

# Coral Reef Conservation Program Grant Update

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Gulf of Mexico Fishery Management Council Meeting

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# Outline

- ❖ Coral Reef Conservation Program grant overview
- ❖ Objective and expectations from the recent grant
- ❖ Selected deliverables produced from task activities
  - Learning Modules
  - Web Applications
  - Stakeholder Engagement
  - Information Dashboard
- ❖ Product highlights
- ❖ Future activities

# Coral Reef Conservation Program Grants

## **2011-2013 Grant Cycle**

Inspiring deep-sea learning

- Deep-sea ecosystems
  - Biologically important
  - Little known outside scientific community
- Print and digital posters highlighting Deep-sea species & ecosystems (e.g., ecosystems of the deep & creatures of the deep)
- Wide-spread distribution of outreach materials
- Developed more digital content

## **2014-2016 Grant Cycle**

Expanding digital content

- Coral, EFH, HAPC, Spiny Lobster, Lionfish Mapper Applications
- Developing species-habitat models, learning modules and Decision Support Tools
- Communicate and coordinate with other management partners in coral ecosystem management efforts through workshops and outreach materials

## **2017-2020 Grant Cycle**

Endangered Coral Species

- Learning modules on deep sea corals, life history, and climate change effect on corals
- Applications and Decision Support tools for exploring ESA coral distribution, HAPC, ESA Coral Habitat Models.
- Gulf of Mexico common coral dive booklet and hosting ESA coral database.

# What does the most recent grant include?

Two-year project (2020-2022) addressing changes in **coral reef habitats** and **potential management implications** to promote the **sustainability** of coral reef associated fisheries in the Gulf of Mexico using:

- Comprehensive scientific review
- Broad stakeholder engagement
- Spatial decision-support tools

Proposed activities were divided into two tasks, each having a goal towards fulfilling the overall objective of the project.

# Task 1: Evaluation of Existing Management Measures

Identification of potential additional coral habitat areas for protection and an evaluation of the effectiveness of current management areas for coral reefs, and associated fishes in the Gulf of Mexico.

- Incorporating new information gathered from a review of recent scientific studies, existing habitat protection measures, fishing activities, and monitoring outcomes.
- Identify and evaluate the performance of existing management measures by comparing coral cover inside/adjacent to managed sites.
- Create outreach materials in the form of learning modules and decision support tools and publish them in the Coral Portal.

