Appendix S2. Statistical analyses of effect sizes using linear mixed models (Table S2) and multiple regression modelling (Table S3).

Table S2 Results from linear mixed models contrasting effect size (the log response ratio) with categorical and continuous predictor variables. Predictor variables were fixed factors and experiment was a random factor. For the categorical habitat, grazer and methodological traits, the random factor experiment was nested within the categorical predictor variable. F and P values are from Type III tests of fixed effects with Kenward-Roger adjusted degrees of freedom. For continuous variables, the REML estimates of slope are presented. R^2 values are derived from the linear mixed models using the method of Edwards et al. (2008). Levels of categorical variables were only used if there were in excess of five replicate experiments per level. The effects of season were only examined for experimental sites outside of the tropics (i.e., absolute latitude greater than 23°). The continuous variables of nitrate, phosphate, duration, height, depth, and plot size were log transformed.

Factor	df	b	F	P	R^2
Habitat traits					
Latitude (absolute)	1,474	0.02	26.77	< **0.001**	0.02
within intertidal rocky reefs	1,293	0.04	36.26	< **0.001**	0.11
within subtidal rocky reefs	1,68.9	-0.01	1.15	0.29	0.02
within coral reefs	1,181	0.04	7.77	**0.006**	0.04
within seagrass beds	1,39.9	0.03	3.22	0.08	0.07
Mean sea surface temperature	1,600	-0.05	30.29	< **0.001**	0.05
within intertidal rocky reefs	1,404	-0.09	35.06	< **0.001**	0.08
within subtidal rocky reefs	1,93.1	-0.001	0.01	0.93	< 0.01
within coral reefs	1,77.9	-0.08	0.54	0.46	0.01
within seagrass beds	1,38.5	-0.07	5.75	**0.02**	0.13
autumn end	1,58.1	0.01	0.77	0.38	0.01
winter end	1,145	-0.13	14.82	**0.0002**	0.09
spring end	1,64.3	-0.07	5.64	**0.02**	0.08
summer end	1,204	0.01	0.41	0.52	< 0.01
Minimum sea surface temperature	1,610	-0.026	11.33	**0.001**	0.02
Maximum sea surface temperature	1,561	-0.09	83.96	< **0.001**	0.13
St. dev. of sea surface temperature	1,620	-0.17	22.83	< **0.001**	0.04
Nitrate	1,611	0.17	9.57	**0.002**	0.02
Phosphate	1,614	0.67	14.78	< **0.001**	0.02
Habitat	6,707		9.70	< **0.001**	0.08
Biogeographic region	11,546		3.92	< **0.001**	0.07
Height on shore	1,245	1.40	85.47	< **0.001**	0.25
Depth	1,197	0.13	4.14	**0.04**	0.02
Grazer traits					
Grazer type					
within intertidal rocky reefs	2,294		8.74	**0.002**	0.06
within subtidal rocky reefs	3,100		3.66	**0.02**	0.10
within coral reefs	2,170		5.60	**0.004**	0.06
within seagrass beds	3,11.1		0.76	0.54	0.17
Grazer size	1,745		15.42	< **0.001**	0.02
within molluscs	1,434		7.80	**0.006**	0.02
within crustaceans	1,48		0.91	0.34	0.02
within multiple taxa	1,85.2		0.04	0.83	< 0.01

Table S2 Continued.

Factor	df	b	F	P	R^2
Producer traits					
Producer functional groups	9,863		16.69	< **0.001**	0.15
within intertidal rocky reefs	6,537		21.62	< **0.001**	0.20
within subtidal rocky reefs	6,153		2.76	**0.01**	0.10
Producer phylum	4,752		19.30	< **0.001**	0.09
within intertidal rocky reefs	3,461		19.29	< **0.001**	0.11
within subtidal rocky reefs	2,216		5.19	**0.006**	0.05
within coral reefs	2,85.3		3.39	**0.04**	0.07
Producer order	17,726		10.22	< **0.001**	0.19
within intertidal rocky reefs	8,396		18.24	< **0.001**	0.27
within subtidal rocky reefs	9,144		5.09	< **0.001**	0.24
within coral reefs	3,252		15.57	< **0.001**	0.16
Variable type (total vs. group vs. species)	2,1522		31.24	< **0.001**	0.04
Type of measure (cover vs. mass vs. counts)	2,976		4.66	**0.01**	0.01
within intertidal rocky reefs	2,650		0.82	0.44	< 0.01
within subtidal rocky reefs	2,135		3.12	**0.047**	0.04
within coral reefs	1,166		930	**0.003**	0.05
Experimental methodology					
Starting conditions (bare vs. existing)	1,616		8.31	**0.004**	0.01
Duration					
within total measures	1,280	0.59	51.45	< **0.001**	0.16
within group measures	1,298	0.23	10.91	**0.001**	0.04
within species measures	1,260	-0.01	0.03	0.86	<0.01
Plot size	1,386	0.04	5.17	**0.02**	0.01
Method of exclusion					
within molluscs	2,291		12.08	< **0.001**	0.08
within urchins	1,81.2		2.31	0.13	0.03
within crustaceans	1,48		0.52	0.47	0.01

