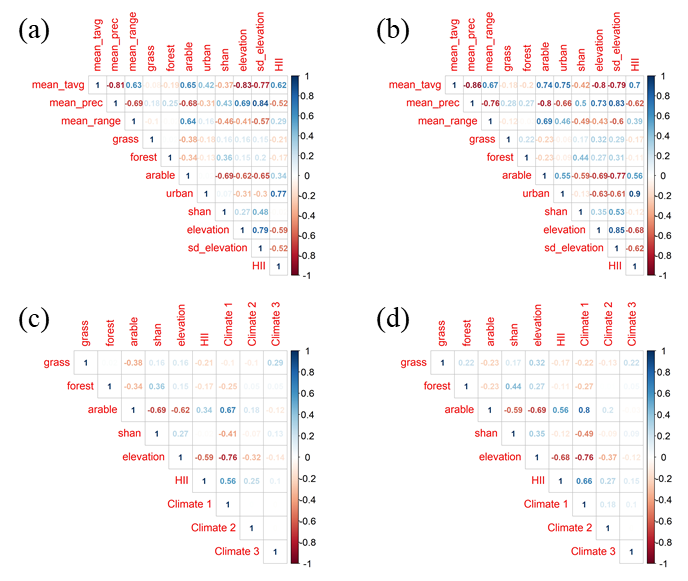
Supplementary Material

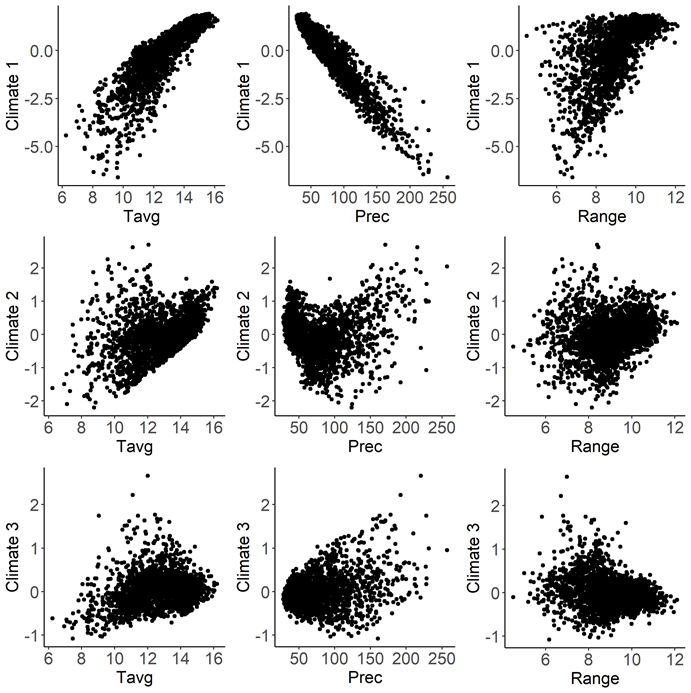
**Supplementary Table 1**. All the species included within the study.

