Supplementary material 1

Occurrence data *Senecio inaequidens*

Table S1. *The spatial scale, coefficients, degrees of freedom (df), AICc values and weights for all models.*

Intrcpt	Scale	JC	JC²	P	P²	JC:P	JC:P²	JC²:P	df	logLik	AICc	delta	weight
-1.4	5	6.13		-8.84	15.75		-13.71		6	-182.35	376.96	0	0.13
-2.53	5	15.39	-11.49	-24.36	28	23.84	-32.06		8	-180.9	378.24	1.285	0.068
-3.14	5	12.46	-5.35	-8.92	14.82		-12.19		7	-181.99	378.32	1.367	0.065
-0.12	5	3.94		-16	22.28	11.32	-23.8		7	-182	378.34	1.379	0.065
-5.31	5	24.88	-19.21	-16.62	27.74		-32.03	18.12	8	-181.29	379.01	2.05	0.046
16.91	20	-48.58	35.72	-76		198.98		-131.09	7	-182.46	379.26	2.3	0.041
-0.37	5		6.74	-3.7	6.31			-10.87	6	-183.51	379.26	2.305	0.041
11.49	10	-27.49	18.04	-54.55		136.12		-86.61	7	-182.49	379.31	2.353	0.04
-0.82	10	18.97	-20.81	-47.71	43.24	58.18	-54.32		8	-181.54	379.5	2.547	0.036
-2.52	5	7.68		0.15	5.69	-12.43			6	-183.75	379.76	2.803	0.032
-2.52	5	8.23	-0.69	-4.38	5.96			-8.63	7	-182.99	380.32	3.366	0.024
-3	5	17.37	-13.38	-24.11	29.02	21.19	-33.63	3.41	9	-180.89	380.33	3.373	0.024
6.91	10	-6.81		-39.14	41.09	45.13	-50.06		7	-183.06	380.46	3.505	0.022
16.67	20	-47.91	37	-78.42	4.08	198.8		-134.01	8	-182.08	380.6	3.643	0.021
-4.05	5	15.33	-10.6	-2.21					5	-185.42	381.01	4.054	0.017
-5.24	20	30.89	-28.88	-64.04	61.77	79.24	-78.29		8	-182.31	381.05	4.097	0.017
11.52	10	-27.67	18.98	-54.22	1.77	132.73		-86.03	8	-182.36	381.14	4.188	0.016
4.68	10	0.37	-6.05	-55.4	32.6	93.58	-40.41	-32.76	9	-181.31	381.17	4.212	0.016
-3.84	5	13.13	-5.19	-1.11	5.4	-10.03			7	-183.45	381.24	4.281	0.015
7.44	20	-13.2	7.14	-79.03	34.83	157.72	-41.36	-78.02	9	-181.51	381.56	4.605	0.013
-0.09	5	0.3	5.41	-12.48	5.84	24.52		-26.25	8	-182.59	381.62	4.664	0.013
1.35	10			-2.41					3	-187.78	381.64	4.679	0.012
-8.17	10	41.23	-36.78	-29.24	50.07		-62.5	42.61	8	-182.71	381.86	4.906	0.011
-1.75	5	4.63		2.07		-6.34			5	-185.85	381.89	4.931	0.011
-4.66	5	18.76	-13.12	-4.83	2.44				6	-184.84	381.93	4.971	0.011
9.03	50	-35.64	31.29	-44.32		140.61		-105.75	7	-183.88	382.09	5.137	0.01
-0.44	5		3.78	0.46				-5.46	5	-185.99	382.15	5.194	0.01
5.43	20	-5.15		-44.85	48.86	53.27	-61.27		7	-184.01	382.36	5.406	0.009
-3.12	5	10.44	-5.47	-0.79				-2.88	6	-185.07	382.4	5.441	0.009
-3.62	5	12.47	-7.35	-0.07		-3.09			6	-185.21	382.67	5.714	0.007
1.03	50	8.55	-19.74	-57	58.37	97.43	-97.47		8	-183.19	382.81	5.85	0.007
1.08	5			-1.9					3	-188.49	383.06	6.102	0.006
-0.02	5	1.92		-2.39					4	-187.52	383.16	6.199	0.006
0.77	10				-2.08				3	-188.57	383.22	6.262	0.006
4.44	50	-9.05	0.47	-58.04	42.14	124.61	-66.43	-45.99	9	-182.37	383.28	6.322	0.005
-0.35	5	1.51	1.38	-10.89		29.82		-24.14	7	-184.54	383.42	6.461	0.005
1.64	10			-3.77	1.26				4	-187.66	383.44	6.48	0.005
-4.4	10	15.89	-10.62	-2.42					5	-186.7	383.57	6.613	0.005
-3.68	5	13.04	-9.26		-1.77				5	-186.7	383.58	6.622	0.005
0.97	10	0.55		-2.51					4	-187.74	383.6	6.643	0.005
1.34	10		0.03	-2.42					4	-187.78	383.68	6.726	0.004
-1.2	5	2.92			2.67		-6.24		5	-186.84	383.86	6.906	0.004

