

Electronic Supplementary Information

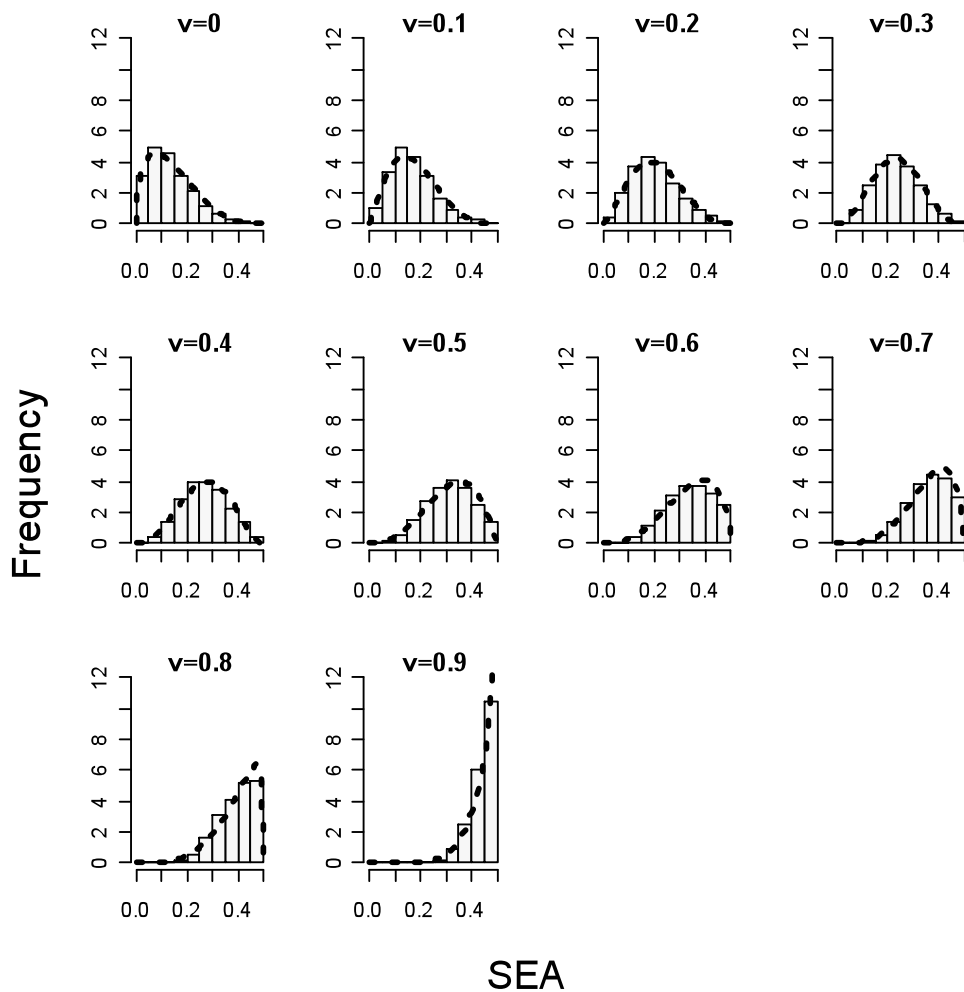
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A1 Scaled beta distributions fitted on secondary extinction area (SEA) frequency distributions (10^5 replicates)

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A1.1 NARRAGANSETT BAY FOOD WEB

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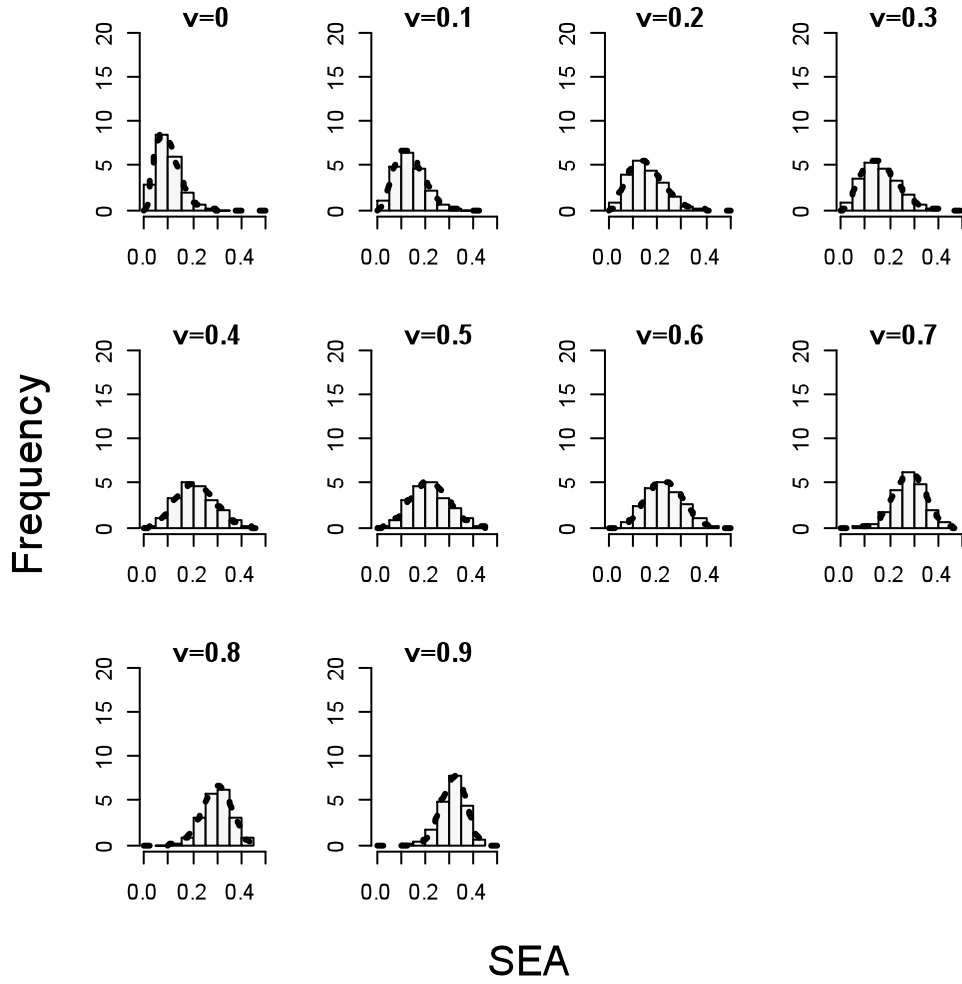


