Ecography

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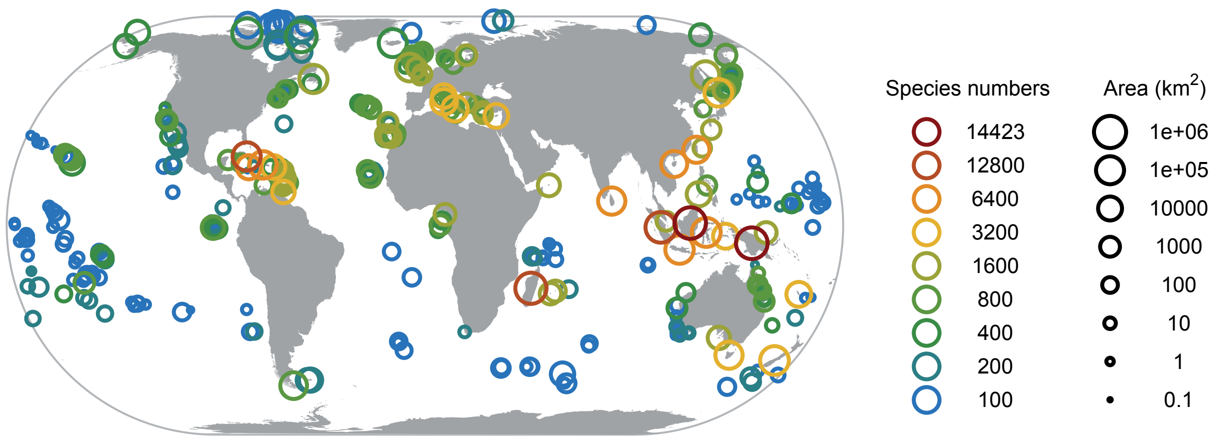
Supplementary material

Appendix 1 Map of the 453 islands considered in this study. Legend numbers for species richness refer to upper limits of classes. Symbol size is a linear function of $\log_{10}$ island area.



Appendix 2 Calculation of seventeen isolation metrics in sixty-eight variations (indicated by minor letters) and their underlying hypotheses. Symbology follows Fig. 1 and Table 1. GIS analyses were performed in ArcGIS/ArcINFO Desktop 9.3.1 (ESRI, Redlands). Landmass polygons were extracted from the GADM database of global administrative areas (Hijmans et al., 2009).

Metric	Calculation	Hypothesis
$\mathbf{D1_m}$	shortest distance from a) target island mass centroid and b) coastline to mainland coastline (excluding Antarctica) using 'Generate Near Table' tool in ArcGIS; azimuthal equidistant map projection centred for target island.	continents are the most important source landmasses for immigration on islands.
$\mathbf{D2_l}$	shortest distance from target island coastline to coastline of a landmass of defined minimum area calculated like $\mathbf{D1b_m}$; varying minimum source area: a-f) 10^0-10^5 km²; g-p) 1-10 times the target island area.	continents and islands, at least large ones, both serve as important sources for immigration on islands.
$\mathbf{U3} = D1b_m^{1/2} + D_a^{1/2} + D2g_l^{1/2}$	for 229 islands, isolation index obtained from UNEP Island Directory (http://islands.unep.ch/isldir.htm); missing values calculated according to Dahl (2004) as sum of square roots of distances to nearest equivalent or larger island ($\mathbf{D2g_l}$), nearest island group or archipelago (D_a) and nearest continent ($\mathbf{D1b_m}$); where one of these did not exist, next higher distance was repeated, except in the case of small satellite islands close to much larger landmasses; D_a measured according to UNEP Island Directory island group or archipelago affiliation.	continents and islands, at least large ones, both serve as important sources for immigration on islands; isolation can be explained as additively compound of distances to mainland, archipelagos and islands.
$\mathbf{D4_{cm}}$	shortest distance from target island coastline to climatically similar mainland area using 'Generate Near Table' tool in ArcGIS; azimuthal equidistant map projection centred for target island; source defined as areas being on average not more than 2°C colder than the minimum and not more than 2°C warmer than the maximum mean annual temperature on the target island and receiving not more than 20% less annual rainfall than the minimum and not more than 20% more than the maximum annual precipitation on the target island (WorldClim; Hijmans et al., 2005); for three high Arctic islands no climatically similar mainland area could be identified, distance to mainland was used instead.	only those parts of continents which are climatically similar to the target island serve as source areas for immigration to islands.
$\mathbf{D5_{cl}}$	shortest distance from target island coastline to climatically similar area on the landmass of defined minimum area calculated like $\mathbf{D4_{cm}}$; varying minimum source area: a-f) 10^0-10^5 km².	those parts of continents and at least large islands which are climatically similar to the target island serve as source areas.
$\mathbf{^{st}C6_m}$; $\mathbf{^{st}D6_m} = \sum {}^{ii}D_m$	shortest stepping stone distance from target island coastline to mainland coastline calculated using the 'Cost Distance' tool of the 'Spatial Analyst' in ArcGIS; analysis window radius = $\mathbf{D1b_m}$ + 1,000 km; the 'Cost Distance' tool calculated the least accumulative cost distance for each cell of a raster layer to the nearest source over a cost surface; the cost surface was a raster layer of 1 km² resolution considering all islands of at least 1 km² as stepping stones; using a higher	stepping stones facilitate dispersal from source landmasses to the target island; continents are the most important source landmasses; a) only dispersal over water limits immigration on islands; b) dispersal over water limits immigration on islands more than

