Positive responses of a seagrass ecosystem to experimental nutrient enrichment

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Supplement. Detailed outputs from multi-factor PERMANOVA analyses presented in Table 1 of the main article

Table S1. Permutational multivariate analysis of variance (PERMANOVAs) comparing seagrass and algae among treatments (Trt) with different nutrient loads (Control [C], Moderate [M] & High [H]), among times of sampling (Ti) and among sites nested within treatments. Terms significant at α = 0.05 are highlighted in bold. *Z. muelleri*: *Zostera muelleri*; *H. ovalis*: *Halophila ovalis*; p-*F*: pseudo-*F*; SA: surface area

	Z. muelleri biomass				*Z. muelleri* blade SA				*Z. muelleri* blade length			
	df	MS	p-*F*	p	df	MS	p-*F*	p	df	MS	p-*F*	p
Treatment = Trt	2	10.57	12.79	**<0.01**	2	26760.0	26.45	**<0.01**	2	1123.7	45.20	**<0.01**
C vs. M	1	7.57	8.27	**<0.01**	1	21784.0	20.91	**<0.01**	1	1080.5	35.14	**<0.01**
C vs. H	1	20.85	28.10	**<0.01**	1	52018.0	55.95	**<0.01**	1	2117.8	165.55	**<0.01**
M vs. H	1	3.29	4.01	**<0.05**	1	6477.3	6.09	**<0.01**	1	172.9	5.57	**<0.05**
Time = Ti	4	35.44	42.88	**<0.01**	4	10619.0	10.50	**<0.01**	3	3884.1	156.23	**<0.01**
Trt × Ti	8	0.77	0.93	0.49	8	1259.3	1.24	0.31	6	100.6	4.05	**<0.01**
Residual	60	0.83			60	1011.7			48	24.9		

	H. ovalis biomass				Rhizomes & roots				Epiphyte biomass			
	df	MS	p-*F*	p	df	MS	p-*F*	p	df	MS	p-*F*	p
Treatment = Trt	2	0.04	4.36	**<0.05**	2	0.78	0.28	0.77	2	<0.001	2.45	0.10
C vs. M	1	<0.01	0.08	0.79	1	0.81	0.28	0.61	1	0.004	6.79	**<0.01**
C vs. H	1	0.06	5.09	**<0.05**	1	0.09	0.03	0.84	1	0.003	2.85	0.10
M vs. H	1	0.05	4.58	**<0.05**	1	1.43	0.56	0.44	1	<0.001	0.06	0.81
Time = Ti	2	0.02	2.10	0.14	2	10.63	3.84	**<0.05**	4	0.026	27.50	**<0.01**
Trt × Ti	4	0.01	1.48	0.24	4	1.26	0.45	0.76	8	<0.001	1.65	0.13
Residual	36	0.01			36	2.76			60	<0.001		

Table S2. PERMANOVAs comparing assemblages structure, richness, biomass and abundances of juvenile predatory fish and epiphyte grazers among treatments (Trt) with different nutrient loads (Control [C], Moderate [M] & High [H]), among times of sampling (Ti) and among sites nested within treatments. Terms significant at α = 0.05 are highlighted in bold; p-F represents pseudo-F and * indicates a non-significant term that was eliminated from the analysis

	df	Grazer assemblages			Richness of grazers			Number of grazers			Biomass of grazers		
		MS	p-*F*	p	MS	p-*F*	p	MS	p-*F*	p	MS	p-*F*	p
Treatment = Trt	2	6.83	0.95	0.45	0.52	0.32	0.75	889.1	0.51	0.69	0.001	0.33	0.80
C vs. M	1	11.04	1.22	0.31	0.08	0.04	0.84	499.3	0.21	0.77	0.001	0.21	0.74
C vs. H	1	3.89	0.42	0.63	0.98	0.80	0.38	392.0	0.84	0.35	0.002	0.48	0.64
M vs. H	1	5.56	1.60	0.22	0.50	0.29	0.58	1776.1	0.76	0.47	0.000	0.20	0.66
Time = Ti	4	7.61	1.05	0.40	8.91	5.44	**<0.01**	5892.6	3.41	**<0.01**	0.007	2.05	0.08
Trt × Ti	8	8.75	1.21	0.28	1.15	0.70	0.68	1311.4	0.76	0.71	0.003	0.87	0.60
Residual	60	7.23			1.64			1729.5			0.003		

