The following supplement accompanies the article

Cryptic regime shift in benthic community structure on shallow reefs in St. John, US Virgin Islands

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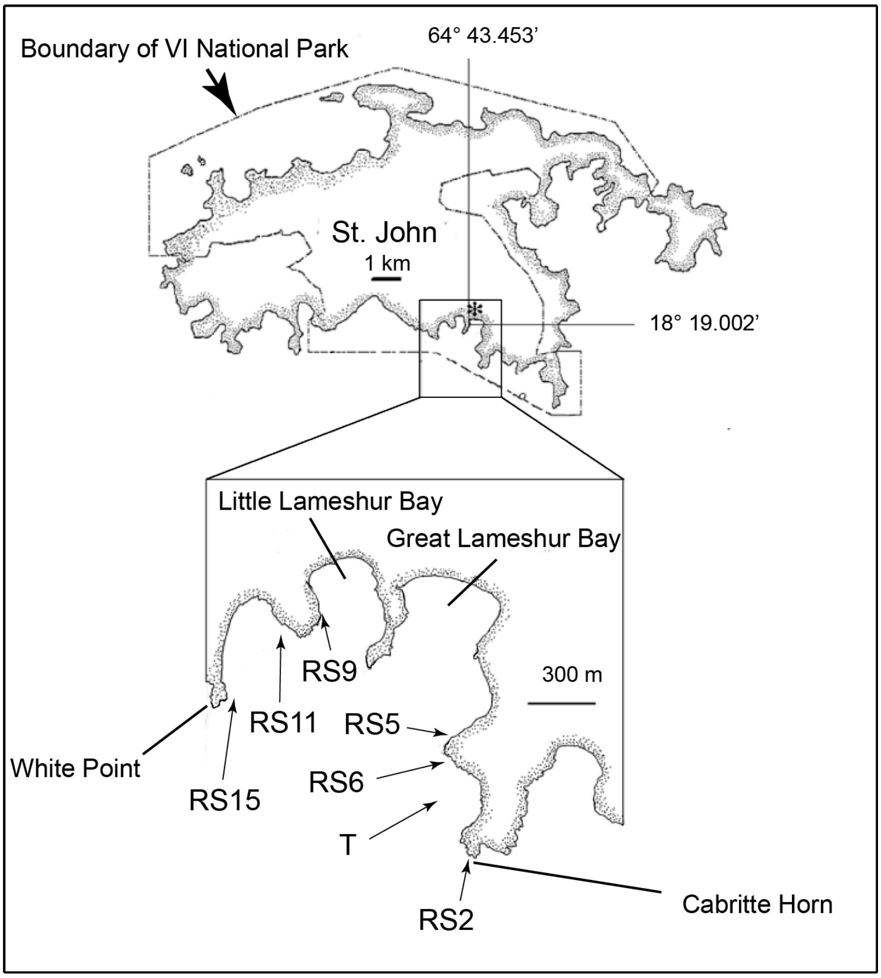

Figure S1. Map of St. John, US Virgin Islands, showing the study sites between Cabritte Horn and White Point. In 1992, six sites (random sites [RS], 2, 5, 6, 9, 11, and 15) were selected on hard bottom using randomly selected coordinates. Sites are permanently marked, and each year ~ 18 (1992-1999) or ~ 40 (2000-present) photoquadrats (0.5 × 0.5 m) have been recorded at random locations along a 20 m (prior to 2000) or 40 m (after 1999) transect at each site, with positions randomized annually. T = approximate location of the Tektite undersea laboratory that was operational in 1969 and 1970.

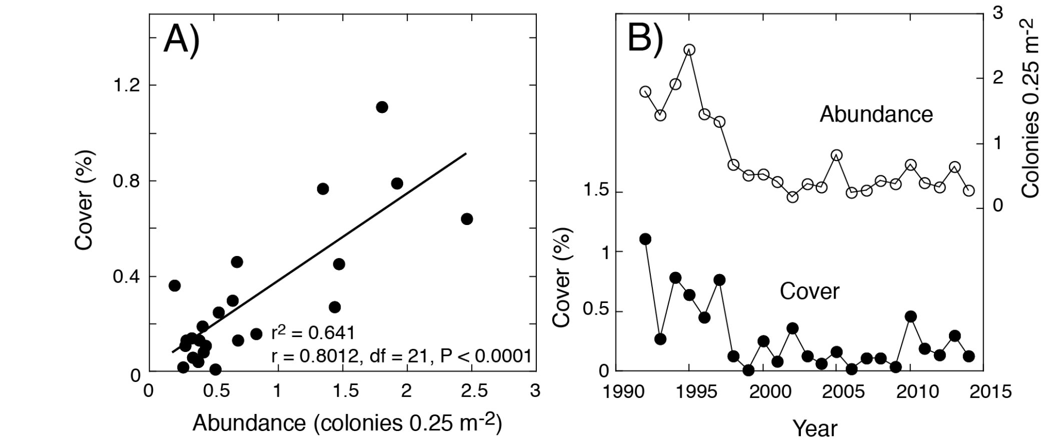

Figure S2. Abundance of *Erythropodium* measured on two scales: abundance (number of colonies in each quadrat which are 0.25 m^2), and percentage cover. The abundance scale is used throughout the analysis, but potentially the results on this scale could hide important changes affecting this taxon if, for example, abundances remained the same, but colonies became larger. The panels show that abundance and cover are strongly associated (A), and both scales show similar trends over time (B). Together, these graphs demonstrate that the abundance scale effectively evaluates the ecological impacts of *Erythropodium* on the shallow reefs of St. John where mean cover of this taxon was ≤ 1.1% between 1992 and 2014.

