurational heterogeneity | < 0.5km | 0.066# | -0.0048 | 0.14 | 1.87 | 14.13 | 0.0027 | 0.040 | 28 | 89 | 68.21 |
| " | " | ≥ 0.5km, but < 1km | 0.12\*\* | 0.041 | 0.20 | 3.048 | 38 | 118 |
| " | " | ≥ 1km | 0.097\*\* | 0.027 | 0.17 | 2.78 | 27 | 71 |
| Shannon diversity | " | < 0.5km | 0.057\* | 0.012 | 0.10 | 2.56 | 5.88 | 0.12 | 0.020 | 22 | 58 | 54.16 |
| " | " | ≥ 0.5km, but < 1km | 0.065\* | 0.0050 | 0.13 | 2.21 | 29 | 79 |
| " | " | ≥ 1km | 0.037 | -0.056 | 0.13 | 0.82 | 17 | 46 |
| Abundance | " | < 0.5km | -0.014 | -0.072 | 0.043 | -0.50 | 3.88 | 0.27 | 0.024 | 31 | 120 | 52.12 |
| " | " | ≥ 0.5km, but < 1km | 0.022 | -0.031 | 0.074 | 0.82 | 40 | 156 |
| " | " | ≥ 1km | 0.037 | -0.022 | 0.095 | 1.24 | 29 | 80 |

