

SUPPORTING INFORMATION

Turnover of breeding bird communities on islands in an inundated lake

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Appendix S1 Comparison of distance-based and buffer-based measures of isolation.

We compared five types of isolation measures for breeding bird communities in Thousand Island Lake (Table S1; see main paper for more details on these measures). Because the island with the largest straight-line distance to mainland in the lake is 3.71 km, we artificially selected nine buffers within a radius of 0.1 km, 0.5 km, 1 km, 1.5 km, 2 km, 2.5 km, 3 km, 3.5 km and 4 km, respectively. We ran the logistic regression analyses based on the measure of BUF2 (buffer water fraction of the total buffer area within the buffer including the mainland; Table S1) to explain the probability of colonization (λ) for breeding bird communities with different buffer distances, respectively: $\text{logit}(\lambda_i) = \alpha + \beta I_i$, where I_i is the isolation of island i , λ_i is the colonization rate of island i , β is the coefficient, and α is the constant coefficient (Moilanen & Nieminen, 2002).

Table S2 shows the results of model selection based on AIC for each buffer distance. The measure with a radius of 2 km had the smallest AIC ($\Delta\text{AIC} > 2$), so we considered the first model with the smallest AIC as the best-fitted model. We therefore used the buffer measure of distance at a radius of 2 km ($r = 2$ km) in our analyses. We then ran the analyses for each measure of isolation.

Figure S1 shows the relationships between island variables and predicted biogeographical parameters for all breeding bird species on 37 islands based on distance-based and buffer-based measures of isolation (see main paper for detailed calculations). These results produced almost identical patterns of these relationships.

REFERENCES

- Moilanen, A. & Nieminen, M. (2002) Simple connectivity measures in spatial ecology. *Ecology*, **83**, 1131–1145.

Table S1 Comparison of distance-based and buffer-based isolation measures of breeding bird communities on 37 islands in Thousand Island Lake (China) from 2007 to 2012 (see main paper for details of the calculations of the relative importance of isolation). Abbreviations: I , isolation; S , connectivity; A , land area; $BUFA$, the total buffer area for a focal island within the buffer; d , distance between two land masses; r , buffer radius.

			Relative importance of isolation [§]	
Measure	Description	Equation	Colonization	Extinction
Distance-based measures				
DIS1	Straight-line distance to the nearest land mass (m)	—	0.28	0.27
DIS2	Straight-line distance to the nearest larger land mass (m)	—	0.27	0.42
DIS3*	Straight-line distance to the nearest mainland (m)	—	0.45	0.41
Buffer-based measures				
BUF1	Buffer water fraction of the total buffer area (mainland not included)	For island i , $I_i = 1 - S_i$, where $S_i = \frac{\sum_{j=1}^n A_j}{BUFA_i}$, for all $j \neq i$ and $d_{ij} < r$.	0.27	0.34
BUF2*	Buffer water fraction of the total buffer area (mainland included)	For land i , $I_i = 1 - S_i/BUFA_i$, where $S_i = \frac{\sum_{j=1}^n A_j}{BUFA_i}$, for all $j \neq i$ and $d_{ij} < r$.	0.41	0.64