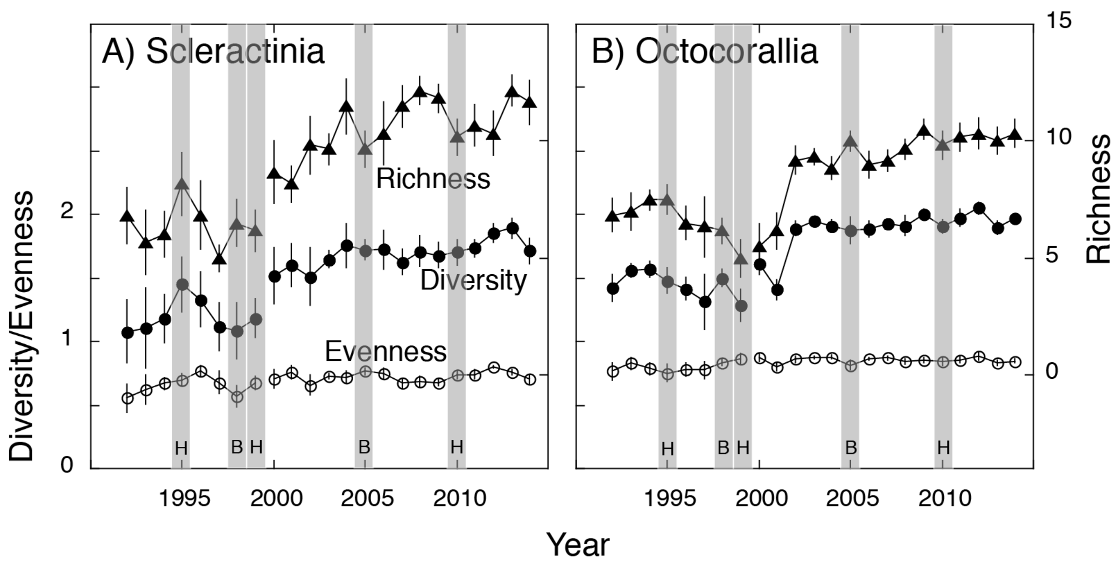

Figure S3. Community composition for scleractinians (A) and octocorals (B) between Cabritte Horn and White Point between 1992 and 2014. Values displayed are mean ± SE (n = 6 sites) for diversity (H′, left abscissa), Evenness (J′, left abscissa), and Richness (right abscissa). For scleractinians, the analysis is based on 22 taxa identified to species, 2 to genus, and 1 to functional group; for octocorals, the analysis is based on 11 taxa identified to genus, and an unknown group. Grey bars show disturbances (H = hurricane, B = bleaching); break in line plots between 1999 and 2000 reflects the change from color slide film (1992–1999, n ~ 18 photoquadrats y^{-1}) to digital images (2000-present, n ~ 40 photoquadrats y^{-1}).

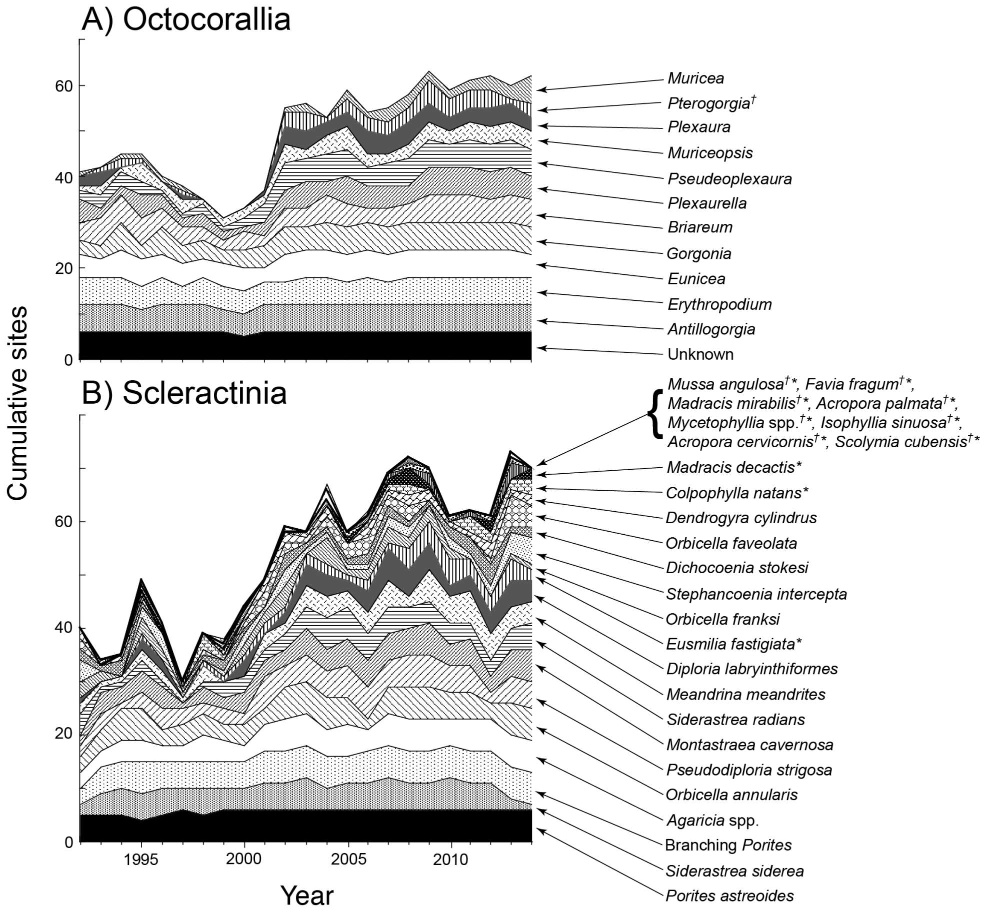

Figure S4. Stacked area graph showing occurrence of octocoral (A) and scleractinian (B) taxa among six sites between 1992 and 2014. Ordinate shows cumulative number of sites at which taxa (right) were found in annual photoquadrats. * = not found in final year of sampling (2014), † = not found in first year of sampling (1992).