|  |  |
| --- | --- |
| Common Name | Scientific Name |
| Red-throated Diver | *Gavia stellata* |
| Black-necked Grebe | *Podiceps nigricollis* |
| Marsh Harrier | *Circus aeruginosus* |
| Hen Harrier | *Circus cyaneus* |
| Goshawk | *Accipiter gentilis* |
| Sparrowhawk | *Accipiter nisus* |
| Buzzard | *Buteo buteo* |
| Golden Eagle | *Aquila chrysaetos* |
| Osprey | *Pandion haliaetus* |
| Kestrel | *Falco tinnunculus* |
| Merlin | *Falco columbarius* |
| Hobby | *Falco subbuteo* |
| Peregrine | *Falco peregrinus* |
| Red Grouse | *Lagopus lagopus* |
| Ptarmigan | *Lagopus muta* |
| Black Grouse | *Lyrurus tetrix* |
| Capercaillie | *Tetrao urogallus* |
| Red-legged Partridge | *Alectoris rufa* |
| Grey Partridge | *Perdix perdix* |
| Quail | *Coturnix coturnix* |
| Pheasant | *Phasianus colchicus* |
| Golden Pheasant | *Chrysolophus pictus* |
| Lady Amherst's Pheasant | *Chrysolophus amherstiae* |
| Water Rail | *Rallus aquaticus* |
| Spotted Crake | *Porzana porzana* |
| Corncrake | *Crex crex* |
| Moorhen | *Gallinula chloropus* |
| Coot | *Fulica atra* |
| Oystercatcher | *Haematopus ostralegus* |
| Common/Scottish Crossbill\* | *Loxia curvirostra/scotica* |
| Avocet | *Recurvirostra avosetta* |
| Stone-curlew | *Burhinus oedicnemus* |
| Rock/Water Pipit\* | *Anthus petrosus/spinoletta* |
| Little Ringed Plover | *Charadrius dubius* |
| Ringed Plover | *Charadrius hiaticula* |
| Dotterel | *Charadrius morinellus* |
| Golden Plover | *Pluvialis apricaria* |
| Lapwing | *Vanellus vanellus* |
| Snipe | *Gallinago gallinago* |
| Woodcock | *Scolopax rusticola* |
| Black-tailed Godwit | *Limosa limosa* |
| Black-throated Diver | *Gavia arctica* |
| Whimbrel | *Numenius phaeopus* |
| Curlew | *Numenius arquata* |
| Redshank | *Tringa totanus* |
| Greenshank | *Tringa nebularia* |
| Common Sandpiper | Actitis hypoleucos |
| Rock Dove | *Columba livia* |
| Stock Dove | *Columba oenas* |
| Woodpigeon | *Columba palumbus* |
| Collared Dove | *Streptopelia decaocto* |
| Turtle Dove | *Streptopelia turtur* |
| Ring-necked Parakeet | *Psittacula krameri* |
| Cuckoo | *Cuculus canorus* |
| Barn Owl | *Tyto alba* |
| Little Owl | *Athene noctua* |
| Tawny Owl | *Strix aluco* |
| Long-eared Owl | *Asio otus* |
| Short-eared Owl | *Asio flammeus* |
| Nightjar | *Caprimulgus europaeus* |
| Swift | *Apus apus* |
| Bittern | *Botaurus stellaris* |
| Kingfisher | *Alcedo atthis* |
| Green Woodpecker | *Picus viridis* |
| Great Spotted Woodpecker | *Dendrocopos major* |
| Lesser Spotted Woodpecker | *Dryobates minor* |
| Woodlark | *Lullula arborea* |
| Skylark | *Alauda arvensis* |
| Sand Martin | *Riparia riparia* |
| Swallow | *Hirundo rustica* |
| House Martin | *Delichon urbicum* |
| Tree Pipit | *Anthus trivialis* |
| Meadow Pipit | *Anthus pratensis* |
| Yellow Wagtail | *Motacilla flava* |
| Grey Wagtail | *Motacilla cinerea* |
| Pied/White Wagtail | *Motacilla alba* |
| Dipper | *Cinclus cinclus* |
| Wren | *Troglodytes troglodytes* |
| Dunnock | *Prunella modularis* |
| Robin | *Erithacus rubecula* |
| Nightingale | *Luscinia megarhynchos* |
| Black Redstart | *Phoenicurus ochruros* |
| Redstart | *Phoenicurus phoenicurus* |
| Whinchat | *Saxicola rubetra* |
| Stonechat | *Saxicola rubicola* |
| Wheatear | *Oenanthe oenanthe* |
| Little Egret | *Egretta garzetta* |
| Ring Ouzel | *Turdus torquatus* |
| Blackbird | *Turdus merula* |
| Song Thrush | *Turdus philomelos* |
| Redwing | *Turdus iliacus* |
| Mistle Thrush | *Turdus viscivorus* |
| Cetti's Warbler | *Cettia cetti* |
| Grasshopper Warbler | *Locustella naevia* |
| Sedge Warbler | *Acrocephalus schoenobaenus* |
| Grey Heron | *Ardea cinerea* |
| Reed Warbler | *Acrocephalus scirpaceus* |
| Dartford Warbler | *Sylvia undata* |
| Lesser Whitethroat | *Sylvia curruca* |
| Whitethroat | *Sylvia communis* |
| Garden Warbler | *Sylvia borin* |
| Blackcap | *Sylvia atricapilla* |
| Wood Warbler | *Phylloscopus sibilatrix* |
| Chiffchaff | *Phylloscopus collybita* |
| Willow Warbler | *Phylloscopus trochilus* |
| Goldcrest | *Regulus regulus* |
| Firecrest | *Regulus ignicapilla* |
| Spotted Flycatcher | *Muscicapa striata* |
| Pied Flycatcher | *Ficedula hypoleuca* |
| Bearded Tit | *Panurus biarmicus* |
| Long-tailed Tit | *Aegithalos caudatus* |
| Marsh Tit | *Poecile palustris* |
| Willow Tit | *Poecile montanus* |
| Crested Tit | *Lophophanes cristatus* |
| Coal Tit | *Periparus ater* |
| Blue Tit | *Cyanistes caeruleus* |
| Great Tit | *Parus major* |
| Nuthatch | *Sitta europaea* |
| Treecreeper | *Certhia familiaris* |
| Jay | *Garrulus glandarius* |
| Magpie | *Pica pica* |
| Chough | *Pyrrhocorax pyrrhocorax* |
| Jackdaw | *Coloeus monedula* |
| Rook | *Corvus frugilegus* |
| Carrion Crow | *Corvus corone* |
| Raven | *Corvus corax* |
| Starling | *Sturnus vulgaris* |
| House Sparrow | *Passer domesticus* |
| Mute Swan | *Cygnus olor* |
| Tree Sparrow | *Passer montanus* |
| Chaffinch | *Fringilla coelebs* |
| Greenfinch | *Chloris chloris* |
| Goldfinch | *Carduelis carduelis* |
| Siskin | *Spinus spinus* |
| Linnet | *Linaria cannabina* |
| Twite | *Linaria flavirostris* |
| Common/Lesser Redpoll\* | *Acanthis flammea/cabaret* |
| Bullfinch | *Pyrrhula pyrrhula* |
| Hawfinch | *Coccothraustes coccothraustes* |
| Snow Bunting | *Plectrophenax nivalis* |
| Yellowhammer | *Emberiza citrinella* |
| Cirl Bunting | *Emberiza cirlus* |
| Reed Bunting | *Emberiza schoeniclus* |
| Corn Bunting | *Emberiza calandra* |
| Greylag Goose | *Anser anser* |
| Canada Goose | *Branta canadensis* |
| Egyptian Goose | *Alopochen aegyptiaca* |
| Little Grebe | *Tachybaptus ruficollis* |
| Shelduck | *Tadorna tadorna* |
| Mandarin Duck | *Aix galericulata* |
| Wigeon | *Mareca penelope* |
| Gadwall | *Mareca strepera* |
| Teal | *Anas crecca* |
| Mallard | *Anas platyrhynchos* |
| Great Crested Grebe | *Podiceps cristatus* |
| Pintail | *Anas acuta* |
| Garganey | *Spatula querquedula* |
| Shoveler | *Spatula clypeata* |
| Red-crested Pochard | *Netta rufina* |
| Pochard | *Aythya ferina* |
| Tufted Duck | *Aythya fuligula* |
| Eider | *Somateria mollissima* |
| Common Scoter | *Melanitta nigra* |
| Goldeneye | *Bucephala clangula* |
| Hooded Crow | *Corvus cornix* |
| Red-breasted Merganser | *Mergus serrator* |
| Goosander | *Mergus merganser* |
| Ruddy Duck | *Oxyura jamaicensis* |
| Red Kite | *Milvus milvus* |

