

**Supplementary material**

**Environmental factors and predator abundance predict the distribution and occurrence of two sympatric urchin species at Ningaloo Reef, Western Australia**

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**Table S1. All GAMs for probability of occurrence of *Echinometra mathaei* and *Echinostrephus molaris***

Included are difference in AICc (d.AICc = AICc – min AICc), AICc-based model weights (wi AICc), explained deviance (Dev.) and the estimated degrees of freedom from the GAM fits (d.f.e)

Response	Model	d.AICc	wi.AICc	Dev.	d.f.e
<i>E. molaris</i>	CLASS.I.REEF_NAME	0	0.42	0.48	6
<i>E. molaris</i>	CLASS+REEF_NAME	1.38	0.21	0.45	4
<i>E. molaris</i>	CLASS+REEF_NAME+RUGOSITY_rev.by.REEF_NAME	1.68	0.18	0.49	7
<i>E. molaris</i>	CLASS+REEF_NAME+RUGOSITY_rev	3.55	0.07	0.45	5
<i>E. molaris</i>	CLASS+REEF_NAME+STATUS	3.55	0.07	0.45	5
<i>E. molaris</i>	CLASS+REEF_NAME+RUGOSITY_rev.by.CLASS	5.75	0.02	0.45	6
<i>E. molaris</i>	CLASS	9.01	0	0.38	2
<i>E. molaris</i>	CLASS.I.REEF_NAME.I.STATUS	10.26	0	0.49	11
<i>E. molaris</i>	CLASS+STATUS	10.36	0	0.39	3
<i>E. molaris</i>	CLASS+RUGOSITY_rev.by.STATUS+STATUS	10.75	0	0.41	5
<i>E. molaris</i>	CLASS+RUGOSITY_rev	11.11	0	0.38	3
<i>E. molaris</i>	CLASS.I.STATUS	12.45	0	0.39	4
<i>E. molaris</i>	CLASS+RUGOSITY_rev+STATUS	12.49	0	0.39	4
<i>E. molaris</i>	CLASS+RUGOSITY_rev.by.CLASS	13.2	0	0.38	4
<i>E. molaris</i>	CLASS.I.STATUS+RUGOSITY_rev	14.61	0	0.39	5
<i>E. molaris</i>	CLASS+RUGOSITY_rev.by.CLASS+STATUS	14.62	0	0.39	5
<i>E. molaris</i>	CLASS.I.STATUS+RUGOSITY_rev.by.CLASS.I.STATUS	16.8	0	0.41	8
<i>E. molaris</i>	MnUb+REEF_NAME+RUGOSITY_rev.by.REEF_NAME	23.34	0	0.39	8.39
<i>E. molaris</i>	MnUb.by.REEF_NAME+REEF_NAME+RUGOSITY_rev.by.REEF_NAME	24.26	0	0.42	10.99
<i>E. molaris</i>	MnUb+RUGOSITY_rev.by.STATUS+STATUS	24.77	0	0.35	6.65
<i>E. molaris</i>	MnUb+REEF_NAME	25.39	0	0.33	5.4
<i>E. molaris</i>	MnUb	25.6	0	0.31	3.64
<i>E. molaris</i>	MnUb+RUGOSITY_rev	26.25	0	0.32	4.68
<i>E. molaris</i>	MnUb+REEF_NAME+RUGOSITY_rev	26.67	0	0.34	6.45
<i>E. molaris</i>	MnUb+STATUS	27.16	0	0.31	4.6
<i>E. molaris</i>	MnUb+REEF_NAME+STATUS	27.7	0	0.33	6.36
<i>E. molaris</i>	MnUb+RUGOSITY_rev+STATUS	27.9	0	0.32	5.65
<i>E. molaris</i>	MnUb.by.REEF_NAME+REEF_NAME	28.3	0	0.36	8.13
<i>E. molaris</i>	MnUb.by.STATUS+RUGOSITY_rev.by.STATUS+STATUS	28.84	0	0.36	8.56
<i>E. molaris</i>	MnUb.by.REEF_NAME+REEF_NAME+RUGOSITY_rev	29.39	0	0.37	9.2
<i>E. molaris</i>	MnUb.by.STATUS+REEF_NAME+STATUS	30.47	0	0.33	7.3
<i>E. molaris</i>	MnUb.by.REEF_NAME+REEF_NAME+STATUS	30.55	0	0.36	9.08
<i>E. molaris</i>	MnUb.by.STATUS+STATUS	31.02	0	0.32	6.5
<i>E. molaris</i>	MnUb.by.STATUS+RUGOSITY_rev+STATUS	31.91	0	0.33	7.56
<i>E. molaris</i>	HARD_CORAL.by.STATUS+RUGOSITY_rev.by.STATUS+STATUS	50.02	0	0.23	7.74