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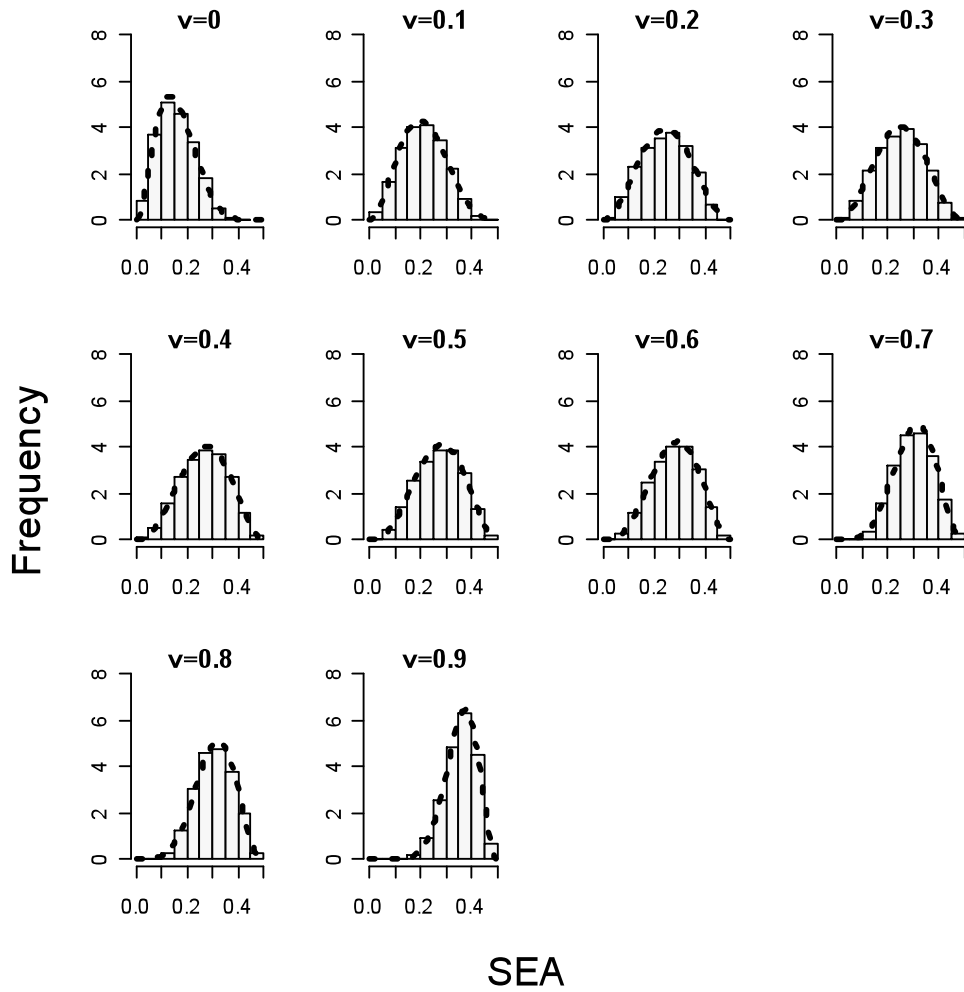
24 **A1.2 CHEASEPEAKE LOWER FOOD WEB**

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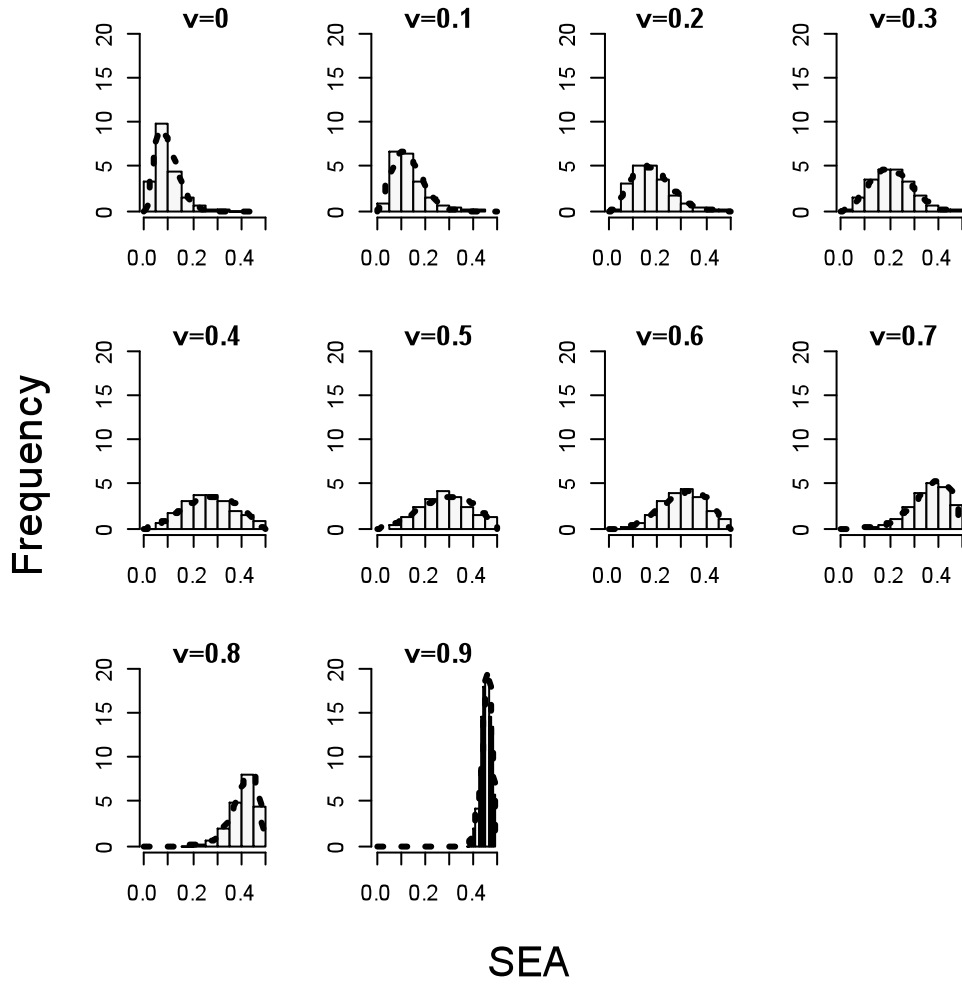
40 **A1.3 CHEASEPEAKE BAY MESOHALINE FOOD WEB**



