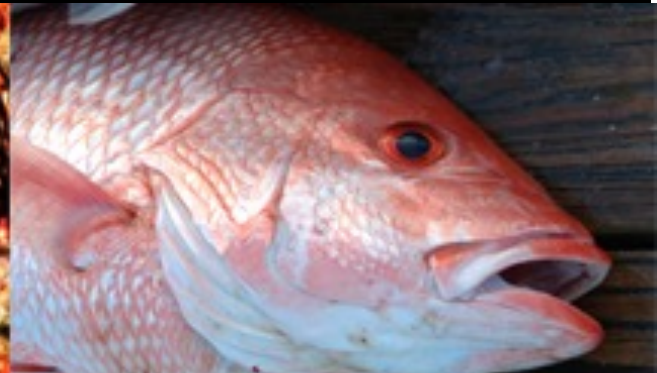




Gulf of Mexico Fishery Management Council:

# CCC Council Highlights



# Outline

- **Fisherman Feedback: Crowdsourcing Observations of the Fisheries**
- **The Great Red Snapper Count: Integrating Novel Science into Management**
- **Ecosystem Modeling Success**
- **Coral Reef Conservation Program Products**

# Fisherman Feedback

Crowdsourcing Qualitative Stakeholder Observations to Enhance Scientific Understanding of Fish Stocks



**Crowdsourcing:** “The practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community...” - *Merriam-Webster*



# Why Gather Crowdsourced Observations?

- Regional Fishery Management Councils encourage local-level knowledge in federal fisheries management
  - Stakeholders with on-the-water knowledge engaged in process
- Crowdsourcing observations from Council stakeholders provides an opportunity for many people to share their individual perspectives
- Participation in the scientific aspects of resource management typically requires considerable involvement
  - Cooperative research
  - Citizen science



# Why Gather Crowdsourced Observations?

Stock assessments can have data gaps or lack real-time data

Current on-the-water knowledge can be used to:

- Ground-truth observed trends
- Explain anomalies
- Inform projections



# How Does Fisherman Feedback Work?

## Solicit Feedback

- Online tool used to collect species-specific observations prior to each assessment
- Association(s) with the fishery
  - Observation
  - Location of observation

## Analyze

- Comments analyzed for overall and stock condition related positive, neutral, or negative sentiment
- Manual Analysis: Two individuals classify sentiment separately and resolve discrepancies
  - Automated Analysis: R statistical software package 'tidytext' using a revised 'Bing' lexicon library to classify sentiment

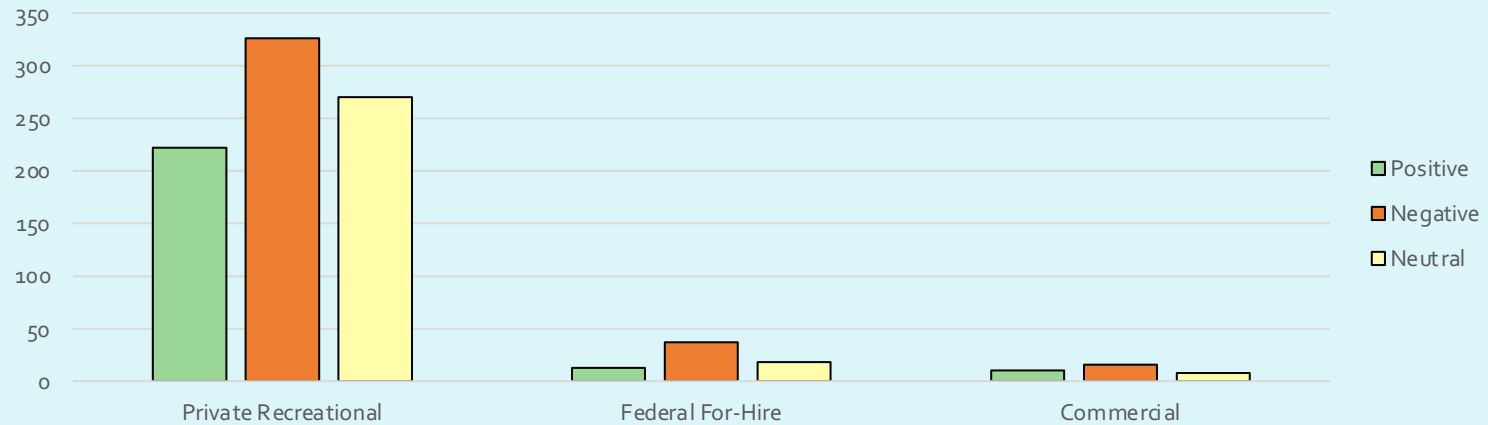
## Share

- Stock Assessment Panel
- Scientific and Statistical Committee / Relevant Advisory Panel
- Council
- Respondents/Stakeholders