	resolution was not feasible due to computational limitations; costs were defined as a) 1 unit per km over water, 0 units per km over land ($^{st}\mathbf{D6a_m}$; sum of inter-island distances ($^{ii}D_m$) in km) or b) 2 units per km over water, 1 unit per km over land ($^{st}\mathbf{C6b_m}$) double counting the distance over water.	dispersal over land.
$^{stM}\mathbf{C7_m}$; $^{stM}\mathbf{D7_m} = (\sum {}^{ii}D_m{}^{x})/y$	stepping stone distance from target island coastline to mainland coastline on minimum inter-island distance path calculated by means of two consecutive 'Cost Distance' analyses (see above); first, calculation of cost distance raster using all landmass as source and a cost surface raster with costs of 1 unit per km over water and 0 units per km over land; second, calculation of cost distance raster for mainland as source using the first output cost distance raster + 1 as input cost surface, i.e. fixed costs of 1 unit per km over land and increasing costs with increasing distance to landmass coast over water; the second output cost distance raster shows exponentially increasing costs with increasing length of inter-island distances forcing the algorithm to find a stepping stone path of minimum inter-island distances ($^{ii}D_m$); a least cost path was calculated using the 'Cost Path' tool; area (A) and number (#) of stepping stones were used in calculations of weighted stepping stone distances: a) costs derived from 'Cost Distance' analysis ($^{stM}\mathbf{C7_m}$); b-g) unweighted and weighted distances over water extracted from cost distance path ($^{stM}\mathbf{D7_m}$): b) x = 1, y = 1; c) x = 2, y = 1; d) x = 1, y = ∑ A; e) x = 2, y = ∑ A f) x = 1, y = # g) x = 2, y = #.	stepping stones facilitate dispersal from source landmasses to target island; continents are most important source landmasses; the length of the inter-island distances limits dispersal; b-g) x = 2: greater influence of larger distances; y = ∑ A: greater influence of large stepping stones; y = #: number of stepping stones important.
$max^{ii}\mathbf{D8_m}$	maximum inter island distance to mainland extracted from minimum inter-island distance path ($^{stM}\mathbf{D7b_m}$).	the length of the maximum inter-island distance between target island and mainland is critical in limiting immigration.
$^{st}\mathbf{D9_l} = \sum {}^{ii}D_l$	shortest stepping stone distance from target island coastline to coastline of landmass of at least 100,000 km² calculated like $^{st}\mathbf{D6a_m}$; $^{ii}D_l$ = inter-island distances.	stepping stones facilitate dispersal from source landmasses to target island; continents and very large islands serve as sources.
$^{stM}\mathbf{C10_l}$; $^{stM}\mathbf{D10_l} = (\sum {}^{ii}D_l{}^{x})/y$	stepping stone distance from target island coastline to coastline of landmass of at least 100,000 km² on minimum inter-island distance path calculated like $^{stM}\mathbf{C7_m}$ and $^{stM}\mathbf{D7_m}$; $^{ii}D_l$ = inter-island distances; a) costs derived from cost distance analysis ($^{stM}\mathbf{C10_l}$); b-g) unweighted distances over water and distances weighted by area (A) or number of stepping stones (#) extracted from cost distance path ($^{stM}\mathbf{C10_l}$): b) x = 1, y = 1; c) x = 2, y = 1; d) x = 1, y = ∑ A; e) x = 2, y = ∑ A f) x = 1, y = # g) x = 2, y = #.	stepping stones facilitate dispersal from source landmasses to the target island; continents and very large islands serve as sources; the length of the inter-island distances limits dispersal; b-g) a = 2: greater influence of larger distances; y = ∑ A: greater influence of large stepping stones; y = #: number of stepping stones important.
$max^{ii}\mathbf{D11_l}$	maximum inter island distance to landmass of at least 100,000 km² extracted from minimum inter-island distance path ($^{stM}\mathbf{D10b_l}$).	the length of the maximum inter-island distance between target island and large landmasses is critical in limiting immigration.
$^{W}\mathbf{C12_m}$	distance to mainland corrected for prevailing winds calculated using the 'Path Distance' tool of the 'Spatial Analyst' in ArcGIS; 'Path Distance' allows to incorporate a horizontal factor in the calculation of	prevailing winds affect dispersal probabilities between mainland and target island.