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61 **A1.4 LAKE MICHIGAN FOOD WEB**

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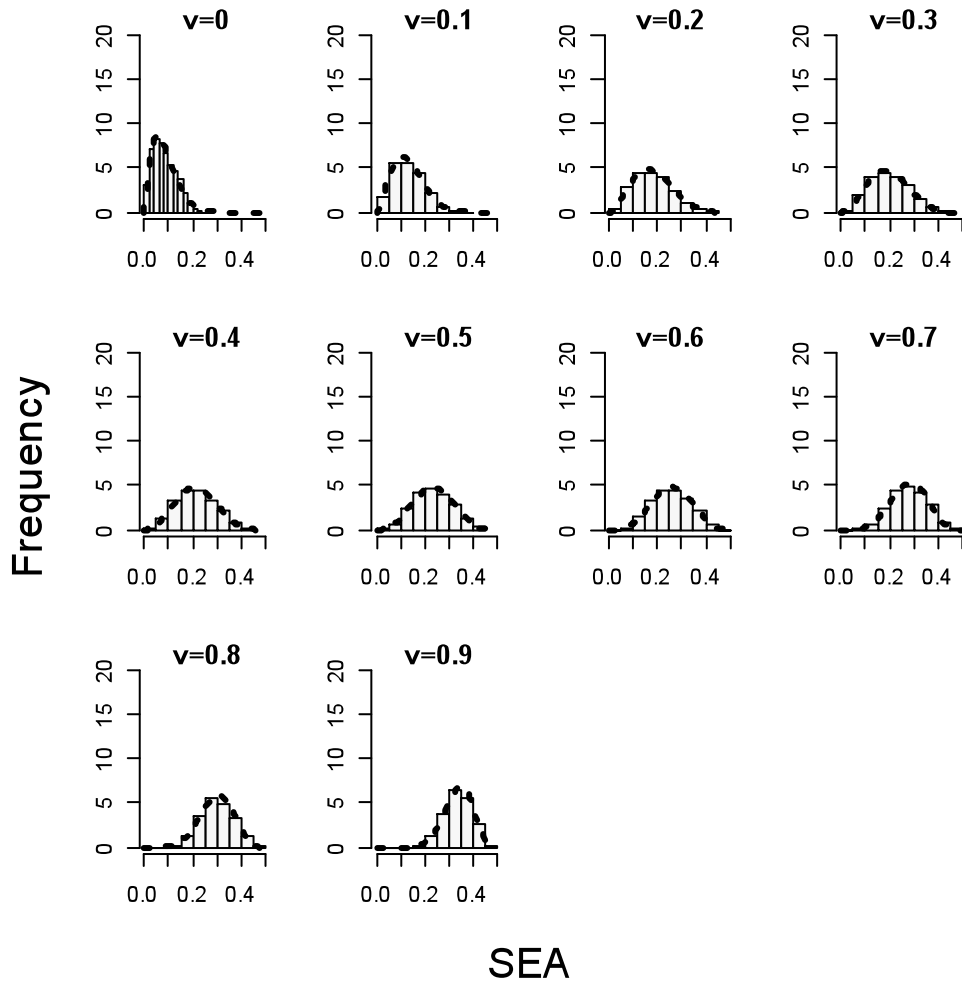


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79 **A1.5 MONDEGO ESTUARY FOOD WEB**

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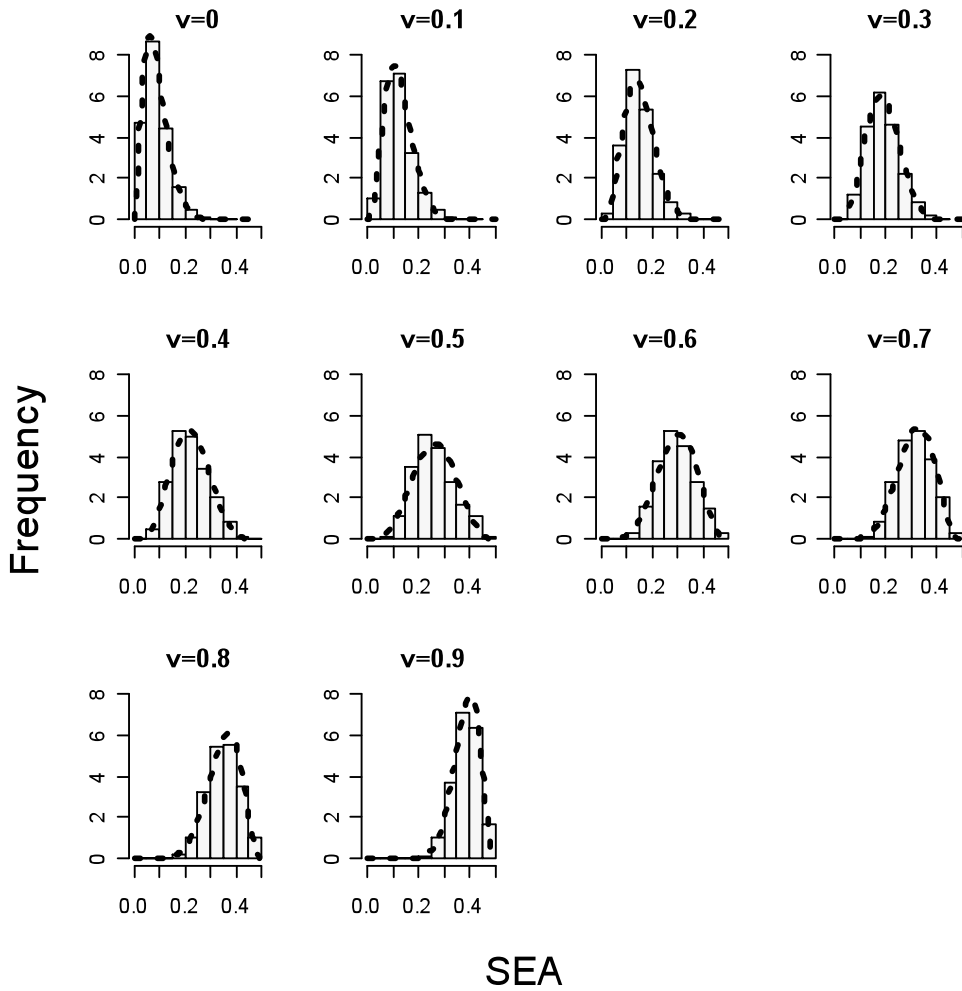
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85 **A1.6 ST. MARKS RIVER FOOD WEB**

