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Supplement of

Seagrass community-level controls over organic carbon storage are constrained by geophysical attributes within meadows of Zanzibar, Tanzania

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Supplementary Information

To confirm the spatial independence and meet the assumptions for our analysis, variogram plots of model residuals were created using the *gstat* package (Zuur et al., 2009). For all analysis (organic carbon and plant traits) there were no clear patterns in model residuals with distance, confirming that the assumption of spatial independence was met.

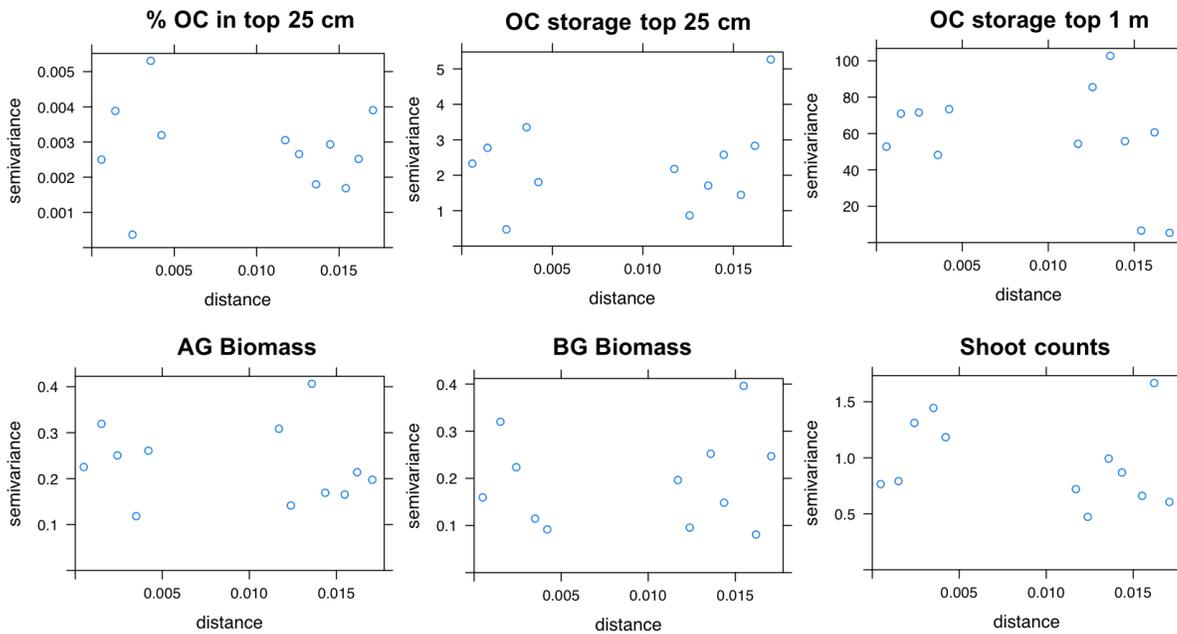


Fig. S1. Variogram plots of residuals for models based on ANOVA/glm with community as the explanatory variable. Distance is great-circle distance in km and semivariance is a measure of spatial correlation between points at different distances. For simplicity, we show plots from global models, directional variograms were also plotted and checked but did not show patterns either.

To qualitatively assess local sediment characteristics of the 5 seagrass communities, high-resolution images were taken of a representative sample of surface sediments (top 2-3 cm) from each community (Supplementary Figure 1) and qualitatively compared based on appearance and texture (Folk, 1954). We found no large qualitative visual differences among surface sediments beneath the different seagrass communities, and all were consistent with the sediment characterization of the region (poorly-sorted, gravelly sand).

