Dataset: Octocorals surveys 1987–2013 (St. John LTREB project, VI Octocorals project).

Project(s): LTREB Long-term coral reef community dynamics in St. John, USVI: 1987-2019 (St. John LTREB)
Ecology and functional biology of octocoral communities (VI Octocorals)

Abstract: Photoquadrats recorded from 1987 – 2013 in Lameshur Bay, St. John, USVI, were used to quantify octocoral abundance with generic resolution. Data are reported as individual counts. For a complete list of measurements, refer to the supplemental document 'Field_names.pdf', and a full dataset description is included in the supplemental file 'Dataset_description.pdf'. The most current version of this dataset is available at: http://www.bco-dmo.org/dataset/664241

Description: Surveys of octocorals from 1987-2013

Surveys of octocorals from 1987-2013

Acquisition Description: **Based on Tsounis and Edmunds (In press), Ecosphere:**

Analyses are based on ~ 1,600 photoquadrats recorded annually since 1987. Photoquadrats were recorded with a Nikonos V camera fitted with Kodachrome 64 slide film from 1987-1999, but from 2000, digital cameras were used (2000-2006: Nikon Coolpix 990, 3.3 megapixels; 2007: Nikon D70, 6.1 megapixels; 2011, Nikon D90, 12.3 megapixels; and 2012-2013, Nikon D7000, 16.2 megapixels). Cameras were fitted with a strobe (Nikonos SB105) and mounted on a quadrapod holding them perpendicular to the substratum (Edmunds 2002, 2013). The camera framer remained identical throughout the study and together with the cameras, resolved objects greater than or equal to 10-mm diameter in a 1 × 1 m framer. At each site, photoquadrats were recorded at ~ 10 contiguous locations along each of three transects that are parallel to one another at constant depth (+/- 2 meters), and 5-m apart (30 images y-1 at each site). The same transects were resampled every year. Sampling occurred in December 1987, March 1988, July 1988, December 1988, April 1989, October 1989, March 1991, May 1992, June 1993, August 1994, May 1995 to 1997, and July or August thereafter. Images are archived online (http://mcr.lternet.edu/vinp/overview/).

Images were analyzed for percentage cover of benthic organisms using CPCe version 3.6 software (Kohler and Gill 2006), or for abundance of octocoral colonies (number of colonies). First, percentage cover was determined using 200 dots randomly scattered on each image and scored by their occurrence on scleractinians, macroalgae (algae greater than or equal to 1 cm high, consisting mostly of *Halimeda, Lobophora, Padina,* and *Dictyota*), and CTB. Scleractinians were scored as a single functional group as the fauna was dominated by *O. annularis* (85 % at Yawzi; 58 % at Tektite, 1987), and resolution in the 1 x 1 m photoquadrats made it difficult to resolve small colonies such as those

of Agaricia and juvenile *Porites spp*. Second, colony abundance of octocorals (individuals m-2) was quantified with annual resolution, and colonies were counted when their holdfasts were visible in the photoquadrats (Lenz et al. 2015). *Erythropodium spp.* and encrusting *Briareum spp*. were represented at low cover and abundance, and were quantified based on the number of discrete areas of colonies. Numerical abundance of octocorals was used at annual resolution. Cover data with 5-year resolution were included for comparison with other studies.

Octocorals are challenging to resolve to species underwater, because identification typically requires analysis of sclerites (Bayer 1961) in voucher specimens, the collection of which is restricted in the Virgin Islands National Park. Identification is even more challenging in photoquadrats where lighting and resolution can be limiting, and therefore our analysis focused on the 11 genera found at these sites: *Briareum, Erythropodium, Plexaura, Pseudoplexaura, Eunicea, Plexaurella, Muriceopsis, Antillogorgia,* and *Gorgonia*. Small colonies of *Eunicea*, *Plexaurella*, *Pseudoplexaura*, and *Plexaura spp*. were scored as "unknowns" as they could not be distinguished in the photographs. The height of small colonies could not be determined in planar images, but they were ~ 12 cm tall. *Pterogorgia* and *Muricea* were found in the region, and either were not detected in the sampling areas, or could not be resolved in the photographs.