**Table S38.** The effect of spatial heterogeneity on vertebrate biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales. Other details analogous to those in Table S6.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Scales** | ***µ*** | **2.5%**  **CIs** | **97.5%**  **CIs** | ***t*-**  **value** | **QM** | ***P*-value for QM** | ***τ2*** | **N** | **K** | ***I2*** |
| Richness | Spatial heterogeneity | < 0.5km | 0.10 | -0.075 | 0.28 | 1.19 | 32.22 | < .0001 | 0.040 | 7 | 32 | 71.57 |
| " | " | ≥ 0.5km, but < 1km | 0.24\*\*\* | 0.13 | 0.35 | 4.49 | 17 | 56 |
| " | " | ≥ 1km | 0.19\*\* | 0.072 | 0.30 | 3.38 | 10 | 41 |
| Shannon diversity | " | < 0.5km | NA | NA | NA | NA | 6.46 | 0.091 | 0.012 | 1 | 4 | 50.83 |
| " | " | ≥ 0.5km, but < 1km | 0.087# | -0.0067 | 0.18 | 2.14 | 9 | 32 |
|  | " | ≥ 1km | NA | NA | NA | NA | 1 | 1 |
| Abundance | " | < 0.5km | NA | NA | NA | NA | 11.93 | 0.0076 | 0.027 | 4 | 18 | 59.17 |
| " | " | ≥ 0.5km, but < 1km | 0.13\*\* | 0.043 | 0.22 | 3.11 | 12 | 68 |
| " | " | ≥ 1km | 0.11 | -0.029 | 0.25 | 1.66 | 8 | 24 |
| Richness | Spatial compositional heterogeneity | < 0.5km | 0.19\*\*\* | 0.10 | 0.28 | 4.52 | 26.32 | < .0001 | 0.025 | 7 | 16 | 59.44 |
| " | " | ≥ 0.5km, but < 1km | 0.20\*\* | 0.084 | 0.32 | 3.58 | 15 | 24 |
| " | " | ≥ 1km | 0.16\* | 0.040 | 0.28 | 2.75 | 9 | 22 |
| Shannon diversity | " | < 0.5km | NA | NA | NA | NA | 7.42 | 0.060 | 0.0050 | 1 | 2 | 27.42 |
| " | " | ≥ 0.5km, but < 1km | 0.077 | -0.029 | 0.18 | 1.69 | 9 | 12 |
| " | " | ≥ 1km | NA | NA | NA | NA | 1 | 1 |
| Abundance | " | < 0.5km | NA | NA | NA | NA | 5.80 | 0.12 | 0.022 | 4 | 9 | 58.46 |
| " | " | ≥ 0.5km, but < 1km | 0.11# | -0.0012 | 0.22 | 2.086 | 11 | 18 |
| " | " | ≥ 1km | 0.082 | -0.045 | 0.21 | 1.36 | 7 | 12 |
| Richness | Spatial configurational heterogeneity | < 0.5km | 0.030 | -0.24 | 0.30 | 0.23 | 22.90 | < .0001 | 0.044 | 7 | 16 | 74.35 |
| " | " | ≥ 0.5km, but < 1km | 0.24\*\* | 0.072 | 0.40 | 2.98 | 15 | 32 |
| " | " | ≥ 1km | 0.19 | 0.064 | 0.32 | 3.13 | 8 | 19 |
| Shannon diversity | " | < 0.5km | NA | NA | NA | NA | 3.30 | 0.19 | 0.019 | 1 | 2 | 61.77 |
| " | " | ≥ 0.5km, but < 1km | 0.096 | -0.032 | 0.22 | 1.72 | 9 | 20 |
| " | " | ≥ 1km | NA | NA | NA | NA | 0 | 0 |
| Abundance | " | < 0.5km | NA | NA | NA | NA | 9.52 | 0.023 | 0.032 | 4 | 9 | 60.13 |
| " | " | ≥ 0.5km, but < 1km | 0.14\* | 0.034 | 0.25 | 2.78 | 12 | 50 |
| " | " | ≥ 1km | 0.11 | -0.13 | 0.35 | 0.96 | 6 | 12 |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S39.** Comparison of the effect of spatial heterogeneity on invertebrate biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.033\* | 0.014 | -2.34 | 0.047 |
| " | " | ≥ 1km – < 0.5km | -0.050# | 0.023 | -2.20 | 0.066 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.017 | 0.017 | -1.00 | 0.56 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.039\* | 0.015 | -2.60 | 0.025 |
| " | " | ≥ 1km – < 0.5km | -0.047\*\* | 0.014 | -3.33 | 0.0025 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.0077 | 0.014 | -0.56 | 0.84 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | -0.013 | 0.012 | -1.12 | 0.45 |
| " | " | ≥ 1km – < 0.5km | -0.021 | 0.027 | -0.79 | 0.67 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.0078 | 0.020 | -0.39 | 0.90 |
| Richness | Spatial compositional heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.058\*\* | 0.018 | -3.18 | 0.0031 |
| " | " | ≥ 1km – < 0.5km | -0.074 | 0.041 | -1.80 | 0.14 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.015 | 0.030 | -0.51 | 0.84 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.054\* | 0.019 | -2.83 | 0.012 |
| " | " | ≥ 1km – < 0.5km | -0.046 | 0.030 | -1.51 | 0.27 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.0080 | 0.023 | 0.35 | 0.93 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | -0.028# | 0.013 | -2.098 | 0.077 |
| " | " | ≥ 1km – < 0.5km | -0.056 | 0.034 | -1.64 | 0.20 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.028 | 0.028 | -1.010 | 0.53 |
| Richness | Spatial configurational heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.0079 | 0.022 | -0.36 | 0.93 |
| " | " | ≥ 1km – < 0.5km | -0.017 | 0.023 | -0.74 | 0.74 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.0089 | 0.026 | -0.34 | 0.94 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.028 | 0.020 | -1.43 | 0.32 |
| " | " | ≥ 1km – < 0.5km | -0.044 | 0.025 | -1.75 | 0.19 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.016 | 0.027 | -0.61 | 0.81 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | 0.0048 | 0.018 | 0.27 | 0.96 |
| " | " | ≥ 1km – < 0.5km | 0.016 | 0.024 | 0.65 | 0.79 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.011 | 0.023 | 0.47 | 0.88 |

