

**Table S4 Single predictor Generalized Linear Model (GLM) and Spatial Linear Model (SLM) complete results at different grid sizes.**

Models	Grid Size	n	SW	$R^2/p-R^2$	CL	$R^2/p-R^2$	HDla	$R^2/p-R^2$	HDIn	$R^2/p-R^2$	SST	$R^2/p-R^2$	NPP	$R^2/p-R^2$
<b>Single predictor GLM (t-values) for all species</b>	Small	1390	13.930***	0.122	16.080***	<b>0.157</b>	4.254***	0.012	10.290***	0.070	0.790ns	0.000	3.599***	0.009
	Medium	570	11.940***	0.199	16.390***	<b>0.320</b>	3.587***	0.020	9.704***	0.141	2.073*	0.006	2.284*	0.007
	Large	223	8.959***	0.263	11.490***	<b>0.371</b>	2.926**	0.033	8.720***	0.253	5.173***	0.104	1.665ns	0.008
	UTM	175	8.604***	0.296	11.220***	<b>0.418</b>	2.609**	0.032	7.931***	0.262	6.557***	0.194	0.416ns	-0.005
	X Large	95	6.861***	0.329	10.040***	<b>0.515</b>	2.648**	0.060	8.916***	0.455	6.425***	0.300	0.848ns	-0.003
	Largest	34	6.281***	0.538	5.296***	<b>0.451</b>	2.792**	0.171	6.356***	0.544	4.346***	0.352	0.480ns	-0.024
<b>Single predictor SLM (z-values) for all species</b>	Small	1390	11.562***	<b>0.494</b>	10.183***	0.484	3.566***	0.019	4.302***	0.453	0.161ns	0.446	1.985*	0.448
	Medium	570	10.486***	0.444	12.407***	<b>0.474</b>	3.406***	0.351	5.506***	0.370	0.801ns	0.339	1.004ns	0.339
	Large	223	7.507***	0.415	11.125***	<b>0.530</b>	4.854***	0.338	6.326***	0.376	3.934***	0.315	1.170ns	0.274
	UTM	175	7.618***	0.495	10.615***	<b>0.591</b>	2.530*	0.352	5.459***	0.423	4.043***	0.382	0.145ns	0.329
	X Large	95	5.221***	0.635	10.047***	<b>0.773</b>	1.579ns	0.544	3.974***	0.593	3.014**	0.569	0.825ns	0.535
	Largest	34	4.480***	0.754	5.470***	<b>0.793</b>	0.655ns	0.616	3.241**	0.697	2.573*	0.675	1.605ns	0.639
<b>Single predictor GLM (t-values) for all fishes</b>	Small	1390	14.960***	0.138	17.410***	<b>0.179</b>	3.768***	0.009	10.410***	0.072	0.278ns	-0.001	4.514***	0.014
	Medium	570	13.570***	0.243	17.910***	<b>0.360</b>	3.006**	0.014	9.756***	0.142	1.804ns	0.004	3.209**	0.016
	Large	223	10.610***	0.334	13.340***	<b>0.444</b>	1.767ns	0.009	8.638***	0.249	4.463***	0.079	2.820**	0.030
	UTM	175	9.906***	0.358	13.780***	<b>0.521</b>	1.988*	0.017	8.142***	0.273	5.738***	0.155	1.188ns	0.002
	X Large	95	6.861***	0.329	12.290***	<b>0.615</b>	1.491ns	0.013	8.583***	0.436	5.857***	0.262	1.908ns	0.027
	Largest	34	7.440***	0.622	6.401***	<b>0.548</b>	2.671*	0.157	6.361***	0.545	3.840***	0.294	0.890ns	-0.006
<b>Single predictor SLM (z-values) for all fishes</b>	Small	1390	12.522***	<b>0.518</b>	10.425***	0.502	3.391***	0.468	4.270***	0.470	0.185ns	0.463	2.105*	0.465
	Medium	570	11.515***	0.471	13.018***	<b>0.492</b>	3.278**	0.362	5.645***	0.383	1.087ns	0.351	1.226ns	0.352
	Large	223	8.469***	0.474	11.833***	<b>0.575</b>	4.416***	0.364	6.357***	0.412	3.741***	0.350	1.683ns	0.318
	UTM	175	8.724***	0.520	12.499***	<b>0.635</b>	2.335*	0.334	5.837***	0.422	3.653***	0.359	0.399ns	0.314
	X Large	95	6.778***	0.714	10.624***	<b>0.807</b>	0.763ns	0.581	3.936***	0.634	2.808**	0.609	1.331ns	0.586
	Largest	34	5.593***	0.750	6.372***	<b>0.786</b>	0.776ns	0.539	3.575***	0.645	2.0214*	0.581	1.748ns	0.570