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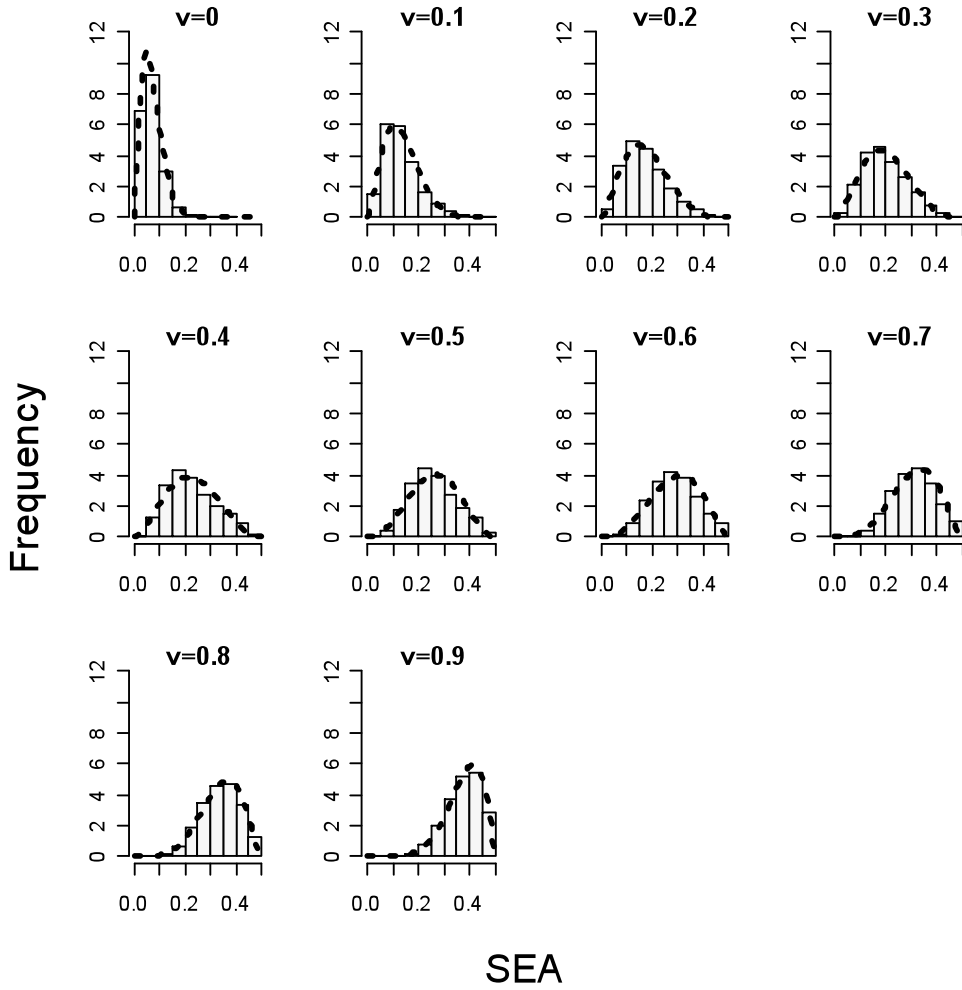


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109 **A1.7 EVERGLADES DRY FOOD WEB**