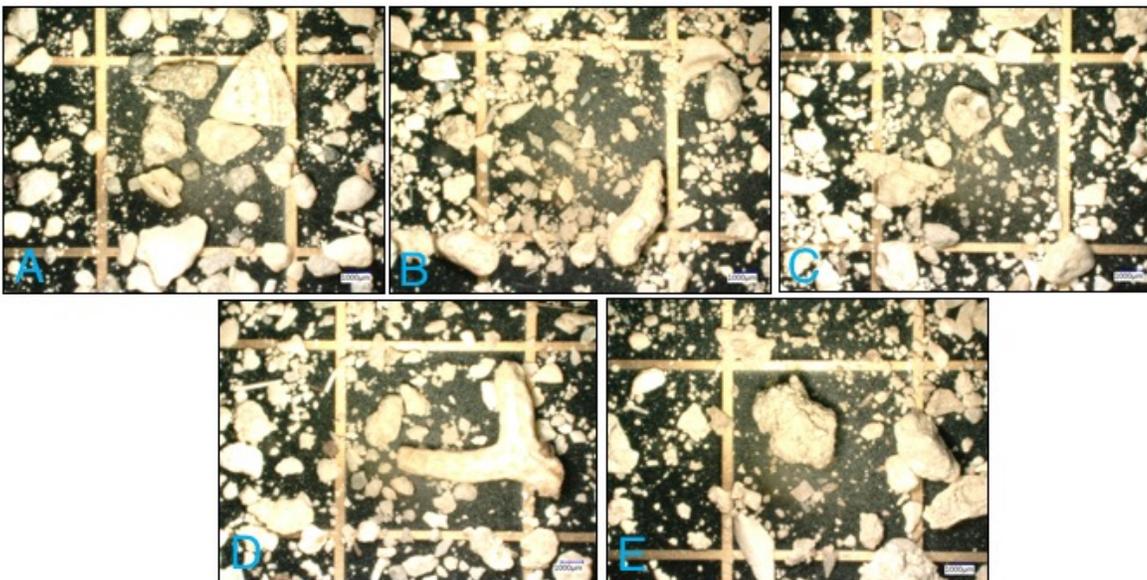


Fig. S2. Images of representative sediments from each seagrass community (A-E), laid over a 5-mm grid.

Table S1. Tukey post hoc results for above ground biomass analysis for comparisons a) among communities, b) among meadows, and c) within communities among meadow. Results reported are the difference between groups, lower and upper 95% confidence intervals, and the adjusted p -values, with statistical difference at the significance level $p \leq 0.05$.

<i>a) Comparisons among communities</i>				
Comparison	difference	lower	upper	adj. p
B-A	1.825	1.060	2.590	<0.001
C-A	-1.406	-1.984	-0.828	<0.001
D-A	-0.748	-1.364	-0.131	0.011
E-A	-0.754	-1.332	-0.176	0.005
C-B	-3.231	-3.939	-2.523	<0.001
D-B	-2.572	-3.312	-1.833	<0.001
E-B	-2.579	-3.287	-1.871	<0.001
D-C	0.658	0.114	1.203	0.011
E-C	0.652	0.151	1.153	0.005
E-D	-0.007	-0.551	0.538	1.000
<i>b) Comparisons among meadows</i>				
Comparison	difference	lower	upper	adj. p
M2-M1	-0.184	-0.572	0.204	0.486
M3-M1	0.547	0.145	0.949	0.005
M3-M2	0.731	0.356	1.107	<0.001
<i>c) Comparisons within communities among meadows</i>				
Comparison	difference	lower	upper	adj. p
A: M2-M1	-0.265	-1.680	1.150	1.000
A: M3-M1	0.699	-0.716	2.114	0.892
A: M3-M2	0.964	-0.450	2.379	0.490
B: M2-M1	-1.312	-2.894	0.270	0.200
B: M3-M1	-	-	-	-
B: M3-M2	-	-	-	-
C: M2-M1	0.225	-1.000	1.450	1.000
C: M2-M1	0.910	-0.315	2.135	0.353
C: M3-M2	0.685	-0.316	1.685	0.483
D: M2-M1	-0.675	-2.257	0.906	0.962
D: M3-M1	0.330	-1.085	1.745	1.000
D: M3-M2	1.005	-0.220	2.231	0.214
E: M2-M1	0.261	-0.739	1.262	1.000
E: M3-M1	0.749	-0.476	1.975	0.660
E: M3-M2	0.488	-0.737	1.714	0.978

Table S2. Tukey post hoc results for below ground biomass analysis for comparisons a) among communities, b) among meadows, and c) within communities among meadow. Results reported are the difference between groups, lower and upper 95% confidence intervals, and the adjusted p -values, with statistical difference at the significance level $p \leq 0.05$.