# Web Application

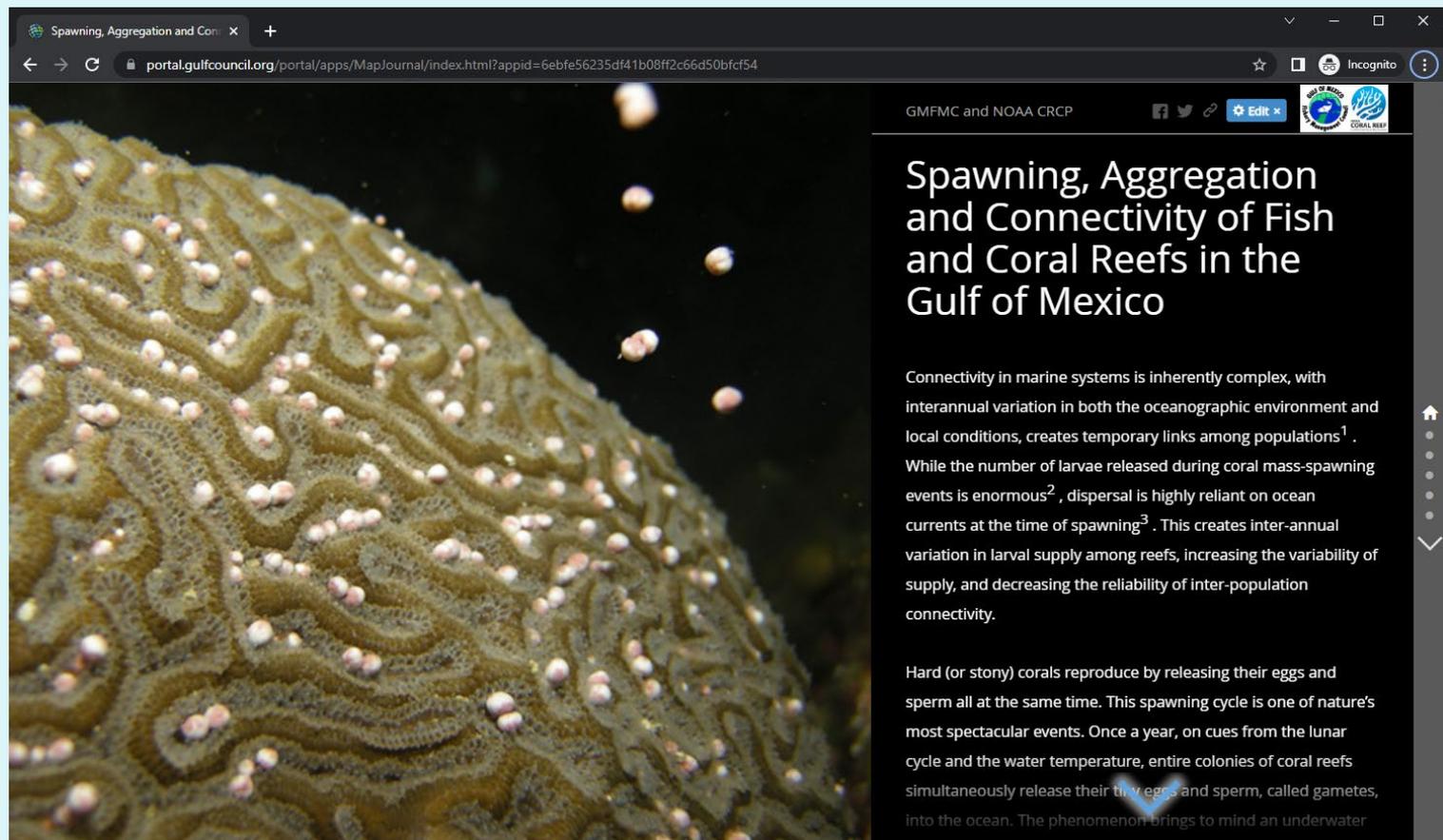
Coral 9 HAPC Explorer application. The application displays the HAPCs established through Coral Amendment 9 in relation to other existing HAPCs in the Gulf with detailed regulations existing in each of them. It can be accessed from <https://portal.gulfcouncil.org/coral9/>

The screenshot shows the Coral 9 HAPC Explorer web application. The top part of the page features a map of the Gulf of Mexico region, including parts of Texas, Louisiana, Mississippi, Alabama, Georgia, and Florida. The map displays various HAPCs (Habitat Areas of Particular Concern) as colored polygons. A sidebar on the left contains navigation controls, and a top navigation bar includes the application title and a search bar. Below the map, there is a table with the following columns: Feature, Depth (m), Area (Square Miles), Regulations Exist, Details of Regulation, Bounding Coordinates, and Download Shape. The table lists 29 features, with one selected: Viosca Knoll 862/906, located at a depth of 300-700 meters, covering an area of 24.90 square miles. The details of regulation for this feature state: "Deployment of a bottom longline, bottom trawl, buoy gear, dredge, pot, or trap, and