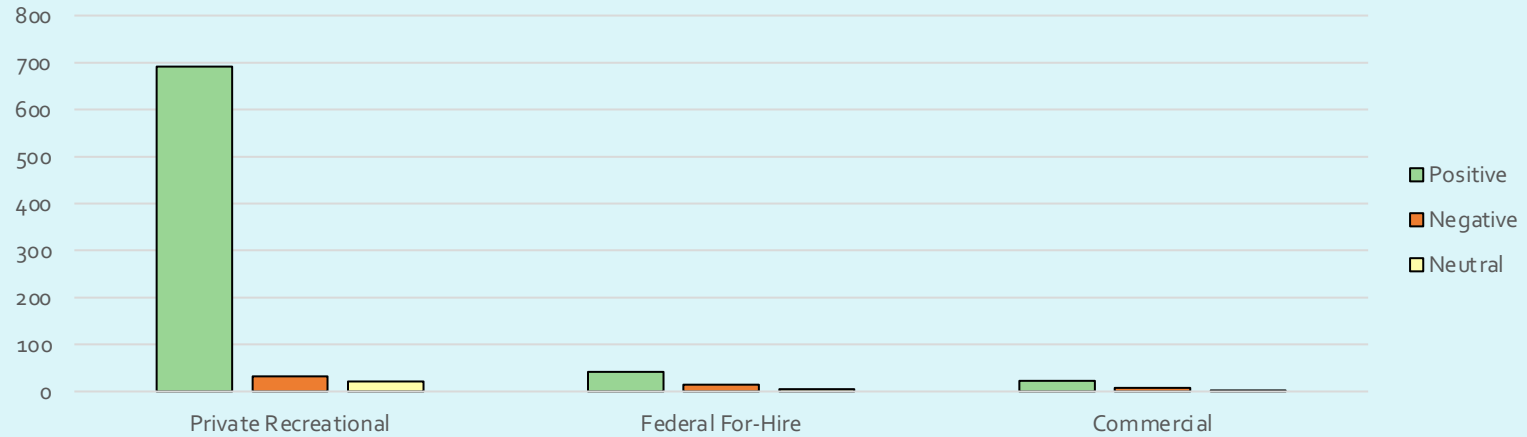


# An Example of Outputs: Red Snapper

## Overall Sentiment by Sector



## Stock Condition Sentiment by Sector



# An Example of Outputs: Red Snapper

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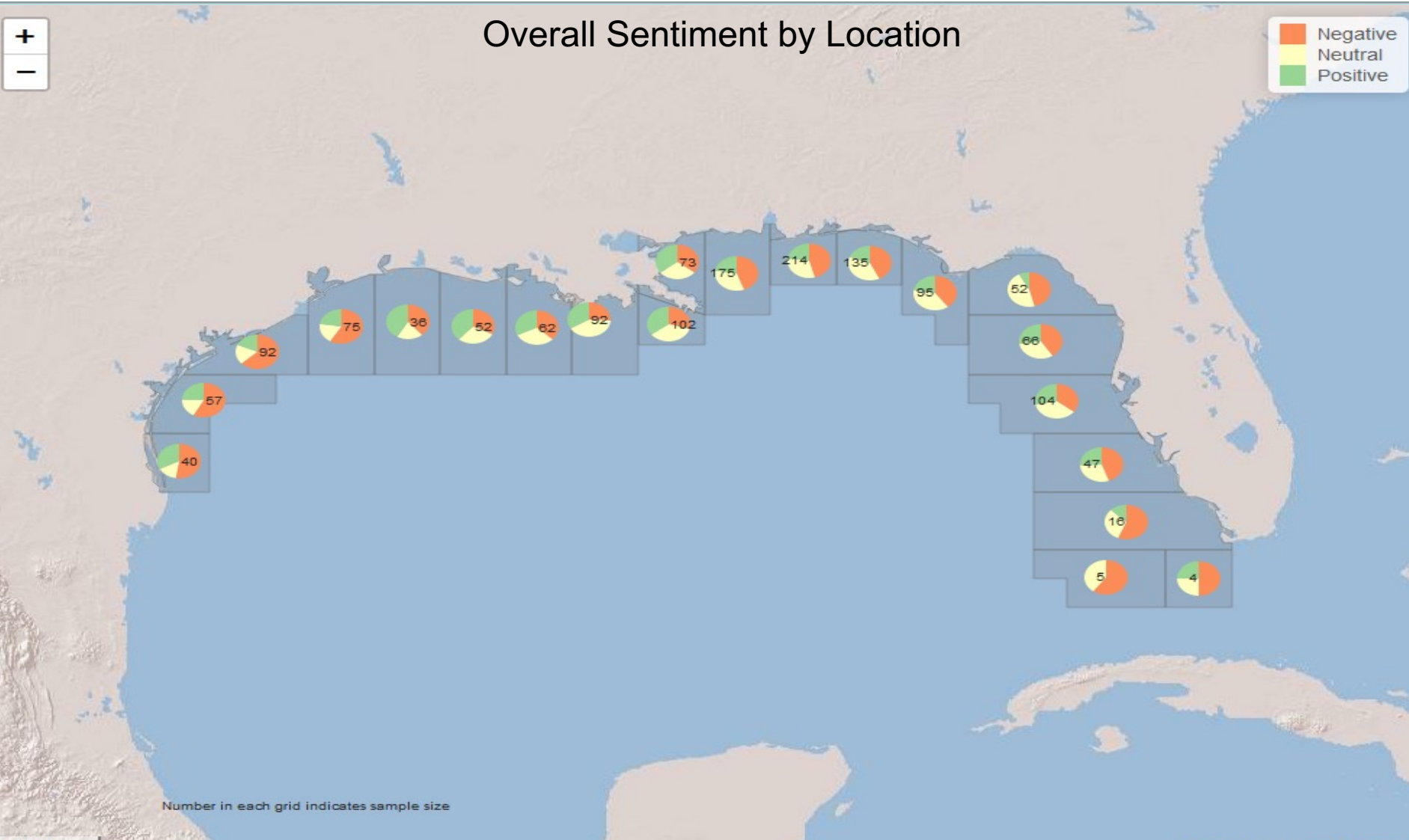
