Fate data for corals sampled at Flower Garden Banks from March 2023 to July 2024

Website: https://www.bco-dmo.org/dataset/986526
Data Type: Cruise Results
Version: 1
Version Date: 2025-10-27

Project
» Collaborative Research: RAPID: A multi-scale approach to predicting coral disease spread: leveraging an outbreak on coral-dense isolated reefs (FGB Disease)

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Abstract
These data summarize the fates of sampled corals from an unknown coral disease outbreak at the Flower Garden Banks National Marine Sanctuary. In late August of 2022, an unidentified multi-species acute tissue loss disease with signs and species susceptibility characteristics reminiscent of white plague and/or Stony Coral Tissue Loss Disease (SCTLD) was documented at East and West Bank in the Flower Garden Banks (FGB, northwest Gulf of Mexico, GoM) by NOAA divers. Our interdisciplinary research team of ecologists, connectivity and disease modelers, microbiologists, and coral immunologists are using photomosaics and colony fate-tracking, molecular and microscopy approaches, as well as modeling of disease reservoirs and dispersal to better understand characteristics of this outbreak. A scientific cruise occurred March 5-10, 2023 to mark and collect samples from diseased and healthy corals at one site, Buoy 5, within the Flower Garden Banks National Marine Sanctuary. Thirty-two stony coral colonies were tagged for sampling. Tagging consisted of hammering a uniquely numbered cattle tag into adjacent dead substrate with a masonry nail. A total of 96 samples were collected from the 32 tagged colonies (species: Orbicella franksi, Porites astreoides, Pseudodiploria strigosa). A second scientific cruise took place June 30 to July 4, 2024, when sampled corals were relocated and their current health status was recorded. This dataset includes the health status of each coral at the time of sampling in March 2023, and its health characteristics in July 2024 if it was found.

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Coverage

Location: Flower Garden Banks National Marine Sanctuary Buoy #5
Spatial Extent: **Lat**:27.880794 **Lon**:-93.873706
Temporal Extent: 2023-03-06 - 2024-07-04

Methods & Sampling

Sample Collection:
The 2023 cruise took place on R/V Pelican (cruise ID PE23-18) from March 5 to 10, 2023. The 2024 cruise was a private charter on M/V Fling (https://texascaribbean.com) from June 30 to July 4, 2024

2023 cruise (R/V Pelican PE23-18):
Boundaries of the Flower Garden Banks National Marine Sanctuary (FGBNMS) long-term monitoring plots were outlined using transect tapes. Both apparently healthy and actively diseased colonies of *Orbicella franksi* (6 colonies of each health state), *Porites astreoides* (5 colonies of each health state), and *Pseudodiploria strigosa* (5 colonies of each health state) were sampled within these boundaries (but avoiding FGBNMS photomosaic areas) for various analyses. Each sampled colony was marked for relocation by hammering a numbered cattle tag into the adjacent dead substrate and then photographed from above. Then, using either a hammer and chisel or an underwater Nemo drill with a diamond-tipped hole saw (no anvil), coral fragments approximately 4 x 4 centimeters (cm) were collected from each colony. Two fragments were collected from apparently healthy corals (HH), and four fragments from diseased corals, including two fragments immediately adjacent to the lesion boundary (DD) and two fragments from apparently healthy tissue (HD). All fragments were placed into individually labeled whirlpacks and transported to the surface. Sample scar edges on the sampled colonies were sealed with underwater epoxy (J-B Weld WaterWeld). If cores were removed with drills, a cement plug was placed into the hole in the skeleton and sealed with epoxy. Corals were rephotographed before and after sealing with the epoxy. Marked colonies were mapped to known landmarks using headings and distances. Once at the surface, one fragment from each sample type (HH, HD, DD) was processed for microbial analyses, gene expression, transmission electron microscopy (TEM), and histopathology (separate datasets).