	cost distances (see above) accounting for horizontal friction; the horizontal factor was calculated from a raster layer of horizontal wind directions using a linear function of the angle between the wind direction and the target (in ArcGIS: horizontal relative moving angle (HRMA); zero factor = 0.5, cut angle = 181, slope = 0.011); costs of the cost surface raster were set to 1 unit per km; analysis window radius = $\mathbf{D1b_m}$ + 1,000 km; prevailing wind directions at water and land surface averaged over 10 years were calculated from monthly means of zonal and meridional wind speed vectors taken from the NCEP/NCAR Reanalysis Project (Kistler et al. 2001) for the time period from 1981 to 1990 at 2.5° resolution. Data were downscaled to 1 km² resolution.	
$\mathbf{^{C}C13_m}$	distance to mainland corrected for prevailing ocean currents calculated like $\mathbf{^{W}C12_m}$; prevailing ocean current directions at water surface averaged over 10 years were calculated from three-day means of zonal and meridional velocity vectors at 0.25° resolution for the period from 1997 to 2006 taken from the NASA project ECCO2 (Menemenlis et al. 2008) Data were downscaled to 1 km² resolution.	prevailing ocean currents affect dispersal probabilities between mainland and target island.
$\mathbf{^{stW}C14_m}$	stepping stone distance to mainland corrected for prevailing winds calculated like $\mathbf{^{W}C12_m}$; costs defined as 1 unit per km over water and 0 units per km over land.	prevailing winds affect dispersal probabilities between mainland and target island; stepping stones facilitate dispersal.
$\mathbf{^{stC}C15_m}$	stepping stone distance to mainland corrected for prevailing ocean currents calculated like $\mathbf{^{C}C13_m}$; costs defined as 1 unit per km over water and 0 units per km over land.	prevailing ocean currents affect dispersal probabilities between mainland and target island; stepping stones facilitate dispersal.
$\mathbf{N16} = \sum (A_l/(D_l + 1)^2)$	Neighbour Index of Kalmar and Currie (2006) calculated as the sum of the area of all neighbouring islands closer than the nearest mainland weighted by their squared distances; shortest distances from target island coastline to source island coastlines calculated like $\mathbf{D1b_m}$; a) only islands closer than mainland; b) all islands; c) all landmass; d) all landmass ($\log_{10} A_l$).	all surrounding landmasses serve as sources for immigration on islands; contribution of potential source landmasses increases with area.
$\mathbf{A17_l} = \sum (A_l/A_r)$	proportion of landmass in the surrounding of the target islands within defined buffer distance (from polygon perimeter); 'Buffer' tool in ArcGIS was applied at an azimuthal equidistant map projection centred for each target island; areas of clipped landmasses were calculated using a cylindrical equal area projection; buffer distances were selected covering the full range of possible distances at logarithmic scale starting at 1 km; a-e) varying buffer radius (r) from 10^0 to 10^4 km (n=1); f-o) sums of landmass proportions in all possible combinations of n=2 to n=5 consecutive buffer distances: f) 10^0-10^1 km; g) 10^1-10^2 km; h) 10^2-10^3 km; i) 10^3-10^4 km; j) 10^0-10^2 km; k) 10^1-10^3 km; l) 10^2-10^4 km; m) 10^0-10^3 km; n) 10^1-10^4 km; o) 10^0-10^4 km.	all surrounding landmasses serve as sources for immigration on islands; not only the distance to but the amount of available source land area nearby drives immigration rates; source coastline shape is important.

Appendix 3 Matrix of Pearson's correlation coefficients among seventeen isolation metrics. Metric variations that showed highest model fits (AIC) in spatial multi-predictor models of vascular plant species richness on 453 globally distributed islands are presented here. See Fig. 1 and Table 1 for explanation of metric abbreviations. All correlations are significant with $p < 0.001$.

