Sampling sites, hydrographic measurements and percent cover of seagrass sampled at the southern Aransas Bay, northern Corpus Christi Bay and East Flat region of Corpus Christi bay between November 2017 and December 2018

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Project
» RAPID: Degradation and Resilience of Seagrass Ecosystem Structure and Function following a Direct Impact by Hurricane Harvey (Harvey Seagrass)

Contributors	Affiliation	Role
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Abstract
Sampling sites, hydrographic measurements and percent cover of seagrass sampled at the southern Aransas Bay (Redfish Bay area), northern Corpus Christi Bay (Redfish Bay area) and East Flat region of Corpus Christi bay between November 2017 and December 2018.

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Coverage

Spatial Extent: **N**:27.99366 **E**:-97.08199 **S**:27.75471 **W**:-97.15306
Temporal Extent: 2017-11-03 - 2018-12-01

Dataset Description

Sampling sites, hydrographic measurements and percent cover of seagrass sampled at the southern Aransas Bay (Redfish Bay area), northern Corpus Christi Bay (Redfish Bay area) and East Flat region of Corpus Christi bay between November 2017 and December 2018.

Acquisition Description

Sampling sites

Sites were selected to correspond to long-term monitoring sites from the statewide Texas Seagrass monitoring data set (see Congdon et al. 2019 for a more detailed description of pre and post Hurricane sampling sites). We focused on 20 of the long-term sampling sites that varied in magnitude and type of impact from Hurricane Harvey.

Eight of the sites were located in southern Aransas Bay (Redfish Bay area) experienced high freshwater runoff and longer retention time of freshwater (> 2 months). These sites included 4 that experienced high degrees of physical seagrass damage (>50 seagrass cover loss) and those with minimal seagrass loss (< 20% change in percent cover).

Eight of the sites were located in northern Corpus Christi Bay (Redfish Bay area) and experienced freshwater runoff with shorter retention time (< 6 weeks). These sites included 4 that experienced high degrees of physical seagrass damage (>50 seagrass cover loss) and those with minimal seagrass loss (< 20% change in percent cover).

Finally, 4 sites were located in the East Flat region of Corpus Christi bay which was further outside of the major impact zone and experienced lower degrees of seagrass loss and freshwater runoff.

The 16 Redfish Bay area sites were sampled in November 2017, March 2018, July 2018, and November 2018. The East flats sites were sampled during July and November 2018.

Hydrographic measurements

At each sampling site, the data sonde was lowered into the water from the side of the boat so that the instrument probes are completely submerged. We measured hydrographic measurements including water depth (m), conductivity (µS/cm), specific conductivity (µS/cm), temperature (C), salinity, dissolved oxygen (% and mg/L), chlorophyll a fluorescence (µg/L), and pH were collected using a YSI 6920 data sonde. Parameter measurements were recorded once readings stabilized at the water surface. In the field, dissolved oxygen levels were checked for accuracy based on 100% saturation at the water-atmosphere interface and recalibrated as necessary.

Care was taken to avoid agitating the benthos since this can re-suspend microalgae and compromise the accuracy of the in situ chlorophyll probe. All sonde measurements and water samples were obtained prior to the deployment of benthic sampling equipment. Upon return to the laboratory, a post-calibration check was performed on salinity, pH, dissolved oxygen, and chlorophyll a. If data sonde probes could not be calibrated or did not maintain their calibration, they were replaced.

Sonde handling:

In the field, dissolved oxygen levels were checked for accuracy based on 100% saturation at the water-atmosphere interface and recalibrated as necessary. The YSI 6920-V2 data sonde was calibrated daily prior to each use in the field. Because the sonde uses temperature compensation, it was important that the temperature probe was properly verified with a traceable digital thermometer in a bucket of tap water. The temperature probe was checked on a daily basis by comparing the readings of multiple data sondes and was verified weekly using a digital thermometer. For conductivity and pH calibration, the calibration cup and sensors were pre-rinsed three times with a small amount of the standard prior to calibration. The conductivity sensors were then submerged completely in the solution, and gently shaken to dislodge any visible air bubbles that may be trapped by the sensor. Three-point calibration was used for pH and calibration steps were followed according to manufacturer's instructions depending on the particular buffer solutions used. Dissolved oxygen calibration was performed in a 100% saturated Freshwater bath for 10 minutes following manufacturer instructions. The chlorophyll sensor was calibrated in DI water, running the wiper at least once to ensure a zero reading on the sensor. If necessary, a two-point calibration was conducted according to manufacturer's specifications using dye standards. Any error messages during any of these calibrations were investigated and appropriately solved before utilizing any data output from the data sonde. Instrument calibration was recorded in a logbook. Upon return to the laboratory, a post-calibration check was performed on salinity, pH, dissolved oxygen, and chlorophyll *a*. If data sonde probes could not be calibrated or did not maintain their calibration, they were replaced.

