The following supplement accompanies the article

Differential impacts of coral reef herbivores on algal succession in Kenya

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Supplement. Additional survey data for herbivore communities, as well as model results, study sites, and experimental design.

Table S1. Mean (with SE) herbivorous fish biomass (kg ha^{-1}) at each study site by fisheries management type. Fish family, species, and functional grouping are also shown. Detritivores were grouped with grazers because their influence on algae is similar (Marshell & Mumby 2012).

			Fished reefs		Community closure		Government closure	
Family	Species	Functional group	Kanamai	Ras Iwatine	Kuruwitu	Mradi	Mombasa	Malindi
Acanthuridae	*Ctenochaetus striatus*	Grazer	0 (0)	3.7 (0.1)	89.1 (8.5)	105.2 (2.6)	39.8 (4.5)	123.2 (9.8)
	Acanthurus nigrofuscus	Grazer	0 (0)	0.9 (0.9)	0 (0)	67.7 (4.1)	38.8 (38.8)	56.1 (22.8)
	Zebrasoma scopas	Grazer	0 (0)	0 (0)	0 (0)	1.5 (1.5)	56.4 (21.1)	26.9 (17.4)
	Naso annulatus	Browser	0 (0)	0 (0)	0 (0)	2.5 (2.5)	3.5 (3.5)	22.5 (10.2)
	Acanthurus triostegus	Grazer	0.9 (0.9)	0 (0)	57.3 (2.1)	0 (0)	0 (0)	0 (0)
	Zebrasoma veliferum	Grazer	0 (0)	0 (0)	0 (0)	0 (0)	5.5 (5.5)	0 (0)
	Acanthurus leucosternon	Grazer	0 (0)	0 (0)	0 (0)	7.1 (7.1)	9.1 (2)	55.3 (15.9)
	Ctenochaetus strigosus	Grazer	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	0 (0)
	Acanthurus nigricauda	Grazer	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7.3 (2.6)
	Acanthurus dussumieri	Grazer	0 (0)	0 (0)	0 (0)	0 (0)	5.5 (5.5)	9.7 (0.2)
	Naso lituratus	Browser	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15.8 (2.8)
	Naso unicornis	Browser	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10.5 (6.8)
Labridae	*Chlorurus sordidus*	Scraper	0 (0)	0 (0)	13.5 (13.5)	2.1 (2.1)	95.1 (25.5)	29.7 (2.6)
	Scarus ghobban	Scraper	0 (0)	3.5 (2.1)	0 (0)	0 (0)	0 (0)	29.2 (11.2)
	Calotomus carolinus	Browser	0 (0)	0 (0)	0 (0)	5.6 (1.4)	92.2 (46.9)	46.4 (10.2)
	Scarus frenatus	Scraper	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (9)
	Scarus psittacus	Scraper	0 (0)	2.8 (2.8)	0 (0)	0 (0)	0 (0)	12.6 (3.6)
	Scarus niger	Scraper	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16.6 (7.6)
	Scarus rubroviolaceus	Scraper	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22.1 (14)
	Hipposcarus harid	Scraper	0 (0)	0 (0)	0 (0)	0 (0)	15.1 (15.1)	0 (0)
	Leptoscarus vaigiensis	Browser	0 (0)	0 (0)	7.8 (0.8)	3.5 (3.5)	24.9 (9.9)	26.1 (10)
	Juvenile sp (< 10cm)	Scraper	3.7 (3.3)	0.2 (0.1)	1.4 (1)	1.6 (0.5)	2 (0.9)	0.8 (0.5)
Pomacanthidae	*Centropyge multispinis*	Grazer	0 (0)	0 (0)	0 (0)	4.9 (1.4)	6.3 (3.2)	7.4 (1.9)
Siganidae	*Siganus sutor*	Browser	0 (0)	1.8 (1.8)	8.7 (5)	2.8 (0.9)	0 (0)	24 (24)
	Siganus argenteus	Browser	0 (0)	0 (0)	0 (0)	0 (0)	61.2 (26.9)	15 (15)
Ephippidae	*Platax teira*	Browser	0 (0)	0 (0)	0 (0)	2.1 (2.1)	1.1 (1.1)	0 (0)
Kyphosidae	Kyphosus vaigiensis	Browser	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9.7 (3.4)
Total			4.6 (4.2)	12.9 (5.8)	177.7 (24.7)	208.6 (2)	456.6 (44.7)	578.9 (23.6)

Table S2. Results from ANOVAs used to evaluate the effect of fisheries management type (fished reefs, community closure, government closure) on the existing abundance of major substratum groups and macroalgae genera. *p < 0.05.