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Overall Sentiment by Location

Negative

Neutral

Positive





# Stock Condition Sentiment by Location



Stock Condition Sentiment by Location

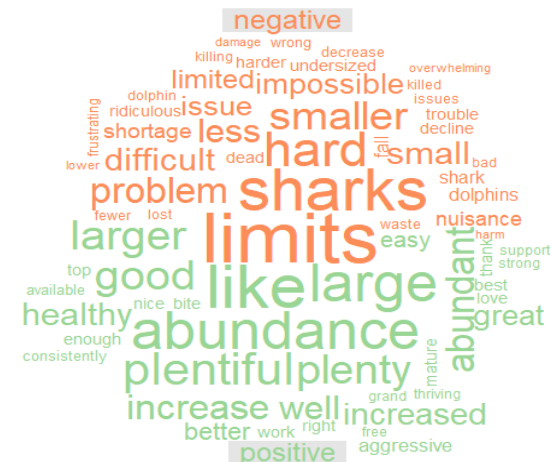
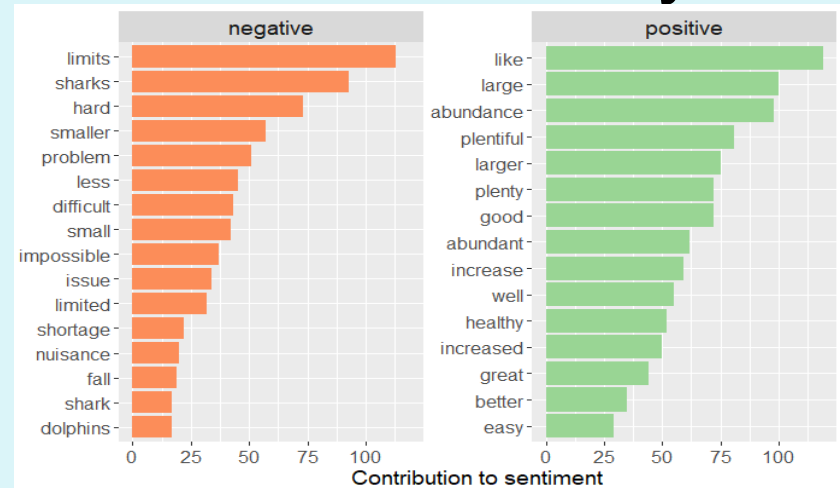