	$D1a_m$	$D2f_l$	U3	$D4c_m$	$D5ec_l$	$^{st}C6b_m$	$^{stM}D7b_m$	$max^{ii}D8_m$	$^{st}D9l$	$^{stM}D10b_l$	$max^{ii}D11_l$	$^{W}C12_m$	$^{C}C13_m$	$^{stW}C14_m$	$^{stC}C15_m$	loglog N16c
$D2f_l$	0.96															
U3	0.88	0.87														
$D4_{cm}$	0.93	0.90	0.85													
$D5e_{cl}$	0.87	0.89	0.78	0.83												
$^{st}C6b_m$	1.00	0.96	0.87	0.92	0.88											
$^{stM}D7b_m$	0.97	0.95	0.85	0.90	0.85	0.98										
$max^{ii}D8_m$	0.69	0.78	0.74	0.64	0.66	0.71	0.69									
$^{st}D9_l$	0.96	0.99	0.86	0.89	0.90	0.97	0.95	0.79								
$^{stM}D10b_l$	0.96	0.97	0.82	0.88	0.87	0.97	0.97	0.74	0.98							
$max^{ii}D11_l$	0.63	0.70	0.74	0.64	0.58	0.64	0.67	0.82	0.72	0.65						
$^{W}C12_m$	0.91	0.87	0.84	0.89	0.78	0.90	0.86	0.55	0.84	0.83	0.55					
$^{C}C13_m$	0.98	0.95	0.87	0.93	0.85	0.98	0.95	0.66	0.94	0.93	0.61	0.94				
$^{stW}C14_m$	0.94	0.92	0.84	0.90	0.84	0.94	0.92	0.63	0.91	0.90	0.62	0.97	0.95			
$^{stC}C15_m$	0.98	0.96	0.86	0.91	0.87	0.99	0.98	0.72	0.97	0.96	0.66	0.89	0.98	0.94		
loglog $N16_c$	-0.87	-0.84	-0.94	-0.82	-0.77	-0.86	-0.83	-0.65	-0.82	-0.80	-0.64	-0.85	-0.85	-0.84	-0.84	
log $A17l_l$	-0.75	-0.73	-0.88	-0.74	-0.67	-0.75	-0.73	-0.61	-0.72	-0.68	-0.61	-0.73	-0.73	-0.74	-0.73	0.89

Appendix 4 Model fits of spatial simultaneous autoregressive models (SAR) for log_{10}-transformed vascular plant species richness on 453 islands as response variable and different isolation metrics as explanatory variables. Models include one isolation metric variation, either alone (r^2) or in a multi-predictor framework (R^2) accounting for island area, temperature, precipitation, elevational range and geology. r^2_{sp} and R^2_{sp} accounting for spatial autocorrelation are shown in parentheses. For multi-predictor models, ΔAIC was calculated as the difference from the best model (AIC = 121.8). P-values in the multi-predictor models refer to estimates of the respective isolation metric. R^2_{pmvd} represents the absolute contribution of the respective isolation metric to the full model fit (R^2). See Fig. 1 and Table 1 for explanation of metric abbreviations. Significance: *** ($p < 0.001$), ** ($p < 0.01$), * ($p < 0.05$), n.s. (not significant at $p \geq 0.05$).

	single-predictor models		multi-predictor models			
Isolation metric	r^2 (r^2_{sp})	p	R^2 (R^2_{sp})	ΔAIC	P	R^2_{pmvd}
$\mathbf{D1a}_{m}$	0.240 (0.489)	***	0.786 (0.851)	29.3	***	0.152
$\mathbf{D1b}_{m}$	0.254 (0.499)	***	0.785 (0.851)	30.6	***	0.155
$\mathbf{D2a}_{l}$	0.084 (0.502)	***	0.728 (0.837)	79.4	***	0.016
$\mathbf{D2b}_{l}$	0.159 (0.486)	***	0.728 (0.834)	84.4	***	0.018
$\mathbf{D2c}_{l}$	0.200 (0.479)	***	0.743 (0.838)	71.3	***	0.045
$\mathbf{D2d}_{l}$	0.201 (0.481)	***	0.756 (0.846)	46.3	***	0.080
$\mathbf{D2e}_{l}$	0.227 (0.488)	***	0.770 (0.847)	43.0	***	0.110
$\mathbf{D2f}_{l}$	0.264 (0.499)	***	0.786 (0.852)	26.7	***	0.158
log $\mathbf{D2g}_{l}$	0.016 (0.517)	n.s.	0.736 (0.838)	74.9	***	0.022
log $\mathbf{D2h}_{l}$	0.018 (0.517)	n.s.	0.736 (0.837)	75.9	***	0.023
log $\mathbf{D2i}_{l}$	0.013 (0.520)	n.s.	0.732 (0.837)	76.1	***	0.021
log $\mathbf{D2j}_{l}$	0.013 (0.520)	n.s.	0.733 (0.838)	75.0	***	0.022
log $\mathbf{D2k}_{l}$	0.013 (0.520)	n.s.	0.734 (0.838)	75.3	***	0.022
log $\mathbf{D2l}_{l}$	0.012 (0.522)	n.s.	0.732 (0.837)	77.8	***	0.020
log $\mathbf{D2m}_{l}$	0.013 (0.522)	n.s.	0.734 (0.837)	76.7	***	0.021
log $\mathbf{D2n}_{l}$	0.013 (0.523)	n.s.	0.734 (0.837)	77.4	***	0.021
log $\mathbf{D2o}_{l}$	0.011 (0.525)	n.s.	0.734 (0.837)	78.0	***	0.020
log $\mathbf{D2p}_{l}$	0.010 (0.529)	*	0.734 (0.837)	77.8	***	0.020