Major substratum	*F*-value	p-value
Hard coral	1.64	0.247
Algal turf	7.55	*
Macroalgae	1.51	0.272
CCA	6.22	*

Macroalgal genus	*F*-value	p-value
Cystoseira	2.90	0.107
Dictyota	1.85	0.212
Hypnea	1.62	0.248
Padina	2.53	0.135
Sargassum	1.23	0.337
Turbinaria	4.90	*

Table S3. Results from 2-way ANOVAs used to evaluate the effects of fisheries management type (fished reefs, community closures, government closures) and treatment (cage, fence, open) on algal percentage cover at the dead-coral plates using algal percentage cover data on experimental substrata. Data used in the models were from the first (day 0) and last sampling events (~day 390). ***p < 0.001, **p < 0.01, *p < 0.05

Algal turf	df	F-value	p-value
(Intercept)	1	1029.02	***
Management	2	14.11	***
Treatment	2	27.20	***
Management x Treatment	4	9.51	***

Upright macroalgae	df	F-value	p-value
(Intercept)	1	413.67	***
Management	2	26.70	***
Treatment	2	39.15	***
Management x Treatment	4	12.54	***

CCA	df	F-value	p-value
(Intercept)	1	23.21	***
Management	2	11.72	***
Treatment	2	5.22	**
Management x Treatment	4	2.57	*

Hypnea	df	F-value	p-value
(Intercept)	1	15.69	***
Management	2	4.88	**
Treatment	2	0.21	0.810
Management x Treatment	4	1.79	0.142

Dictyota	df	F-value	p-value
(Intercept)	1	40.11	***
Management	2	11.43	***
Treatment	2	8.84	***
Management x Treatment	4	6.18	***

Padina	df	F-value	p-value
(Intercept)	1	42.65	***
Management	2	8.17	**
Treatment	2	3.19	*
Management x Treatment	4	0.58	0.681

Sargassum	df	F-value	p-value
(Intercept)	1	120.13	***
Management	2	4.22	**
Treatment	2	14.69	***
Management x Treatment	4	6.06	***

Turbinaria	df	F-value	p-value
(Intercept)	1	6.67	*
Management	2	0.95	0.392
Treatment	2	1.68	0.195
Management x Treatment	4	0.84	0.504

Cystoseira	df	F-value	p-value
(Intercept)	1	20.56	***
Management	2	1.50	0.230
Treatment	2	4.30	*
Management x Treatment	4	3.78	**

Table S4. Pairwise comparisons between treatments (cage, fence, open) by fisheries management type (fished reefs, community closures, government closures) of total upright macroalgae (% cover) on experimental substrata. Data are from the final sampling event (~390 days since deployment). ***p < 0.001, **p < 0.01, *p < 0.05

Fished reefs	Estimate	Z-value	p-value
Fence vs. Cage	-2.81	-0.45	0.894
Open vs. Cage	-54.35	-8.74	***
Open vs. Fence	-51.54	-8.28	***

Community closure	Estimate	Z-value	p-value
Fence vs. Cage	-11.18	-1.35	0.370
Open vs. Cage	-10.68	-1.28	0.404
Open vs. Fence	0.51	0.06	0.998

Government closure	Estimate	Z-value	p-value
Fence vs. Cage	-53.35	-14.40	***
Open vs. Cage	-53.59	-15.39	***
Open vs. Fence	-0.24	-0.07	0.997

