Crustracean population surveys pre- and post-hurricane Irma from seagrass flats in the Florida Keys, USA from 2017 to 2019

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Project
» RAPID: Effects of Hurricane Irma on shallow-water marine ecosystems: Assessing resiliency of sponge and macroinvertebrate communities in the Florida Keys (Irma Sponge Inverts)

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Abstract
Crustacean populations were surveyed in 2017, 2018, and 2019 (pre- and post-hurricane Irma) from shallow water (1 meter) seagrass quadrats in Summerland Key, Florida, USA.

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Coverage

Spatial Extent: **Lat**:24.661337 **Lon**:-81.444847
Temporal Extent: 2017-06 - 2019-06

Methods & Sampling

Work was conducted in shallow (less than 1 meter) seagrass and algal flats off the southern coast of Summerland Key, FL (24.65989, -81.45571) before and after the landfall of Hurricane Irma. We assessed the effects of the storm on mesograzer populations building off of work we had been doing at this site in years prior to Irma's landfall. We randomly deployed one-meter-squared quadrats across the shallow seagrass habitats (pre-Hurricane Irma in June-July 2017 and post-Hurricane Irma in May 2018, and June 2019) and collected all of the algae found within the quadrat. All mesograzers were removed from algae and seagrasses, sorted by morphospecies, and imaged.

33 algae samples were collected in June-July, 2017, 50 algal samples were collected in May 2018, and 10 samples were collected in June 2019. All algal samples were transported to the lab where mesograzers were separated from the algal material (n = 21,430 individuals), sorted into morphospecies categories (n = 50 crustaceans; n = 18 ophiurids), and preserved in 70 percent ethanol. The total number of individuals grouped by morphospecies within each algal sample was tallied.

Data Processing Description

All invertebrates collected in this study were imaged and sized using ImageJ.

BCO-DMO processing description:
- Adjusted field/parameter names to comply with BCO-DMO naming conventions
- Missing data identifier '#DIV/0!' replaced with 'blank' (BCO-DMO's default missing data identifier)
- Rounded column "Number_of_Individuals" to 2 decimal places
- Added "Latitude" and "Longitude" columns and rounded to 3 decimal places
- Added month sampled and changed "Year" column to "Date"

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Parameters

Parameter	Description	Units
Date	Month and Year of sample collection	unitless
Latitude	Latitude of sample collection	decimal degrees
Longitude	Longitude of sample collection (West is negative)	decimal degrees
Season	Season of sample collection	unitless
Number_of_Quadrats	Number of quadrats collected	unitless
Area	Area of quadrat	1 meter squared
Factor	Factor	unitless
Quad_ID	MS1-45: Identification used for the morphospecies (sequentially numbered in order of their appearance in the samples)	unitless
Number_of_Individuals	Total number of individuals grouped by morphospecies within each algal sample	unitless

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Instruments

Dataset-specific Instrument Name	standard stereomicroscope
Generic Instrument Name	Microscope - Optical
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".

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Project Information

RAPID: Effects of Hurricane Irma on shallow-water marine ecosystems: Assessing resiliency of sponge and macroinvertebrate communities in the Florida Keys (Irma Sponge Inverts)

Coverage: Summerland Key, FL

Hurricane Irma was a massively destructive storm that traveled directly over the lower Florida Keys. While the above water damage was obvious, effects from the hurricane on shallow benthic marine habitats in the Florida Keys is unknown. Shallow water habitats, which are important nurseries for economically important fisheries, likely experienced the strong effects from the storm. Sponge communities in these ecosystems perform vital ecological functions due to their feeding behavior, which involves pumping large quantities of water and filtering material from the water column. The project tests important hypotheses about sponge responses to ecological disruptions that are caused by hurricanes. Sponges are abundant in many reef ecosystems, and play essential ecological roles, so learning about system responses to sponge community disturbances is important. The work trains undergraduates in field research, data management and analysis, and science communication. Some of the activities developed as part of this project are incorporated in the University of Richmond Integrated Science Experience (URISE), and the first-year Science, Math and Research Training (SMART) course, both of which are designed to increase participation in STEM disciplines by individuals from underrepresented groups. Furthermore, the research is presented in a variety of public forums to disseminate as widely as possible.

Sponges represent a significant benthic-pelagic coupling point in tropical reef habitats. The recently proposed sponge loop hypothesis predicts that these animals release detritus as a function of their biofiltering capabilities, which is then consumed by organisms at the base of the food web. Hurricane Irma may have disrupted components of the sponge loop, and the investigators are exploring four hypotheses related to the storm's effects. First, the proposed work tests whether sponge damage from the storm was non-random, disproportionately affecting larger sponges. The second hypothesis examines the effects of the storm on macroinvertebrate communities in these habitats. This work builds on sponge and macroinvertebrate surveys conducted by the investigators in the years preceding the storm. Thirdly, the hypothesis that the hurricane influenced bacterioplankton populations through disruption of sponge feeding is tested. The PIs also compare pre- and post-hurricane plankton structure via flow cytometery using inhalant-exhalent water samples collected as part of an on-going study of sponge feeding behavior. Finally, inhalant-exhalent water samples are collected from shallow-water populations of several sponges from different size categories to determine if feeding behavior shows any demographic shifts based on the size of the sponge. Samples are processed to examine the retention efficiencies and prey selectivity of the host sponges using flow cytometry. Initial surveys are conducted of sponges (size, density, diversity) and macroinvertebrates in December, 2017. Preliminary sponge pumping activity occurs then too. Extensive surveys take place again in May-July, 2018 with further monitoring to occur in subsequent years.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1807169

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