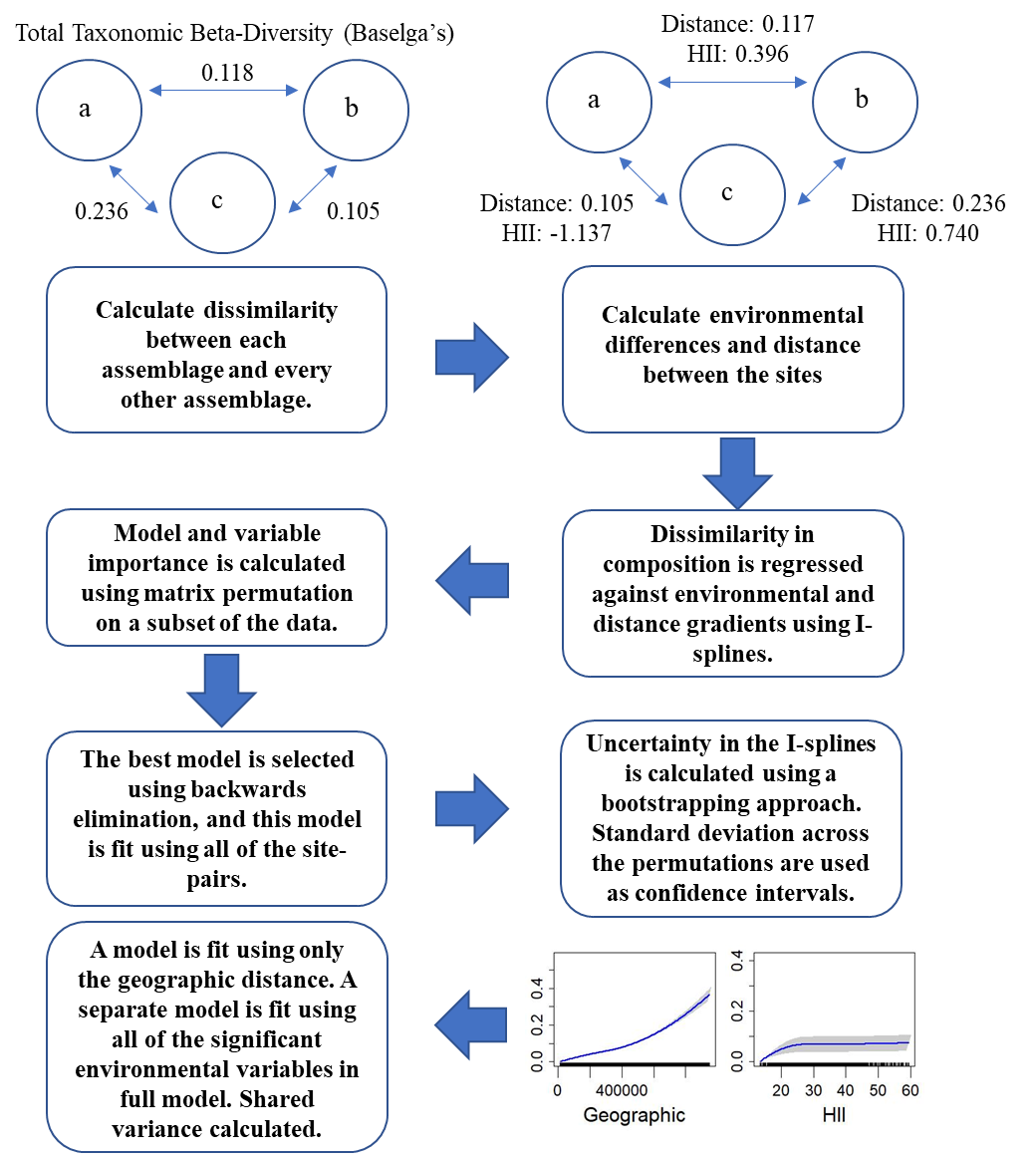
\*These species/subspecies were aggregated to species level