Table S5. Pairwise comparisons between fisheries management types (fished reefs, community closures, government closures) by herbivorous fish functional group (scrapers, browsers, grazers) of mass standardized bite impact (kg × bites h^{-1}) on experimental substrata using stationary underwater video. Data were log-transformed to satisfy the assumptions of homogeneity of variances and normality of residuals. *p < 0.05, **p < 0.01, ***p < 0.001

Scraper	Estimate	Z-value	p-value
Fished vs. Government	-2.90	-16.92	***
Community vs. Government	-2.49	-16.60	***
Community vs. Fished	0.41	2.37	*

Browser	Estimate	Z-value	p-value
Fished vs. Government	-2.56	-1.79	0.173
Community vs. Government	-2.40	-1.73	0.194
Community vs. Fished	0.16	0.11	0.993

Grazer	Estimate	Z-value	p-value
Fished vs. Government	-2.53	-11.46	***
Community vs. Government	-1.17	-5.71	***
Community vs. Fished	1.36	5.91	***

Fig S1. Schematic of experimental design with replicate numbers

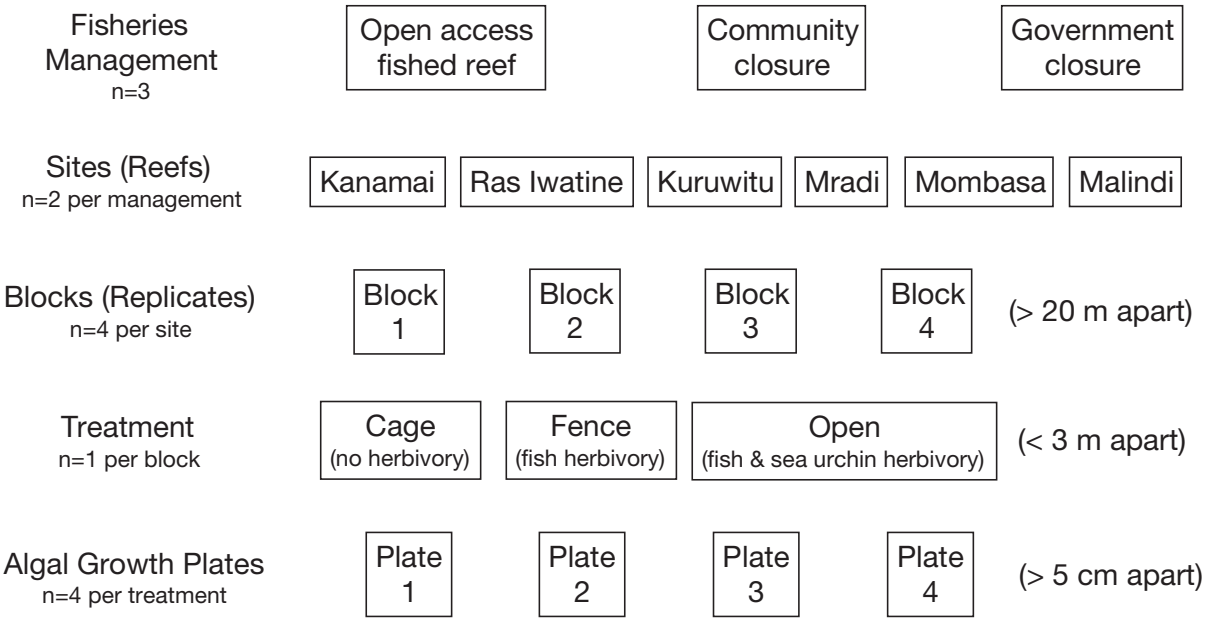

Fig. S2. Non-metric multidimensional scaling (MDS) describing the similarity of the algal communities by treatment (cage, fence, open). Data are for (a) ~180 days and (b) ~390 days since deployment. Different shapes represent different fisheries management (fished reefs, community closures, government closures). Associated R^2 and p-values from PERMANOVAs are displayed in the upper corner of each plot. Points that are closer together in ordination space are more similar in terms of algal community and individual algae are overlaid to visualize dominant assemblages. Stress for all plots was < 0.16.