U3	0.231	(0.493)	***	0.795	(0.856)	15.9	***	0.151
$\mathbf{D4}_{cm}$	0.262	(0.498)	***	0.776	(0.845)	49.8	***	0.111
log $\mathbf{D5a}_{cl}$	0.253	(0.533)	***	0.726	(0.834)	87.0	***	0.019
log $\mathbf{D5b}_{cl}$	0.264	(0.519)	***	0.733	(0.835)	83.3	***	0.033
$\mathbf{D5c}_{cl}$	0.230	(0.485)	***	0.756	(0.842)	59.5	***	0.071
$\mathbf{D5d}_{cl}$	0.258	(0.493)	***	0.774	(0.851)	31.9	***	0.115
$\mathbf{D5e}_{cl}$	0.299	(0.513)	***	0.800	(0.856)	14.7	***	0.176
$\mathbf{D5f}_{cl}$	0.287	(0.514)	***	0.792	(0.854)	20.5	***	0.175
$^{st}\mathbf{D6a}_{m}$	0.248	(0.495)	***	0.787	(0.851)	29.1	***	0.152
$^{st}\mathbf{C6b}_{m}$	0.253	(0.498)	***	0.786	(0.852)	27.0	***	0.158
log $^{stM}\mathbf{C7a}_{m}$	0.166	(0.489)	***	0.760	(0.842)	61.0	***	0.066
$^{stM}\mathbf{D7b}_{m}$	0.249	(0.492)	***	0.783	(0.849)	35.9	***	0.133
log $^{stM}\mathbf{D7c}_{m}$	0.170	(0.489)	***	0.770	(0.846)	49.5	***	0.086
$^{stM}\mathbf{D7d}_{m}$	0.006	(0.506)	n.s.	0.718	(0.832)	92.3	**	0.004
log $^{stM}\mathbf{D7e}_{m}$	0.042	(0.499)	n.s.	0.739	(0.833)	86.7	***	0.020
log $^{stM}\mathbf{D7f}_{m}$	0.120	(0.485)	***	0.758	(0.840)	65.8	***	0.054
log $^{stM}\mathbf{D7g}_{m}$	0.145	(0.485)	***	0.766	(0.843)	57.9	***	0.069
max$^{ii}\mathbf{D8}_{m}$	0.138	(0.475)	***	0.778	(0.845)	49.8	***	0.074
$^{st}\mathbf{D9}_{l}$	0.264	(0.497)	***	0.793	(0.852)	24.4	***	0.161
$^{stM}\mathbf{C10a}_{l}$	0.151	(0.478)	***	0.777	(0.847)	42.6	***	0.096
$^{stM}\mathbf{D10b}_{l}$	0.230	(0.485)	***	0.778	(0.848)	37.8	***	0.122
log $^{stM}\mathbf{D10c}_{l}$	0.187	(0.494)	***	0.767	(0.844)	55.8	***	0.084
$^{stM}\mathbf{D10d}_{l}$	0.006	(0.506)	n.s.	0.717	(0.832)	92.4	*	0.004
log $^{stM}\mathbf{D10e}_{l}$	0.030	(0.501)	n.s.	0.730	(0.832)	91.3	**	0.014
log $^{stM}\mathbf{D10f}_{l}$	0.124	(0.490)	***	0.746	(0.838)	73.6	***	0.046
log $^{stM}\mathbf{D10g}_{l}$	0.151	(0.490)	***	0.755	(0.840)	67.2	***	0.061
max$^{ii}\mathbf{D11}_{l}$	0.180	(0.483)	***	0.777	(0.845)	48.4	***	0.096
$^{W}\mathbf{C12}_{m}$	0.254	(0.503)	***	0.763	(0.846)	44.8	***	0.123
$^{C}\mathbf{C13}_{m}$	0.251	(0.501)	***	0.782	(0.851)	28.6	***	0.152
$^{stW}\mathbf{C14}_{m}$	0.273	(0.502)	***	0.775	(0.849)	34.8	***	0.146
$^{stC}\mathbf{C15}_{m}$	0.253	(0.499)	***	0.787	(0.853)	22.3	***	0.163
log **N16a**	0.147	(0.513)	***	0.718	(0.831)	93.7	*	0.006
log **N16b**	0.175	(0.513)	***	0.722	(0.833)	88.5	**	0.013
loglog **N16c**	0.253	(0.514)	***	0.786	(0.852)	28.9	***	0.151
N16d	0.079	(0.522)	***	0.714	(0.830)	97.8	n.s.	0.001