# An Example of Outputs: Red Snapper

## Manual Analysis

- A majority of respondents believe the stock is in good condition.
  - Stock is so prolific that it's difficult to target other species.
  - Damaging the ecosystem
- Some respondents indicated red snapper regulations do not match the health of the stock
  - Recreational seasons and/or bag limits should be increased
  - Culling and regulatory discards are an issue
- Some respondents did indicate that fishing pressure is too high
  - Causing local-level depletion
  - In-shore stocks are depleted but offshore populations are healthy.
- Some respondents shark, and to a lesser extent dolphin, depredation was on the rise and that something needs to be done to mitigate the issue

## Automated Analysis



# Fisherman Feedback Efforts

Species	Assessment	# of Respondents
Red Grouper	SEDAR 61	97
Gray Triggerfish	SEDAR 62	132
Yellowtail Snapper	SEDAR 64	364
King Mackerel	Update Assessment	47
Vermilion Snapper	SEDAR 67	63
Cobia	Update Assessment	586
Scamp	SEDAR 68	32
Greater Amberjack	SEDAR 70	64
Gag	SEDAR 72	418
Red Snapper	SEDAR 74	880

**Next up:** Mutton Snapper and Spanish Mackerel



# Fishermen Feedback Features

- Bridges data lags and gaps
- Identifies ecosystem indicators
- Bolsters recreational engagement
  - Great 'bang for the buck,' from staff and public perspectives
  - Gathers private recreational angler feedback effectively



# The Future of Fisherman Feedback



- Continue to complete one for each stock assessment
- Formalize SOPP's and a Technical Guidance document
- Currently working to achieve Paperwork Reduction Act 'general approval'
- Develop and publish a paper

# Novel Science and Management: The *Great Red Snapper Count*

## The *Great Red Snapper Count* (GRSC):

- Region-wide collaborative research project
- Purpose: estimate absolute abundance of red snapper in the Gulf
- Completed between 2018 – 2019

**Result:** estimated 85.6 million  
age 2+ red snapper



# Novel Science and Management: *The Great Red Snapper Count*

- GMFMC led NS2-compliant expert peer-review, quick integration of BSIA into fisheries management
  - Rigor applauded by GRSC PIs and observers
- What's next?:
  - GRSC data considered in next stock assessment
  - Stock assessment process will consider best ways to apply GRSC to broader universe of data
  - *Great Amberjack Count*
    - Peer-review will be similar in structure and rigor to example set by GMFMC for GRSC

# Ecosystem Modeling: Red Tide and Gag

Red tide:

- Dinoflagellate
- Ever-present in the Gulf of Mexico, can bloom over vast areas
- Grows in thick mats, blooms can be detected via remote sensing satellites
- Releases a toxin as it dies; decomposition draws dissolved  $O_2$  out of the water



# Ecosystem Modeling: Red Tide and Gag

Gag grouper vulnerable to episodic mortality from red tide harmful algal blooms

Red tide model explorations and products:

- Improves estimates of natural and fishing mortality rate by year
  - Generated estimates of comparative severity of 2018 red tide relative to 2005 (presumed worst)
  - Estimated mortality effects at age
  - Determined fraction of vulnerable biomass
- Supports improved catch level projections