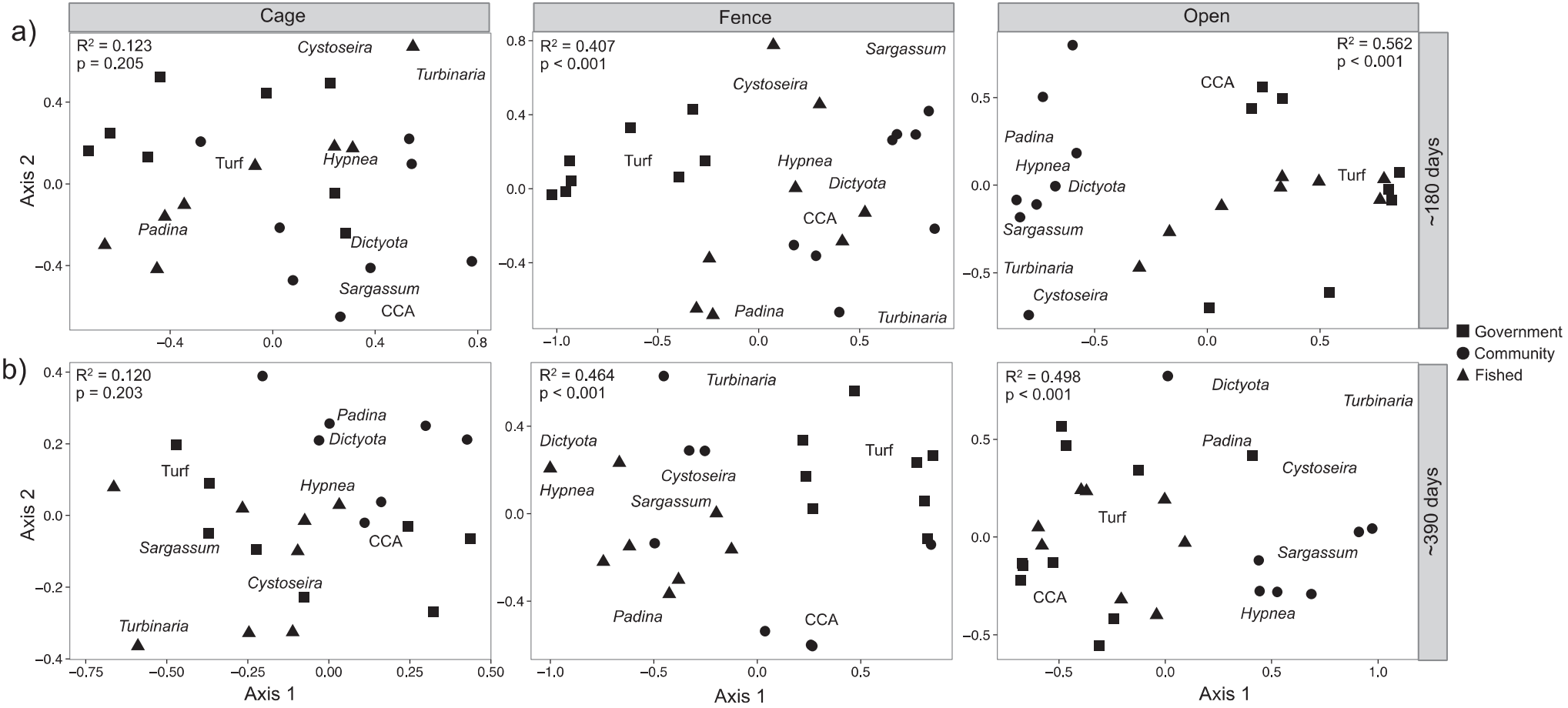

Fig. S3. Mass standardized bite impact (kg × bites h^{-1}; mean + SE) by size class (total length; cm; estimated to the nearest 5 cm) of herbivorous fishes (scraper, browser, grazer) by fisheries management type (fished reefs, community closures, government closures) on experimental substrata using stationary underwater video (n = ~160 h per management type)