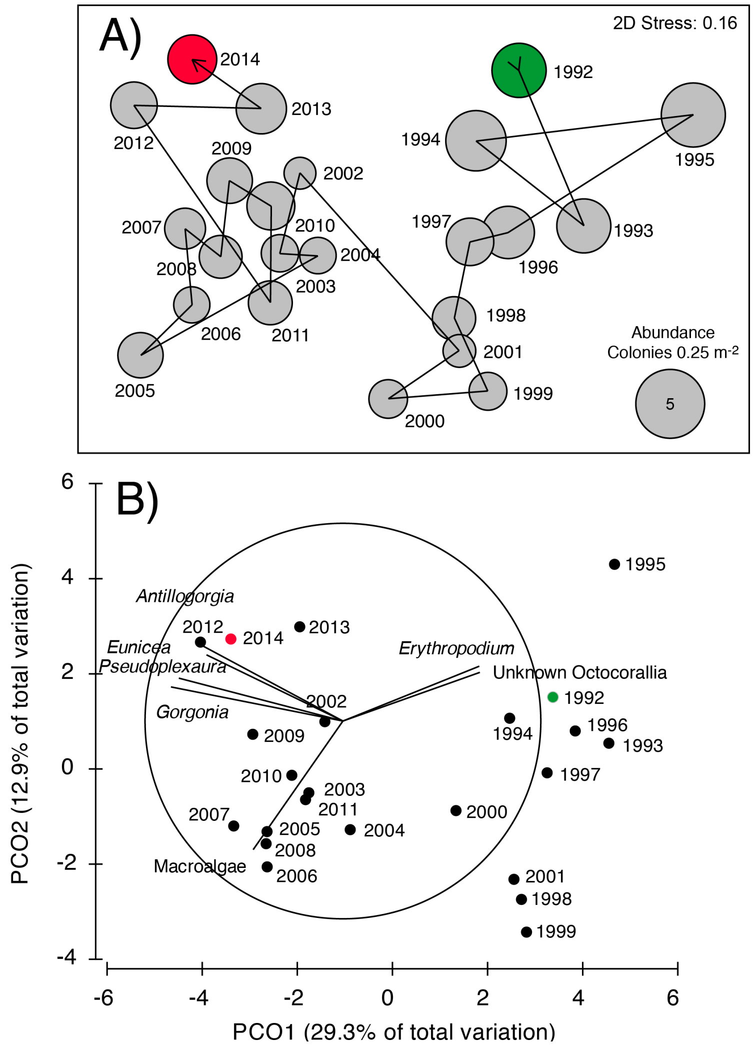

Figure S5. Multivariate community structure from 1992 (green) to 2014 (red), using annual surveys from 2000–onward that were subsampled for the first 18 photoquadrats along each transect. Subsampling was used to standardize sampling effort across the full study period. When using the percentage cover of 24 scleractinians, 12 octocorals, and the cover of macraoalgae and CTB, averaged among sites in each year, the temporal structure of the multivariate communities broadly were similar to those resolved with the full set of data (Fig. 3). The analysis for 1992-1999 used all images obtained with the 35 mm cameras, and the analyses for 2000-2014 were limited to the first 18 photoquadrats along each transect, so that sampling is equitable at all sites across the study. Data were standardized as normal deviates (z) prior to calculating resemblance matrices. A) MDS with bubbles scaled to the abundance of octocorals. B) PCoA of resemblance matrix showing years arrayed on axes of PCO1 and PCO2. Vectors display correlations between dependent variables and PCO1 and PCO2, screened to values > 0.6. Separation along PCO1 is associated mostly with increasing abundance of *Erythropodium*, and unknown octocorals (to the right) and increased abundance of *Gorgonia, Pseudoplexaura, Porites astreoides*, and *Eunicea* (to the left); separation along PCO2 is associated mostly with increased abundance of *Briareum* and *Muricea* (up).

One limitation of our study arises from adopting digital photography in 2000 and doubling the sampling effort in that year and thereafter (versus 1991–1999). As methodology varied between two periods that overlap with the separation of years differing in community structure (Fig. 3), we cannot exclude methodology (rather than biology) as the cause of the differences. However, there are reasons to conclude that methodology is not an effective explanation for this aspect of our results. First, image quality is unlikely to have affected the results, as the fine-grained 35 mm slides from 1992–1999 were professionally scanned at a resolution exceeding that of the first generation of digital cameras used in this study. The capacity to resolve taxa therefore was similar between methods. Second, the change in methodology did not result in incongruent trajectories of change in cover or abundance of benthic taxa for 1992–1999 versus 2000-2014 (Fig. 1). While changes in the trajectories of diversity and richness of scleractinians and octocorals corresponded to the change in methods, both metrics increased over time for both taxa when only the results from 2000–2014 were considered. Third, the timing of shifts in abundance of the most common taxa relative to their long-term average abundance was variable among taxa (Fig. 2), suggesting the shifts in abundances were not an artifact of the methods. Finally, the overall pattern of variation in community structure did not change when the sites were sampled with similar effort (number of quadrats) across the study period (this figure).