# Ecosystem Modeling: Red Tide and Gag

GMFMC supported integration of ecosystem component into science and management

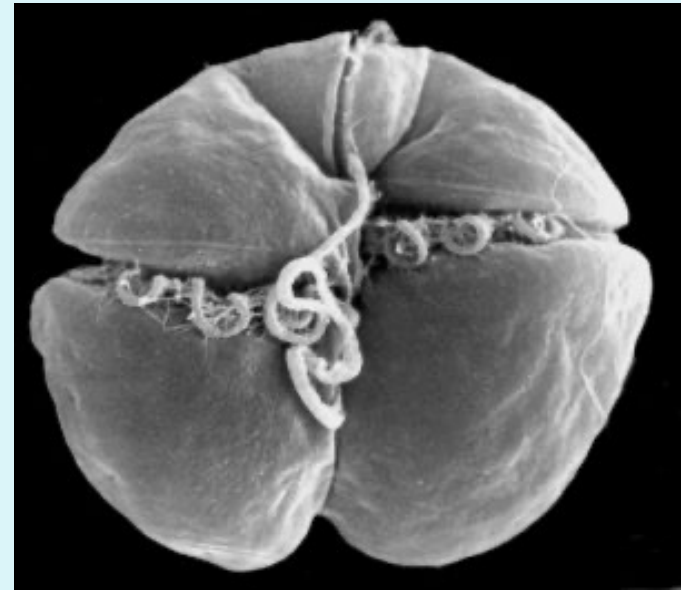
- Explicit consideration of an environmental variable
  - Allows for better understanding of effects
- Directly affects short-term yield projections
  - Allows for better conceptualization of fisheries management for vulnerable stocks



# Ecosystem Modeling: Red Tide and Gag

## What's next?

- GMFMC will support similar work for red grouper to inform upcoming stock assessment
- Consideration of red tide as a fishery ecosystem issue
  - FEI is a way of integrating ecosystem issues into a broader goal of ecosystem-based or ecosystem-informed fisheries management



# Coral Reef Conservation Program Products

Grant focuses on identifying status, changes in **coral reef habitats** and **potential management implications** to promote the **sustainability and conservation** of coral reef and associated fisheries in the Gulf of Mexico.

## Methods

- Comprehensive scientific review
- Broad stakeholder engagement

## Outreach Products

- Learning modules
- Spatial decision-support tools
- White papers

# Learning Modules

Effectiveness of Spiny lobster closed areas in protecting the Corals

In 2009, the National Marine Fisheries Service completed a Biological

## Spiny Lobster Closed Areas

Coral Reef Invasive Species in the Gulf of Mexico

Coral cover can be influenced by biotic stressors such as invasive species and substrate competition with other benthic invertebrates. Invasive species can cause severe and lasting damage to the habitats they invade by reducing the abundance of native species as well as altering the ecosystem structure. They can rapidly spread in the ecosystem, compete for resources, and may introduce diseases to native species to which they themselves are immune.

The presence of invasive species and space competition with other benthic invertebrates can affect species that depend on healthy reef habitat.

## Coral Reef Invasive Species

Non-climatic stressors for corals in the Gulf

Coral reefs are susceptible to climate (i.e. temperature, salinity) and non-climate stressors (NCS) due to their fragile nature. The majority of the scientific literature on stressors was focused on the effect of climatic stressors on coral reefs<sup>1-3</sup>. There are limited studies that provide perspective on how coral reef habitats are affected by non-climatic stressors.

In this module, we will focus on highlighting information about non-climatic stressors on the coral reefs in the Gulf, particularly three major stressors oil spills, harmful algal blooms, and hurricanes.

## Non-climatic Stressors of Corals

Ancient Deep-Sea Corals

Deep Sea Soft Corals

The deep sea benthic environment is a hot bed of biodiversity, yet the ecological and evolutionary mechanisms that generate and maintain this diversity are poorly understood (1).

Cold water corals represent some of the most abundant and diverse structure-forming species assemblages in deep sea ecosystems, serving as an excellent model to understand evolution in the deep sea. Deep sea soft corals (Cnidaria) are abundant foundation species, when occurring as extensive beds of colonies in the upper bathyal region (1,000 - 3,000 m).

Colonies of soft corals remain viable for a diverse range of durations (100 - 1000 years).

## Soft Corals (*Callogorgia spp.*)

Deep Sea Black Corals

The deep-water environment of the Florida Escarpment proved to be a good habitat for slender deep-water coral communities.

Black Coral (or Antipatharia) – a group of branching corals are often associated with deep reef habitats. Although their exterior flesh is usually red, white, or orange, their internal skeleton is black. Black corals can live to for thousands of years. In fact, one from the Gulf of Mexico was aged to be more than 2000 years old.

These corals are a valuable tool for scientists because their skeletons contain rings, like trees. The rings have chemical signatures that allow scientists to learn about past oceanic environments. Black corals have also been harvested for jewelry, a practice which is not sustainable.