bottom anchoring by fishing vessels are prohibited year-round in the area. This". The bounding coordinates are provided in a list format: Point, Lat, Lon: A 29°07.640' 88°23.608', B 29°07.603' 88°20.590', C 29°03.749' 88°20.554', D 29°03.734' 88°22.016', E 29°02.367' 88°21.998', F 29°02.281'. The download shape link is <https://portal.gulfcouncil.org/coral/>. The bottom of the page shows a status bar indicating "29 features 0 selected".

Feature	Depth (m)	Area (Square Miles)	Regulations Exist	Details of Regulation	Bounding Coordinates	Download Shape
Viosca Knoll 862/906	300-700	24.90	Yes	Deployment of a bottom longline, bottom trawl, buoy gear, dredge, pot, or trap, and bottom anchoring by fishing vessels are prohibited year-round in the area. This	Point, Lat, Lon: A 29°07.640' 88°23.608', B 29°07.603' 88°20.590', C 29°03.749' 88°20.554', D 29°03.734' 88°22.016', E 29°02.367' 88°21.998', F 29°02.281'	<a href="https://portal.gulfcouncil.org/coral/">https://portal.gulfcouncil.org/coral/</a>

# Learning Module

The learning module highlights known coral and fish aggregations, spawning areas in the Gulf, and known connectivity among these locations. It can be accessed online at <https://portal.gulfcouncil.org/spawnagg/>



