Soundscape monitoring acoustic data collected in July of 2017 during an in situ larval coral settlement experiment in St. John, US Virgin Islands

Website: https://www.bco-dmo.org/dataset/742573
Data Type: Other Field Results
Version: 1
Version Date: 2018-07-27

Project
» Coral Chorus: The Role of Soundscapes in Coral Reef Larval Recruitment and Biodiversity (Coral Chorus)

Contributors	Affiliation	Role
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Abstract
Matlab R2016 was used to process acoustic data from raw wave audio files. Mean power spectral densities were estimated (Hamming window, non-overlapping 0.5-sec windows, frequency resolution: 1.47 Hz) within 1-minute samples across the total experiment length (62 hours).

Table of Contents

Coverage

Spatial Extent: **N**:18.31789 **E**:-64.72218 **S**:18.30962 **W**:-64.76065
Temporal Extent: 2017-07-25 - 2017-07-27

Dataset Description

This dataset contains audio files and mean power spectral densities (PSD). See the "Data Files" section to download files by site.

Methods & Sampling

SoundTrap (ST-300, Ocean Instruments NZ) acoustic recorders were deployed to continuously record at 48 kHz sampling frequency from 25-27 July, 2017. Recorders were positioned approximately 0.5 m above the seafloor.

Sites:
Tektite Reef (18.30962N, 64.72218W)
Cocoloba Reef (18.31528N, 64.76065W)
OffReef (18.31789N, 64.75059W) - A sand site with no reef structure within 100m

Soundscape and habitat characterization:
Acoustic recordings were analyzed to compare the experimental soundscapes, first by examining acoustic spectra (sound power as a function of frequency). Mean power spectral densities were estimated (Hamming window, non-overlapping 0.5-sec windows) within 1-minute samples across the total experiment length (62 hours). Root-mean-square (rms) sound pressure levels (SPL; dB re 1Pa) were calculated for each site in the 1-minute samples, within two frequency bands of interest. The lower analysis band (50-1000 Hz) contains the majority of fish-produced acoustic signals, as well as noise generated by wind and waves, while the higher analysis band (1000-20000 Hz) primarily represents the acoustic energy derived from invertebrate sounds (e.g., snapping shrimp). Because reef soundscapes exhibit diel variability, spectrograms were produced to further detect acoustic differences between sites.
Benthic cover and fish diversity and abundance at the sites were characterized during July 2017 using visual surveys as previously described (Kaplan et al. 2015). Benthic surveys included six 10m long, 1m wide transects, with benthic cover recorded every 10cm. For fish, three 30m-long, 2m-wide video transects were performed, with fish enumerated and identified. Fish abundances were calculated as the total number per transect, and fish species richness was the total number of species identified at each site.

Data Processing Description

Matlab R2016 was used to process acoustic data from raw wave audio files. Mean power spectral densities were estimated (Hamming window, non-overlapping 0.5-sec windows, frequency resolution: 1.47 Hz) within 1-minute samples across the total experiment length (62 hours).

[table of contents | back to top]

Data Files

File	
Cocoloba_PSD.zip	(ZIP Archive (ZIP), 185.13 MB) MD5:d1262f13638f5ec42a69724baf3018a3
Mean power spectral densities (PSD). Processed data from acoustic recordings for site Cocoloba. The zip file includes three files: "_POavg.txt" - The acoustic data output for each site as a matrix of calculated mean acoustic power (units = µPa^2) within each frequency (rows) for each 1-minute sample (columns). “_datetime.txt" - A matrix of timestamps (UTC) for the acoustic samples in column format YYYY M DD HH mm ss. Rows correspond to the acoustic power matrix columns. "_freq.txt" - A vector of frequencies (Hz) corresponding to the acoustic power matrix rows.	
Cocoloba_rawaudio.tar.gz	(GZIP (.gz), 9.36 GB) MD5:f9346628b342f791401ce7a3744913d5
Raw audio (.*wav) files for site Cocoloba.	