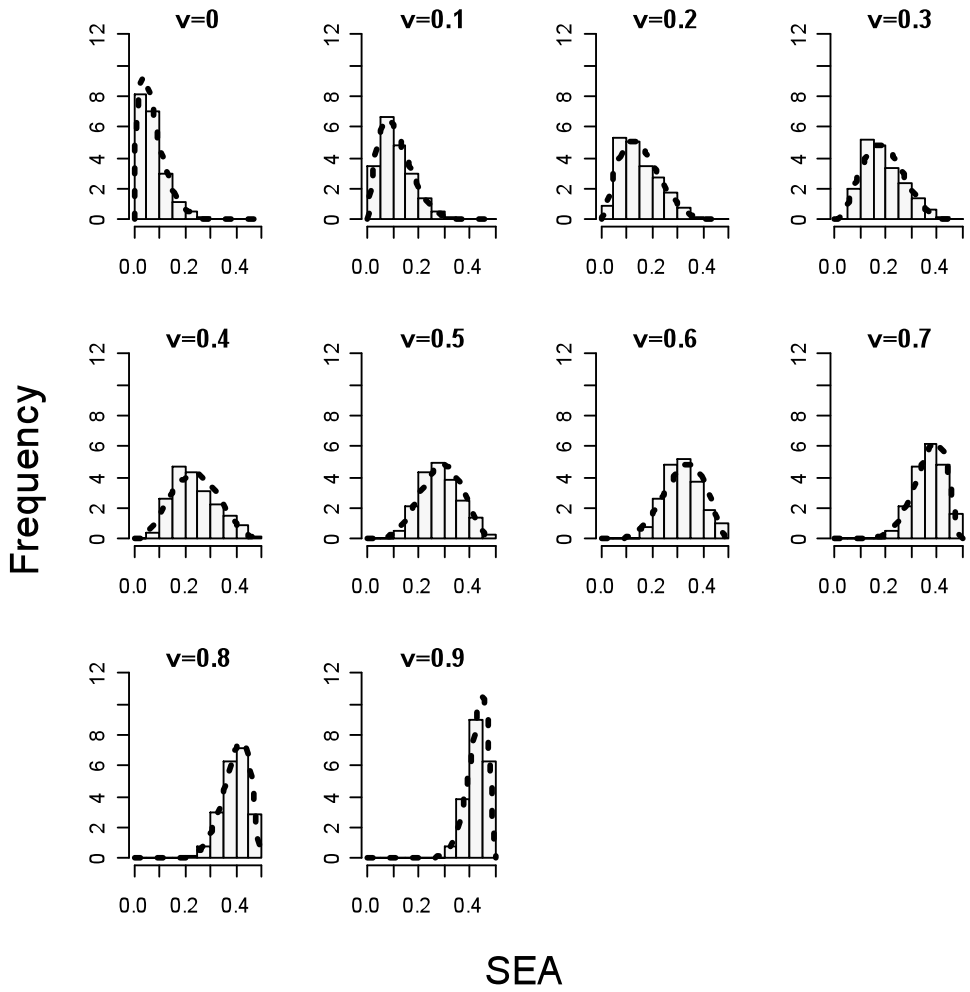
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130 **A1.8 CYPRESS WET FOOD WEB**

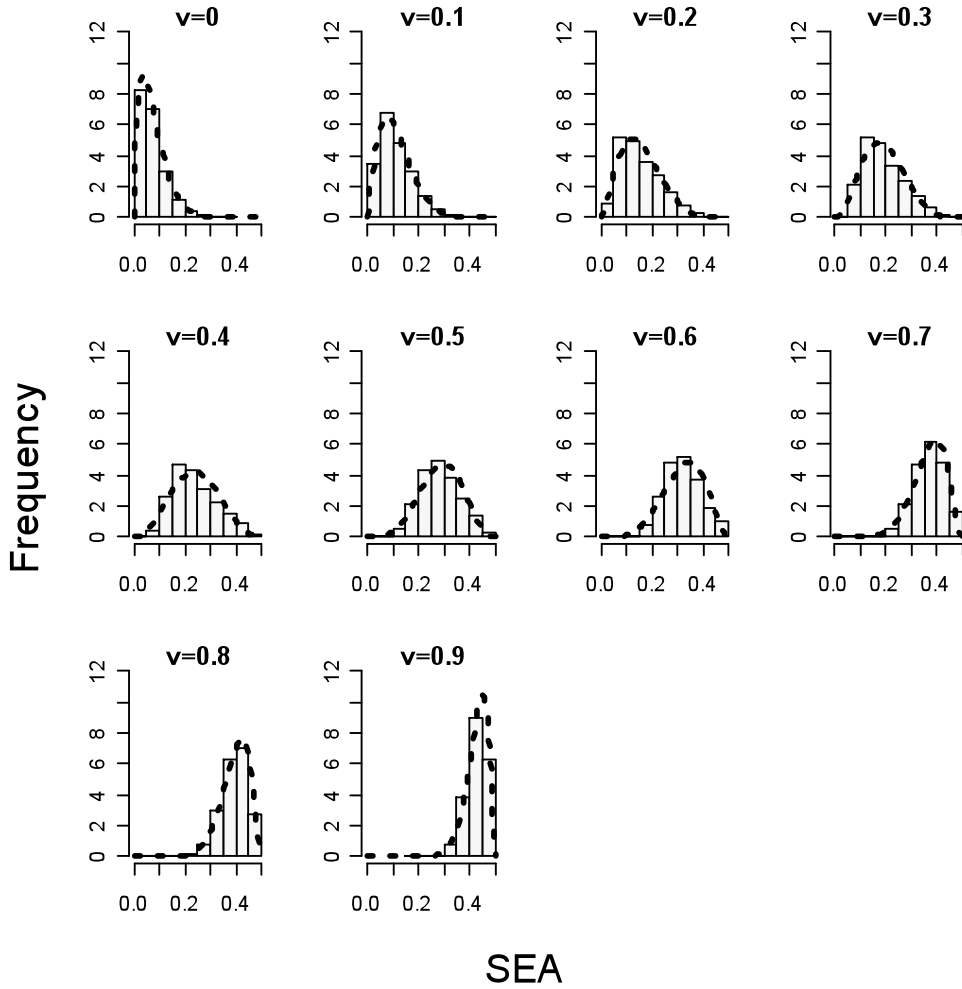
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153 **A1.9 MANGROVE DRY FOOD WEB**