The screenshot shows a web browser window with the URL [portal.gulfcouncil.org/portal/apps/MapJournal/index.html?appid=6ebfe56235df41b08ff2c66d50bfc54](https://portal.gulfcouncil.org/portal/apps/MapJournal/index.html?appid=6ebfe56235df41b08ff2c66d50bfc54). The page features a large image of a coral reef with many small, glowing pinkish-white spots, likely representing spawning events. The text on the page is as follows:

GMFMC and NOAA CRCP

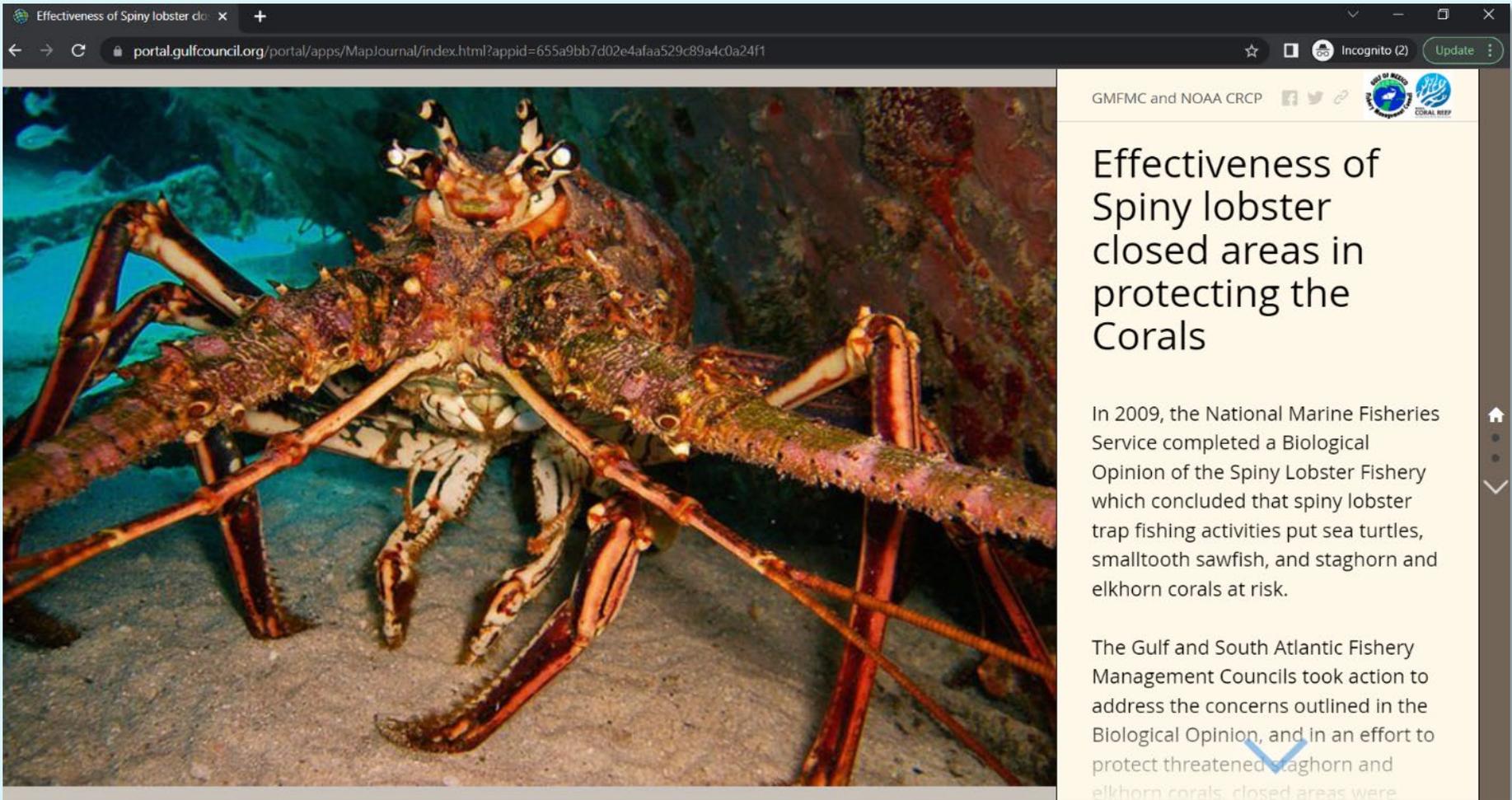
## Spawning, Aggregation and Connectivity of Fish and Coral Reefs in the Gulf of Mexico

Connectivity in marine systems is inherently complex, with interannual variation in both the oceanographic environment and local conditions, creates temporary links among populations<sup>1</sup>. While the number of larvae released during coral mass-spawning events is enormous<sup>2</sup>, dispersal is highly reliant on ocean currents at the time of spawning<sup>3</sup>. This creates inter-annual variation in larval supply among reefs, increasing the variability of supply, and decreasing the reliability of inter-population connectivity.