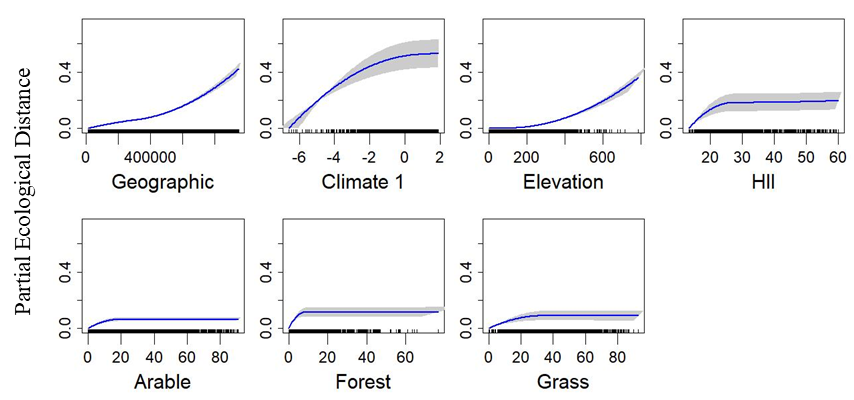
**Supplementary Figure. 1**. Correlation plots of the variables considered for inclusion in the models. Plots a and b show the Pearson’s and Spearman’s correlations, respectively, between all variables considered. Plots c and d show the Pearson’s and Spearman’s correlations, respectively, between the variables selected for the final models.