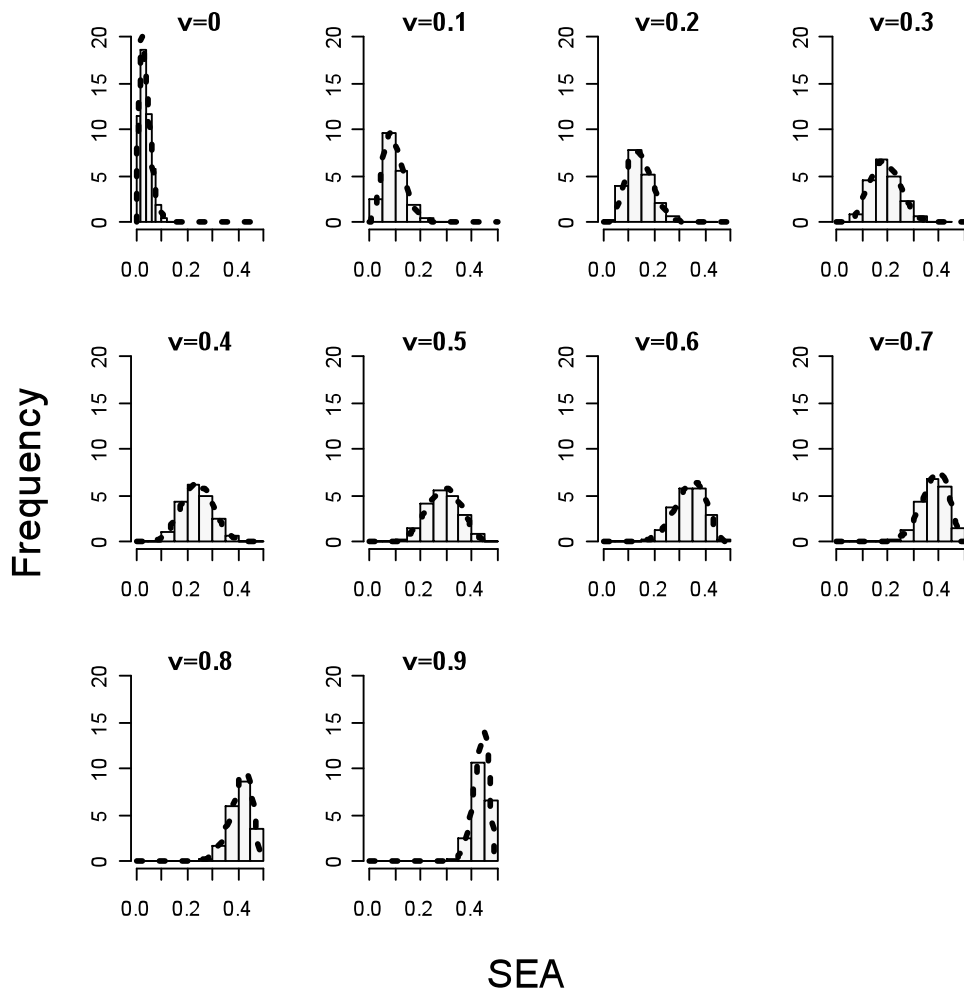
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173 **A1.10 FLORIDA BAY WET FOOD WEB**

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193 **A2 Estimates of parameters α and β of scaled beta probability**
 194 **distribution of secondary extinction area.**

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TABLE A2.1. Estimates of parameters α and β of scaled beta probability distribution of secondary extinction area

2 SEA \sim Be(α, β)

<i>Narragansett Bay</i>	α	β	<i>Cheasepeake Mesohaline</i>	α	β
v=0	1.54	3.94	v=0	3.06	6.53
v=0.1	2.29	4.39	v=0.1	3.17	4.32
v=0.2	2.64	3.80	v=0.2	3.22	3.35
v=0.3	3.50	3.92	v=0.3	3.45	3.46
v=0.4	3.64	3.06	v=0.4	3.64	3.13
v=0.5	3.72	2.12	v=0.5	3.85	3.18
v=0.6	3.65	1.71	v=0.6	4.11	3.22
v=0.7	4.64	1.77	v=0.7	5.71	3.75
v=0.8	4.57	1.19	v=0.8	6.12	3.82
v=0.9	6.89	0.87	v=0.9	9.20	3.71

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<i>Cypress wet</i>	α	β
v=0	1.67	9.64
v=0.1	2.21	7.63
v=0.2	2.59	5.81
v=0.3	3.45	5.55
v=0.4	3.54	3.82
v=0.5	5.24	3.88
v=0.6	5.54	3.06
v=0.7	8.30	2.93
v=0.8	10.46	2.75
v=0.9	14.49	2.47

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<i>St. Marks river</i>	α	β	<i>Everglades dry</i>	α	β
v=0	2.68	12.63	v=0	1.67	9.64
v=0.1	3.81	11.67	v=0.1	2.21	7.63
v=0.2	4.51	10.48	v=0.2	2.59	5.81
v=0.3	5.20	8.45	v=0.3	3.45	5.55
v=0.4	4.97	6.22	v=0.4	3.54	3.82
v=0.5	4.67	4.27	v=0.5	5.24	3.88
v=0.6	6.00	4.16	v=0.6	5.54	3.06
v=0.7	7.01	4.12	v=0.7	8.30	2.93
v=0.8	8.27	3.53	v=0.8	10.46	2.75
v=0.9	12.71	3.82	v=0.9	14.49	2.47

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<i>Mangrove dry</i>	α	β	<i>Florida Bay wet</i>	α	β
v=0	1.68	9.68	v=0	2.59	31.10
v=0.1	2.21	7.65	v=0.1	3.96	16.52
v=0.2	2.59	5.81	v=0.2	5.39	13.31
v=0.3	3.44	5.56	v=0.3	6.44	10.50
v=0.4	3.55	3.83	v=0.4	7.80	8.42
v=0.5	5.19	3.83	v=0.5	7.74	5.55
v=0.6	5.53	3.05	v=0.6	10.012	4.71
v=0.7	8.31	2.93	v=0.7	11.988	3.82
v=0.8	10.33	2.73	v=0.8	16.161	3.61
v=0.9	14.35	2.44	v=0.9	26.294	3.97

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<i>Cheasepeake bay lower</i>	α	β
v=0	3.28	13.59
v=0.1	3.78	10.04
v=0.2	3.23	7.25
v=0.3	3.28	6.97
v=0.4	4.19	5.74
v=0.5	4.63	5.91
v=0.6	5.17	6.07
v=0.7	8.31	6.54
v=0.8	10.14	6.87
v=0.9	14.06	8.17

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<i>Lake Michigan</i>	α	β
v=0	3.37	14.77
v=0.1	3.32	9.42
v=0.2	3.18	5.43
v=0.3	3.69	5.21
v=0.4	2.89	2.40
v=0.5	3.11	2.26
v=0.6	4.11	2.5
v=0.7	5.94	2.12
v=0.8	10.79	2.38
v=0.9	43.8	4.72

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<i>Mondego Estuary</i>	α	β
v=0	2.18	10.79
v=0.1	2.95	8.31
v=0.2	3.13	5.73
v=0.3	3.47	5.34
v=0.4	3.85	5.13
v=0.5	4.43	4.99
v=0.6	4.9	4.57
v=0.7	6.24	4.94
v=0.8	7.76	5.29
v=0.9	11.39	5.54

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251 **A3 Secondary extinction area and extinction threshold**

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253 **TABLE A3.1.** Mean value of secondary extinction as a function of extinction threshold and
 254 in the binary degree removal scenario.