Response	Model	d.AICc	wi.AICc	Dev.	d.f. <sub>e</sub>
<i>E. molaris</i>	REEF_NAME+RUGOSITY_rev.by.REEF_NAME+STATUS	50.57	0	0.21	7
<i>E. molaris</i>	HARD_CORAL.by.STATUS+STATUS	50.97	0	0.21	6.62
<i>E. molaris</i>	HARD_CORAL+STATUS	51.66	0	0.17	4.67
<i>E. molaris</i>	HARD_CORAL	52.8	0	0.16	3.75
<i>E. molaris</i>	HARD_CORAL.by.STATUS+RUGOSITY_rev+STATUS	52.96	0	0.21	7.44
<i>E. molaris</i>	HARD_CORAL+RUGOSITY_rev+STATUS	53.75	0	0.18	5.63
<i>E. molaris</i>	ALGAE.by.STATUS+RUGOSITY_rev.by.STATUS+STATUS	54.36	0	0.17	6
<i>E. molaris</i>	HARD_CORAL+RUGOSITY_rev.by.STATUS+STATUS	54.46	0	0.18	6.6
<i>E. molaris</i>	ALGAE+RUGOSITY_rev.by.STATUS+STATUS	54.74	0	0.16	5
<i>E. molaris</i>	HARD_CORAL+RUGOSITY_rev	54.97	0	0.16	4.74
<i>E. molaris</i>	ALGAE.by.STATUS+STATUS	55.27	0	0.14	4
<i>E. molaris</i>	ALGAE.by.STATUS+RUGOSITY_rev+STATUS	55.42	0	0.15	5
<i>E. molaris</i>	REEF_NAME.I.STATUS+RUGOSITY_rev.by.REEF_NAME.I.STATUS	55.7	0	0.24	12
<i>E. molaris</i>	ALGAE+RUGOSITY_rev+STATUS	55.9	0	0.14	4
<i>E. molaris</i>	ALGAE+STATUS	55.91	0	0.13	3.21
<i>E. molaris</i>	REEF_NAME+RUGOSITY_rev.by.REEF_NAME	57.26	0	0.15	6
<i>E. molaris</i>	REEF_NAME.I.STATUS+RUGOSITY_rev	58.11	0	0.16	7
<i>E. molaris</i>	ALGAE	58.68	0	0.11	2.67
<i>E. molaris</i>	REEF_NAME.I.STATUS	59.2	0	0.14	6
<i>E. molaris</i>	ALGAE+RUGOSITY_rev	59.59	0	0.11	3.39
<i>E. molaris</i>	REEF_NAME+RUGOSITY_rev.by.STATUS+STATUS	60.13	0	0.14	6
<i>E. molaris</i>	REEF_NAME+RUGOSITY_rev+STATUS	60.16	0	0.13	5
<i>E. molaris</i>	REEF_NAME+STATUS	61.53	0	0.1	4
<i>E. molaris</i>	REEF_NAME+RUGOSITY_rev	65.6	0	0.08	4
<i>E. molaris</i>	RUGOSITY_rev.by.STATUS+STATUS	65.92	0	0.08	4
<i>E. molaris</i>	REEF_NAME	66.24	0	0.07	3
<i>E. molaris</i>	RUGOSITY_rev+STATUS	66.52	0	0.06	3
<i>E. molaris</i>	STATUS	67.49	0	0.05	2
<i>E. molaris</i>	RUGOSITY_rev	72.74	0	0.02	2
<i>E. molaris</i>	null	73.52	0	0	1
<i>E. mathaei</i>	ALGAE+RUGOSITY_rev+STATUS	0	0.2	0.24	4
<i>E. mathaei</i>	ALGAE+RUGOSITY_rev.by.STATUS+STATUS	0.44	0.16	0.26	5.39
<i>E. mathaei</i>	ALGAE+STATUS	1.2	0.11	0.22	3
<i>E. mathaei</i>	ALGAE.by.STATUS+RUGOSITY_rev+STATUS	1.23	0.11	0.26	5.77
<i>E. mathaei</i>	ALGAE.by.STATUS+RUGOSITY_rev.by.STATUS+STATUS	1.52	0.09	0.27	6.49
<i>E. mathaei</i>	ALGAE.by.STATUS+STATUS	2.83	0.05	0.23	4.18
<i>E. mathaei</i>	MnUb.by.REEF_NAME+REEF_NAME+RUGOSITY_rev	2.96	0.04	0.27	7.63
<i>E. mathaei</i>	MnUb.by.REEF_NAME+REEF_NAME	3.02	0.04	0.26	6.6
<i>E. mathaei</i>	HARD_CORAL+RUGOSITY_rev+STATUS	3.42	0.04	0.24	5.29
<i>E. mathaei</i>	HARD_CORAL.by.STATUS+RUGOSITY_rev.by.STATUS+STATUS	3.72	0.03	0.27	7.34
<i>E. mathaei</i>	HARD_CORAL.by.STATUS+RUGOSITY_rev+STATUS	3.75	0.03	0.25	6.33