0.03	10	3.44		-7.69	12.9		-10.39		6	-185.88	384.01	7.049	0.004
1.48	20			-2.74					3	-189.05	384.16	7.205	0.004
8.93	50	-35.27	31.49	-44.69	1.17	139.69		-105.99	8	-183.87	384.17	7.21	0.004
0.67	5				-1.67				3	-189.07	384.21	7.257	0.003
0.75	5		0.95	-2.22					4	-188.11	384.34	7.383	0.003
0.85	20				-2.58				3	-189.32	384.71	7.755	0.003
-5.03	10	19.29	-12.94	-5.11	2.52				6	-186.25	384.75	7.798	0.003
-3.01	5	9.76	-5.97		1.1		-3.93		6	-186.3	384.86	7.9	0.002
-0.43	20	2.66		-3.18					4	-188.42	384.95	7.994	0.002
-0.29	5	1.53			-2.01				4	-188.42	384.95	7.995	0.002
1.19	5			-2.48	0.54				4	-188.46	385.04	8.079	0.002
0.1	5	1.96		-3.17	0.73				5	-187.46	385.09	8.133	0.002
-5.44	10	20.87	-15.4	-5.61		4.24			6	-186.45	385.14	8.187	0.002
4.59	50	-9.8		-36.48	38.72	64.82	-68.4		7	-185.41	385.15	8.192	0.002
-12.58	20	52.35	-43.63	-35.16	63.06		-79.96	52.32	8	-184.41	385.25	8.291	0.002
0.61	10	0.22			-2.11				4	-188.57	385.25	8.296	0.002
0.85	10		-0.15		-2.04				4	-188.57	385.25	8.298	0.002
0.76	10		1.13	-1.24				-2.03	5	-187.56	385.29	8.338	0.002
0.67	20		1.52	-3.12					4	-188.59	385.3	8.34	0.002
1.27	10	0.54		-3.85	1.25				5	-187.62	385.42	8.462	0.002
0.35	10	1.41		-1.12		-1.84			5	-187.65	385.49	8.532	0.002
1.65	10		-0.01	-3.76	1.27				5	-187.66	385.5	8.54	0.002
-5.08	10	18.75	-13.19	-3.14				1.24	6	-186.65	385.54	8.585	0.002
-2.93	10	12.49	-6.78	-7.34	10.49		-7.64		7	-185.63	385.59	8.632	0.002
-3.94	10	13.36	-9.18		-1.98				5	-187.78	385.73	8.773	0.002
-0.85	20	2.25			-2.92				4	-188.84	385.81	8.85	0.002
0.37	5		0.72		-1.88				4	-188.84	385.81	8.851	0.002
0.84	10		2.71	-3.75	4.07			-5.19	6	-186.82	385.89	8.929	0.001
0.05	20		1.37		-2.9				4	-188.94	385.99	9.033	0.001
-1.94	20	6.56		-9.01	14.77		-12.03		6	-186.89	386.04	9.083	0.001
1.43	20			-2.52	-0.22				4	-189.04	386.2	9.248	0.001
-4.9	20	15.1	-8.36	-3.17					5	-188.02	386.21	9.258	0.001
0.86	5		0.96	-2.81	0.56				5	-188.07	386.33	9.369	0.001
-0.22	20		3.26	-1.36				-3.18	5	-188.14	386.45	9.495	0.001
-0.17	10	3.21		-1.79	3.37	-5.7			6	-187.15	386.55	9.597	0.001
-1.35	20	3.99		-1.17		-2.73			5	-188.25	386.69	9.731	0.001
-4.21	10	16.14	-9.9	-4.88	3.27			-1.77	7	-186.19	386.72	9.76	0.001
0.05	10	0.98			0.42		-3.16		5	-188.32	386.81	9.858	0.001
-5.23	10	20.16	-13.88	-5.59	2.22	1.07			7	-186.24	386.82	9.864	0.001
-0.43	20	2.66		-3.16	-0.02				5	-188.42	387.01	10.054	0.001
0.61	20		1.52	-2.83	-0.28				5	-188.59	387.35	10.392	0.001
-1.42	20	3.03			-0.5		-3.06		5	-188.66	387.5	10.54	0.001
-3.32	20	9.2	-4.73		-2.86				5	-188.71	387.61	10.652	0.001
-0.21	20		5.14	-4.07	4.49			-6.56	6	-187.71	387.66	10.708	0.001
-4.05	10	13.76	-9.51		-2.25		0.34		6	-187.77	387.8	10.841	0.001
-3.65	20	11.66	-3.62	-9.11	14.15		-11.07		7	-186.84	388.02	11.067	0.001
-5.79	20	18.44	-10.52	-4.83	1.61				6	-187.92	388.09	11.136	0
-3.78	20	10.86	-4.72	-2.26				-1.61	6	-187.95	388.14	11.187	0
-4.93	20	15.23	-8.48	-3.24		0.09			6	-188.02	388.29	11.33	0
-1.93	20	5.74		-1.84	3	-5.99			6	-188.06	388.38	11.42	0