	<i>v</i>										
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	BDR
<i>NARRAGANSETT</i>	0.14	0.17	0.2	0.23	0.27	0.32	0.34	0.36	0.39	0.44	0.37
<i>CHEASE LOWER</i>	0.096	0.14	0.15	0.16	0.21	0.22	0.23	0.28	0.3	0.32	0.23
<i>CHEASEPEAKE MESO</i>	0.16	0.21	0.24	0.25	0.27	0.27	0.28	0.3	0.31	0.36	0.29
<i>LAKE MICHIGAN</i>	0.092	0.13	0.17	0.21	0.27	0.29	0.31	0.37	0.41	0.45	0.32
<i>MONDEGO ESTUARY</i>	0.084	0.13	0.18	0.19	0.21	0.23	0.26	0.28	0.3	0.34	0.12
<i>ST MARKS</i>	0.08	0.12	0.15	0.19	0.22	0.25	0.29	0.31	0.35	0.38	0.27
<i>EVERGLADES DRY</i>	0.071	0.13	0.17	0.2	0.22	0.26	0.3	0.31	0.34	0.38	0.24
<i>CYPRESS WET</i>	0.073	0.11	0.14	0.17	0.24	0.29	0.32	0.37	0.39	0.43	0.28
<i>MANGROVE DRY</i>	0.073	0.11	0.15	0.19	0.24	0.29	0.32	0.37	0.39	0.42	0.16
<i>FLORIDA WET</i>	0.038	0.096	0.14	0.19	0.24	0.29	0.33	0.38	0.4	0.43	0.14

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258 **TABLE A3.2.** Parameters estimates±se for the linear regression of mean SEA on extinction
 259 threshold for all food webs. *p* is always less than 0.01.

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	Slope	Intercept
<i>NARRAGANSETT</i>	0.33± 0.0097	0.14±0.0052
<i>CHEASE LOWER</i>	0.24±0.0120	0.10±0.0064
<i>CHEASEPEAKE MESO</i>	0.17± 0.0018	0.19± 0.0096
<i>LAKE MICHIGAN</i>	0.39±0.012	0.09±0.0057
<i>MONDEGO ESTUARY</i>	0.25±0.014	0.10±0.0078
<i>ST MARKS</i>	0.33± 0.005	0.09± 0.00264
<i>EVERGLADES DRY</i>	0.32± 0.0013	0.09± 0.0072
<i>CYPRESS WET</i>	0.41± 0.014	0.07± 0.0073
<i>MANGROVE DRY</i>	0.40± 0.0112	0.07± 0.006
<i>FLORIDA WET</i>	0.44± 0.015	0.05± 0.0081

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TABLE A3.3. Fraction of secondary extinction events higher than binary most connected removal as a function of extinction threshold. BDR indicates the secondary extinction area by removal from the most-connected to the least-connected. BDR reported in the table is the average of 100 replicates, since there species may have the same number of number of links.

	v										BDR
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
<i>NARRAGANSETT</i>	0.02	0.027	0.049	0.069	0.149	0.295	0.393	0.489	0.657	0.91	0.37
<i>CHEASE LOWER</i>	0.009	0.069	0.156	0.179	0.39	0.43	0.49	0.80	0.88	0.95	0.23
<i>CHEASEPEAKE</i>	0.04										
<i>MESO</i>		0.193	0.34	0.35	0.43	0.45	0.47	0.56	0.59	0.85	0.29
<i>LAKE MICHIGAN</i>	0.002	0.012	0.047	0.084	0.3	0.36	0.46	0.76	0.96	1	0.32
<i>MONDEGO</i>	0.27										
<i>ESTUARY</i>		0.57	0.84	0.9	0.95	0.97	0.992	0.997	1	1	0.12
<i>ST MARKS</i>	0.002	0.015	0.04	0.11	0.24	0.4	0.61	0.72	0.89	0.98	0.27
<i>EVERGLADES DRY</i>	0.004	0.079	0.207	0.296	0.390	0.5496	0.693	0.792	0.891	0.967	0.24
<i>CYPRESS WET</i>	0.004	0.018	0.074	0.15	0.293	0.5	0.69	0.92	0.98	0.998	0.28
<i>MANGROVE DRY</i>	0.08	0.212	0.56	0.804	0.963	0.993	0.999	1	1	1	0.16
<i>FLORIDA WET</i>	0.0003	0.15	0.47	0.79	0.96	0.997	0.999	1	1	1	0.14

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271 **TABLE A3.4.** Median value of secondary extinction as a function of extinction threshold.