**Table S40.** Comparison of the effect of spatial heterogeneity on vertebrate biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | 0.14 | 0.11 | 1.28 | 0.38 |
| " | " | ≥ 1km – < 0.5km | 0.083 | 0.11 | 0.71 | 0.74 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.054 | 0.047 | -1.16 | 0.45 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | NA | NA | NA | NA |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.019 | 0.066 | -0.28 | 0.96 |
| Richness | Spatial compositional heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | 0.0075 | 0.052 | 0.14 | 0.99 |
| " | " | ≥ 1km – < 0.5km | -0.032 | 0.082 | -0.39 | 0.92 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.039 | 0.076 | -0.52 | 0.86 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | NA | NA | NA | NA |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.025 | 0.067 | -0.38 | 0.92 |
| Richness | Spatial configurational heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | 0.21 | 0.18 | 1.13 | 0.44 |
| " | " | ≥ 1km – < 0.5km | 0.16 | 0.14 | 1.14 | 0.43 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.045 | 0.071 | -0.63 | 0.77 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | NA | NA | NA | NA |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – < 0.5km | NA | NA | NA | NA |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.032 | 0.11 | -0.29 | 0.95 |

NA = Not Available, for levels in the moderator variable that had data from less than five studies.

**Table S41.** Comparison of the effect of spatial heterogeneity on pollinators biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.058\*\*\* | 0.016 | -3.61 | 0.00082 |
| " | " | ≥ 1km – < 0.5km | -0.077\*\*\* | 0.020 | -3.84 | 0.00032 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.018 | 0.019 | -0.96 | 0.60 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.058\*\* | 0.018 | -3.18 | 0.0042 |
| " | " | ≥ 1km – < 0.5km | -0.063\*\*\* | 0.017 | -3.74 | 0.00054 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.0055 | 0.015 | -0.38 | 0.92 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | -0.031# | 0.014 | -2.26 | 0.058 |
| " | " | ≥ 1km – < 0.5km | -0.053 | 0.027 | -2.010 | 0.10 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.022 | 0.025 | -0.87 | 0.65 |
| Richness | Spatial compositional heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.048 | 0.030 | -1.57 | 0.24 |
| " | " | ≥ 1km – < 0.5km | -0.13\* | 0.052 | -2.43 | 0.035 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.078# | 0.037 | -2.10 | 0.081 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.030 | 0.029 | -1.045 | 0.52 |
| " | " | ≥ 1km – < 0.5km | -0.075 | 0.045 | -1.66 | 0.20 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.045 | 0.030 | -1.49 | 0.27 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | -0.028 | 0.019 | -1.44 | 0.31 |
| " | " | ≥ 1km – < 0.5km | -0.098\* | 0.039 | -2.54 | 0.028 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.070 | 0.036 | -1.96 | 0.11 |
| Richness | Spatial configurational heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.040 | 0.027 | -1.48 | 0.30 |
| " | " | ≥ 1km – < 0.5km | -0.029 | 0.034 | -0.87 | 0.66 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.011 | 0.031 | 0.36 | 0.93 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.057 | 0.028 | -2.036 | 0.10 |
| " | " | ≥ 1km – < 0.5km | -0.045 | 0.037 | -1.23 | 0.43 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.012 | 0.028 | 0.42 | 0.91 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | -0.025 | 0.021 | -1.16 | 0.48 |
| " | " | ≥ 1km – < 0.5km | -0.012 | 0.025 | -0.46 | 0.89 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.013 | 0.026 | 0.50 | 0.87 |

