Breviolum symbiont CP23S genotypes in Orbicella faveolata recruits from 2009-2011 (SymBioSys project)

Website: https://www.bco-dmo.org/dataset/882097
Data Type: experimental, Other Field Results
Version: 1
Version Date: 2023-01-24

Project
» Ontogenic change in Cnidarian-algal symbioses: A genomic and ecologic perspective (SymBioSys)

Contributors	Affiliation	Role
Coffroth, Mary Alice	State University of New York at Buffalo (SUNY Buffalo)	Principal Investigator, Contact
Miller, Margaret W.	NOAA Southeast Fisheries Science Center (NOAA SEFSC)	Co-Principal Investigator
Sheets, David	Canisius College	Co-Principal Investigator
Leigh, Noel J.	State University of New York at Buffalo (SUNY Buffalo)	Student
McIlroy, Shelby E.	State University of New York at Buffalo (SUNY Buffalo)	Student
Newman, Sawyer	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Chloroplast 23S genotypes (based on length heteroplasmy in domain V of chloroplast large subunit (cp23S) ribosomal DNA sequences) of Breviolum sp. symbionts within Orbicella faveolata recruits that were outplanted to reefs in the Florida Keys.

Table of Contents

Coverage

Spatial Extent: **N**:25.1167 **E**:-80.2833 **S**:24.5449 **W**:-81.4094
Temporal Extent: 2009 - 2011

Methods & Sampling

Sampling and Analytical Methodology:

Egg-sperm bundles were collected from adult colonies of *O. faveolata* following the techniques described by Miller (2014). Larvae were reared at a shore-based lab and settled onto terracotta tiles. Once the larvae had metamorphosed and attached to the tiles, they were outplanted onto the reef by attachment vertically to a PVC rack approximately 0.2 m above the substrate to allow uptake of algal symbionts. Tiles with recruits were sampled one to three months after outplanting, recruits removed from the tile and preserved individually in 95% ethanol for subsequent molecular analysis. DNA extraction followed Coffroth et al. (1992). Cp-23S genotypes of the algal symbionts within the genus *Breviolum* were characterized following the protocol of

Santos et al. (2003).

Locations in the Florida Keys with Abbreviations

- Alligator (AR)
- Coral Garden (CG)
- Cheeca Rocks (CR)
- East Turtle (ET)
- Grecian Rocks (GR)
- Looe Key (LK)
- Sand Island (SI)
- Tennessee (TR)

Data Processing Description

Processing notes from researcher:

- NA indicates "No Amp - did not amplify after multiple attempts"

BCO-DMO Processing Notes:

- Special characters and spaces replaced by underscores ("_") in parameter names
- Longitude and latitude are split into separate columns and converted to decimal degrees
- Longitude and latitude values rounded to the 6th place

[table of contents | back to top]

Data Files

File	
cp-type_recruits-1.csv	(Comma Separated Values (.csv), 17.10 KB) MD5:d1639bdfb76f603f8beb949d3931fad5
File processed with laminar pipeline "882097_v1_CP23S_Genotypes" at path 882097/1/data/cp-type_recruits-1.csv	

[table of contents | back to top]

Related Publications

Coffroth, M. A., Lasker, H. R., Diamond, M. E., Bruenn, J. A., & Bermingham, E. (1992). DNA fingerprints of a gorgonian coral: a method for detecting clonal structure in a vegetative species. Marine Biology, 114(2), 317–325. doi:10.1007/bf00349534 https://doi.org/10.1007/BF00349534
Methods

Coffroth, M. A., Leigh, N. J., McIlroy, S. E., Miller, M. W., & Sheets, H. D. (2022). Genetic structure of dinoflagellate symbionts in coral recruits differs from that of parental or local adults. Ecology and Evolution, 12(9). Portico. https://doi.org/10.1002/ece3.9312
Results

Correa, A. M. S., Brandt, M. E., Smith, T. B., Thornhill, D. J., & Baker, A. C. (2009). Symbiodinium associations with diseased and healthy scleractinian corals. Coral Reefs, 28(2), 437–448. https://doi.org/10.1007/s00338-008-0464-6
Methods

Santos, S. R., Gutierrez-Rodriguez, C., & Coffroth, M. A. (2003). Phylogenetic identification of symbiotic dinoflagellates via length heteroplasmy in Domain V of chloroplast Large Subunit (cp23S)-Ribosomal DNA