	df	Predator assemblages			Richness of predators			Number of predators			Biomass of predators		
		MS	p-F	p	MS	p-F	p	MS	p-F	p	MS	p-F	p
Treatment = Trt	2	5857.5	3.31	<0.01	3.57	4.92	<0.05	2211.7	2.62	0.08	401.25	4.53	<0.05
C vs. M	1	6761.4	3.61	<0.01	3.92	5.23	<0.05	3819.4	4.57	<0.05	696.6	7.90	<0.01
C vs. H	1	9882.9	5.58	<0.01	6.48	9.00	<0.01	2723.2	4.10	<0.05	488.8	5.83	<0.05
M vs. H	1	928.2	0.56	0.77	0.32	0.45	0.51	92.5	0.11	0.75	18.4	0.20	0.65
Time = Ti	4	13300.0	7.34	<0.01	10.93	15.96	<0.01	15825.0	19.96	<0.01	462.61	4.69	<0.01
Site (Trt)	12	1591.2	0.88	0.74	0.89	1.30	0.27	1049.2	1.33	*0.23	48.04	0.49	0.92
Trt × Ti	8	1648.2	0.91	0.60	1.02	1.49	0.15	166.3	0.21	*0.986	110.63	1.12	0.37
Residual	48	1811.7			0.69			793.0			98.72		

Table S3. PERMANOVAs comparing below-ground variables among treatments with different nutrient loads (Trt: Control [C], Moderate [M] & High [H]), among times of sampling (Ti) and among sites nested within treatments. Terms significant at = 0.05 are highlighted in bold; p-*F*: pseudo-*F*

	\% C in sediment				C:N ratio of sediment				Detritivores & deposit feeders			
	df	MS	p-*F*	p	df	MS	p-*F*	p	df	MS	p-*F*	p
Treatment = Trt	2	0.01	0.38	0.72	2	121.67	0.13	0.94	2	274.87	1.35	0.30
C vs. M	1	0.02	0.63	0.43	1	180.72	0.14	0.83	1	520.83	2.36	0.14
C vs. H	1	0.00	0.05	0.85	1	0.02	0.00	1.00	1	45.63	0.17	0.69
M vs. H	1	0.01	0.53	0.46	1	184.28	0.79	0.38	1	258.13	2.17	0.17
Time = Ti	1	0.07	2.34	0.12	1	2252.00	2.36	0.13	2	120.80	0.59	0.55
Trt × Ti	2	0.01	0.24	0.79	2	986.01	1.03	0.43	4	113.47	0.56	0.67
Residual	24	0.03			24	954.64			36	203.93		

	Grazers				Suspension feeders				Predator & scavengers			
	df	MS	p-*F*	p	df	MS	p-*F*	p	df	MS	p-*F*	p
Treatment = Trt	2	2.96	0.08	0.94	2	17.42	0.19	0.84	2	157.27	5.34	0.01
C vs. M	1	5.63	0.12	0.69	1	34.13	0.30	0.59	1	64.53	2.23	0.15
C vs. H	1	2.70	0.07	0.80	1	13.33	0.18	0.70	1	313.63	15.71	<0.01
M vs. H	1	0.53	0.02	0.91	1	4.80	0.06	0.81	1	93.63	2.37	0.13
Time = Ti	3	146.02	3.80	<0.05	3	322.49	3.53	<0.05	3	27.80	0.94	0.41
Trt × Ti	6	32.76	0.85	0.54	6	82.56	0.90	0.47	6	22.07	0.75	0.57
Residual	36	38.43			36	91.42			36	29.47		