Hard (or stony) corals reproduce by releasing their eggs and sperm all at the same time. This spawning cycle is one of nature's most spectacular events. Once a year, on cues from the lunar cycle and the water temperature, entire colonies of coral reefs simultaneously release their tiny eggs and sperm, called gametes, into the ocean. The phenomenon brings to mind an underwater

# Learning Module

Learning module on the effectiveness of spiny lobster closed areas in protecting corals. The module can be accessed at <https://portal.gulfcouncil.org/SpinyLobster/slca>



Effectiveness of Spiny lobster closed areas in protecting the Corals

GMFMC and NOAA CRCP

In 2009, the National Marine Fisheries Service completed a Biological Opinion of the Spiny Lobster Fishery which concluded that spiny lobster trap fishing activities put sea turtles, smalltooth sawfish, and staghorn and elkhorn corals at risk.

The Gulf and South Atlantic Fishery Management Councils took action to address the concerns outlined in the Biological Opinion, and in an effort to protect threatened staghorn and elkhorn corals, closed areas were

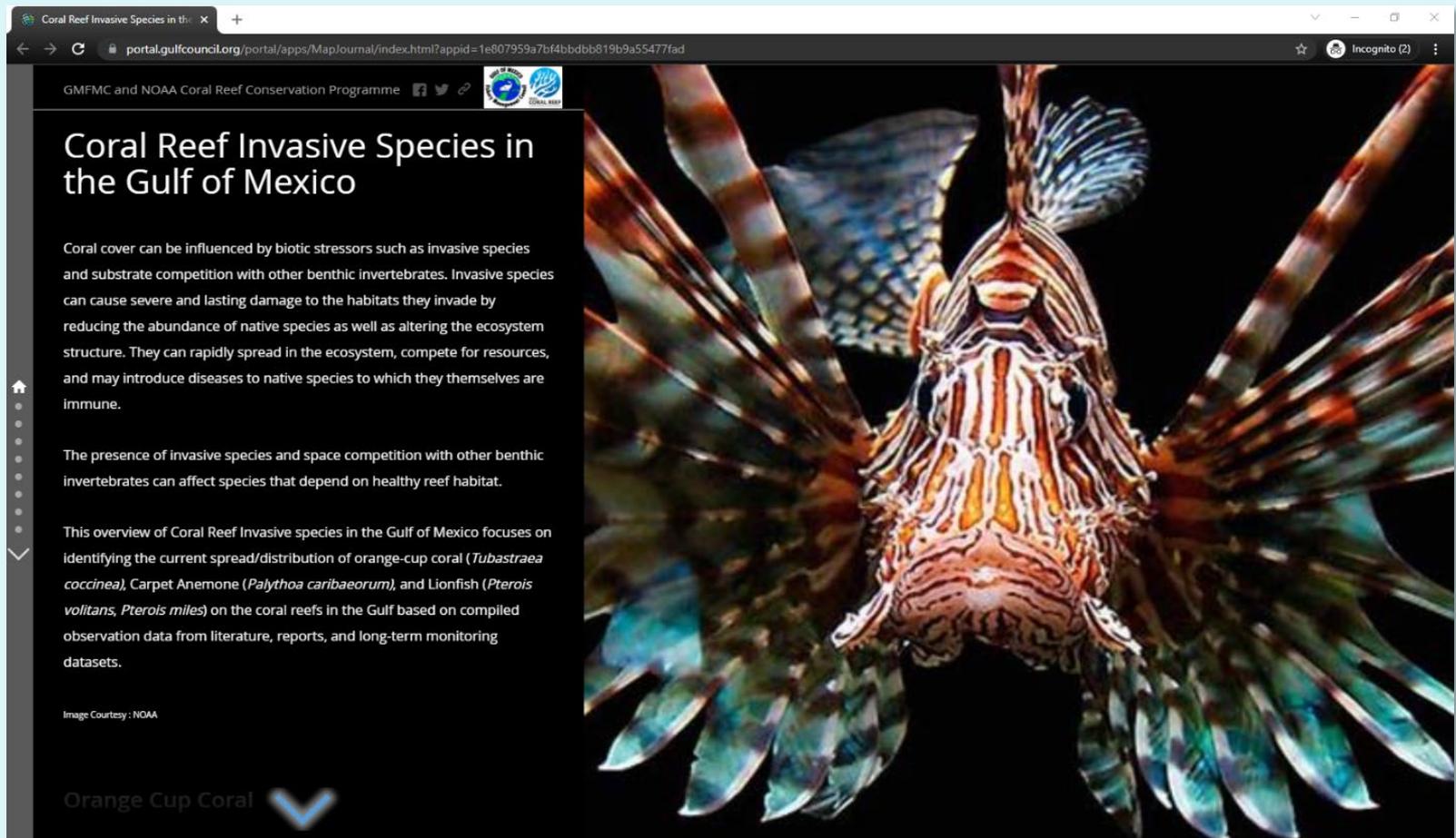
## Task 2: Assessing Changes to Coral Reef Habitat Composition