Response	Model	d.AICc	wi.AICc	Dev.	d.f. <sub>e</sub>
<i>E. mathaei</i>	MnUb.by.REEF_NAME+REEF_NAME+RUGOSITY_rev.by.REEF_NAME	4.36	0.02	0.32	10.76
<i>E. mathaei</i>	MnUb.by.REEF_NAME+REEF_NAME+STATUS	5.1	0.01	0.26	7.51
<i>E. mathaei</i>	ALGAE+RUGOSITY_rev	5.14	0.01	0.2	3
<i>E. mathaei</i>	HARD_CORAL+RUGOSITY_rev.by.STATUS+STATUS	5.23	0.01	0.25	6.26
<i>E. mathaei</i>	ALGAE	5.91	0.01	0.18	2
<i>E. mathaei</i>	REEF_NAME.I.STATUS	6.14	0.01	0.23	6
<i>E. mathaei</i>	HARD_CORAL+STATUS	6.28	0.01	0.22	4.42
<i>E. mathaei</i>	REEF_NAME.I.STATUS+RUGOSITY_rev	6.35	0.01	0.24	7
<i>E. mathaei</i>	CLASS.I.REEF_NAME.I.STATUS	7.74	0	0.29	11
<i>E. mathaei</i>	HARD_CORAL.by.STATUS+STATUS	9.29	0	0.22	5.74
<i>E. mathaei</i>	CLASS.I.REEF_NAME	9.52	0	0.21	6
<i>E. mathaei</i>	HARD_CORAL+RUGOSITY_rev	9.72	0	0.2	4.42
<i>E. mathaei</i>	HARD_CORAL	11.03	0	0.18	3.51
<i>E. mathaei</i>	MnUb.by.STATUS+REEF_NAME+STATUS	11.6	0	0.22	7.08
<i>E. mathaei</i>	MnUb+REEF_NAME	12.94	0	0.18	4.85
<i>E. mathaei</i>	MnUb+REEF_NAME+RUGOSITY_rev	13.78	0	0.19	6
<i>E. mathaei</i>	REEF_NAME.I.STATUS+RUGOSITY_rev.by.REEF_NAME.I.STATUS	14.06	0	0.27	12
<i>E. mathaei</i>	MnUb+REEF_NAME+STATUS	14.11	0	0.18	5.49
<i>E. mathaei</i>	REEF_NAME+RUGOSITY_rev+STATUS	15.67	0	0.16	5
<i>E. mathaei</i>	REEF_NAME+STATUS	15.87	0	0.15	4
<i>E. mathaei</i>	REEF_NAME+RUGOSITY_rev.by.STATUS+STATUS	16.6	0	0.17	6
<i>E. mathaei</i>	CLASS+REEF_NAME+STATUS	16.73	0	0.16	5
<i>E. mathaei</i>	MnUb+REEF_NAME+RUGOSITY_rev.by.REEF_NAME	16.95	0	0.2	8.01
<i>E. mathaei</i>	CLASS+REEF_NAME	17	0	0.14	4
<i>E. mathaei</i>	REEF_NAME	17.75	0	0.13	3
<i>E. mathaei</i>	REEF_NAME+RUGOSITY_rev.by.REEF_NAME+STATUS	17.89	0	0.18	7
<i>E. mathaei</i>	REEF_NAME+RUGOSITY_rev	18.07	0	0.14	4
<i>E. mathaei</i>	CLASS+REEF_NAME+RUGOSITY_rev	18.23	0	0.15	5
<i>E. mathaei</i>	CLASS+REEF_NAME+RUGOSITY_rev.by.CLASS	20.39	0	0.15	6
<i>E. mathaei</i>	REEF_NAME+RUGOSITY_rev.by.REEF_NAME	20.66	0	0.15	6
<i>E. mathaei</i>	CLASS+REEF_NAME+RUGOSITY_rev.by.REEF_NAME	21.46	0	0.16	7
<i>E. mathaei</i>	MnUb.by.STATUS+RUGOSITY_rev.by.STATUS+STATUS	24.46	0	0.14	7.02
<i>E. mathaei</i>	MnUb.by.STATUS+RUGOSITY_rev+STATUS	24.69	0	0.13	5.98
<i>E. mathaei</i>	RUGOSITY_rev+STATUS	24.99	0	0.09	3
<i>E. mathaei</i>	RUGOSITY_rev.by.STATUS+STATUS	26.13	0	0.09	4
<i>E. mathaei</i>	MnUb+RUGOSITY_rev+STATUS	26.23	0	0.1	4.71
<i>E. mathaei</i>	MnUb.by.STATUS+STATUS	26.51	0	0.11	4.94
<i>E. mathaei</i>	CLASS+RUGOSITY_rev+STATUS	27.09	0	0.09	4
<i>E. mathaei</i>	MnUb+RUGOSITY_rev.by.STATUS+STATUS	27.48	0	0.11	5.64
<i>E. mathaei</i>	STATUS	27.58	0	0.06	2
<i>E. mathaei</i>	CLASS+RUGOSITY_rev.by.CLASS+STATUS	28.11	0	0.09	5