-3.73	20	10.7	-2.72	-4.91	4.43				-5	7	-187.53	389.39	12.434	0
-2.5	20	6.27	-2.32		-1.01		-2.38			6	-188.64	389.52	12.568	0
-5.28	20	16.25	-8.01	-3.73	2.77	-3.1				7	-187.85	390.05	13.089	0
-4.01	5	15.09	-12.74							4	-191.44	390.99	14.033	0
-4.08	10	15.37	-12.64							4	-192.26	392.64	15.685	0
1.45	10		-2.32							3	-193.33	392.74	15.783	0
-0.23	50		2.39	-2.43						4	-192.41	392.93	15.974	0
-1.02	50	2.93		-2.39						4	-192.68	393.47	16.513	0
-0.64	50		2.23		-2.53					4	-192.68	393.49	16.532	0
2.31	10	-2.96								3	-193.83	393.73	16.778	0
-1.27	50	2.56			-2.36					4	-193.07	394.26	17.305	0
0.78	50			-1.57						3	-194.21	394.49	17.532	0
0.47	50				-1.68					3	-194.32	394.71	17.753	0
0.68	5		-1.3							3	-194.35	394.78	17.819	0
0.53	50	-2.53	4.26	-2.39						5	-192.34	394.85	17.898	0
-0.41	50		2.94	-2.02					-1.06	5	-192.36	394.9	17.939	0
-0.03	Int.									2	-195.45	394.94	17.979	0
-0.21	50		2.39	-2.52	0.1					5	-192.41	394.99	18.033	0
0.88	50	-4.99	6		-2.6					5	-192.41	395.01	18.049	0
-0.43	50	1.82		-3.92		2.53				5	-192.48	395.15	18.189	0
-0.92	50	2.99		-3.19	0.93					5	-192.65	395.47	18.513	0
-0.74	50		1.17							3	-194.87	395.8	18.847	0
0.74	5	-1.07								3	-194.99	396.05	19.096	0
-1.03	50	1.33								3	-195.02	396.11	19.154	0
-1.21	50	2.46			-2.72		0.5			5	-193.07	396.31	19.355	0
0.72	20		-1.12							3	-195.14	396.35	19.39	0
-1.45	50	5.22		-7.47	10.68		-7.6			6	-192.12	396.49	19.531	0
0.78	50			-1.57	0					4	-194.21	396.54	19.58	0
1.08	20	-1.38								3	-195.24	396.54	19.588	0
0.8	50	-4.73	7.07	-1.48					-2.26	6	-192.17	396.6	19.642	0
-0.38	50		4.56	-4.19	3.92				-4.11	6	-192.2	396.65	19.697	0
0.91	50	-5.7	6.96		-1.03		-2.29			6	-192.32	396.89	19.934	0
0.64	50	-3.28	4.81	-1.69	-0.81					6	-192.32	396.89	19.936	0
0.5	50	-2.15	3.71	-2.81		0.71				6	-192.33	396.91	19.951	0
0.02	50	-0.09		-2.72	-4.09	6.38				6	-192.33	396.91	19.957	0
0.38	50	-3.71	3.95							4	-194.7	397.52	20.566	0
-3.35	20	11.02	-8.37							4	-194.81	397.73	20.776	0
0.16	50	-1.31	5.1	-6.01	9.09		-7.8			7	-191.73	397.8	20.845	0
-1.78	50	12.01	-13.55	-13.92	26.24		-43.1	31.37		8	-190.86	398.16	21.205	0
0.63	50	-3.96	7.69	-3.34	3.14			-4.47		7	-192.07	398.48	21.526	0
0.81	50	-3.51	3.43	-1.78	-3.57	4.14				7	-192.21	398.75	21.796	0