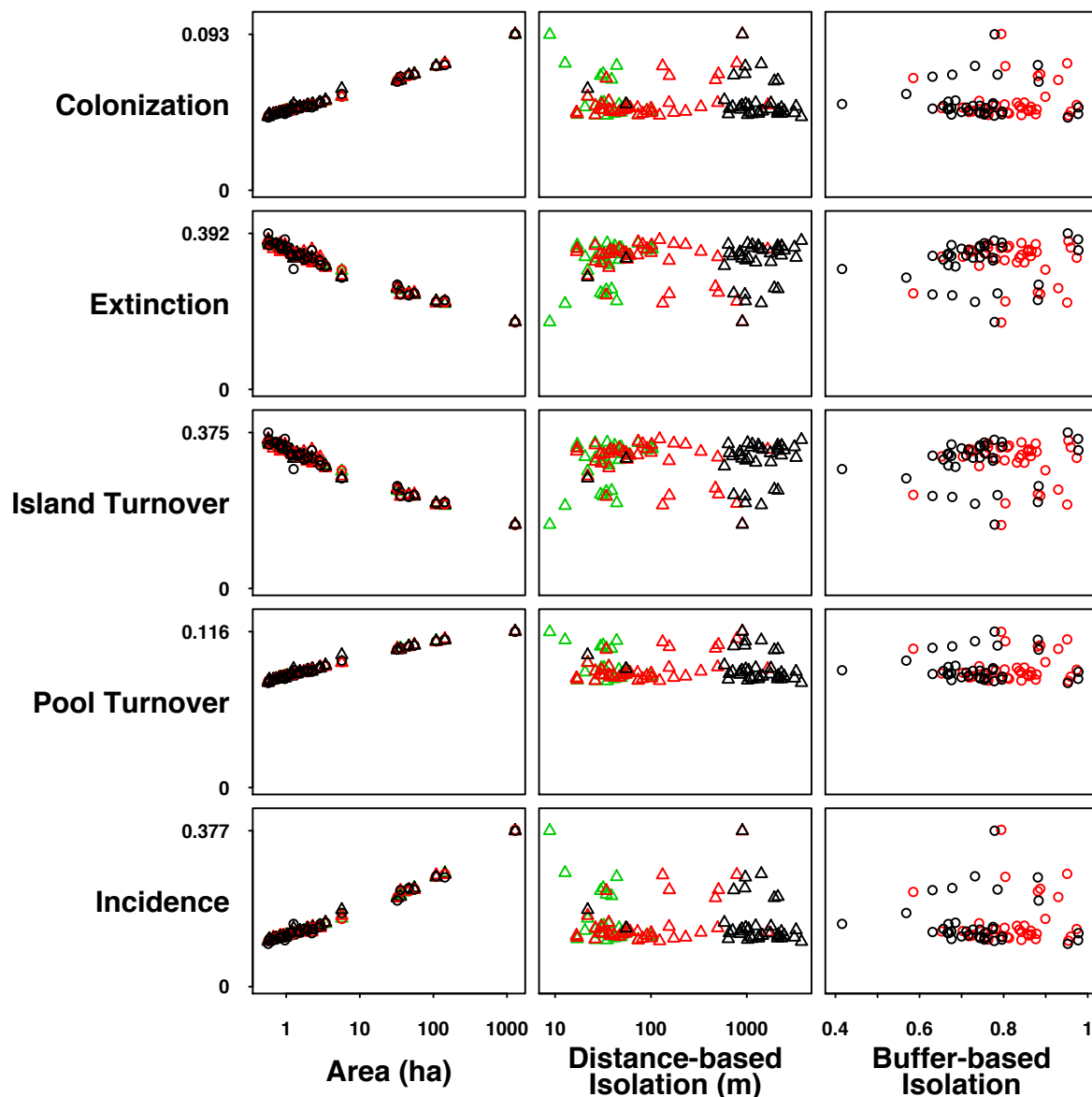
*DIS3 provided the best fit to the data of breeding bird communities among distance-based measures according to the relative importances; BUF2 was a better fit than BUF1.

[§]All unconditional confidence intervals of the weighted parameter estimates for isolations included zero (data not shown).

Table S2 Logistic regression with buffer-based measures of isolation within different buffer radii explaining the probability of colonization for breeding bird communities on 37 islands in Thousand Island Lake (China) surveyed from 2007 to 2012. Abbreviations: I_i , isolation for island i ; d.f., degrees of freedom; log(L), log-likelihood; AIC, Akaike's information criterion; r , buffer radius.

Measures	d.f.	log(L)	AIC	Δ AIC	Model weight
I_i , $r = 2$ km	2	-3008.37	6020.75	0	0.63
I_i , $r = 1$ km	2	-3009.41	6022.82	2.07	0.23
I_i , $r = 1.5$ km	2	-3010.45	6024.91	4.16	0.08
I_i , $r = 0.5$ km	2	-3010.86	6025.73	4.98	0.05
I_i , $r = 0.1$ km	2	-3013.53	6031.05	10.30	0.00
I_i , $r = 2.5$ km	2	-3013.95	6031.89	11.15	0.00
I_i , $r = 3$ km	2	-3014.85	6033.69	12.94	0.00
I_i , $r = 3.5$ km	2	-3015.10	6034.20	13.45	0.00
I_i , $r = 4$ km	2	-3015.11	6034.23	13.48	0.00

Figure S1 Relationships between island variables and predicted biogeographical parameters for all breeding bird species on 37 islands in Thousand Island Lake (China) surveyed from 2007 to 2012, based on distance-based and buffer-based measures of isolation. The distance-based measures are the straight-line distance in metres to the nearest nearby land mass (DIS1; green triangle), straight-line distance to the nearest larger land mass (DIS2; red triangle) and straight-line distance to the nearest mainland (DIS3; black triangle). We also calculated two buffer-based measures based on the presence of land within a 2-km buffer around a focal island: the buffer water fraction of the total area of all islands intersecting the buffer, excluding the mainland (BUF1; red circle), and the buffer water fraction of the total area of all land intersecting the buffer, including the mainland (BUF2; black circle). The colonization and extinction rates were model-weighted averages, and the higher-order parameters were derived from these.