2024 cruise (private charter aboard M/V Fling):
The corals sampled and tagged in 2023 were added to the FGBNMS Long Term Monitoring Program Map for their 100 x 100 meter (m) plot using previously recorded headings and distances to known landmarks and were confirmed with orthomosaics. Using these maps, divers on SCUBA took photos, recorded size estimates (length, width, and height), percent of the colony showing old mortality (defined as calyx degradation and algal recruitment), percent of the colony showing recent mortality (defined as bright white exposed skeleton with no algal recruitment), percent of living tissue that was bleached or paled, and disease identification (if applicable). Colony ID was confirmed by comparing the monitoring photos to photos of the colony at sampling. 25 of the 32 sampled colonies were found, photographed, and monitored for health status.

Instrument Details:
Corals were tagged with 2½ inch masonry nails and plastic cattle tags with unique IDs. Coral and sample-specific images were recorded with Olympus Tough TG-6 cameras in Olympus underwater housings. Either Milwaukee 3lb sledges and ¾ inch mason chisels or Nemo underwater drills with 1½ inch diamond hole saws (anvil removed) were used to collect fragments.

Data Processing Description

Each coral was assigned a representative health state at the monitoring period (either apparently healthy, diseased, or other health impairment) to fate track colonies and compare fates among the sampling health states.

BCO-DMO Processing Description

- Imported original file "RAPID_FateTracking_FGB_revised.csv" into the BCO-DMO system.
- Marked "NA" as a missing data value (missing data are empty/blank in the final CSV file).
- Changed format of dates to YYYY-MM-DD.
- Corrected years of 3023 to 2023.

- Renamed fields to comply with BCO-DMO naming conventions.
- Saved the final file as "986526_v1_fgb_fate_tracking.csv".

Problem Description

Not all corals could be relocated to determine their fates and health characteristics in 2024.

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Parameters

Parameter	Description	Units
SpeciesID	Species code consisting of the first letter of the genus and first three letters of the species	unitless
Species	Name of coral species	unitless
Tag_ID	ID number on tag	unitless
SampleDate	Date that the coral was sampled	unitless
SamplingHealthState	Health state of coral at the time of sampling in 2023, either healthy or diseased	unitless
MonitoringDate	Date that the coral was reassessed and health data were taken	unitless
HealthState_2024	Health state of the coral when revisited in 2024. Could be: Healthy, diseased, not found, or other health impairment noted	unitless
Length_cm_2024	Maximum planar length in centimeters of the coral as measured by a diver on SCUBA	centimeters (cm)
Width_cm_2024	Maximum planar width perpendicular to the length in centimeters of the coral as measured by a diver on SCUBA	centimeters (cm)
Height_cm_2024	Maximum planar height from the substrate as measured by a diver on SCUBA	centimeters (cm)
Old_Mortality_pcnt_2024	Percent of the coral exhibiting old mortality as estimated by a diver on SCUBA	percent (%)
Rec_Mortality_pcnt_2024	Percent of the coral exhibiting recent mortality as estimated by a diver on SCUBA; recent mortality distinguished from old mortality as an area showing little to no algal colonization	percent (%)

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Instruments

Dataset-specific Instrument Name	plastic cattle tags
Generic Instrument Name	labeling tag
Dataset-specific Description	Corals were tagged with 2 ½" masonry nails and plastic cattle tags with unique IDs.
Generic Instrument Description	Passive devices attached to captured organisms to specifically identify them when recaptured after release.

Dataset-specific Instrument Name	Milwaukee 3lb sledges and ¾ in mason chisels or Nemo underwater drills
Generic Instrument Name	Manual Biota Sampler
Dataset-specific Description	Either Milwaukee 3lb sledges and ¾ in mason chisels or Nemo underwater drills with 1 ½" diamond hole saws (anvil removed) were used to collect fragments.
Generic Instrument Description	"Manual Biota Sampler" indicates that a sample was collected in situ by a person, possibly using a hand-held collection device such as a jar, a net, or their hands. This term could also refer to a simple tool like a hammer, saw, or other hand-held tool.