Sequences. Marine Biotechnology, 5(2), 130–140. doi:10.1007/s10126-002-0076-z
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
Sample_ID	Identification of Orbicella faveolata recruit sampled	unitless
Year	Year in which sample was collected	unitless
Spawn_site	Reef where egg-sperm bundles were collected from O. faveolata adult colonies; site of parental colonies. AR = Alligator; CG = Coral Garden; CR = Cheeca Rocks; ET = East Turtle; GR = Grecian Rocks; LK = Looe Key; SI = Sand Island; TR = Tennessee.	unitless
Latitude_Spawn_site_decimal_degrees	Latitude of reef where adult samples were taken in decimal degrees. A positive value indicates North.	decimal degrees
Longitude_Spawn_site_decimal_degrees	Longitude of reef where adult samples were taken. A negative value indicates West.	decimal degrees
Depth_m_Spawn_site	Depth where adult colonies were located.	meters (m)
Outplant_Site	Reef where newly settled recruits were outplanted. AR = Alligator; CG = Coral Garden; CR = Cheeca Rocks; ET = East Turtle; GR = Grecian Rocks; LK = Looe Key; SI = Sand Island; TR = Tennessee.	unitless
Latitude_outplant_site_decimal_degrees	Latitude of reef where samples were taken in decimal degrees. A positive value indicates North.	decimal degrees
Longitude_outplant_site_decimal_degrees	Longitude of reef where samples were taken. A negative value indicates West.	decimal degrees
Depth_m_outplant site	Depth where newly settled recruits were outplanted.	meters (m)
CP_type	Fragment size of the hypervariable region of domain V of chloroplast large subunit rDNA (cp23S) allele	unitless

[table of contents | back to top]

Project Information

Ontogenic change in Cnidarian-algal symbioses: A genomic and ecologic perspective (SymBioSys)

Coverage: Florida Keys, Bahamas, Panama, Mexico

PROJECT SUMMARY:
The symbiosis between corals (Cnidaria:Hexacorallia:Scleractinia) and photosynthetic dinoflagellate symbionts (Alveolata: Dinophycea: Symbiodinium) provides the foundation and structure of the coral reef ecosystem, as well as significant contributions to global carbon and biogeochemical cycles. Given the importance of this symbiosis to the coral-algal holobiont and the reef ecosystem, understanding the mechanisms governing the establishment and long term maintenance of this symbiosis is essential. The overall aim of this project is to identify the mechanisms and selective processes that lead to the final assemblage of symbionts harbored by adult hosts. This question will be approached from two perspectives, ecologic and genomic, with the specific aims of determining (1) if different Symbiodinium strains differentially affect fitness of corals as the adult settles into a mature symbiosis (2) if competition among symbionts or environmental conditions contribute to

the final host-symbiont pairing and (3) how host/symbiont transcriptomes varying as the symbiont community within a host is winnowed to the final assemblage found in the adult host. Traits that directly affect coral fitness (i.e. growth, survivorship, energy production) will be measured under different environmental conditions over the ontogeny of coral recruits that are experimentally infected with different types of Symbiodinium. Concurrently, high throughput gene expression profiling will be used to follow changes in gene expression between host and symbiont. Together, these data will be used to validate or falsify the hypotheses that the final symbiont assemblage found in the adult host is determined by (a) host selection (b) competition among symbionts and/or (c) environmental condition.

This study pools the expertise of two labs that have focused on these aspects of the symbiosis. The Coffroth lab pioneered the studies on early ontogeny of the symbiosis and symbiont diversity and will continue to take the lead in the ecological studies. The Medina lab is at the forefront in the development and utilization of genomic technology to study transcriptomic changes during the establishment and breakdown of the symbiosis. Furthermore, the Medina lab has the coral microarrays to be used in this study and in 2009 will also have oligo arrays for two Symbiodinium species based on 454 EST data. Although several groups have initial studies of the host transcriptome, none have combined an approach that examines the host and the symbiont in a single experiment. This will be a powerful approach as it will allow the investigators to track complementary changes in gene expression between host and symbiont and relate those to turnover in the symbiont community as the final symbiont complement is established.

The data resulting form the study will bridge an important gap in our understanding of the establishment and maintenance of coral-Symbiodinium symbiosis. Understanding the mechanism(s) regulating the establishment of the symbiosis will broaden our knowledge and help to predict the response of this symbiosis to future climate conditions. As in the past, the genomic tools (arrays, ESTs) will be made readily available to researchers via array distribution at cost, microarray analysis training, or sequence data, providing valuable resources to continue exploring these systems.

In conjunction the Aquarium of Niagara, Coffroth will develop educational and outreach programs to train and disseminate information on coral reefs to local area teachers and the general public. The Medina lab will continue to produce science and environment podcasts in multiple languages (English, Spanish and Hmong) with undergraduate students at UC Merced and will continue to collaborate with the California Academy of Sciences (CAS) in their coral reef outreach efforts. Additionally, this work will result in the training and mentoring of a postdoctoral fellow, at least one graduate student and at least 2 undergraduates. Through this project these students will have the opportunity to participate in research in both a lab and field setting, learning a range of ecological, molecular and algal culturing techniques. The extensive culture collection housed at the University at Buffalo is an important resource that is available to researchers worldwide which the proposed funding will help to maintain. Our EST annotations are publicly available through our EST database (http://montastraea.psu.edu/SymBioSys/).

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0926822

[table of contents | back to top]