Seagrass percent cover

Species composition and areal coverage were obtained from two replicate quadrat samples per station at two cardinal locations from the vessel boat (starboard-bow and starboard-stern). Percent cover of areal biomass was estimated by direct observation, looking down at the seagrass canopy through the water using a 0.25 m2 quadrat framer subdivided into 100 cells.

Processing Description

BCO-DMO processing notes:

- Converted Date and Time columns to ISO format
- Added ISO_DateTime_UTC column
- Replaced , and 's by ; and is respectively to comply with database requirements
- Adjusted column names to comply with database requirements

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Related Publications

Congdon, V. M., Bonsell, C., Cuddy, M. R., & Dunton, K. H. (2019). In the wake of a major hurricane: Differential effects on early vs. late successional seagrass species. Limnology and Oceanography Letters, 4(5), 155–163. doi:10.1002/lol2.10112
Methods

Duffy, J. E., Ziegler, S. L., Campbell, J. E., Bippus, P. M., & Lefcheck, J. S. (2015). Squidpops: A Simple Tool to Crowdsource a Global Map of Marine Predation Intensity. PLOS ONE, 10(11), e0142994. doi:10.1371/journal.pone.0142994
Methods

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Parameters

Parameter	Description	Units
Site_ID	Site name	unitless
Site_Latitude	Latitude of sampling site, south is negative	decimal degrees
Site_Longitude	Longitude of sampling site, west is negative	decimal degrees
Date	Date sampled	unitless
Time	Time arrived at site (US Central local Time)	unitless
Depth	Depth of the water column	centimeters (cm)
Secchi_depth	Secchi depth in cm	centimeters (cm)
Wind	Wind speed in kilometers per hour	kilmeters per hour (kph)
Temp	Surface water temperature	degrees Celsius (°C)
Sp_Cond	Specific conductivity of surface water	micro Siemens per centimeters (µS/cm)

Cond	Conductivity of surface water	micro Siemens per centimeters (μS/cm)
Salinity	Salinity of surface water	unitless
DO_percent	Percent saturation of disolved oxygen	percentage (%)
DO	Dissolved oxygen	milligrams per liter (mg/L)
Sonde_Depth	Depth of YSI sonde during water qulity measurements	meters (m)
pH	Ph of surface water	unitless
Chl_a	Chlorophyll a concentration	micrograms per liter (μg/L)
Q1_Halodule	Percent cover of Halodule wrightii in Quadrat 1	percentage (%)
Q1_Thalassia	Percent cover of Thalassia testutinum in Quadrat 1	percentage (%)
Q1_Syringodium	Percent cover of Syringodium filiforme in Quadrat 1	percentage (%)
Q1_Ruppia	Percent cover of Ruppia marina in Quadrat 1	percentage (%)
Q1_Wrack	Percent cover of seagrass wrack or dead biomass in Quadrat 1	percentage (%)
Q1_Bare	Percent cover of bare substrate in Quadrat 1	percentage (%)
Q1_Other	Percent cover of other cover types in Quadrat 1	percentage (%)
Q2_Halodule	Percent cover of Halodule wrightii in Quadrat 2	percentage (%)
Q2_Thalassia	Percent cover of Thalassia testutinum in Quadrat 2	percentage (%)
Q2_Syringodium	Percent cover of Syringodium filiforme in Quadrat 2	percentage (%)
Q2_Ruppia	Percent cover of Ruppia marina in Quadrat 2	percentage (%)
Q2_Wrack	Percent cover of seagrass wrack or dead biomass in Quadrat 2	percentage (%)
Q2_Bare	Percent cover of bare substrate in Quadrat 2	percentage (%)
Q2_Other	Percent cover of other cover types in Quadrat 2	percentage (%)
Notes	Notes	unitless
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted (YYYY-MM-DDTHH:MM)	unitless