In this storyboard, we will learn more about black coral in the Gulf of Mexico.

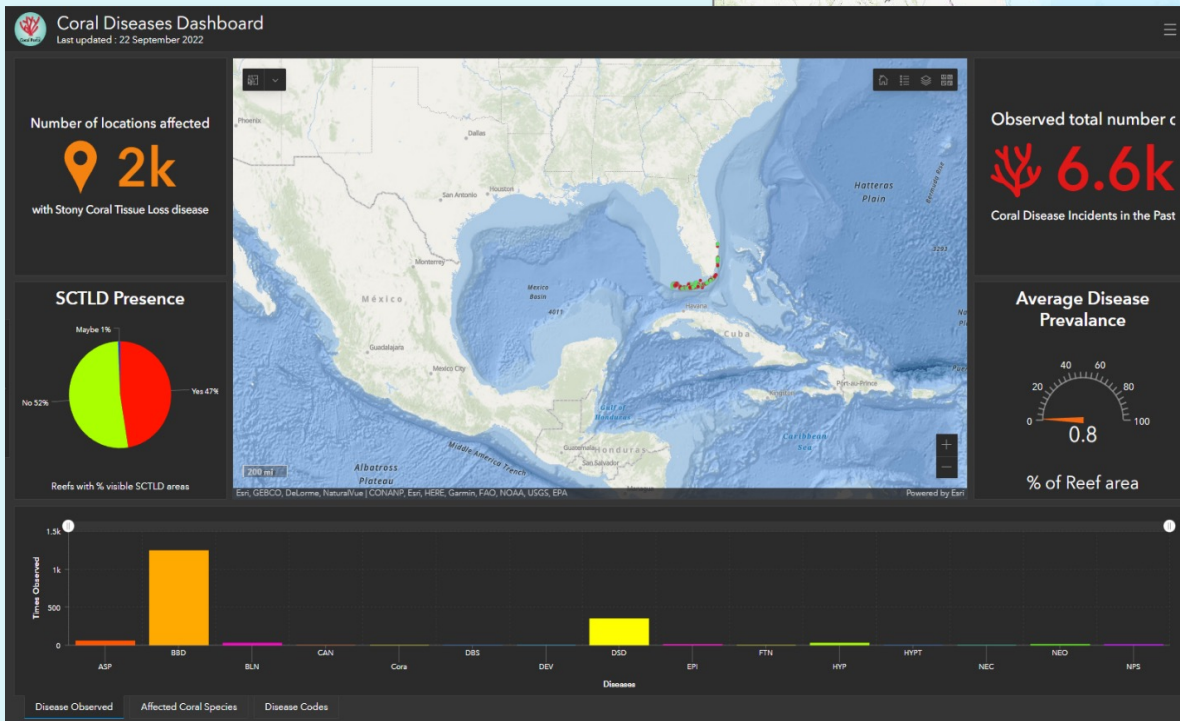
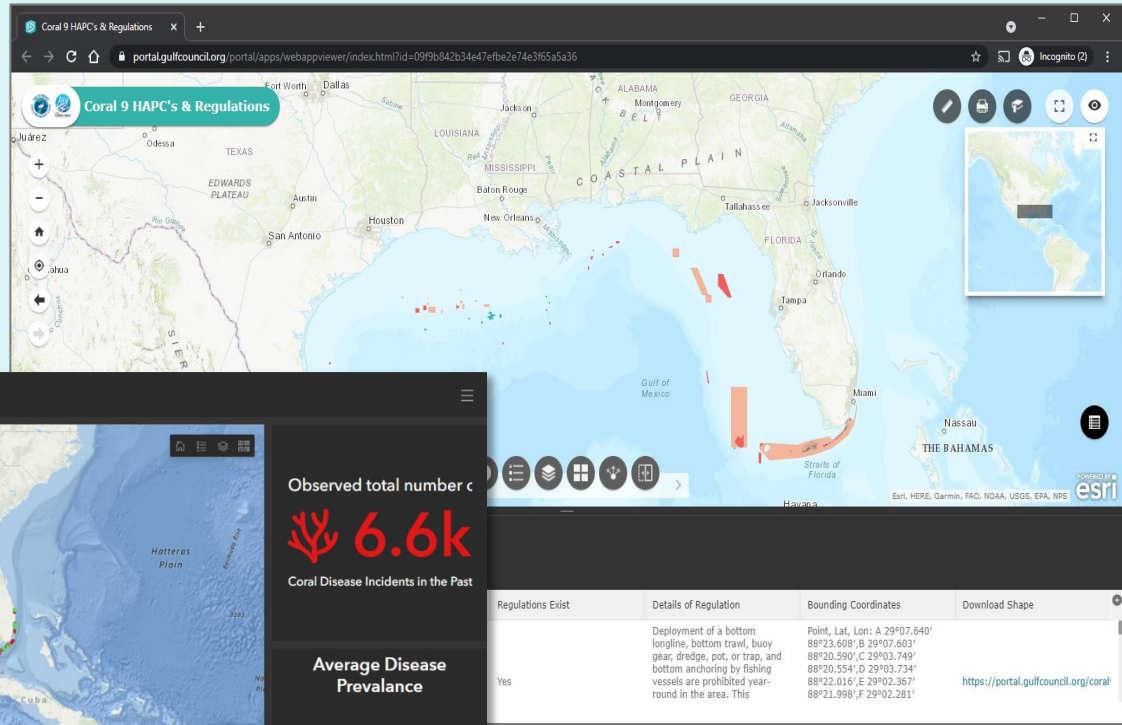
## Black Corals (*Antipathes sp.*)