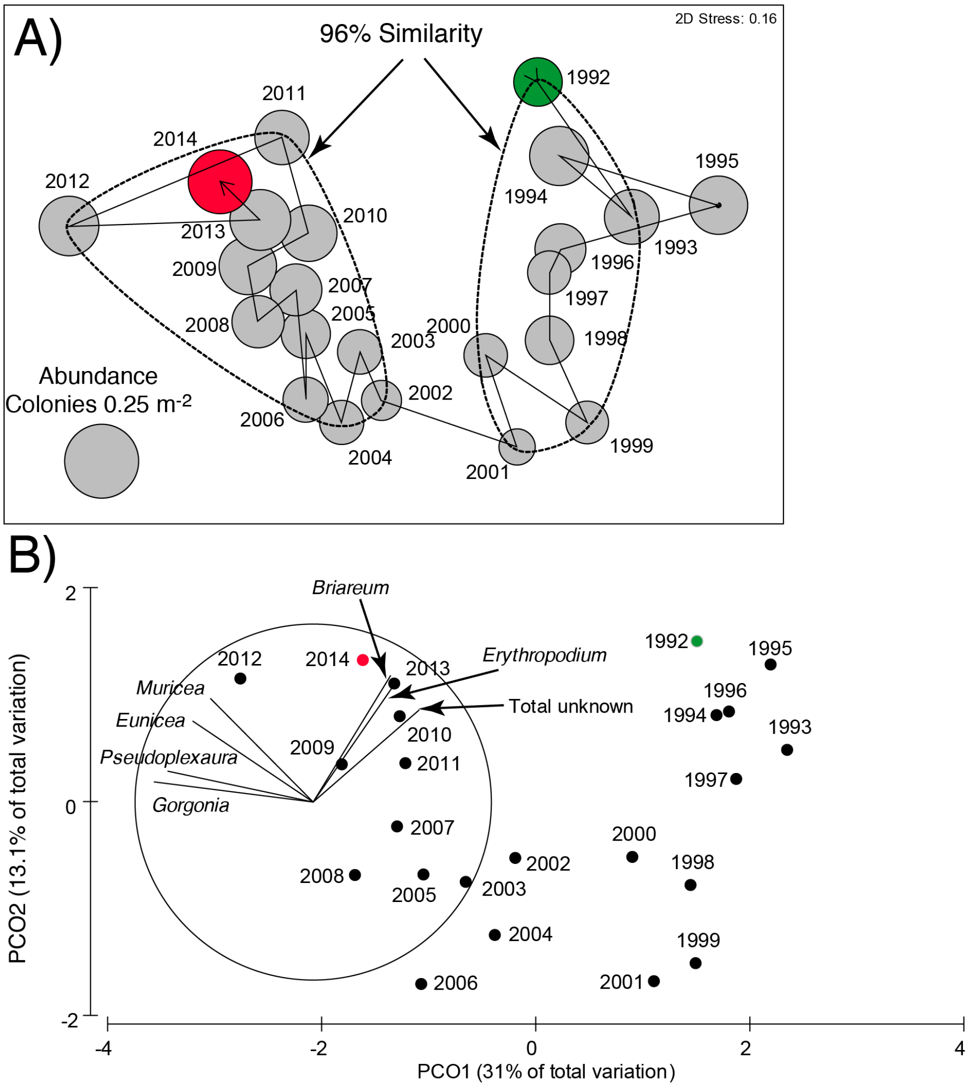

Figure S6. Multivariate community structure from 1992 (green) to 2014 (red) for Octocorallia, Scleractinia (both by lowest taxon), macroalgae, and CTB, averaged among sites. In this analysis, *Erythropodium* is measured on a percentage cover scale (cf. Fig. 3 where an abundance scale is used), but otherwise the analysis is conducted in an identical to way to that displayed in Fig. 3; the results are similar. A) MDS with bubbles scaled to the abundance of octocorals, and dashed line showing a significant ($p = 0.001$) 96% similarity contour, and B) PCoA of resemblance matrix showing years arrayed along PCO1 and PCO2; vectors display Spearman correlations between dependent variables and PCO1 and PCO2, screened to values > 0.75. Separation along PCO1 is associated mostly with increasing abundance of *Erythropodium*, and unknown octocorals (to the right) and increased abundance of *Gorgonia, Pseudoplexaura, Muricea*, and *Eunicea* (to the left); separation along PCO2 is associated mostly with increased abundance of *Briareum*, *Erythropodium,* and *Muricea* (up).

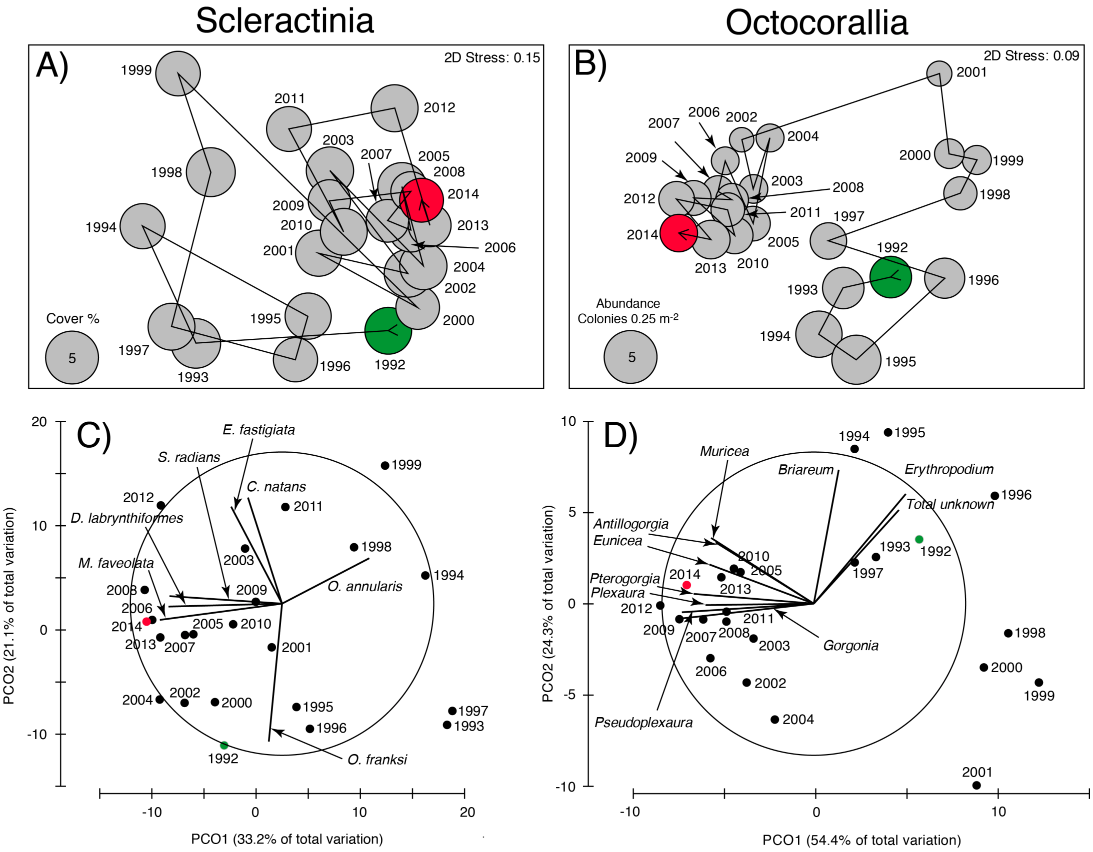

Figure S7. Multivariate community structure from 1992 (green) to 2014 (red) based on taxa of scleractinians (A, C) and taxa of octocorals (B, D). Resemblance matrices prepared from percentage cover of scleractinians and density (colonies quadrat^{-1}) of octocorals, using 4th root transformed data and Bray-Curtis similarities. (A, B) MDS showing similarities among years with bubbles scaled to cover of scleractinians, and density of octocorals, respectively; (C, D) PCoA of resemblance matrix showing years arrayed on axes of PCO1 and PCO2. Vectors display correlations between dependent variables and PCO1 and PCO2, screened to values > 0.6 for scleractinians, and ≥ 0.7 for octocorals.