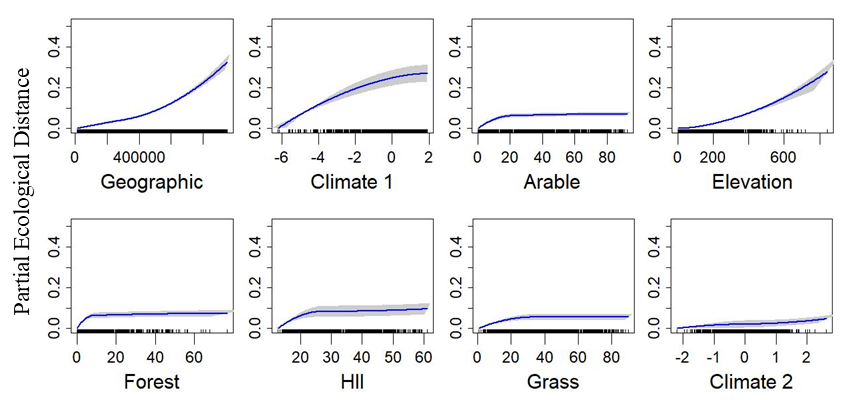
**Supplementary Figure. 2**. Scatter plots showing the correlation between the original climate variables (average temperature (Tavg), average total precipitation (Prec), and average range in temperature (Range)) and the resultant axes from a principal component analysis.



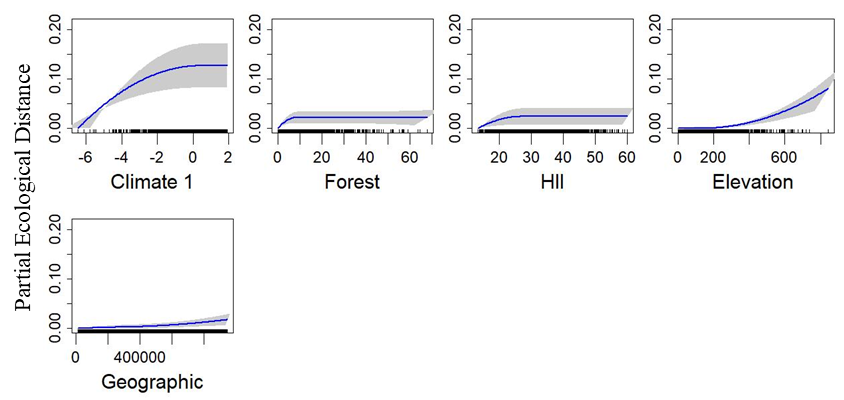
**Supplementary Figure. 3**. Flow chart displaying the process of fitting generalized dissimilarity models utilized in this study. In the top row, a, b, and c are different sites.