Response	Model	d.AICc	wi.AICc	Dev.	d.f. <sub>e</sub>
<i>E. mathaei</i>	CLASS+RUGOSITY_rev.by.STATUS+STATUS	28.27	0	0.09	5
<i>E. mathaei</i>	MnUb+STATUS	28.41	0	0.07	3.36
<i>E. mathaei</i>	CLASS.I.STATUS+RUGOSITY_rev	29.2	0	0.09	5
<i>E. mathaei</i>	CLASS+STATUS	29.24	0	0.06	3
<i>E. mathaei</i>	CLASS.I.STATUS+RUGOSITY_rev.by.CLASS.I.STATUS	30.1	0	0.14	8.82
<i>E. mathaei</i>	MnUb+RUGOSITY_rev	30.98	0	0.07	4.03
<i>E. mathaei</i>	CLASS.I.STATUS	31.29	0	0.06	4
<i>E. mathaei</i>	MnUb	33.01	0	0.04	2.84
<i>E. mathaei</i>	RUGOSITY_rev	33.45	0	0.02	2
<i>E. mathaei</i>	CLASS+RUGOSITY_rev	34.28	0	0.03	3
<i>E. mathaei</i>	CLASS	35.4	0	0.01	2
<i>E. mathaei</i>	CLASS+RUGOSITY_rev.by.CLASS	35.45	0	0.04	4
<i>E. mathaei</i>	null	35.7	0	0	1