Genotype of symbionts detected in Orbicella faveolata recruits inoculated with either Symbiodinium microadriaticum, S. minutum or control (McIlroy,J. Phycology, 2016) (SymBioSys project)

Website: https://www.bco-dmo.org/dataset/714433
Data Type: experimental
Version:
Version Date: 2017-09-07

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
McIlroy, Shelby E.	State University of New York at Buffalo (SUNY Buffalo)	Student, Contact
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Genotype of symbionts detected in *Orbicella faveolata* recruits inoculated with either *Symbiodinium microadriaticum*, *Symbiodinium minutum,* or maintained aposymbiotic (Control), and reared in the laboratory for monitoring. These data were used in McIlroy et al (2016).

Methods, data processing, and results reported in:
McIlroy SE, Gillette P, Cunning R, Klueter A, Capo T, Baker AC, Coffroth MA (2016) The effects of Symbiodinium (Pyrrhophyta) identity on growth, survivorship, and thermal tolerance of newly settled coral recruits. Journal of Phycology 52:1114–1124. DOI: 10.1111/jpy.12471

Related datasets:
McIlroy_2016: Growth of Orbicella faveolata recruits
McIlroy_2016: Effective quantum yield for Orbicella faveolata recruits
McIlroy_2016: Maximum quantum yield for Orbicella faveolata recruits

Methods & Sampling

Collection of Orbicella faveolata larvae was made at Alligator Reef (24°48.7710 N, 80°40.1670 W) and Looe Key (24°32.6930 N, 81°24.5620 W) in 2011. Initial rearing was done at Keys Marine Laboratory (KML), Long Key, FL. Settled corals were then maintained at University of Miami Experimental Hatchery (Virginia Key, Miami, FL). *Symbiodinium* cultures originated from highly concentrated, isoclonal reference cultures maintained at the University at Buffalo – SUNY (BURR Culture Collection: http://www.nsm.buffalo.edu/Bio/burr/). The cultures used in the experiments were maintained at the Keys Marine Lab (Florida) in f/2 medium (Guillard 1975), at ~27°C, under a 14:10 h light:dark regime.

Samples were preserved in 95% ethanol for subsequent DNA extraction following a 29 Cetyl trimethyl ammonium bromide protocol for Symbiodinium DNA isolation (Coffroth et al. 1992). This protocol was slightly modified by the addition of a "bead-beating" step in which a 50-100 lL volume of glass beads (size: 425-600 lm; Sigma, Sigma-Aldrich, St. Louis, MO, USA) per tube were added and shaken on high on a Vortex Genie (Scientific Industries, Inc., Bohemia, New York, USA) on the highest setting for 5 min to rupture the symbiont cell wall (Goulet and Coffroth 1997, Yuan et al. 2015). Symbiont species were distinguished via length heteroplasmy in domain V of cp23S ribosomal DNA (Santos et al. 2003). The cp-23S gene was amplified by polymerase chain reaction (PCR) and the PCR product was then run on a 6.5% Long Ranger acrylamide gel using LI-COR's Long ReadIR 4200 DNA Sequencer along with size standards for fragment size analysis. PCR for each sample was repeated at least twice for scoring. In rare cases, replicates differed in their banding patterns and were repeated a third time. Very faint bands were excluded if they occurred only once in three replicates, otherwise, all bands from all replicates were included in the analysis.

Data Processing Description

BCO-DMO Processing:
- original file: DATASET_McIlroyetal2016_Orbicella Symbiont Genotypes.xlsx
- modified conventional header with dataset name, PI name, version date, reference information
- changed parameter names to be BCO-DMO compatible

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Data Files

File	
McIlroy_2016_sym_genotypes.csv	(Comma Separated Values (.csv), 2.77 KB) MD5:a379a08b7c04c73b7f93ae3838239692
Primary data file for dataset ID 714433	

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Related Publications

McIlroy, S. E., Gillette, P., Cunning, R., Klueter, A., Capo, T., Baker, A. C., & Coffroth, M. A. (2016). The effects ofSymbiodinium(Pyrrhophyta) identity on growth, survivorship, and thermal tolerance of newly settled coral recruits. Journal of Phycology, 52(6), 1114–1124. doi:10.1111/jpy.12471
Results

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Parameters

Parameter	Description	Units
Symbiodinium	Species of Symbiodinium used for larval inoculation	unitless
TileRod	Coral larvae were settled onto ceramic tiles (the unit of replication) which were placed onto rods in different tanks assigned to symbiont treatments	unitless
Date	Month/Year of data collection	unitless
None_Detected	Number of recruits sampled in which there was no detectable symbiont DNA	recruits
S_minutum	Number of recruits sampled in which S. minutum DNA was detected	recruits
S_microadriaticum	Number of recruits sampled in which S. microadriaticum DNA was detected	recruits
S_minutum_and_S_microadriaticum	Number of recruits sampled in which both S. minutum and S. microadriaticum DNA was detected	recruits
Total_Recruits_Sampled	Total number of recruits sampled	recruits

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Instruments

Dataset-specific Instrument Name	LI-COR Long ReadIR 4200 DNA Sequencer
Generic Instrument Name	Automated DNA Sequencer
Generic Instrument Description	General term for a laboratory instrument used for deciphering the order of bases in a strand of DNA. Sanger sequencers detect fluorescence from different dyes that are used to identify the A, C, G, and T extension reactions. Contemporary or Pyrosequencer methods are based on detecting the activity of DNA polymerase (a DNA synthesizing enzyme) with another chemoluminescent enzyme. Essentially, the method allows sequencing of a single strand of DNA by synthesizing the complementary strand along it, one base pair at a time, and detecting which base was actually added at each step.

Dataset-specific Instrument Name	
Generic Instrument Name	Thermal Cycler
Generic Instrument Description	A thermal cycler or "thermocycler" is a general term for a type of laboratory apparatus, commonly used for performing polymerase chain reaction (PCR), that is capable of repeatedly altering and maintaining specific temperatures for defined periods of time. The device has a thermal block with holes where tubes with the PCR reaction mixtures can be inserted. The cycler then raises and lowers the temperature of the block in discrete, pre-programmed steps. They can also be used to facilitate other temperature-sensitive reactions, including restriction enzyme digestion or rapid diagnostics. (adapted from http://serc.carleton.edu/microbelife/research_methods/genomics/pcr.html)

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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/).

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Funding

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

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