Number and size of gonads found in monthly samples of Antillogorgia americana colonies at a study site in the San Blas Islands, Panama from July 1990 to August 1991

Website: https://www.bco-dmo.org/dataset/918010
Data Type: Other Field Results
Version: 1
Version Date: 2024-03-13

Project
» Collaborative Research: Pattern and process in the abundance and recruitment of Caribbean octocorals (Octocoral Community Dynamics)
» Effects of Vegetative Reproduction on the Distribution and Abundance of Benthic Marine Invertebrates (Invertebrate vegetative reproduction)

Contributors	Affiliation	Role
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Abstract
The reproductive biology of the branching octocoral Antillogorgia americana was studied at a site on the Caribbean coast of Panama in 1990-1991. Eleven colonies were tagged and monthly samples were collected over a 14-month period. Colonies were gonochoric and the samples included 6 females and 4 females. Ten polyps were examined from each sample and the number and size of gonads were determined. An additional 4 branches were sampled from a female colony in January 1991 and fecundity was determined relative to the branch, position of branchlet on the branch, and position of the polyp on the branchlet. The lack of synchrony among colonies on the scale of months may reflect less need for all colonies to spawn in a single event among abundant species that release large numbers of gametes. Such a strategy also spreads the risk of reproductive failure due to environmental conditions during any single month. Multiple spawning episodes can also drive reproductive isolation of populations and may reflect the presence of cryptic species within the taxon. Studies of reproductive timing can be an important adjunct in identifying variation in life history strategies as well as assessing the validity of species boundaries. This dataset includes the number and size of gonads found in monthly samples of each of 11 A. americana colonies.

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Coverage

Location: San Blas Islands, Panama
Spatial Extent: **Lat**:9.5486 **Lon**:-78.9583
Temporal Extent: 1990-07 - 1991-08

Methods & Sampling

Methods are further described in Lasker & Calderon (submitted), Asynchronous reproductive cycles among colonies of the Caribbean octocoral *Antillogorgia americana.*

All samples were collected from colonies, greater than 1 meter (m) in height, at 5-7 m depth on a shallow reef, locally referred to as Tiantupo, in the San Blas Islands, Panama (9° 32' 55" N, 78° 57' 30"W). Samples were obtained on scuba working from small boats in the vicinity of the Smithsonian Tropical Research Institute's field station in the San Blas Islands. To establish the reproductive status of colonies, 11 colonies were marked and mapped, and approximately 15 centimeters (cm) of tissue from an arbitrarily selected branch along with its associated branchlets was collected from each of the marked colonies from July 1990 through August 1991, with the exception of November 1990 and July 1991. Samples were fixed in 5% formalin and later rinsed and transferred to 70% ethanol. Each sample had a central branch with at least 10 branchlets. A total of 10 polyps were examined from the 10th branchlet, counting down from the tip. Polyps were sampled starting 1 cm above the base of the branchlet, extended no further than within 2 cm of the branchlet tip. Polyps were arbitrarily selected, never sampling adjacent polyps. Polyps were dissected open using fine forceps and a scalpel and examined at 25X (Wild M-5 dissecting scope) for the presence of gonad. *A. americana* is gonochoric (Yoshioka, 1979), and the sex was determined for those samples with gonads large enough to differentiate spermaries and eggs (≥ 160 micrometers (µm)). The eggs or spermaries were counted and the diameter of each was measured using an eyepiece micrometer. Spermaries are seldom perfect spheres, and an "average" diameter was chosen and measured for each. The volume of each egg or spermary was calculated from the measurement of the diameter assuming they were spheres, and the average egg or spermary size was calculated for each polyp. In figures depicting reproductive status, values for November 1990 and July 1991 were interpolated from the months before and after the missing sample. Statistical analyses of the number and sizes of gonads were conducted using SPSS (v.29).

Variation in reproductive output among branches within a colony was examined for a single large (>1m height) fecund female colony collected in January 1991. Five large branches each with at least 10 branchlets were collected. Analyses were then conducted on polyps from 4 branchlets from each of the branches. Counting down from the tip, branchlets at positions 1 and 10 were sampled, one from the right side of the branchlet and one from the left at each position. From each of those branchlets 20 polyps were sampled, 10 from 1 cm above the base and 10 from 1 cm below the tip. Polyps were arbitrarily selected, dissected and numbers and sizes of eggs enumerated and compared as described above.