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	<i>v</i>									
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
<i>NARRAGANSET</i>	0.1215	0.1581	0.1935	0.2290	0.2667	0.3193	0.3419	0.3688	0.4021	0.4537
<i>CHEASE LOWER</i>	0.0913	0.1312	0.1462	0.1526	0.2043	0.2139	0.2247	0.2795	0.3000	0.3204
<i>CHEASEPEAKE MESO</i>	0.1534	0.2102	0.2471	0.2509	0.2727	0.2774	0.2831	0.3020	0.3077	0.3617
<i>LAKE MICHIGAN</i>	0.0806	0.1159	0.1639	0.2025	0.2630	0.2823	0.3109	0.3731	0.4159	0.4513
<i>MONDEGO ESTUARY</i>	0.0773	0.1237	0.1736	0.1905	0.2096	0.2317	0.2561	0.2770	0.2950	0.3374
<i>ST MARKS</i>	0.0784	0.1134	0.1418	0.183	0.2136	0.2508	0.2907	0.3133	0.3506	0.3874
<i>EVERGLADES DRY</i>	0.0640	0.1195	0.1612	0.1863	0.2114	0.2511	0.2864	0.3110	0.3425	0.3837
<i>CYPRESS WET</i>	0.0598	0.0986	0.1361	0.1764	0.2244	0.2803	0.3158	0.3715	0.3992	0.4311
<i>MANGROVE DRY</i>	0.0599	0.0981	0.1374	0.1754	0.2244	0.2797	0.3157	0.3715	0.3990	0.4322
<i>FLORIDA WET</i>	0.0341	0.0890	0.1371	0.1836	0.2365	0.2882	0.3416	0.3813	0.4122	0.4374

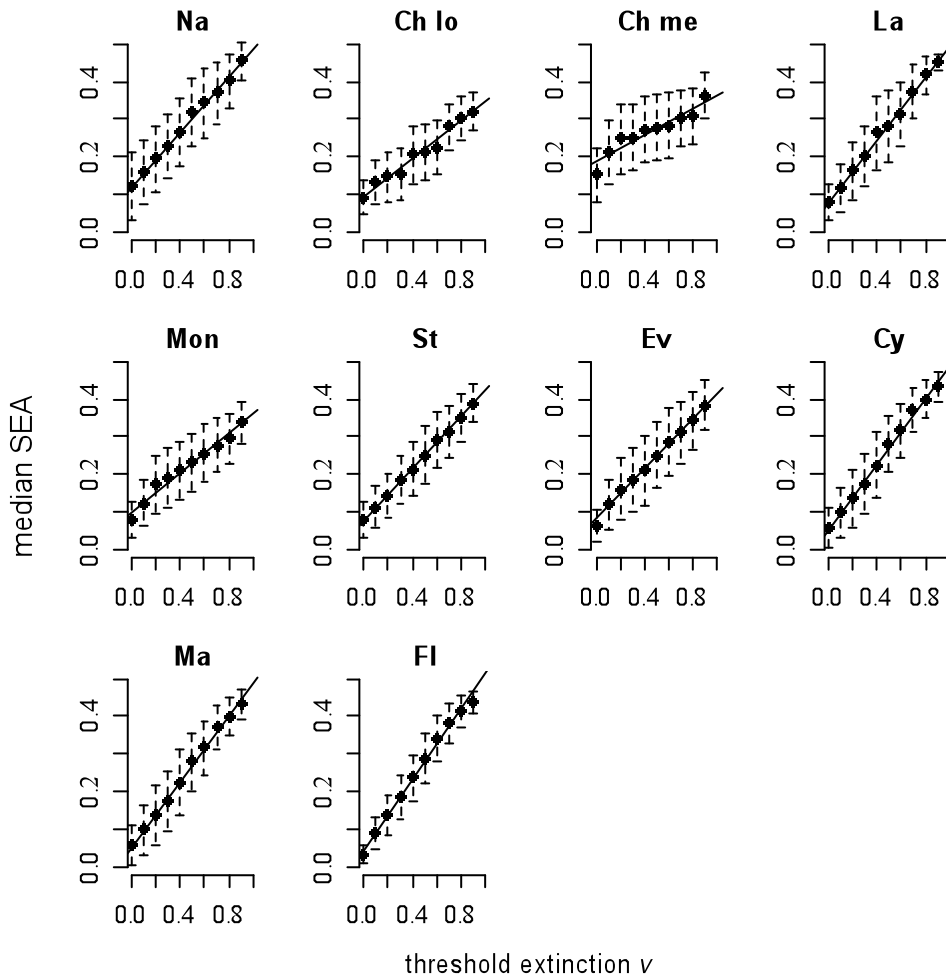
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FIGURE A3.1. Linear models of median SEA as a function of extinction threshold v . (Na) Narragansett food web, species richness $S = 31$; (Ch lo) Cheasepeake bay lower food web, $S = 31$; (Ch me) Cheasepeake bay mesohaline food web, $S = 33$; (La) Lake Michigan food web, $S = 35$; (Mo) Mondego Estuary food web, $S = 42$; (St) St Marks, $S = 48$; (Ev) Everglades dry food web, $S = 63$; (Cy) Cypress wet food web, $S = 65$; (Ma) Mangrove dry food web, $S = 91$; (Fl) Florida Bay wet food web, $S = 123$. Dashed lines represent \pm sd of the empirical distribution of SEA.



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291 **A4 Further work**

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293 Our extinction scenario assumes that all species have the same sensitivity to energy intake
294 decrease. It is likely that different species will display different sensitivity to the loss of
295 their resources [1]. This variability may depend on a species' population size, body mass,
296 diet specialization or trophic level. A straightforward and intriguing extension of the
297 model presented in our work is the analysis of how food web robustness changes when
298 there is heterogeneity in species sensitivity to loss of incoming energy.

299 Another relevant assumption in our study is that species go extinct at random, although
300 this happens rarely (i.e. as after a catastrophic event), and the order in which species are
301 lost largely affects network response [2,3]. An additional extension is thus the analysis of
302 food web response to species loss combining energetic criteria with different extinction
303 sequences, based on traits such as the number of links of the species, trophic level, body
304 size or others specific and relevant characteristics.

305 The model presented in this study is in a bottom-up perspective and does not take into
306 account top-down extinction cascades. Detecting such cascades requires an analysis based
307 on dynamical models, such as Lotka-Volterra and allometric bioenergetic models, where
308 changes in the abundances of species are introduced [4,5]. However, the acquisition of
309 such information for empirical food webs is clearly cumbersome and rarely available for
310 complex food webs.

311 Finally, the scenarios we analysed can be interpreted as worst-case scenario, since changes
312 in trophic interactions ("rewiring") are likely to follow species loss, a process potentially
313 increasing the robustness of the food web [6].

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315 **A5References**

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