Appendix S2 Island attributes and the correlation matrix of the study islands.

Table S3 Characteristics of 37 study islands in Thousand Island Lake, China.

Abbreviations: *A*, area (ha); *I*, isolation; *Pe*, perimeter (m); *PAR*, perimeter to area ratio; *SI*, shape index; *Hr*, habitat richness; *E*, maximum elevation (m).

Island	<i>A</i>	<i>I</i>	<i>Pe</i>	<i>PAR</i>	<i>SI</i>	<i>Hr</i>	<i>E</i>	Number of transects	Total length of transects (m)
1	1289.23	0.78	105,965	82	832	7	298.5	8	3200
2	143.19	0.88	17,465	122	412	6	251.1	4	1600
3	109.03	0.73	12,022	110	325	6	226.9	4	1600
4	55.08	0.79	7570	137	288	5	198.0	2	800
5	46.37	0.68	10,444	225	433	5	174.0	2	800
6	35.64	0.63	7318	205	346	5	175.2	2	800
7	32.29	0.88	5892	182	292	5	196.7	2	800
8	5.69	0.57	1489	262	176	3	109.0	1	375
9	3.42	0.69	1164	340	178	4	131.1	1	300
10	2.90	0.67	1242	428	206	3	126.3	1	275
11	2.83	0.77	901	318	151	4	125.5	1	150
12	2.29	0.77	957	418	178	4	130.5	1	300
13	2.23	0.98	1341	601	253	3	113.5	1	400
14	2.00	0.74	795	397	158	3	126.0	1	300
15	1.93	0.73	658	341	134	4	125.3	1	250
16	1.74	0.66	604	347	129	3	126.2	1	300
17	1.54	0.76	706	459	161	3	125.5	1	375
18	1.52	0.71	604	398	138	3	123.5	1	250
19	1.40	0.68	723	516	172	3	115.9	1	375
20	1.26	0.42	427	339	107	3	138.5	1	200
21	1.20	0.67	506	421	130	3	125.1	1	225
22	1.20	0.67	552	460	142	3	116.7	1	225
23	1.17	0.63	609	520	159	3	116.6	1	250
24	1.15	0.67	503	437	132	3	121.0	1	275
25	1.03	0.80	488	474	136	3	115.6	1	250
26	1.01	0.72	492	487	138	3	124.0	1	250
27	0.96	0.98	595	620	171	3	115.0	1	250
28	0.91	0.74	412	453	122	4	122.2	1	275
29	0.86	0.70	429	498	130	3	119.5	1	225
30	0.83	0.74	432	521	134	3	123.0	1	275
31	0.83	0.75	398	479	123	4	120.7	1	250
32	0.80	0.74	451	563	142	2	117.8	1	300
33	0.73	0.80	527	722	174	3	106.7	1	300
34	0.67	0.75	420	626	145	3	109.8	1	325
35	0.59	0.68	314	532	115	3	113.0	1	225
36	0.59	0.78	408	691	150	3	110.0	1	250
37	0.57	0.95	346	607	129	3	113.0	1	200

Table S4 The Pearson correlation matrix for the island attributes of the 37 study islands in Thousand Island Lake, China. Abbreviations: *A*, area (ha); *I*, isolation; *Pe*, perimeter (m); *PAR*, perimeter to area ratio; *SI*, shape index; *Hr*, habitat richness; *E*, maximum elevation (m).

	<i>A</i>	<i>I</i>	<i>Pe</i>	<i>PAR</i>	<i>SI</i>	<i>Hr</i>
<i>I</i>	0.09					
<i>Pe</i>	0.99***	0.14				
<i>PAR</i>	-0.96***	0.06	-0.91***			
<i>SI</i>	0.94***	0.25	0.97***	-0.79***		
<i>Hr</i>	0.88***	0.16	0.86***	-0.87***	0.79***	
<i>E</i>	0.95***	0.10	0.94***	-0.94***	0.86***	0.88***

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Appendix S3 Species accumulation curves for the largest island and comparison of two species pools.