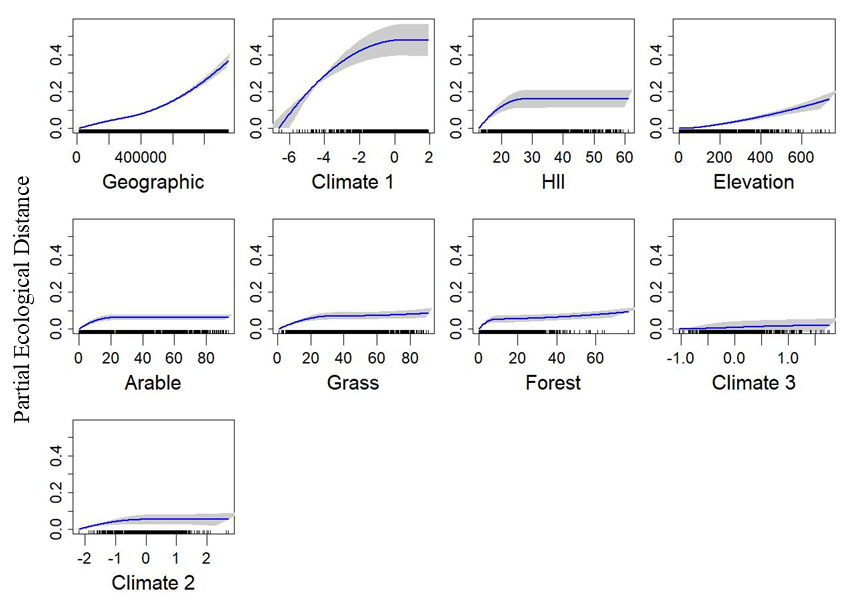
**Supplementary Figure. 4**. Plotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (total Sorenson’s beta-diversity) of British breeding birds. Climate 1 is the first axis from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest, Grass, and Arable) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.



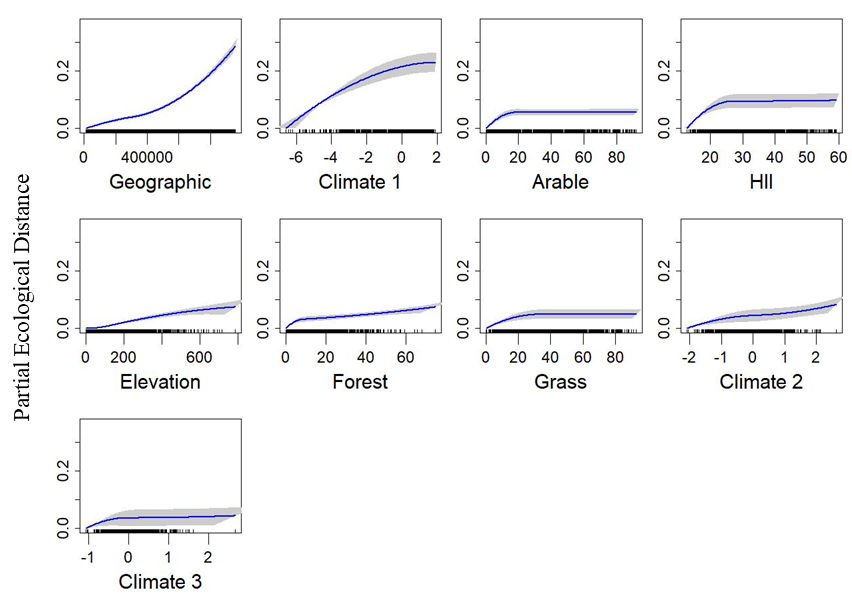
**Supplementary Figure. 5**. PPlotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (turnover component of Sorenson’s beta-diversity) of British breeding birds. Climate 1 and Climate 2 are the first and second axes, respectively, from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest, Grass, and Arable) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.