log **A17a**$_{I}$	0.009 (0.506)	n.s.	0.716 (0.832)	92.0	**	0.004
log **A17b**$_{I}$	0.002 (0.511)	n.s.	0.715 (0.831)	95.8	n.s.	0.002
log **A17c**$_{I}$	0.036 (0.498)	n.s.	0.732 (0.841)	67.7	***	0.026
log **A17d**$_{I}$	0.186 (0.486)	***	0.774 (0.850)	33.6	***	0.096
A17e$_{I}$	0.151 (0.472)	***	0.780 (0.845)	49.7	***	0.076
log **A17f**$_{I}$	0.004 (0.509)	n.s.	0.716 (0.831)	93.8	*	0.003
log **A17g**$_{I}$	0.028 (0.502)	n.s.	0.729 (0.839)	73.2	***	0.023
log **A17h**$_{I}$	0.146 (0.480)	***	0.777 (0.855)	21.5	***	0.101
log **A17i**$_{I}$	0.231 (0.489)	***	0.809 (0.858)	7.2	***	0.140
log **A17j**$_{I}$	0.031 (0.501)	n.s.	0.730 (0.839)	71.6	***	0.025
log **A17k**$_{I}$	0.128 (0.478)	***	0.772 (0.852)	29.2	***	0.096
log **A17l**$_{I}$	0.185 (0.479)	***	0.807 (0.861)	0.0	***	0.134
log **A17m**$_{I}$	0.130 (0.478)	***	0.773 (0.853)	27.1	***	0.100
log **A17n**$_{I}$	0.164 (0.475)	***	0.801 (0.858)	9.7	***	0.126
log **A17o**$_{I}$	0.165 (0.475)	***	0.802 (0.858)	8.1	***	0.128

Appendix 5 Model fits of non-spatial models (GLM) with the $\log_{10}$-transformed number of vascular plant species on 453 islands as response variable and different isolation metrics as explanatory variables. The first model includes no isolation metrics, but only island area, temperature, precipitation, elevational range and geology, and is included for comparison. All other models include one isolation metric, either as a single predictor (r^2) or in a multi-predictor model including also island area, temperature, precipitation, elevational range and geology (R^2). Except for $A17i_l$ and N16c all single predictor relationships are negative. For multi-predictor models, ΔAIC was calculated as the difference from the best model (AIC = 229.6). P-values in the multi-predictor models refer to estimates of the respective isolation metric. See Fig. 1 and Table 1 for abbreviations. Significance: *** (p < 0.001).

	single-predictor models		multi-predictor models			
Isolation metric	r^2	P	R^2	ΔAIC	P	R^2_{pmvd}
-	-	-	0.718	182.0	-	-
$\mathbf{D1a_m}$	0.240	***	0.787	57.2	***	0.141
$\mathbf{D2f_l}$	0.264	***	0.787	56.4	***	0.145
U3	0.231	***	0.796	36.8	***	0.167
$\mathbf{D4_{cm}}$	0.262	***	0.779	74.0	***	0.135
$\mathbf{D5e_{cl}}$	0.299	***	0.801	25.6	***	0.182
$^{st}\mathbf{D6a_m}$	0.248	***	0.788	53.8	***	0.137
$^{stM}\mathbf{D7b_m}$	0.249	***	0.784	62.2	***	0.133
$\max^{ii}\mathbf{D8_m}$	0.138	***	0.781	68.5	***	0.078
$^{st}\mathbf{D9_l}$	0.264	***	0.794	41.2	***	0.150
$^{stM}\mathbf{C10a_l}$	0.151	***	0.782	66.6	***	0.083
$\max^{ii}\mathbf{D11_l}$	0.180	***	0.781	68.6	***	0.094
$^{W}\mathbf{C12_m}$	0.254	***	0.764	102.5	***	0.114
$^{C}\mathbf{C13_m}$	0.251	***	0.784	63.3	***	0.138
$^{stW}\mathbf{C14_m}$	0.273	***	0.776	79.5	***	0.136
$^{stC}\mathbf{C15_m}$	0.253	***	0.789	52.8	***	0.142
loglog **N16c**	0.253	***	0.789	52.9	***	0.180
log $\mathbf{N17i_l}$	0.231	***	0.812	0.0	***	0.146

Appendix 6 Best multi-predictor models (SAR) including (a) one, (b) two, or (c) three isolation metrics as explanatory variables in addition to area, temperature, precipitation, elevational range and geology. The response variable is $\log_{10}$-transformed vascular plant species richness on 453 globally distributed islands. R^2 of individual variables shows their absolute contribution to the full model R^2 calculated as R^2_{pmvd}. See Fig. 1 and Table 1 for metric abbreviations. Significance: *** ($p < 0.001$), ** ($p < 0.01$), * ($p < 0.05$).