PCA growth experiment

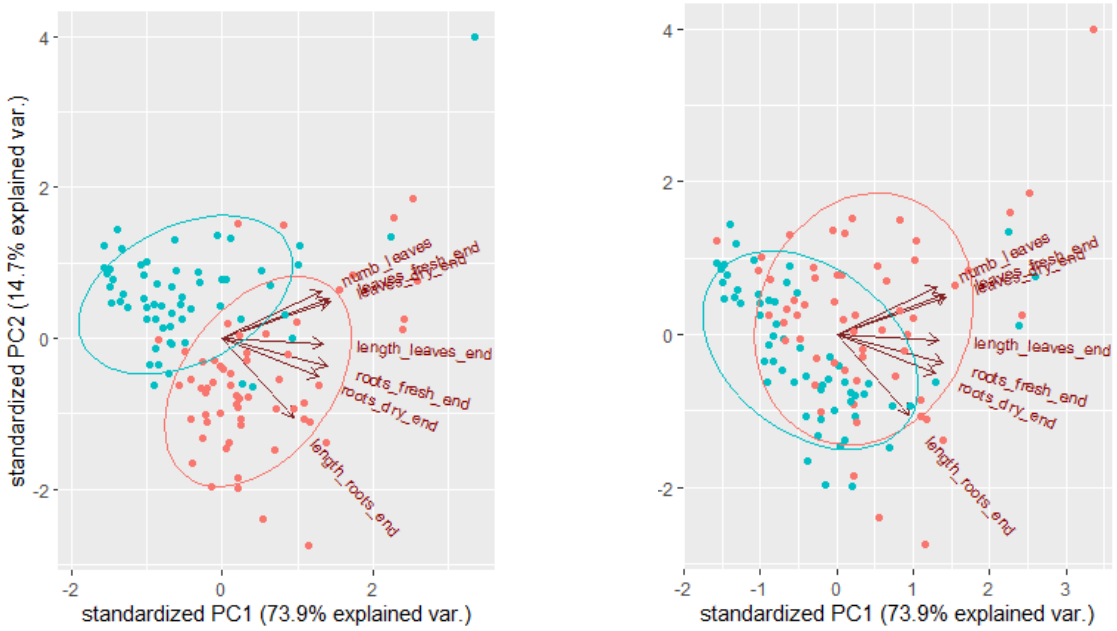

Figure S1. *PCA plots for growth experiment. Groups: (left) biota-treatment: red = sterilized, blue = unsterilized; or (right) Senecio-treatment: red =* S. inaequidens*, blue = unvegetated sand.*

Table S2. *Correlation of all measured traits with PC1*

Measured trait	**Correlation with PC1**
Number of leaves	0.86
Length of leaves	0.88
Length of roots	0.62
Weight of leaves (fresh)	0.93
Weight of roots (fresh)	0.91
Weight of leaves (dry)	0.94
Weight of roots (dry)	0.84

Sensitivity analysis of results

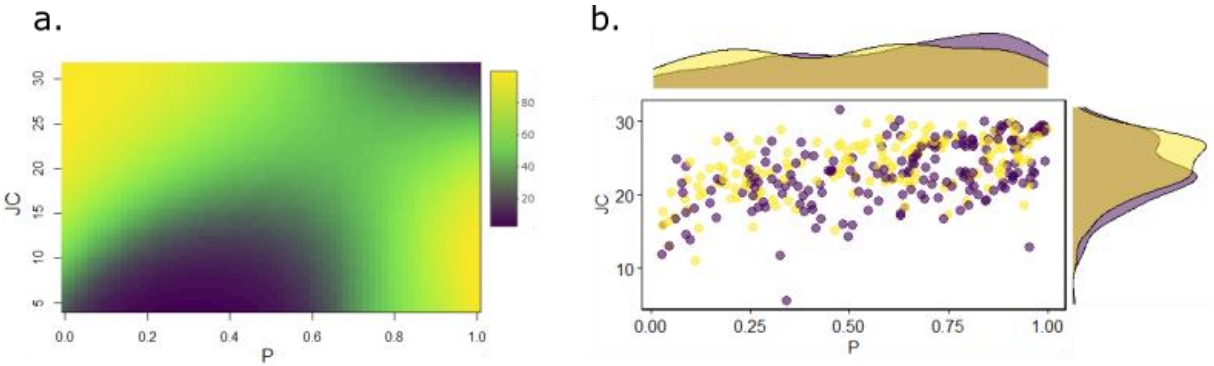

Figure S2. *The analysis of the occurrence data, rerun without samples with very low P and JC values. (a) . (a) The overall relation between the probability of occurrence of* S. inaequidens *and the spatial configuration of marram grass. The colours indicate the probability of occurrence as %. (b) Density distribution plots of the observed cover (P) and spatial autocorrelation (JC) of marram grass within a 5m radius of the central marram grass tussock. This plot only contains the data of the transects where S. inaequidens was found. Colours indicate whether* S. inaequidens *was present (yellow) or absent (purple).*