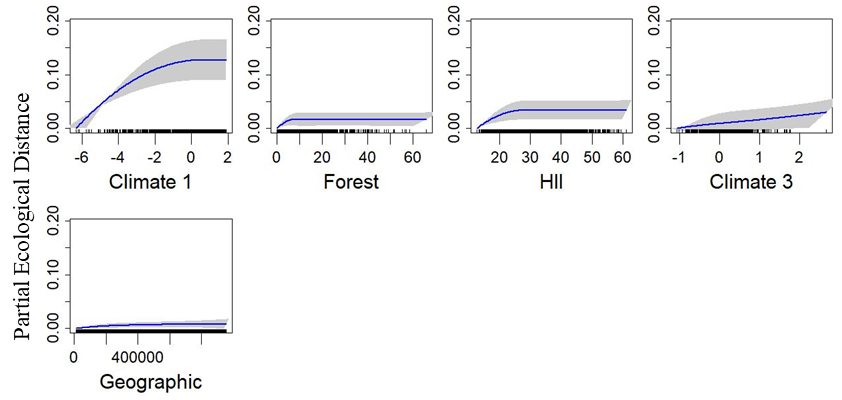
**Supplementary Figure. 6**. Plotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (nestedness resultant dissimilarity component of Sorenson’s beta-diversity) of British breeding birds. Climate 1 is the first axis from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.



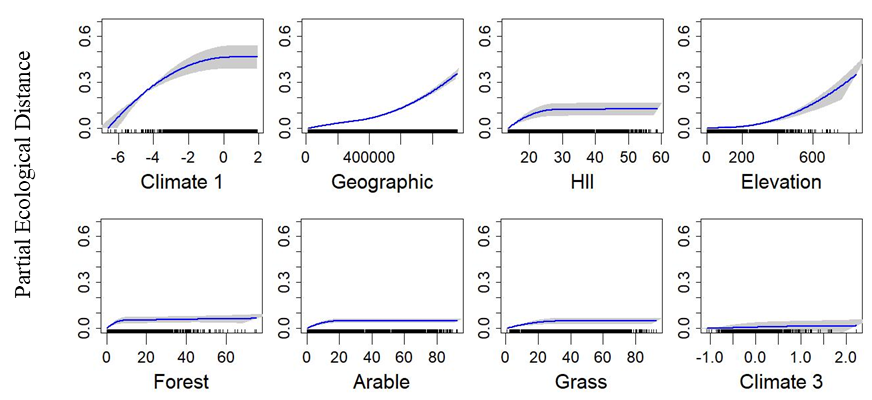
**Supplementary Figure. 7**. Plotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (total functional Sorenson’s beta-diversity) of British breeding birds. Climate 1, Climate 2, and Climate 3 are the first, second, and third axes, respectively, from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest, Grass, and Arable) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.



**Supplementary Figure. 8**. Plotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (turnover component of functional Sorenson’s beta-diversity) of British breeding birds. Climate 1, Climate 2, and Climate 3 are the first, second, and third axes, respectively, from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest, Grass, and Arable) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.



**Supplementary Figure. 9**. Plotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (nestedness resultant dissimilarity component of functional Sorenson’s beta-diversity) of British breeding birds. Climate 1 and Climate 3 are the first and third axes, respectively, from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.



**Supplementary Figure. 10**.Plotted I-splines of the significant, important variables (determined from variable importance scores) from a generalised dissimilarity model analysing the relationship between environmental gradients and geographic distance (Geographic), and spatial variation in community the composition (mean nearest taxon distance (MNTD)) of British breeding birds. . Climate 1 and Climate 3 are the first and third axes, respectively, from a principal component analysis using three measures of average climate (temperature, range, and precipitation). All the land use predictors (Forest, Grass, and Arable) are percentage cover. HII is the human influence index, calculated as the average within each quadrat. Curves show the relationship between the gradients and community dissimilarity obtained using I-splines. The most important variables are on the left with decreasing variable importance to the right (top to bottom). Blue lines show the I-Spline correlations, with standard deviation (grey shaded area) calculated through bootstrapping (100 permutations) on a portion of the dataset. A rug plot on the x axis shows the spread of the data. Note the varying y-axis for each measure.