Ancient Deep-Sea Corals

## Ancient Corals (*Leiopathes spp.*)

# Web Applications and Dashboards

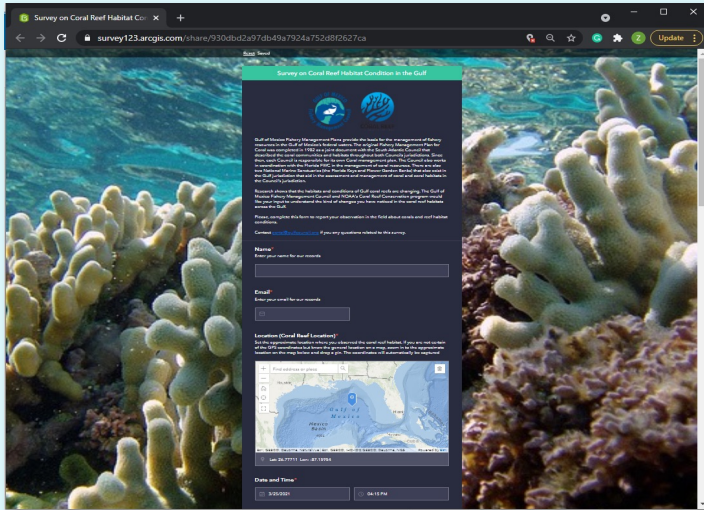
**Coral 9 HAPC Explorer Application.**  
Displays the HAPCs established through Coral Amendment 9 in relation to other existing HAPCs in the Gulf with detailed regulations in each of them. Can be accessed from <https://portal.gulfcouncil.org/coral9/>



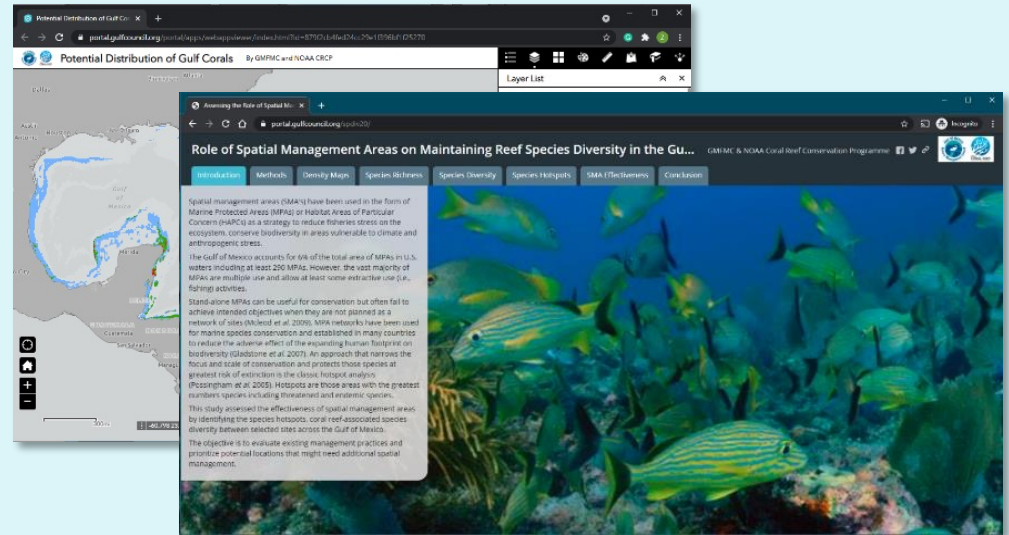
**Coral Disease Dashboard.**  
Highlights coral disease occurrence in the Gulf with data sourced from partner agencies. Can be accessed at <https://portal.gulfcouncil.org/coraldisease>