Identifying change in coral reefs habitat composition across the Gulf to improve management of coral reef and associated resources in the future.

- An extensive review of information (i.e. literature, data) to assess changes in coral habitat composition associated with invasive species.
  - Mapping the impact of non-climatic stressors for coral reef habitats in the Gulf in recent years.
  - Conduct a survey to stakeholders to identify the gap in management from their perception of changing coral reef habitat and available data.
- Create a comprehensive coral disease dashboard for the Gulf.

# Learning Module

Learning module on coral reef invasive species in the featured distribution map of common invasive species in the Gulf. The module can be accessed at <https://portal.gulfcouncil.org/invasives/>



Coral Reef Invasive Species in the Gulf of Mexico

GMFMC and NOAA Coral Reef Conservation Programme

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.

This overview of Coral Reef Invasive species in the Gulf of Mexico focuses on identifying the current spread/distribution of orange-cup coral (*Tubastraea coccinea*), Carpet Anemone (*Palythoa caribaeorum*), and Lionfish (*Pterois volitans*, *Pterois miles*) on the coral reefs in the Gulf based on compiled observation data from literature, reports, and long-term monitoring datasets.

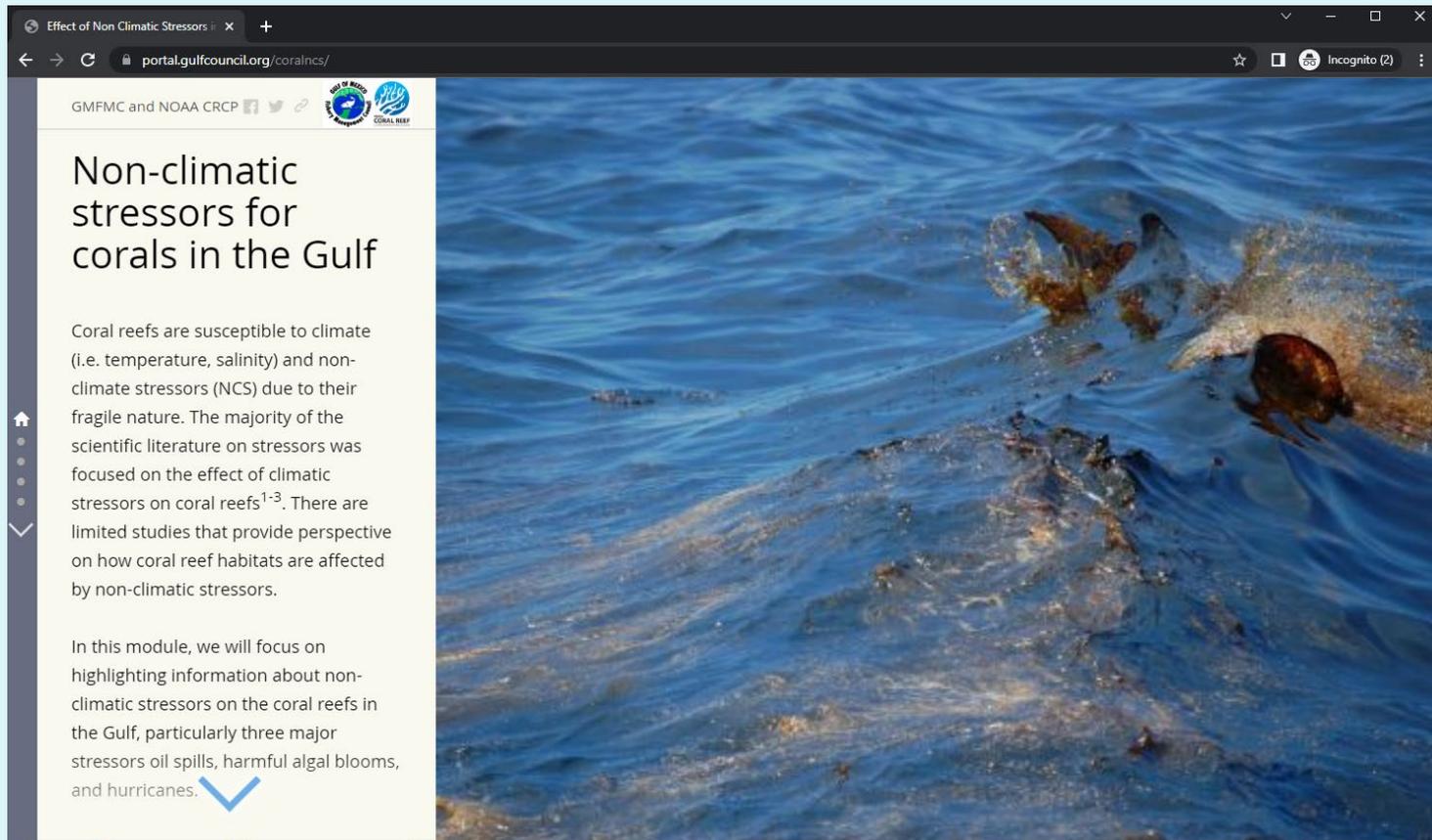
Image Courtesy : NOAA

Orange Cup Coral



# Learning Module

A learning module presents the result of an analysis that evaluated the Coral reef vulnerability to three major non-climatic stressors namely, spill incidents (oil, chemical, and others), observed red tide events, and hurricane-induced stress locations in the Gulf. The module can be accessed from <https://portal.gulfcouncil.org/coralncs>



The screenshot shows a web browser window with the address bar displaying [portal.gulfcouncil.org/coralncs/](https://portal.gulfcouncil.org/coralncs/). The page header includes the text "GMFMC and NOAA CRCP" and logos for the Gulf of Mexico Council and NOAA Coral Reef Conservation Program. The main heading is "Non-climatic stressors for corals in the Gulf".

The text on the page reads: "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."