BCO-DMO Curation Notes

- Imported original file "Monthly Surveys-bco-dmo.xlsx" into the BCO-DMO system.
- Changed the values in the Year column from 2 digits to 4 digits.
- Added columns for site Latitude and Longitude.
- Rounded the "Avg_Diam" column to hundredths place and the "Volume" column to thousandths place.
- Removed rows that have "AC" in the "Sex" column (not part of the analyses).
- Saved the final file as "918010_v1_a_americana_monthly_surveys.csv".

Problem Description

Samples were not collected in November 1990 and July 1991.

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Data Files

File	
918010_v1_a_americana_monthly_surveys.csv	(Comma Separated Values (.csv), 61.67 KB) MD5:cb35346151c269fe86a7ea49f41fd3bd
Primary data file for dataset ID 918010, version 1	

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Related Publications

Lasker, HR & Calderon, J. (submitted) Asynchronous reproductive cycles among colonies of the Caribbean octocoral Antillogorgia americana. Invertebrate Biology.
Results

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Parameters

Parameter	Description	Units
Sex	Sex. 1 = female; 2 = male; 0 = indeterminant.	unitless
Colony	Tag numbers assigned to mapped colonies	unitless
Month	Collection month	unitless
Year	Collection year	unitless
Polyp	Polyp number (numbers 1-10). 10 polyps were examined from each sample and aribitrarily labeled 1 through 10. 1	unitless
Number	Number of eggs or spermaries found in each polyp.	unitless
Avg_diam	Average diameter (um) of the gonads found in the polyp. (Average of columns Diam1 through Diam6).	micrometers (um)
Volume	Total volume (mm^3) of the gonads found in the polyp assuming each was a sphere.	cubic millimeters (mm^3)
N_GE_400	Number of eggs or spermaries greater than or equal to 400 micrometers	unitless
Diam1	Diameter (um) of each egg in the polyp	micrometers (um)
Diam2	Diameter (um) of each egg in the polyp	micrometers (um)
Diam3	Diameter (um) of each egg in the polyp	micrometers (um)
Diam4	Diameter (um) of each egg in the polyp	micrometers (um)
Diam5	Diameter (um) of each egg in the polyp	micrometers (um)
Latitude	Latitude of the sampling site	decimal degrees
Longitude	Longitude of the sampling site; negative values = West	decimal degrees

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Instruments

Dataset-specific Instrument Name	scuba and shears
Generic Instrument Name	Manual Biota Sampler
Dataset-specific Description	Samples were collected by divers on scuba, using shears to remove branches.
Generic Instrument Description	"Manual Biota Sampler" indicates that a sample was collected in situ by a person, possibly using a hand-held collection device such as a jar, a net, or their hands. This term could also refer to a simple tool like a hammer, saw, or other hand-held tool.

Dataset-specific Instrument Name	Wild M-5 microscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Dissections were conducted with a Wild M-5 microscope with an eyepiece micrometer.
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

Dataset-specific Instrument Name	scalpel
Generic Instrument Name	scalpel
Dataset-specific Description	Polyps were dissected open using fine forceps and a scalpel.
Generic Instrument Description	A scalpel, or lancet, or bistoury, is a small and extremely sharp bladed instrument used for dissection and surgery.

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Project Information

Collaborative Research: Pattern and process in the abundance and recruitment of Caribbean octocorals (Octocoral Community Dynamics)