# Engagement and Outreach

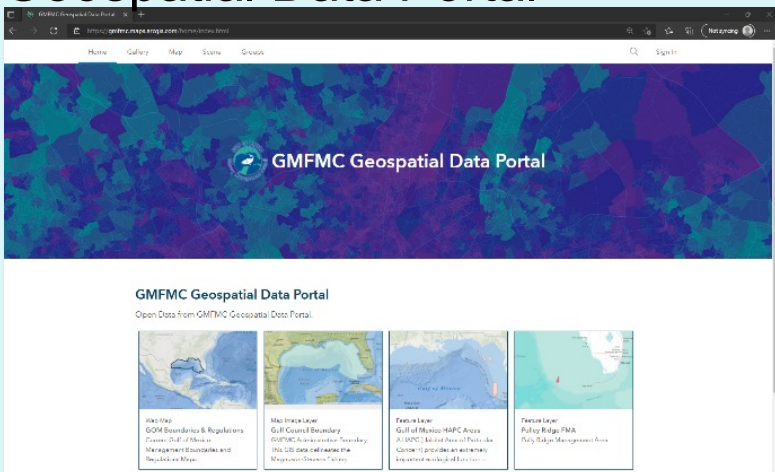
## Online Surveys



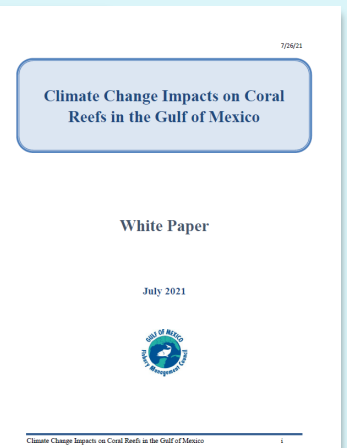
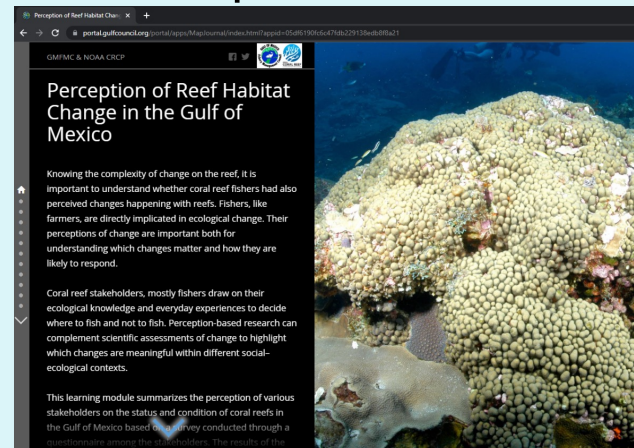
## Interactive Web Modules



## Geospatial Data Portal



## White Papers



# Guides on Gulf Corals

Printable flash cards on [ESA listed coral species](#) and waterproof guides for common coral species from the Gulf are available in hard copy and as a downloadable [electronic pdf format](#) on the portal.





# Takeaways

## Fisherman Feedback:

- Reaches recreational anglers that don't usually participate in the Council process
  - Large ROI
- Ground truthing trends identified in stock assessments
- Identifies ecosystem indicators

## Great Red Snapper Count

- Developed rigorous, collaborative review process for integrating novel science into management
  - Can be applied to future efforts

## Ecosystem Modeling

- Made progress towards integrating environmental factors into management and catch advice

## Coral Grant

- Improves understanding of linkage between habitat and associated fisheries to support ecosystem management
  - Provides resources to develop interactive stakeholder tools