		Estimate	SE	z	P	R^2 (R^2_{sp})	AIC
(a)	**Full model**					0.807 (0.861)	121.8
	(Intercept)	-5.36	0.61	-8.81	***		
	Log area	0.30	0.02	19.20	***	0.439	
	Log elevation	0.09	0.03	3.06	**	0.023	
	Log temperature	2.81	0.33	8.52	***	0.067	
	Log precipitation	0.45	0.06	8.11	***	0.051	
	Geology					0.092	
	atoll	-	-	-	-		
	continental	0.42	0.08	5.57	***		
	volcanic	0.33	0.07	4.93	***		
	Isolation						
	log **A17I$_{I}$**	2.06	0.20	10.52	***	0.134	
(b)	**Full model**					0.839 (0.871)	84.9
	(Intercept)	-5.25	0.58	-9.01	***		
	Log area	0.29	0.01	19.58	***	0.419	
	Log elevation	0.08	0.03	3.04	**	0.025	
	Log temperature	2.90	0.32	9.16	***	0.065	
	Log precipitation	0.43	0.05	8.11	***	0.047	
	Geology					0.066	
	atoll	-	-	-	-		
	continental	0.34	0.07	4.56	***		
	volcanic	0.26	0.06	4.14	***		
	Isolation						
	D5e$_{cl}$	$-1.07e^{-04}$	$1.69e^{-05}$	-6.37	***	0.124	
	log **A17I$_{I}$**	1.54	0.20	7.54	***	0.095	

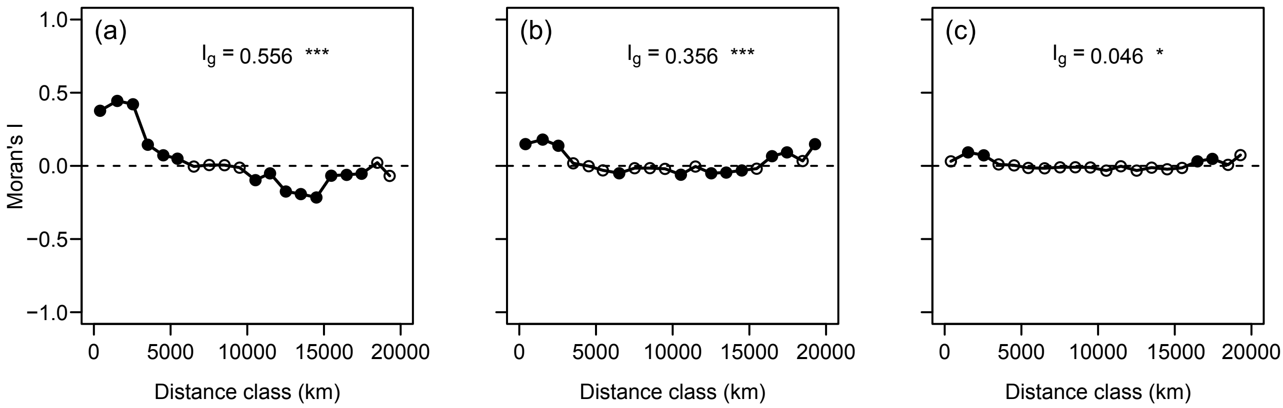
(c)	**Full model**					0.847 (0.872)	81.5
	(Intercept)	-5.29	0.56	-9.49	***		
	Log area	0.29	0.01	19.52	***	0.418	
	Log elevation	0.08	0.03	3.12	**	0.025	
	Log temperature	2.94	0.30	9.72	***	0.065	
	Log precipitation	0.43	0.05	8.20	***	0.047	
	Geology					0.063	
	atoll	-	-	-	-		
	continental	0.33	0.07	4.53	***		
	volcanic	0.28	0.06	4.46	***		
	Isolation						
	max[ii]**D11$_{\mathbf{l}}$**	$-1.01e^{-04}$	$4.15e^{-05}$	-2.43	*	0.015	
	D5e$_{\mathbf{cl}}$	$-9.59e^{-05}$	$1.71e^{-05}$	-5.60	***	0.122	
	log **A17l$_{\mathbf{l}}$**	1.42	0.21	6.79	***	0.093	

Appendix 7 Best non-spatial multi-predictor models (GLM) including (a) one, (b) two, or (c) three isolation metrics as explanatory variables in addition to area, temperature, precipitation, elevational range and geology. The response variable is $\log_{10}$-transformed vascular plant species richness on 453 globally distributed islands. R^2 of individual variables shows their absolute contribution to the full model R^2 calculated as R^2_{pmvd}. See Fig. 1 and Table 1 for explanation of metric abbreviations. Significance: *** ($p < 0.001$), ** ($p < 0.01$) , n.s. (not significant at $p \geq 0.05$).