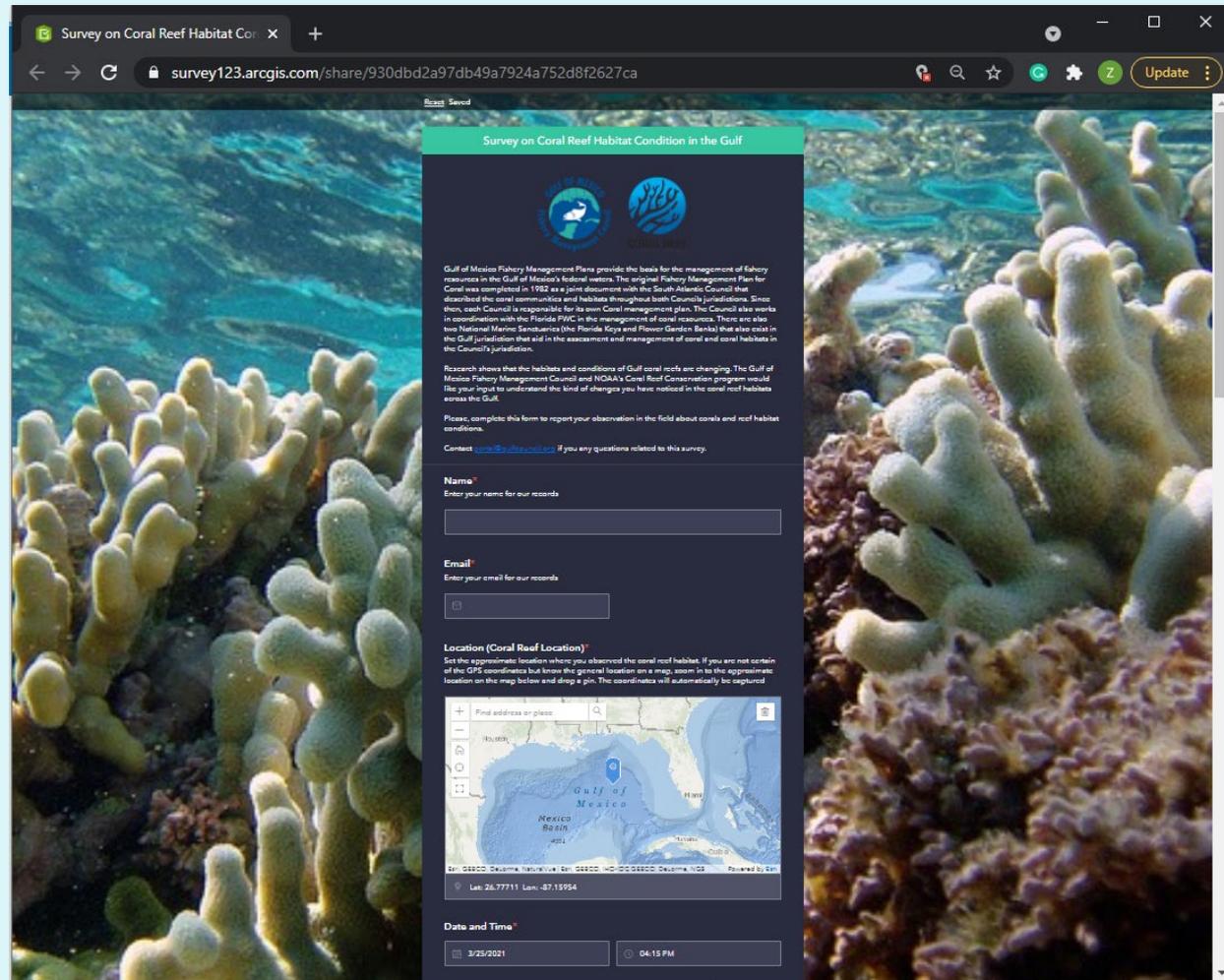
Below this, it states: "In this module, we will focus on highlighting information about non-climatic stressors on the coral reefs in the Gulf, particularly three major stressors oil spills, harmful algal blooms, and hurricanes."

The right side of the page features a large image of a coral reef with a significant amount of brown, oily material floating on the surface, illustrating the impact of a spill.

# Stakeholder Engagement

An targeted online survey was designed to ask stakeholders about their perceptions of change in coral reef habitat in the Gulf.