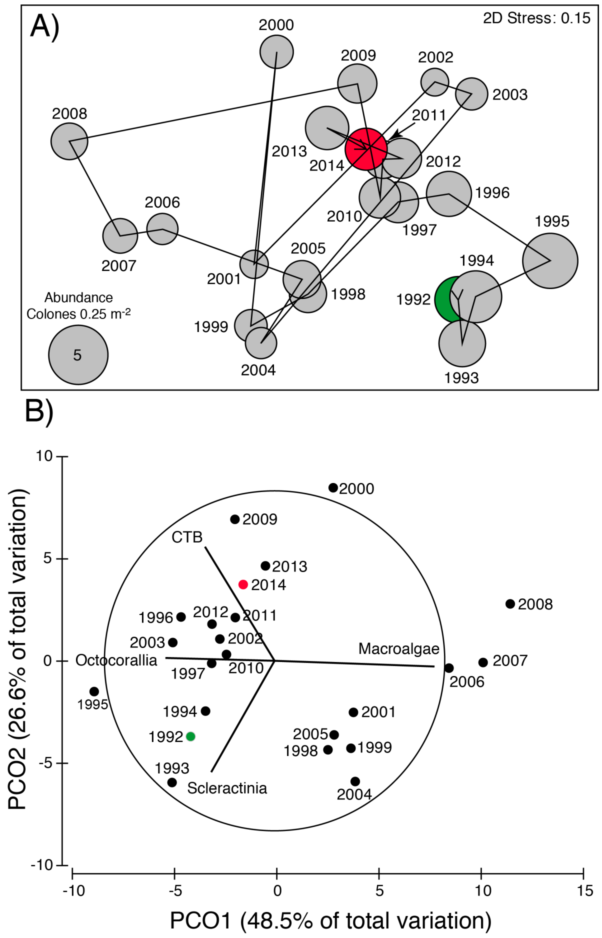

Figure S8. Multivariate community structure from 1992 (green) to 2014 (red) for functional groups that include cover of scleractinians (pooled among taxa), abundance of octocorallians (pooled among taxa), cover of macroalgae, and cover of CTB, and are averaged among sites. A) MDS with bubbles scaled to octocoral abundance, and B) PCoA of resemblance matrix showing years arrayed on axes of PCO1 and PCO2. Vectors display correlations between dependent variables and PCO1 and PCO2, scaled to a value of 1 (shown with the circle). Separation along PCO1 is mostly associated with increasing cover of macroalgae (to the right), and increased abundance of octocorals (to the left); separation along PCO2 is mostly associated with increased cover of CTB (up), and increased cover of Scleractinia (down).

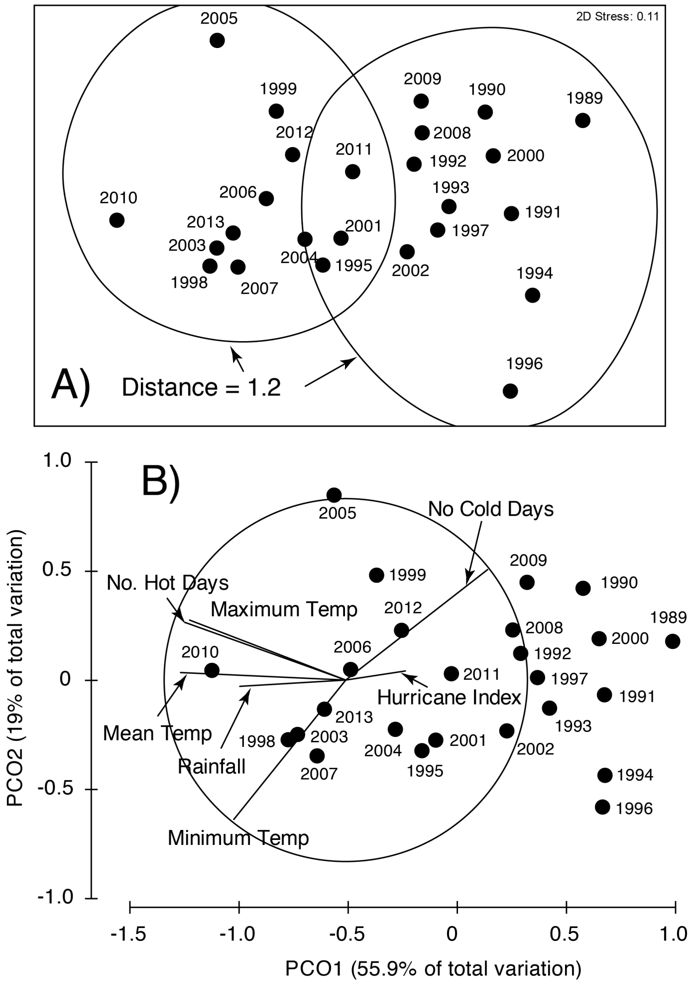

Figure S9. Multivariate physical environment based on seven dependent variables (Table S4) measuring the impact of hurricanes, seawater temperature, and rainfall. Values were converted to normal deviates (z), square-root transformed and used to create a resemblance matrix based on Euclidian Distances. A) MDS displaying years separated by a distance of 1.20, which is a significant separation (SIMPROF, $\pi = 0.1$, $P = 0.001$), and B) PCoA of resemblance matrix showing years arrayed on axes for PCO1 and PCO2; vectors display correlations between dependent variables (as normal deviates) and PCO1 and PCO2. Separation along PCO1 is associated mostly with cold days (to the right), and higher minimum, maximum, and mean temperature (to the left).