<b>Single predictor GLM (t-values) for invertebrates</b>	Small	1390	10.320***	0.071	12.810***	<b>0.105</b>	4.884***	0.016	8.866***	0.053	0.976ns	0.000	1.420ns	0.001
	Medium	570	7.550***	0.090	12.780***	<b>0.222</b>	4.019***	0.026	8.142***	0.103	1.335ns	0.001	0.323ns	-0.002
	Large	223	5.102***	0.101	7.990***	<b>0.221</b>	4.898***	0.094	7.789***	0.212	4.291***	0.073	-0.455ns	-0.004
	UTM	175	4.383***	0.095	6.382***	0.186	4.076***	0.082	6.504***	<b>0.192</b>	6.571***	0.195	-1.554ns	0.008
	X Large	95	4.408***	0.164	5.626***	0.246	4.684***	0.182	8.490***	<b>0.431</b>	6.089***	0.277	-1.199ns	0.005
	Largest	34	2.809***	0.173	2.038*	0.087	2.497*	0.137	5.509***	<b>0.471</b>	4.459***	0.364	-1.295ns	0.020
<b>Single predictor SLM (z-values) for invertebrates</b>	Small	1390	9.794***	<b>0.437</b>	9.147***	0.432	3.531***	0.403	3.777***	0.404	0.022ns	0.398	1.484ns	0.399
	Medium	570	7.442***	0.299	10.755***	<b>0.358</b>	3.506***	0.248	4.790***	0.260	0.099ns	0.231	0.290ns	0.232
	Large	223	4.978***	0.256	9.150***	<b>0.397</b>	5.482***	0.272	5.933***	0.278	3.020**	0.205	0.242ns	0.174
	UTM	175	3.961***	0.341	6.815***	<b>0.433</b>	2.718**	0.311	3.987***	0.339	3.935***	0.334	-0.443ns	0.283
	X Large	95	2.568*	0.644	7.468**	<b>0.760</b>	2.419*	0.642	3.397***	0.659	2.231*	0.638	0.239ns	0.620
	Largest	34	0.794ns	0.794	1.306ns	0.801	-0.006ns	0.791	3.039**	0.835	3.798***	<b>0.853</b>	-0.008ns	0.791
<b>Single predictor GLM (t-values) for habitat-forming species</b>	Small	1390	11.570***	0.087	13.400***	<b>0.114</b>	5.984***	0.024	11.870***	0.092	2.608**	0.004	0.397ns	-0.001
	Medium	570	9.745***	0.142	13.450***	<b>0.240</b>	4.427***	0.032	10.258***	0.155	2.955**	0.013	0.296ns	-0.002
	Large	223	6.213***	0.145	7.947***	0.219	4.580***	0.083	8.897***	<b>0.260</b>	6.492***	0.156	-0.621ns	-0.003
	UTM	175	6.763***	0.205	7.365***	0.234	3.455***	0.059	8.388***	<b>0.285</b>	8.246***	0.278	-1.137ns	0.002
	X Large	95	4.408***	0.164	5.897***	0.264	3.587***	0.112	8.467***	<b>0.429</b>	7.568***	0.375	-0.666ns	-0.006
	Largest	34	3.002**	0.195	2.493*	0.136	2.647*	0.154	5.505***	<b>0.470</b>	2.266***	0.540	-0.266ns	-0.029
<b>Single predictor SLM (z-values) for habitat-forming species</b>	Small	1390	10.079***	<b>0.550</b>	9.502***	0.540	3.631***	0.515	4.678***	0.518	0.252ns	0.510	1.929ns	0.511
	Medium	570	9.480***	0.408	11.359***	<b>0.440</b>	3.213**	0.327	5.686***	0.350	0.645ns	0.315	0.383ns	0.315
	Large	223	5.842***	0.350	9.214***	<b>0.455</b>	5.403***	0.337	6.041***	0.347	4.210***	0.299	0.026ns	0.250
	UTM	175	6.597***	0.513	8.033***	<b>0.556</b>	2.985**	0.422	5.824***	0.489	4.441***	0.445	-0.279ns	0.393
	X Large	95	2.971**	0.665	5.061***	<b>0.712</b>	1.208ns	0.640	2.839**	0.662	4.160***	0.688	-1.158ns	0.639
	Largest	34	0.109ns	0.423	0.802ns	0.433	0.683ns	0.430	3.264*	<b>0.529</b>	5.174***	0.677	0.111ns	0.424

The predictors are shallow water area (SW), coastline length (CL), habitat diversity based on area (HD<sub>a</sub>), habitat diversity based on number of patches (HD<sub>n</sub>), sea surface temperature (SST), and net primary productivity (NPP). Values under predictor variables are t-values for GLM and z-values for SLM. Asterisks indicate significance value of P: \* (<0.05), \*\* (<0.01); \*\*\* (<0.001); ns (not significant). Sample size for each grid (n) is shown. The highest adjusted  $R^2$  (GLM) and pseudo- $R^2$  (p- $R^2$ ; SLM) value within each grid size are highlighted in boldface.