<i>a) Comparisons among communities</i>				
Comparison	difference	lower	upper	adj. p
B-A	0.979	0.312	1.646	0.001
C-A	-0.235	-0.739	0.270	0.676
D-A	0.091	-0.447	0.629	0.989
E-A	0.506	0.002	1.010	0.049
C-B	-1.213	-1.831	-0.596	<0.001
D-B	-0.888	-1.533	-0.243	0.003
E-B	-0.473	-1.091	0.145	0.206
D-C	0.326	-0.149	0.800	0.305
E-C	0.740	0.304	1.177	<0.001
E-D	0.415	-0.060	0.890	0.112
<i>b) Comparisons among meadows</i>				

Comparison	difference	lower	upper	adj. p
M2-M1	-0.328	-0.666	0.011	0.059
M3-M1	0.003	-0.347	0.353	1.000
M3-M2	0.331	0.003	0.658	0.047
<i>c) Comparisons within communities among meadows</i>				
Comparison	difference	lower	upper	adj. p
A: M2-M1	-0.564	-1.797	0.670	0.937
A: M3-M1	0.197	-1.037	1.431	1.000
A: M3-M2	0.760	-0.473	1.994	0.649
B: M2-M1	-0.214	-1.594	1.165	1.000
B: M3-M1	-	-	-	-
B: M3-M2	-	-	-	-
C: M2-M1	-0.607	-1.676	0.461	0.759
C: M2-M1	0.345	-0.724	1.414	0.997
C: M3-M2	0.852	0.080	1.825	0.081
D: M2-M1	-0.424	-1.803	0.955	0.998
D: M3-M1	-0.528	-1.761	0.706	0.962
D: M3-M2	-0.104	-1.172	0.965	1.000
E: M2-M1	0.024	-0.849	0.896	1.000
E: M3-M1	-0.249	-1.317	0.820	1.000
E: M3-M2	-0.272	-1.341	0.796	1.000

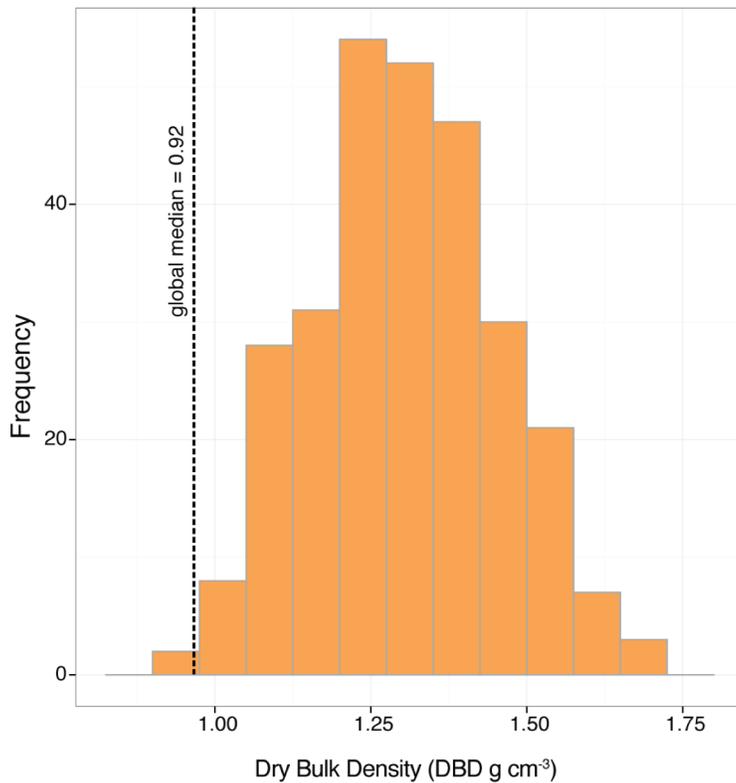


Figure S3. Frequency distribution of the dry bulk density of sediments with OC cores, with the global median reported by Fourqorean et al., 2012a for comparison.