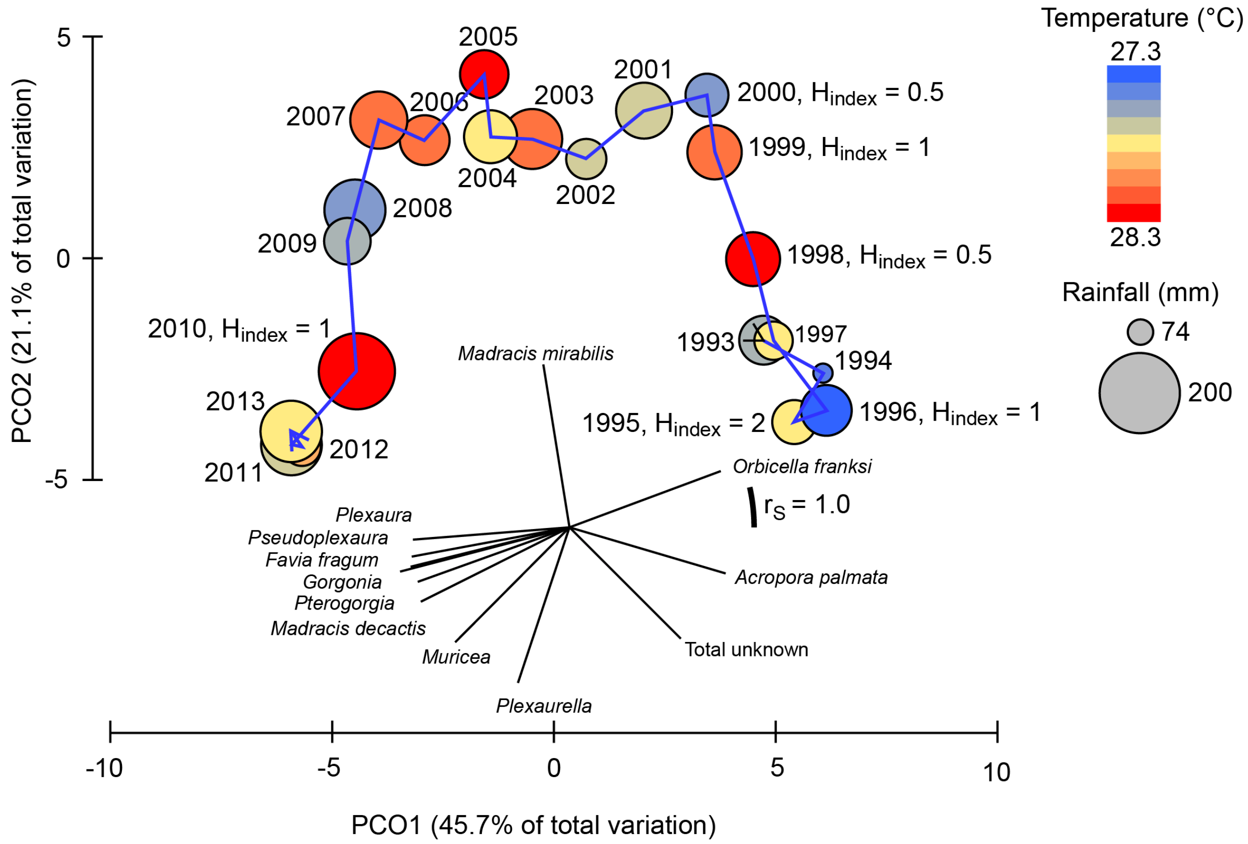

Figure S10. PCoA plot based on cover of scleractinians (by species), abundance of octocorals (by genus), cover of macroalgae, and cover of CTB, averaged by site within each year and smoothed with a 3 y centered moving average. Blue line shows sampling chronology of 1994 (right) to 2014 (left). Analysis based on normalized and square-root transformed values converted to a resemblance matrix using Bray-Curtis similarities. Bubbles correspond to years, with diameter scaled to mean annual rainfall, and color scaled to mean seawater temperature. Multivariate community structure is associated with annual rainfall, and to a lesser extent, hurricane intensity (H_{index}, shown for values > 0), and seawater temperature (Table S6). Vectors display Spearman correlations of dependent variables (in units of measure) with each PCO, screened to values > 0.85; arc shows scaling of vectors against a Spearman correlation (r_S) of 1.0.

Table S1. Summary of taxa scored in photoquadrats for scleractinians and octocorals. For scleractinians *Agaricia* spp. is represented by *A. agaricites* and *A. humilis* on the shallow reefs of St. John, but the difficulty of distinguishing these species in photographs prompted their pooling as *Agaricia* spp. Branching *Porites* spp. included *P. porites*, *P. furcata* and *P. divaricata*, whose validity as separate species has been questioned (Prada et al. 2014). For octocorals, colonies that could not be identified were placed in an "unknown" category, and while these could not be identified to genus, the distinctness of the colony form made it unlikely that they were either *Antillogorgia* or *Gorgonia*.

Scleractinia	**Octocorallia**
Orbicella annularis	*Briareum*
O. faveolata	*Erythropodium*
O. franksi	*Plexaura*
Agaricia spp	*Pseudoplexaura*
Colpophyllia natans	*Eunicea*
Dendrogyra cylindrus	*Plexaurella*
Dichocoenia stokesi	*Muricea*
Diploria labrynthiformes	*Muriceopsis*
Pseudodiploria strigosa	*Antillogorgia*
Eusmilia fastigiata	*Gorgonia*
Favia fragum	*Pterogorgia*
Madricis decactis	Unknown
M. mirabilis	
Montastraea cavernosa	
Meandrina meandrites	
Mussa angulosa	
Porites astreoides	
Stephanocoenia intercepta	
Siderastrea radians	
S siderea	
Mycetophyllia spp.,	
Isophyllia sinuosa	
Branching *Porites* spp.,	
Acropora palmata	
A cervicornis	
Scolymia cubensis	

Prada C, DeBiasse MB, Neigel JE, Yednock B, Stake JL, Forsman ZH, Baums IB, Hellberg ME (2014) Genetic species delineation among branching Caribbean *Porites* corals. Coral Reefs 33: 1019–1030 (doi:10.1007/s00338-014-1179-5)

Table S2. Results of PERMANOVA comparing multivariate community structure among times (repeated measures, Year) and sites using site means to prepare resemblance matrices using transformed values, or where measuring units differ, normalized and transformed values. Whole community is Octocorallia + Scleractinia + macroalgae + CTB; Octocorallia are by genus and unknown; and Scleractinia are by taxon. Significant time contrasts (p < 0.050) represent planned contrasts between pairs of consecutive years, site contrasts are unplanned, post hoc contrasts (p < 0.05).

Dependent variables	Factor	df	MS	Pseudo-F	p_{perm}	Significant time contrasts	Site contrasts
Whole community	Year	22	105	9.893	0.001	1998 vs 1999, 1999 vs 2000, 2001 vs 2002, 2004 vs 2005, 2005 vs 2006	All differ
	Site	5	642	60.560	0.001		All differ
Octocorallia	Year	22	1056	3.376	0.001	None	
	Site	5	3686	11.789	0.001		All differ
Scleractinia	Year	22	1950	2.323	0.001	2003 vs 2004, 2012 vs 2013	
	Site	5	15578	18.562	0.001		All differ
Octocorallia + Scleractinia	Year	22	20	2.498	0.001	1996 vs 1997	
	Site	5	131	16.556	0.001		All differ

Table S3. Tests of linear association between community structure and time for macroalgae, CTB, scleractinians (% cover), and octocorals (colonies 0.25 m^{-2}). Dependent variables are cover or abundance, Shannon Weiner index of diversity (H′), and Pielous's index of evenness (J′) as calculated for periods chosen based on the shape of the long-term trends in abundance (Fig. 1). Data were tested for autocorrelation over time with the Durbin Watson statistic (d), and where not significant, linear relationships were calculated using Model I regression; where significant, linear regressions were adjusted using the Cochrane-Orcutt model.