Processing Description: **Based on Tsounis and Edmunds (In press), Ecosphere:**

Community structure was characterized for four assemblage constructs that employed annual means for dependent variables (cover or abundance). First, the scleractinian-focused assemblage was quantified using the percentage cover of scleractinians (pooled among taxa), macroalgae, and CTB. Second, the octocoral-focused assemblage was quantified using octocoral abundance (pooled among taxa) together with cover of macroalgae, and CTB. Third, the octocoral genus assemblage focused on octocoral abundance resolved to genus, or unknowns. Fourth, a complete assemblage was used, containing scleractinians (all taxa), octocorals (abundance by genus), macroalgae and CTB. Data for each benthic group were presented untransformed as means +/- SE by year on scatterplots.

All analyses of scleractinian-focused, octocoral-focused, octocoral genera, and complete assemblages were based on resemblance matrices using Bray-Curtis similarities. Data for the scleractinian-focused assemblage consisted of percent cover and were square root transformed; data for the octocoral-focused and complete assemblage consisted of both percent cover and numerical abundance, and therefore were z-score standardized (Sokal and Rohlf 2012); and data for the octocoral genera were z-score standardized to optimize the performance of PCoA for the zero-inflated data. A dummy value of 3 was added to z-score standardized

data to create positive values that could analyzed in this statistical framework.

Non-metric multidimensional scaling (nMDS) was used to visualize multivariate trends in community structure for the four assemblages. To prepare nMDS plots, multiple restarts of 999 iterations were used until stress stabilized and ordinations were repeatable (after Clarke and Warwick 2001). In these plots, years were represented as circles scaled to scleractinian cover in the scleractinian-focused analysis, and to pooled abundance of octocorals in the octocoral focused and octocoral genera analyses. Sampling years were clustered using the SIMPROF routine in PRIMER-E, with 999 permutations and significant clusters identified at an alpha of 0.05. SIMPROF results were displayed as similarity contours on the respective nMDS plots visualizing hierarchical similarity among years (after Clarke and Warwick 2001). To evaluate similarities between two groupings of years that became apparent during initial analysis (as in Edmunds 2013; Edmunds and Lasker 2016), we used an iterative procedure for each graph to determine the highest value of dissimilarity percentage that would describe the groups of years separated in nMDS state space. To identify the contribution of each benthic group to inter-annual variability, a principal coordinate analysis (PCoA) was performed using the cmdscale function in the R statistical package (R Development Core Team 2008). Loading scores were calculated as the Pearson correlations of each dependent variable (i.e., benthic group) against PCO1 and PCO2, and were displayed when significant (P less than 0.05) as vectors scaled to a maximum length of 1. The PCoA were based on Bray-Curtis similarities that were produced using the vegan package for R (Oksanen et al. 2015).

Question 1. To test whether the description of community dynamics differ when described with the four assemblages constructs, we used a multivariate correlation procedure with significance determined within a permutational framework using a Mantel test (Legendre and Legendre 1998). First we compared the scleractinian-focused assemblage with the octocoral-focused assemblage; second, we compared the scleractinian-focused assemblage with the octocoral genera assemblage; and third, we tested whether the scleractinian-focused assemblage differed from the complete assemblage. The Mantel test was performed using the Vegan package in R [Oksanen et al. 2015; R Development Core Team 2008]).

Each of the four assemblages was tested for associations with all combinations of the four measures of physical conditions, using Spearman rank correlation (Clarke and Ainsworth 1993). The Bioenv function (Clarke and Ainsworth 1993) was used for correlations, and was followed with a Mantel procedure (Legendre and Legendre 1998) to identify the set of physical variables most strongly associated

with the biological variables, with significance evaluated in a permutational framework. The Bioenv function was performed using the vegan package for R (R Development Core Team 2008 [Oksanen et al. 2015]).

Analysis of general implications

To address general implications of our findings, the Yawzi Point versus Tektite contrast was interpreted as a comparison of a reef dominated by living *Orbicella annularis* (i.e., Tektite), with one dominated by antecedent (but dead) colonies of *O. annularis* with the decline in cover of this species having taken place since 1987. In this format, the contrast has utility in evaluating how the regional trend for declining cover of *O. annularis* (e.g., Hughes and Tanner 2000, Edmunds 2015) is likely to influence the community dynamics of octocorals. Central to this interpretation was an inferential test of octocoral community dynamics at Yawzi Point versus Tektite, and this was accomplished using the Mantel test to compare all four assemblages as described above.

Deployment Information

Deployment description for Virgin Islands National Park Edmunds_VINP

Studies of corals and hermit crabs

Instrument Information

Instrument	camera
Description	Nikon D90 - 6.8 megapixel digital camera
Generic Instrument Name	Camera
Generic Instrument Description	A camera (could be a 35 mm type), most often used to photograph marine mammals or birds.