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Instruments

Dataset-specific Instrument Name	YSI 6920-V2 data sonde
Generic Instrument Name	YSI Sonde 6-Series
Dataset-specific Description	In the field, dissolved oxygen levels were checked for accuracy based on 100% saturation at the water-atmosphere interface and recalibrated as necessary. The YSI 6920-V2 data sonde was calibrated daily prior to each use in the field. Because the sonde uses temperature compensation, it was important that the temperature probe was properly verified with a traceable digital thermometer in a bucket of tap water. The temperature probe was checked on a daily basis by comparing the readings of multiple data sondes and was verified weekly using a digital thermometer. For conductivity and pH calibration, the calibration cup and sensors were pre-rinsed three times with a small amount of the standard prior to calibration. The conductivity sensors were then submerged completely in the solution, and gently shaken to dislodge any visible air bubbles that may be trapped by the sensor. Three-point calibration was used for pH and calibration steps were followed according to manufacturer's instructions depending on the particular buffer solutions used. Dissolved oxygen calibration was performed in a 100% saturated Freshwater bath for 10 minutes following manufacturer instructions. The chlorophyll sensor was calibrated in DI water, running the wiper at least once to ensure a zero reading on the sensor. If necessary, a two-point calibration was conducted according to manufacturer's specifications using dye standards. Any error messages during any of these calibrations were investigated and appropriately solved before utilizing any data output from the data sonde. Instrument calibration was recorded in a logbook. Upon return to the laboratory, a post-calibration check was performed on salinity, pH, dissolved oxygen, and chlorophyll a. If data sonde probes could not be calibrated or did not maintain their calibration, they were replaced.
Generic Instrument Description	YSI 6-Series water quality sondes and sensors are instruments for environmental monitoring and long-term deployments. YSI datasondes accept multiple water quality sensors (i.e., they are multiparameter sondes). Sondes can measure temperature, conductivity, dissolved oxygen, depth, turbidity, and other water quality parameters. The 6-Series includes several models. More from YSI.

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Project Information

RAPID: Degradation and Resilience of Seagrass Ecosystem Structure and Function following a Direct Impact by Hurricane Harvey (Harvey Seagrass)

Coverage: Corpus Christi Bay and Mission-Aransas Bays, Texas, USA

NSF Award Abstract: Disturbance has long been recognized as a major organizing force in marine communities with the potential to shape biodiversity. Hurricanes provide a natural experiment to understand how acute physical disturbances (storm surge and wind energy) may interact with longer-term changes in environmental conditions (salinity or turbidity) to alter the structure and function of ecological communities. As models indicate that hurricane intensity and precipitation will increase with a warming climate, understanding the response and recovery of coastal ecosystems is of critical societal importance. Harvey made landfall as a Category Four hurricane on the Texas coast on August 25, 2017, bringing extreme rainfall as the storm stalled over the middle Texas coast. The heavy rainfall and freshwater run-off created a low salinity lens that continues to persist two months later. Seagrass ecosystems may be particularly vulnerable because they grow on shallow, soft-sediment bottoms (and thus are easily dislodged or buried) and because seagrasses are sensitive to changes in salinity and turbidity. The societal implications of seagrass loss are well recognized: seagrasses provide highly valuable ecosystem services of large economic value for estuarine and nearshore dependent fisheries, serve as nursery habitats, and sequester gigatons of carbon on a global scale. Using measurements of the health and function of the seagrass and of the community for which it is habitat, the PIs are assessing the impact of the hurricane and of the persistent freshwater lens. Context is provided by looking at non-impacted sites and by six prior years of data. This project addresses the overarching question: How do intense physical disturbances in conjunction with chronic chemophysical perturbations affect loss and recovery of seagrass community structure and function, including local production, trophic linkages, and metazoan community diversity? To understand the impacts of Hurricane Harvey on seagrass ecosystems across the middle Texas coast, the investigators are (1) documenting losses in physical habitat structure, (2) teasing apart independent and interactive effects of multiple stressors associated with storm events on biodiversity and ecosystem function, and (3) identifying factors that promote resilience following disturbance. A state-wide seagrass monitoring program with six years of data from areas within Harvey's path and surrounding seagrass systems will provide invaluable context. The investigators are measuring seagrass structure, employing a Before-After-Control-Impact design at sites that experienced severe physical damage and appropriate reference sites. In situ loggers deployed after the storm track the evolution of the low salinity event together with seagrass physiological stress measurements (e.g. chlorophyll fluorescence, pigment loss, reduced growth). Changes in seagrass habitat function is assessed through measurements of faunal biodiversity within impacted and reference sites sampled via cores, benthic push nets, and seine nets. Tethering assays of seagrass blades and common invertebrate prey enables comparison trophic interactions across sites that vary in disturbance impact. These data are used to create models of ecosystem response to an extreme disturbance event and identify factors that best predict recovery of the physical structure of the habitat and of associated ecosystem functions.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1807143

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