Table S3 Results from multiple regression modelling using categorical and continuous variables to predict the effect size (the log response ratio). In A), absolute latitude, mean sea surface temperature, phosphate concentration, nitrate concentration, experimental duration, and plot size are used as continuous predictor variables across all habitats. We randomly selected one data point per experiment to avoid the non-independence of multiple measures taken from each experiment. P values for the marginal tests for each variable are derived from 9999 permutations. The overall best solutions are the top five models ranked by fit as defined by AIC values. Note that models with AIC values differing by less than 2 are considered to have similar support (Burnham & Anderson 1998)[2]. These models thus fail to isolate a subset of these variables that strongly predict effect sizes. Similar results were found with BIC and Adjusted R^2 as fit criteria. In B) and C), analyses are conducted within each of the intertidal and subtidal rocky reef habitats. Predictor variables were: mean sea surface temperature (as the proxy for latitude and other temperature variables), phosphate concentration, grazer type, producer order, starting conditions (bare vs existing communities), plot size and duration. In these analyses, levels of the categorical predictors were included only if they had greater than 5 replicate measures per level, and only one data point per experiment was used (randomly chosen).

A) Global			
Marginal tests			
Variable	**$F_{1,603}$**	**P**	**Proportion of variation**
Latitude	15.70	< 0.001	0.025
Temperature	25.73	< 0.001	0.041
Nitrate[1]	8.94	0.004	0.014
Phosphate[1]	23.75	< 0.001	0.038
Plot size[1]	0.92	0.33	0.002
Duration[1]	0.92	0.34	0.002
Overall best solutions			
AIC	**R^2**	**Variables**	**Selections**
663.9	0.050	3	Temperature, Duration, Plot size
664.4	0.053	4	Temperature, Duration, Plot size, Phosphate
665.1	0.051	4	Temperature, Duration, Plot size, Latitude
665.4	0.054	5	Temperature, Duration, Plot size, Latitude, Phosphate
665.6	0.051	4	Temperature, Duration, Plot size, Nitrate
B) Intertidal rocky reefs			
Marginal tests			
Variable	**F (res df = 240**	**P**	**Proportion of variation**
Temperature	31.00	< 0.001	0.114
Herbivore	1.37	0.25	0.011
Starting conditions	23.17	< 0.001	0.088
Producer order	14.39	< 0.001	0.429
Phosphate[1]	14.32	< 0.001	0.056
Duration[1]	0.55	0.45	0.002
Plot size[1]	17.35	< 0.001	0.067
Overall best solutions			
AIC	**R^2**	**Variables**	**Selections**
220.88	0.507	6	Order, Temperature, Duration, Plot size, Start, Herbivore
221.34	0.504	7	Order, Temperature, Duration, Plot size, Start, Herbivore, Phosphate
223.25	0.487	5	Order, Temperature, Duration, Plot size, Start
225.01	0.488	5	Order, Temperature, Duration, Plot size, Herbivore
225.13	0.488	6	Order, Temperature, Duration, Plot size, Start, Phosphate

Table S3 Continued.

C) Subtidal rocky reefs			
Marginal tests			
Variable	**F** (res df = 79	**P**	**Proportion of variation**
Temperature	2.60	0.11	0.032
Herbivore	0.12	0.95	0.005
Starting conditions	0.19	0.66	0.002
Producer order	3.55	0.002	0.311
Phosphate[1]	11.71	0.002	0.130
Duration[1]	0.04	0.83	<0.001
Plot size[1]	0.31	0.57	0.004
Overall best solutions			
AIC	**R^2**	**Variables**	**Selections**
40.952	0.403	2	Order, Phosphate
41.219	0.415	3	Order, Phosphate, Plot size
42.146	0.423	4	Order, Phosphate, Plot size, Start
42.56	0.420	4	Order, Phosphate, Plot size, Temperature
42.582	0.405	3	Order, Phosphate, Start

[1] variable is log transformed

[2]Burnham, K.P. & Anderson, D.R. (1998) *Model selection and multimodel inference: a practical information-theoretic approach*. Springer.