Taxon	Dependent variable	Time Period	d	r^2	F	df	p	Slope
Macroalgae	%	1992-2014	0.951, P < 0.05	0.012	0.243	1,20	0.627	n/a
CTB	%	1992-2014	1.826, ns	0.123	2.956	1,21	0.100	n/a
Scleractinia	All taxa - %	1992-2014	1.568, ns	0.169	4.280	1,21	0.051	n/a
	H′	1992-2014	0.975, P < 0.05	0.407	13.752	1,20	<0.001	0.031 ± 0.008 H′ y^{-1}
	J′	1992-2014	1.436, ns	0.316	9.685	1,21	0.005	0.005 ± 0.002 J′ y^{-1}
	Richness	1992-2014	1.327, ns	0.758	65.777	1,21	<0.001	0.297 ± 0.037 taxa y^{-1}
Octocorallia	All taxa - colonies 0.25 m^2	1992-2014	0.436, P < 0.05	0.003	0.066	1,20	0.800	n/a
	All taxa - colonies 0.25 m^2	1992-2002	1.094, ns	0.742	25.833	1,9	0.001	-0.29 ± 0.06 colonies 0.25 m^2 y^{-1}
	All taxa - colonies 0.25 m^2	2002-2014	2.751, ns	0.772	37.147	1,11	<0.001	0.11 ± < 0.02 colonies 0.25 m^2 y^{-1}
	H′	1992-2014	1.275, P < 0.05	0.485	18.843	1,20	<0.001	0.031 ± 0.007 H′ y^{-1}
	J′	1992-2014	1.559, ns	0.371	12.387	1,21	0.002	0.004 ± 0.001 J′ y^{-1}
	Richness	1992-2014	0.679, P < 0.05	0.326	9.627	1,20	0.006	0.238 ± 0.077 taxa y^{-1}

Table S4. Summary of physical environmental conditions recorded in St. John from 1992–2014. H_{index} = index of hurricane intensity on the south shore for the year in which the storm(s) occurred; as hurricanes occurred after annual sampling each year, biological data were paired with H_{index} values for the previous year. Seawater temperature was recorded at 9–14 m depth at 10–15 minute intervals and averaged by day for each year, with these values used to calculate the annual mean, minimum, and maximum temperatures, as well as the number of hot days (> 29.3°C) and number of cold days (≤ 26.0°C) (see Edmunds 2014). AMO = detrended Atlantic Multidecadal Oscillation for the internal component of the north Atlantic SST (data courtesy of B. Steinman as used in Steinman et al. [2015]). nd = no data.

Year	H_{index}	Rain (cm)	Mean Temp (°C)	Min. Temp (°C)	Max. Temp (°C)	No. hot days	No. cold days	AMO
1989	1	118	27.2	24.9	29.0	0	94	-0.053531499
1990	0	106	27.4	24.9	29.7	23	77	-0.009722828
1991	0	86	27.3	25.4	29.3	1	72	-0.160180697
1992	0	123	27.5	25.3	29.6	10	65	-0.245763155
1993	0	112	27.6	25.4	29.2	0	54	-0.215166137
1994	0	68	27.4	25.6	29.0	0	39	-0.189967972
1995	2	102	27.8	25.8	29.7	17	9	0.190206996
1996	1	116	27.3	25.5	28.9	0	21	-0.014297305
1997	0	92	27.8	25.3	29.5	9	55	0.114983449
1998	0.5	123	28.2	26.3	29.8	70	0	0.408112938
1999	1	124	28.0	25.2	30.3	70	41	0.18491302
2000	0.5	100	27.5	25.1	29.5	7	78	0.080447811
2001	0	128	27.7	25.8	29.6	18	18	0.193460314
2002	0	95	27.7	25.6	29.4	5	36	0.099595941
2003	0	138	28.0	26.2	29.9	67	0	0.260418937
2004	0	121	27.8	25.7	29.7	35	5	0.250472407
2005	0	111	28.2	25.0	30.6	112	49	0.374732685
2006	0	114	28.0	25.6	30.1	52	10	0.370238582
2007	0	131	28.0	26.2	29.9	40	0	0.221204961
2008	0	141	27.5	25.3	29.6	20	83	0.260092426
2009	0	107	27.6	24.9	29.6	32	62	0.098028524
2010	1	186	28.3	26.0	30.3	81	1	0.455904084
2011	0	140	27.7	25.5	29.7	26	38	0.205845641
2012	0	91	27.9	25.5	30.2	53	34	0.331337412
2013	0	142	27.8	26.0	30.2	42	4	nd
2014	0	127	27.9	26.2	29.8	51	0	nd

Table S5. Tests of linear association between physical environmental conditions (Table S1) and time. Data were tested for autocorrelation over time with the Durbin Watson statistic (d), and where significant Model I linear regressions were adjusted using the Cochrane-Orcutt model. *F* = variance ratio, df = degrees of freedom, and *p* = probability. Slopes (± SE) shown for significant regressions.

Dependent variable	d	r^2	*F*	df	*p*	Slope
H_{index}	1.769, P < 0.05	0.026	0.624	1,23	0.438	n/a
Rain (cm)	2.280, P < 0.05	0.379	14.044	1,23	0.001	1.6 ± 0.4 cm y^{-1}
Mean temp (°C)	2.030, P < 0.05	0.233	6.983	1,23	0.015	0.02 ± 0.01 °C y^{-1}
Min. temp (°C)	2.046, P < 0.05	0.114	2.955	1,23	0.099	n/a
Max. temp (°C)	1.857, P < 0.05	0.368	13.413	1,23	0.001	0.03 ± 0.01 °C y^{-1}
No. hot days	1.971, P < 0.05	0.242	7.348	1,23	0.012	2.0 ± 0.8 d y^{-1}
No. cold days	2.024, P < 0.05	0.140	3.753	1,23	0.065	n/a

Table S6. Multivariate tests of association between community structure and environmental conditions (Table S1). Analyses were conducted either using biological and environmental conditions in the year of measurement ("Same Year", n = 23 y), or with both sets of values smoothed with a 3 y, centered-moving average ("3 y smoothing", *n* = 21 y) to attenuate stochastic variation. First, the BEST procedure was used to test for association between resemblances among years for biological data (using Bray-Curtis similarities) and environmental conditions (using Euclidian distances) based on 999 permutations to determine the rank correlations (ρ) and its probability of occurrence (p_{perm}). Where BEST identified significant associations, the DISTLM procedure was used to fit linear models of environmental conditions to the biological data, with the best model identified by AIC_c. Where BEST identified significant associations, only the association with the best explanatory capacity (as determined by AIC_c) is listed together with the proportion of the variance explained (R^2), and the contribution of each environmental condition to this variance. Analyses are completed for five measures of community assemblage: (A) overall community structure (density of octocorals [summed among taxa], cover of scleractinians [summed among taxa], macroalgae, and CTB), (B) overall community, octocorals by genus, scleractinians mostly by species, macroalgae, and CTB, (C) Octocorallia (by genus), (D) Scleractinia (mostly by species), and (E) Octocorallia and Scleractinia (by genus or mostly species, respectively). Environmental conditions were reduced to four dependent variables ("Var") based on strong collinearity among some variables (Table S4): 1 = hurricane index, 2 = rainfall (cm), 3 = mean temperature (°C), and 4 = number of cold days (≤ 26.0°C).