Coverage: St. John, US Virgin Islands

NSF Award Abstract:
Coral reefs are exposed to a diversity of natural and anthropogenic disturbances, and the consequences for ecosystem degradation have been widely publicized. However, the reported changes have been biased towards fishes and stony corals, and for Caribbean reefs, the most notable example of this bias are octocorals ("soft corals"). Although they are abundant and dominate many Caribbean reefs, they are rarely included in studies due to the difficulty of both identifying them and in quantifying their abundances. In some places there is compelling evidence that soft corals have increased in abundance, even while stony corals have become less common. This suggests that soft corals are more resilient than stony corals to the wide diversity of

disturbances that have been impacting coral corals. The best coral reefs on which to study these changes are those that have been studied for decades and can provide a decadal context to more recent events, and in this regard the reefs of St. John, US Virgin Islands are unique. Stony corals on the reefs have been studied since 1987, and the soft corals from 2014. This provides unrivalled platform to evaluate patterns of octocoral abundance and recruitment; identify the patterns of change that are occurring on these reefs, and identify the processes responsible for the resilience of octocoral populations. The project will extend soft coral monitoring from 4 years to 8 years, and within this framework will examine the roles of baby corals, and their response to seafloor roughness, seawater flow, and seaweed, in determining the success of soft corals. The work will also assess whether the destructive effects of Hurricanes Irma and Maria have modified the pattern of change. In concert with these efforts the project will be closely integrated with local high schools at which the investigators will host marine biology clubs and provide independent study opportunities for their students and teachers. Unique training opportunities will be provided to undergraduate and graduate students, as well as a postdoctoral researcher, all of whom will study and work in St. John, and the investigators will train coral reef researchers to identify the species of soft corals through a hands-on workshop to be conducted in the Florida Keys.

Understanding how changing environmental conditions will affect the community structure of major biomes is the ecological objective defining the 21st century. The holistic effects of these conditions on coral reefs will be studied on shallow reefs within the Virgin Islands National Park in St. John, US Virgin Islands, which is the site of one of the longest-running, long-term studies of coral reef community dynamics in the region. With NSF-LTREB support, the investigators have been studying long-term changes in stony coral communities in this location since 1987, and in 2014 NSF-OCE support was used to build an octocoral "overlay" to this decadal perspective. The present project extends from this unique history, which has been punctuated by the effects of Hurricanes Irma and Maria, to place octocoral synecology in a decadal context, and the investigators exploit a rich suite of legacy data to better understand the present and immediate future of Caribbean coral reefs. This four-year project will advance on two concurrent fronts: first, to extend time-series analyses of octocoral communities from four to eight years to characterize the pattern and pace of change in community structure, and second, to conduct a program of hypothesis-driven experiments focused on octocoral settlement that will uncover the mechanisms allowing octocorals to more effectively colonize substrata than scleractinian corals on present day reefs. Specifically, the investigators will conduct mensurative and manipulative experiments addressing four hypotheses focusing on the roles of: (1) habitat complexity in distinguishing between octocoral and scleractinian recruitment niches, (2) the recruitment niche in mediating post-settlement success, (3) competition in algal turf and macroalgae in determining the success of octocoral and scleractian recruits, and (4) role of octocoral canopies in modulating the flux of particles and larvae to the seafloor beneath. The results of this study will be integrated to evaluate the factors driving higher ecological resilience of octocorals versus scleractinians on present-day Caribbean reefs.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

Effects of Vegetative Reproduction on the Distribution and Abundance of Benthic Marine Invertebrates (Invertebrate vegetative reproduction)

Coverage: Caribbean coast of Panama

NSF Award Abstract
Colonial species unlike aclonal species of ten generate new colonies a sexually through fission or fragmentation. This form of vegaetative reproduction plays an important role in determining species abundances and community structure. Thus, an understanding of vegetative reproduction and the conditions under which it is successful is a necessary component of the study of marine communities. Vegetative reproduction also has important effects on population genetics and these effects may control the resilience of species to changes in climate. Previous work on vegetative reproduction has focused on quantifying the effect of vegetative propagation on short term population dynamics within single populations. That work has not considered the effects of clonal growth on the production of new clones nor the selective pressures for propagules which can disperse between habitats. In the proposed research I will complement work on vegetative reproduction among Caribbean gorgonians with new data on larval production, dispersal, survival and settlement. These data will allow me to determine the interaction between vegetative reproduction, sexual reproduction and the dispersal of larvae to new habitats. The data will provide a quantitative basis for understanding the effects of vegetative reproduction on marine communities.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1756381
NSF Division of Ocean Sciences (NSF OCE)	OCE-9012168

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