**Table S42.** Comparison of the effect of spatial heterogeneity on predator biodiversity at small (i.e., < 0.5km radius area), intermediate (i.e., ≥ 0.5km, but < 1km), and large (i.e., ≥ 1km radius area) spatial scales.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Biodiversity metrics** | **Spatial** **heterogeneity types** | **Compared levels** | **Estimate** | **Standard error** | ***Z*-value** | ***P*-value** |
| Richness | Spatial heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | 0.010 | 0.024 | 0.44 | 0.90 |
| " | " | ≥ 1km – < 0.5km | 0.000052 | 0.032 | -0.0020 | 1.00 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.010 | 0.024 | -0.44 | 0.90 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.040 | 0.026 | -1.51 | 0.29 |
| " | " | ≥ 1km – < 0.5km | -0.026 | 0.021 | -1.27 | 0.41 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.013 | 0.023 | 0.58 | 0.83 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | 0.012 | 0.023 | 0.52 | 0.85 |
| " | " | ≥ 1km – < 0.5km | 0.014 | 0.036 | 0.38 | 0.92 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.0015 | 0.028 | 0.052 | 1.00 |
| Richness | Spatial compositional heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | -0.048 | 0.033 | -1.45 | 0.30 |
| " | " | ≥ 1km – < 0.5km | -0.029 | 0.050 | -0.57 | 0.83 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.019 | 0.037 | 0.51 | 0.86 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | -0.089\* | 0.038 | -2.35 | 0.048 |
| " | " | ≥ 1km – < 0.5km | -0.037 | 0.041 | -0.91 | 0.63 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.052 | 0.029 | 1.81 | 0.16 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | -0.0069 | 0.028 | -0.25 | 0.97 |
| " | " | ≥ 1km – < 0.5km | -0.019 | 0.048 | -0.41 | 0.91 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.013 | 0.036 | -0.35 | 0.93 |
| Richness | Spatial configurational heterogeneity | ≥ 0.5km, but < 1km – < 0.5km | 0.056 | 0.044 | 1.26 | 0.40 |
| " | " | ≥ 1km – < 0.5km | 0.031 | 0.026 | 1.23 | 0.42 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.024 | 0.036 | -0.68 | 0.77 |
| Shannon diversity | " | ≥ 0.5km, but < 1km – < 0.5km | 0.0081 | 0.024 | 0.34 | 0.93 |
| " | " | ≥ 1km – < 0.5km | -0.020 | 0.036 | -0.55 | 0.84 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | -0.028 | 0.044 | -0.63 | 0.79 |
| Abundance | " | ≥ 0.5km, but < 1km – < 0.5km | 0.036 | 0.027 | 1.33 | 0.38 |
| " | " | ≥ 1km – < 0.5km | 0.051 | 0.031 | 1.65 | 0.23 |
| " | " | ≥ 1km – ≥ 0.5km, but < 1km | 0.015 | 0.030 | 0.49 | 0.87 |

# **Supplementary Figures**

**Identification of studies through databases**

Records removed before screening:

Duplicate records removed (N = 369)

Records removed for other reasons (N = 0)

Record identified

Web of Science (N = 486)

Scopus (N = 530)

By March, 2023

**Identification**

Records excluded

(N = 157)

Note: this includes book or book chapters, conference proceedings, and non-English papers.

Records screened

(N = 647)

Records with full text not retrievable

(N = 50)

Records sought for full text retrieval

(N = 490)

**Screening**

Records excluded (N = 325)

Note: this includes studies for which the raw data were not available publicly or on our request. See “Data compilation” section in the main text.

Full text paper screened

(N = 440)

Datasets included in the meta-analysis (N = 122 unique datasets from 115 papers)

**Included**

Effect sizes included in the meta-analysis (K = 3,203)

**Figure S1.** PRISMA flow diagram.

**A graph of a pyramid

Description automatically generated**

**Figure S2.** Funnel plot, showing there was no publication bias in our dataset; it is symmetric around zero. The *X*-axis of the plot shows the Fisher’s Z transformed corelation coefficient, while the *Y*-axis shows the Standard errors.See Table S3 above, for statistics related to this plot.

**A graph with numbers and lines

Description automatically generated**

**Figure S3.** Baujat plot, showing there were no influential studies in our dataset; the influence of each study on the overall estimate is below 0.055. The *X*-axis of the plot shows the overall heterogeneity contribution of each study, and the *Y*-axis shows the influence of each study on the pooled result. Numbers in the plot represent each study.