	Same Year			3 y smoothing					
	BEST			BEST			DISTLM		
Assemblage Type	Var	ρ	p_{perm}	Var	ρ	p_{perm}	AIC_c	R^2	Contribution to R^2
A) Overall community (functional group)	4	0.069	0.614	2	0.258	0.033	84.1	0.20	2 = 0.20
				2, 3	0.267	0.025	84.5	0.28	2 = 0.19, 3 = 0.09
B) Overall community (genus and species)	1	0.015	0.869	all	0.299	0.017	72.1	0.61	2 = 0.33, 1 = 0.12, 3 = 0.09, 4 = 0.08
C) Octocorallia (genus)	1	0.041	0.755	1, 2	0.363	< 0.001	73.2	0.49	2 = 0.37, 1 = 0.15
D) Scleractinia (species)	1, 2, 3	0.089	0.601	all	0.291	< 0.001	72.1	0.60	2 = 0.31, 1 = 0.12, 4 = 0.09, 3 = 0.08
E) Octocorallia (genus) + Scleractinia (species)	1, 2	0.038	0.778	1, 2	0.350	< 0.001	72.3	0.46	2 = 0.34, 1 = 0.12

Table S7. Multivariate tests of association between community structure and physical conditions (Table S5) using the BEST procedure in Primer. Results shown for 999 permutational tests of rank correlations (ρ) for individual environmental conditions evaluated as a resemblance matrix prepared from Euclidian distance with five measures of community assemblage: (A) overall community structure (density of octocorals [summed among taxa], cover of scleractinians [summed among taxa], macroalgae, and CTB), (B) overall community, octocorals by genus, scleractinians mostly by species, macroalgae, and CTB, (C) Octocorallia (by genus), (D) Scleractinia (mostly by species), and (E) Octocorallia and Scleractinia (by genus or mostly species, respectively). Environmental conditions were reduced to four dependent variables based on strong collinearity among some variables (Table S4): 1 = hurricane index, 2 = rainfall (cm), 3 = mean temperature (°C), and 4 = number of cold days (≤ 26.0°C). All combinations of variable were tested and only the highest correlation is shown for each analysis.

A) Associations between biological data in year of measure and physical conditions lagged either 1 year or 2 years.

	Lag 1			Lag 2		
Assemblage Type	Variables	ρ	p_{perm}	Variables	ρ	p_{perm}
A) Overall community (functional group)	3	0.205	0.102	1	0.128	0.303
B) Overall community (genus and species)	2, 3	0.226	0.050	3	0.158	0.170
C) Octocorallia (genus)	2, 3	0.151	0.241	3	0.135	0.279
D) Scleractinia (species)	2, 3	0.215	0.082	3	0.152	0.237
E) Octocorallia (genus) + Scleractina (species)	2, 3	0.236	0.046	3	0.161	0.188

B) Associations between biological data and physical conditions smoothed over 3 y centered on the year of measurement (3 y center smoothed) (the full BEST procedure results prior to distinction among linear models by DISTLM [see Table S6]).

	3 y center smoothed		
Assemblage Type	Variables	ρ	p_{perm}
A) Overall community (functional group)	2, 3	0.267	0.029
	3	0.264	0.029
	2	0.258	0.031
B) Overall community (genus and species)	2, 3	0.503	< 0.001
	2; 1-3; 1, 2; all; 1, 3; 1, 2, 4; 1; 1, 3, 4; 1, 4; 3	≥ 0.209	< 0.050
C) Octocorallia (genus)	2, 3	0.476	< 0.001
	2; 1-3; 1, 2; all; 1, 2, 4; 1, 3; 1; 1, 3, 4; 1,4	≥ 0.287	< 0.050
D) Scleractinia (species)	2, 3	0.309	< 0.001
	2; 1-3; 1, 2; all; 1, 2, 4; 1, 3; 1, 4; 1, 3, 4; 1	≥ 0.246	< 0.050
E) Octocorallia (genus) + Scleractinia (species)	2, 3	0.498	< 0.001
	2; 1-3; 1, 2; all; 1, 2, 4; 1, 3; 1; 1, 3, 4; 1, 4	≥ 0.276	< 0.050

C) Associations between biological variables in year of measure with physical data smoothed over 3 years centered around the observation year (3 y center smoothed) or smoothed over the current and preceding 2 years (3 y lag smoothed).

	3 y center smoothed			3 y lag smoothed		
Assemblage Type	Variables	ρ	p_{perm}	Variables	ρ	p_{perm}
A) Overall community (functional group)	3	0.233	0.049	3	0.174	0.179
B) Overall community (genus and species)	2, 3	0.466	0.001	2, 3	0.504	0.001
C) Octocorallia (genus)	2, 3	0.492	0.001	2, 3	0.381	0.004
D) Scleractinia (species)	2, 3	0.309	0.012	2, 3	0.504	0.001
E) Octocorallia (genus) + Scleractinia (species)	2, 3	0.488	0.001	2, 3	0.520	0.001

D) Associations between biological smoothed and physical data smoothed in the current and preceding 2 years (3 y lag smoothed).

	3 y lag smoothed		
Assemblage Type	Variables	ρ	p_{perm}
A) Overall community (functional group)	2, 3	0.267	0.027
B) Overall community (genus and species)	2, 3	0.503	0.001
C) Octocorallia (genus)	2, 3	0.476	0.001
D) Scleractinia (species)	2, 3	0.456	0.002
E) Octocorallia (genus) + Scleractinia (species)	2, 3	0.498	0.001

E) Associations between biological smoothed over 3 y centered on the year of measurement (3 y center smoothed) and physical data smoothed in the current and preceding 2 years (3 y lag smoothed).

	3 y lag smoothed		
Assemblage Type	Variables	ρ	p_{perm}
A) Overall community (functional group)	3	0.370	0.002
B) Overall community (genus and species)	2, 3	0.660	0.001
C) Octocorallia (genus)	2, 3	0.542	0.001
D) Scleractinia (species)	2, 3	0.657	0.001
E) Octocorallia (genus) + Scleractinia (species)	2, 3	0.653	0.001