Dataset-specific Instrument Name	SCUBA
Generic Instrument Name	Self-Contained Underwater Breathing Apparatus
Dataset-specific Description	Divers on SCUBA took photos, recorded size estimates, percent of the colony showing old mortality, percent of the colony showing recent mortality, percent of living tissue that was bleached or paled, and disease identification.
Generic Instrument Description	The self-contained underwater breathing apparatus or scuba diving system is the result of technological developments and innovations that began almost 300 years ago. Scuba diving is the most extensively used system for breathing underwater by recreational divers throughout the world and in various forms is also widely used to perform underwater work for military, scientific, and commercial purposes. Reference: https://oceanexplorer.noaa.gov/technology/technical/technical.html

Dataset-specific Instrument Name	Olympus Tough TG-6 cameras in Olympus underwater housings
Generic Instrument Name	Underwater Camera
Dataset-specific Description	Coral and sample specific images were recorded with Olympus Tough TG-6 cameras in Olympus underwater housings.
Generic Instrument Description	All types of photographic equipment that may be deployed underwater including stills, video, film and digital systems.

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Deployments

PE23-18

Website	https://www.bco-dmo.org/deployment/988057
Platform	R/V Pelican
Start Date	2023-03-05
End Date	2023-03-11
Description	More information is available from R2R: https://www.rvdata.us/search/cruise/PE23-18

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Project Information

Collaborative Research: RAPID: A multi-scale approach to predicting coral disease spread: leveraging an outbreak on coral-dense isolated reefs (FGB Disease)

Coverage: Flower Garden Banks National Marine Sanctuary, northwest Gulf of Mexico

NSF Award Abstract:

Marine diseases have devastating impacts on ocean ecosystems and this work directly informs understanding of disease transmission in the ocean. To understand the cause and patterns of spread of a disease outbreak that began in late summer of 2022 at the Flower Garden Banks National Marine Sanctuary (northwest Gulf of Mexico, GoM), a team of ecologists, ocean connectivity and disease modelers, microbiologists, and coral immunologists (from Rice University, the University of Virgin Islands (UVI), Louisiana State University (LSU), and Woods Hole Oceanographic Institution) is monitoring the health of corals, and biopsy their tissues. This data aid in developing a model that predicts coral disease transmission and its impacts on economically valuable coral reefs in the GoM. This project supports multidisciplinary field and laboratory research experiences of graduate students at multiple minority-serving institutions, and provides undergraduate students with hands-on training in modeling, ecological and molecular analysis techniques. UVI and LSU are in EPSCoR jurisdictions and have diverse student bodies, including numerous under-represented minority (URM) students. The research team collaboratively provides URM students with research experiences in STEM fields. Project findings are being broadly communicated through virtual public programming, to the Disease Advisory Council, and via direct updates to managers of the Flower Garden Bank National Marine Sanctuary.

Over the last four decades, diseases decimated ecosystem engineers in marine coastal environments, including coral reefs. Recent results from studies of white plague and stony coral tissue loss disease (SCTLD) show coral species immune traits can influence disease resistance and therefore predict of coral community structure post-outbreak in the Caribbean. In late August of 2022, an unidentified multi-species acute tissue loss disease with signs and species susceptibility characteristics reminiscent of white plague or SCTLD was documented at the Flower Garden Banks (northwest Gulf of Mexico, GoM). This disease is having significant impacts on FGB and could become widespread across the GoM, offering an opportunity to test hypotheses about the influence of coral community composition and pathogen dispersal on disease spread during the early stages of an outbreak; few studies examine this on relatively isolated, deep, coral-dense reefs. The interdisciplinary research team employs photomosaics and colony fate-tracking, layered molecular datasets and microscopy approaches, as well as modeling of disease reservoirs and dispersal to assess the etiology of the disease and contribute to the development of a generalizable framework for disease spread on reefs. By parsing the impacts of reef-scale community composition versus seascape-scale dispersal in disease transmission and persistence, this work helps reveal the potential resistance and resilience of isolated, coral-dense reefs to diseases that decimate these ecosystems across the wider Caribbean.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using

the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2316579

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