**A graph of a function

Description automatically generated**

**Figure S4.** Gosh plot, showing there are no outlier studies in our dataset, outlier studies should be isolated and displayed separately in this plot. The *X*-axis of the plot shows the Fisher’s z transformed corelation coefficient, while the *Y*-axis shows the *I2* (i.e., amount of the total variance due to variance in the true effects).

**A graph of a number of dots

Description automatically generated with medium confidence**

**Figure S5.** Cook’s distances, showing there were no outlier studies in our dataset; all the values are lower than 0.2. The *X*-axis of the plot shows the Cook’s distance, while the *Y*-axis shows the observed effects.

**A graph of numbers and text

Description automatically generated with medium confidence**

**Figure S6.** Estimated average Pearson’s correlation coefficients among heterogeneity components and bird biodiversity, with 90% (thicker bars) and 95% (thinner bars) Confidence Intervals (CIs). Different colours indicate how the data were subdivided for each corresponding model, i.e., blue for the model without a moderator, orange for the model with the ‘Spatial heterogeneity type’ as a moderator, green for the model with the ‘Land-cover type’ as a moderator, and pink for the model with the ‘Heterogeneity component’ as a moderator (see Table S3).The number of correlations and studies (in brackets) included for each estimation are displayed beside the upper bound of the 95% CIs. Asterisks indicate the level of the statistical significance (\**P*-value < 0.05, \*\**P*-value < 0.01, \*\*\**P*-value < 0.001). The dashed line indicates the zero *X*-axis intercept. See Table S11 above, for detailed statistics.

**A graph of numbers and text

Description automatically generated with medium confidence**

**Figure S7.** Estimated average Pearson’s correlation coefficients among heterogeneity components and Hymenoptera biodiversity. Details analogous to those in Figure S6. See Table S13 above, for detailed statistics.

**A group of colorful lines with text

Description automatically generated with medium confidence**

**Figure S8.** Estimated average Pearson’s correlation coefficients among heterogeneity components and Lepidoptera biodiversity. Details analogous to those in Figure S6. See Table S14 above, for detailed statistics.

**A graph of numbers and text

Description automatically generated with medium confidence**

**Figure S9.** Estimated average Pearson’s correlation coefficients among heterogeneity components and Diptera biodiversity. Details analogous to those in Figure S6. See Table S15 above, for detailed statistics.