File	
OffReef_PSD.zip	(ZIP Archive (ZIP), 191.72 MB) MD5:1dba2f0baafd3731584e39a7bd78e3fc
Mean power spectral densities (PSD). Processed data from acoustic recordings for site OffReef. The zip file includes three files: "_POavg.txt" - The acoustic data output for each site as a matrix of calculated mean acoustic power (units = µPa^2) within each frequency (rows) for each 1-minute sample (columns). “_datetime.txt" - A matrix of timestamps (UTC) for the acoustic samples in column format YYYY M DD HH mm ss. Rows correspond to the acoustic power matrix columns. "_freq.txt" - A vector of frequencies (Hz) corresponding to the acoustic power matrix rows.	
OffReef_rawaudio.tar.gz	(GZIP (.gz), 7.96 GB) MD5:be20e99ae91c0be5e1e0145560f7df5f
Raw audio (.*wav) files for site OffReef.	
Tektite_PSD.zip	(ZIP Archive (ZIP), 197.19 MB) MD5:55d3b726b1a50b3747aa33f764c2dd46
Mean power spectral densities (PSD). Processed data from acoustic recordings for site Tektite. The zip file includes three files: "_POavg.txt" - The acoustic data output for each site as a matrix of calculated mean acoustic power (units = µPa^2) within each frequency (rows) for each 1-minute sample (columns). “_datetime.txt" - A matrix of timestamps (UTC) for the acoustic samples in column format YYYY M DD HH mm ss. Rows correspond to the acoustic power matrix columns. "_freq.txt" - A vector of frequencies (Hz) corresponding to the acoustic power matrix rows.	
Tektite_rawaudio.tar.gz	(GZIP (.gz), 8.77 GB) MD5:1755c8969c7ca7a877028fd3cdac88a9
Raw audio (.*wav) files for site Tektite.	

[table of contents | back to top]

Related Publications

Kaplan, M., Mooney, T., Partan, J., & Solow, A. (2015). Coral reef species assemblages are associated with ambient soundscapes. Marine Ecology Progress Series, 533, 93–107. doi:10.3354/meps11382

Methods

[table of contents | back to top]

Related Datasets

IsRelatedTo

Apprill, A., Mooney, T., Lillis, A. (2018) **Porites astreoides coral settlement counts collected in July of 2017 from an in situ larval coral settlement experiment in St. John, US Virgin Islands.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2018-09-21 doi:10.1575/1912/bco-dmo.742565.1 [view at BCO-DMO]
Relationship Description: Contains coral settlement data where these audio recordings were collected.

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	SoundTrap (ST-300, Ocean Instruments NZ) acoustic recorders
Generic Instrument Name	Acoustic Recorder
Generic Instrument Description	An acoustic recorder senses and records acoustic signals from the environment.

[table of contents | back to top]

Deployments

Coral_Chorus_St_John

Website	https://www.bco-dmo.org/deployment/748532
Platform	Virgin Islands

[table of contents | back to top]

Project Information

Coral Chorus: The Role of Soundscapes in Coral Reef Larval Recruitment and Biodiversity (Coral Chorus)

NSF Award Abstract:
Coral reef ecosystems host some of the highest biodiversity of life per unit area on Earth and harbor about one-quarter to one-third of all marine animals. Reef-associated animals are a major source of protein for millions of people, and reefs offer shoreline protection and provide a significant source of tourism revenue, especially in developing countries. Factors that influence supply and settlement of young (larval) fish, coral, and associated animals can have large impacts on reef ecosystem and population structure, and learning more about these can help improve understanding of how to maintain the benefits provided by coral reefs. This

study will lead to a detailed, mechanistic understanding of how young larvae use natural sounds to orient toward, locate, and select preferred settlement habitat. The approach will combine detailed field measurements and experiments to isolate key soundscape variables that impact coral reef larvae.

For marine communities, such as those on coral reefs, factors influencing larval supply and settlement can have major impacts on community structure and population replenishment. There are now some indications that sound plays an important role in attracting larvae to suitable settlement habitat. There is little understanding of what soundscape habitat information is available to larvae and how differences and variability in sound can influence settlement. This project will include comprehensive experiments, environmental measurements, and modeling with the goal of understanding the role of sound in influencing larval recruitment and local biodiversity. The investigators will measure in situ settlement of larval fish and coral in relation to different soundscapes and habitat conditions in a marine protected area using traditional larval sampling methods, moored acoustic recorders, and a suite of environmental observations. Controlled and calibrated environmental playback experiments will isolate soundscape components and determine specific and fundamental acoustic cues larvae use to orient and settle. The spatial and temporal variability of soundscape cues and components across reef habitats will be established. Finally, the project will determine the relevant ranges of sound plumes that larvae may encounter through direct measurements of the sound fields of multiple reefs.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1536782

[table of contents | back to top]