		Estimate	SE	z	P	R^2	AIC
(a)	**Full model**					0.812	229.6
	(Intercept)	-6.19	0.40	-15.41	***		
	Log area	0.29	0.02	17.40	***	0.418	
	Log elevation	0.06	0.03	1.84	n.s.	0.009	
	Log temperature	3.19	0.22	14.66	***	0.072	
	Log precipitation	0.52	0.04	11.57	***	0.055	
	Geology					0.113	
	atoll	-	-	-	-		
	continental	0.56	0.06	9.04	***		
	volcanic	0.48	0.06	8.25	***		
	Isolation						
	log $\mathbf{A17i_l}$	2.92	0.20	14.93	***	0.146	
(b)	**Full model**					0.846	143.0
	(Intercept)	-5.74	0.37	-15.63	***		
	Log area	0.28	0.02	18.35	***	0.406	
	Log elevation	0.07	0.03	2.59	**	0.018	
	Log temperature	3.08	0.20	15.58	***	0.067	
	Log precipitation	0.51	0.04	12.67	***	0.053	
	Geology					0.072	
	atoll	-	-	-	-		
	continental	0.37	0.06	6.18	***		
	volcanic	0.33	0.06	6.06	***		
	Isolation						
	$\mathbf{D5e_{cl}}$	$-1.17e^{-04}$	$1.19e^{-05}$	-9.79	***	0.128	
	log $\mathbf{A17i_l}$	2.18	0.19	11.28	***	0.102	

(c)	**Full model**					0.854	120.4
	(Intercept)	-5.74	0.36	-16.03	***		
	Log area	0.28	0.02	18.57	***	0.405	
	Log elevation	0.07	0.03	2.77	**	0.018	
	Log temperature	3.07	0.19	15.91	***	0.067	
	Log precipitation	0.51	0.04	12.93	***	0.053	
	Geology					0.080	
	atoll	-	-	-	-		
	continental	0.41	0.06	7.03	***		
	volcanic	0.39	0.06	7.11	***		
	Isolation						
	$^{stM}\mathbf{C10a}_{\mathbf{I}}$	$-1.71e^{-10}$	$3.44e^{-11}$	-4.97	***	0.020	
	$\mathbf{D5e}_{\mathbf{cI}}$	$-8.87e^{-05}$	$1.29e^{-05}$	-6.88	***	0.110	
	log $\mathbf{A17i}_{\mathbf{I}}$	2.02	0.19	10.59	***	0.100	

Appendix 8 Moran's I correlograms for vascular plant species richness on 453 globally distributed islands. Graphs show spatial autocorrelation of (a) log_{10}-transformed species richness, (b) residuals from non-spatial multi-predictor models (GLM) and (c) residuals from spatial multi-predictor models (SAR) both including area, temperature, precipitation, elevational range, geology and isolation measured as the proportion of surrounding landmass (**A17I**$_{l}$), as explanatory variables for plant species richness. Values of filled circles are significant at 5%-level. Significance of global Moran's I values (I_g): *** ($p < 0.001$), * ($p < 0.05$).



Appendix 9 Values for isolation metrics of 453 islands worldwide. Data comprise variations of seventeen metrics that performed best in spatial multi-predictor regression analyses including area, temperature, precipitation, elevational range and geology as co-predictors of vascular plant species richness (Tab. 2) as well as eleven additional metric variations that might be of interest (**D1b**$_{\mathbf{m}}$, **D2g**$_{\mathbf{l}}$, $^{\mathbf{st}}$**D6a**$_{\mathbf{m}}$, $^{\mathbf{stM}}$**C7a**$_{\mathbf{m}}$, $^{\mathbf{stM}}$**C10a**$_{\mathbf{l}}$, **N16a**, **A17a**$_{\mathbf{l}}$, **A17b**$_{\mathbf{l}}$, **A17c**$_{\mathbf{l}}$, **A17d**$_{\mathbf{l}}$, **A17e**$_{\mathbf{l}}$). Raw data (not log-transformed) are provided as comma separated text file (Weigelt_Kreft_isolation.csv). The first line contains column headers. Metric nomenclature follows Fig. 1 and Tab. 1. Metrics indicated by the letter D are true distances measured in kilometres or weighted derivatives, other letters describe dimensionless metrics. Island names (Name), ISO 3166-1 country codes (ISO), corresponding English country names (Country), as well as latitude (LAT) and longitude (LON) of the mass centroids in decimal degrees are given.

Appendix 10 List of references used to compile the data set of vascular plant species richness on 453 islands worldwide.

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