**A group of numbers and lines with text

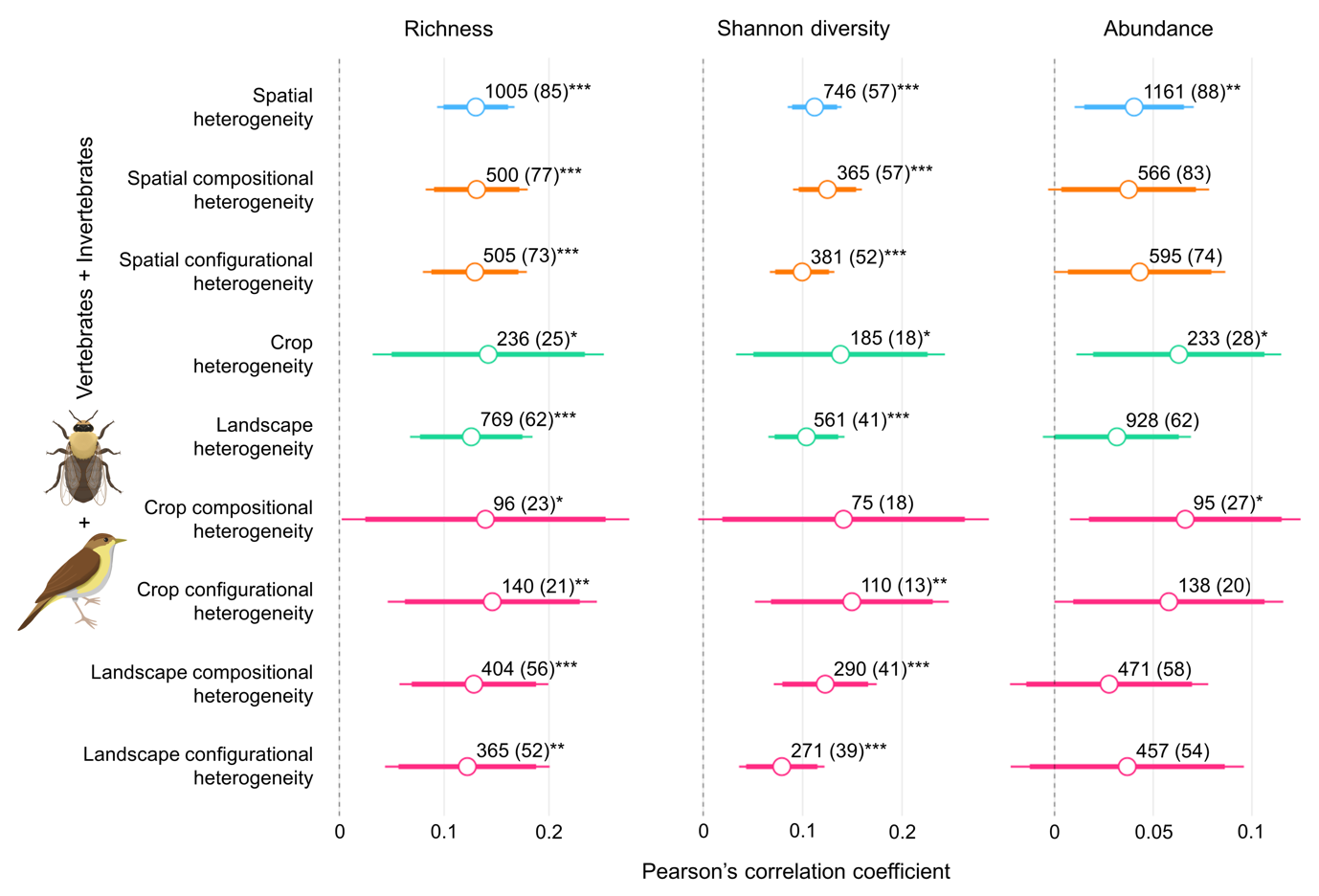
Description automatically generated with medium confidence**

**Figure S10.** Estimated average Pearson’s correlation coefficients among heterogeneity components and Coleoptera biodiversity. Details analogous to those in Figure S6. See Table S16 above, for detailed statistics.

**A group of numbers and lines with text

Description automatically generated with medium confidence**

**Figure S11.** Estimated average Pearson’s correlation coefficients among heterogeneity components and Araneae biodiversity. Details analogous to those in Figure S6. See Table S17 above, for detailed statistics.

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**Figure S12.** Estimated average Pearson’s correlation coefficients among heterogeneity components and animal biodiversity. Details analogous to those in Figure S6. See Table S30 above, for detailed statistics.

**A graph of different colored lines

Description automatically generated with medium confidence**

**Figure S13.** Estimated average Pearson’s correlation coefficients among heterogeneity components and animal biodiversity in tropical and temperate agroecosystems. Details analogous to those in Figure S6. See Table S31, for detailed statistics.

**A screenshot of a graph

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**Figure S14.** Comparison in the estimated average Pearson’s correlation coefficients among heterogeneity components and animal biodiversity in tropical and temperate agroecosystems. Details analogous to those in Figure S6. See Table S32, for detailed statistics.

**A screenshot of a graph

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**Figure S15.** Estimated average Pearson’s correlation coefficients among heterogeneity components and animal biodiversity in annual and perennial cropping systems. Details analogous to those in Figure S6. See Table S33, for detailed statistics.

A graph of different types of plants

Description automatically generated with medium confidence

**Figure S16.** Comparison in the estimated average Pearson’s correlation coefficients among heterogeneity components and animal biodiversity in perennial and annual cropping systems. Details analogous to those in Figure S6. See Table S34, for detailed statistics.

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