Figure S2 Species accumulation curves for the largest, and proportionally least-sampled, island (Island 1 in Fig. 1) in Thousand Island Lake, China. Each curve represented the cumulative count of species recorded against the number of samples in each year from 2007 to 2012.

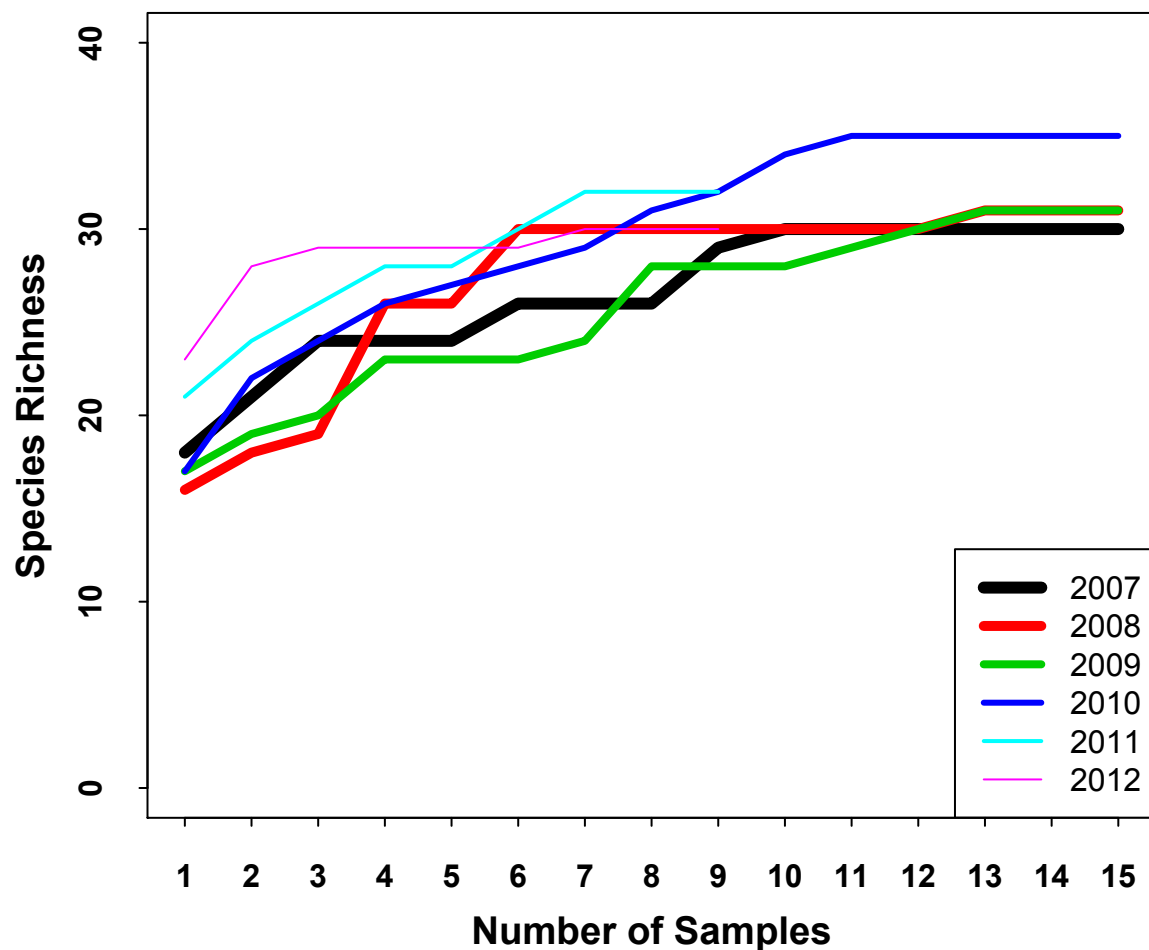


Figure S3 Comparison of the colonization and extinction rates between two species pools across areas and isolations of breeding bird communities in Thousand Island Lake region, China. Abbreviations: RI, residents with evidence of breeding recorded only on islands (71 species); RIM, residents with evidence of breeding recorded on both islands and the nearby mainland (93 species).