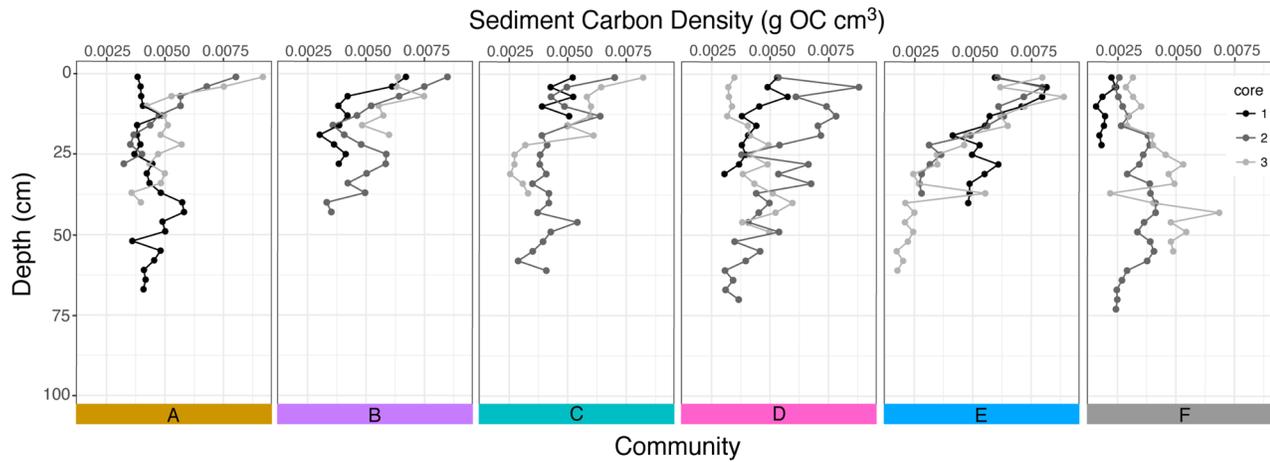


Figure S4: Sediment organic carbon density at different depths (cm) down each sediment core taken within the five seagrass communities (A-E) and bare sediment (F).

Table S3. ANOVA outputs (df=degrees of freedom, SS=sum of squares, F=F-value, and p=p-value) for explanatory models of response variables: percent OC in top 25 cm, storage of OC in the top 25 cm, and storage in the top 1 m.

Description	Response	Explanatory	df	SS	F	p
Explanatory models comparing only communities with seagrass (A-E) and the three meadows (M1, M2, M3).	% OC top 25cm ~	community	4	0.0211	1.340	0.327
		meadow	2	0.0249	3.163	0.091
		residuals	9	0.0354		
Explanatory models comparing all communities (A-F; with seagrass and bare sediment) and the three meadows (M1, M2, M3).	% OC top 25cm ~	community	5	0.1311	6.973	0.004
		meadow	2	0.0238	3.169	0.082
		residuals	11	0.0414		
Explanatory models comparing only communities with seagrass (A-E) and the three meadows (M1, M2, M3).	OC stock 25cm ~	community	4	16.87	1.425	0.302
		meadow	2	29.90	3.352	0.082
		residuals	9	26.63		
Explanatory models comparing all communities (A-F; with seagrass and bare sediment) and the three meadows (M1, M2, M3).	OC stock 25cm ~	community	5	126.94	7.963	0.002
		meadow	2	31.04	3.668	0.060
		residuals	11	35.07		
Explanatory models comparing only communities with seagrass (A-E) and the three meadows (M1, M2, M3).	OC stock 1m ~	community	4	71.00	0.196	0.934
		meadow	2	0.700	0.004	0.996
		residuals	9			
Explanatory models comparing all communities (A-F; with seagrass and bare sediment) and the three meadows (M1, M2, M3).	OC stock 1m ~	community	5	607.3	1.448	0.282
		meadow	2	13.47	0.161	0.854
		residuals	11	922.4		