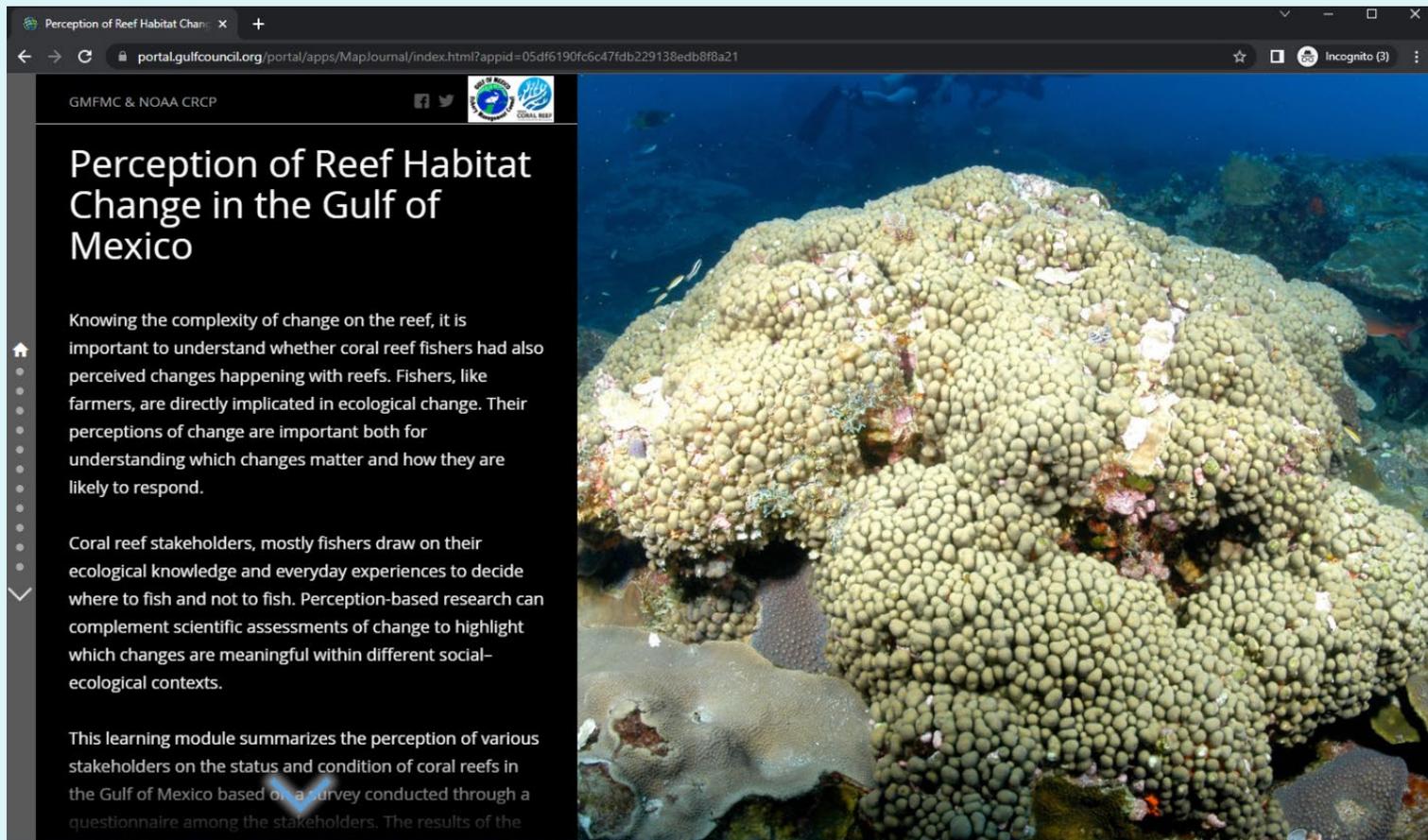
Survey responses were compared with the effect of invasive species presence, non-climatic stressors, and coral disease impact on reef habitats to identify the gaps in knowledge.



The image shows a web browser window displaying an online survey. The browser's address bar shows the URL: `survey123.arcgis.com/share/930dbd2a97db49a7924a752d8f2627ca`. The survey title is "Survey on Coral Reef Habitat Condition in the Gulf". The survey content includes a header with two circular logos, a paragraph of introductory text about the Gulf of Mexico Fishery Management Plans, a request for input to understand changes in coral reef habitats, and a contact email: `coral@arcgis.com`. Below the text are input fields for "Name", "Email", and "Location (Coral Reef Location)". The "Location" field includes a map of the Gulf of Mexico with a blue pin and coordinates: `Lat: 26.77711 Lon: -87.15954`. At the bottom, there are input fields for "Date and Time", showing `3/25/2021` and `04:15 PM`.

# Stakeholder Engagement

A learning module summarizes the perceptions of various stakeholders on the status and condition of coral reefs in the Gulf of Mexico, based on a survey conducted through a questionnaire distributed among the stakeholders. The module can be accessed from <https://arcg.is/0fTC1X>



The screenshot shows a web browser window with the URL [portal.gulfcouncil.org/portal/apps/MapJournal/index.html?appid=05df6190fc6c47fdb229138edb8f8a21](https://portal.gulfcouncil.org/portal/apps/MapJournal/index.html?appid=05df6190fc6c47fdb229138edb8f8a21). The page header includes 'GMFMC & NOAA CRCP' and social media icons for Facebook and Twitter. The main title is 'Perception of Reef Habitat Change in the Gulf of Mexico'. The content is organized into sections with a vertical navigation bar on the left. The first section discusses the importance of understanding changes on the reef for stakeholders like fishers and farmers. The second section explains how perception-based research complements scientific assessments. The third section introduces the learning module's purpose.

GMFMC & NOAA CRCP

## Perception of Reef Habitat Change in the Gulf of Mexico

Knowing the complexity of change on the reef, it is important to understand whether coral reef fishers had also perceived changes happening with reefs. Fishers, like farmers, are directly implicated in ecological change. Their perceptions of change are important both for understanding which changes matter and how they are likely to respond.

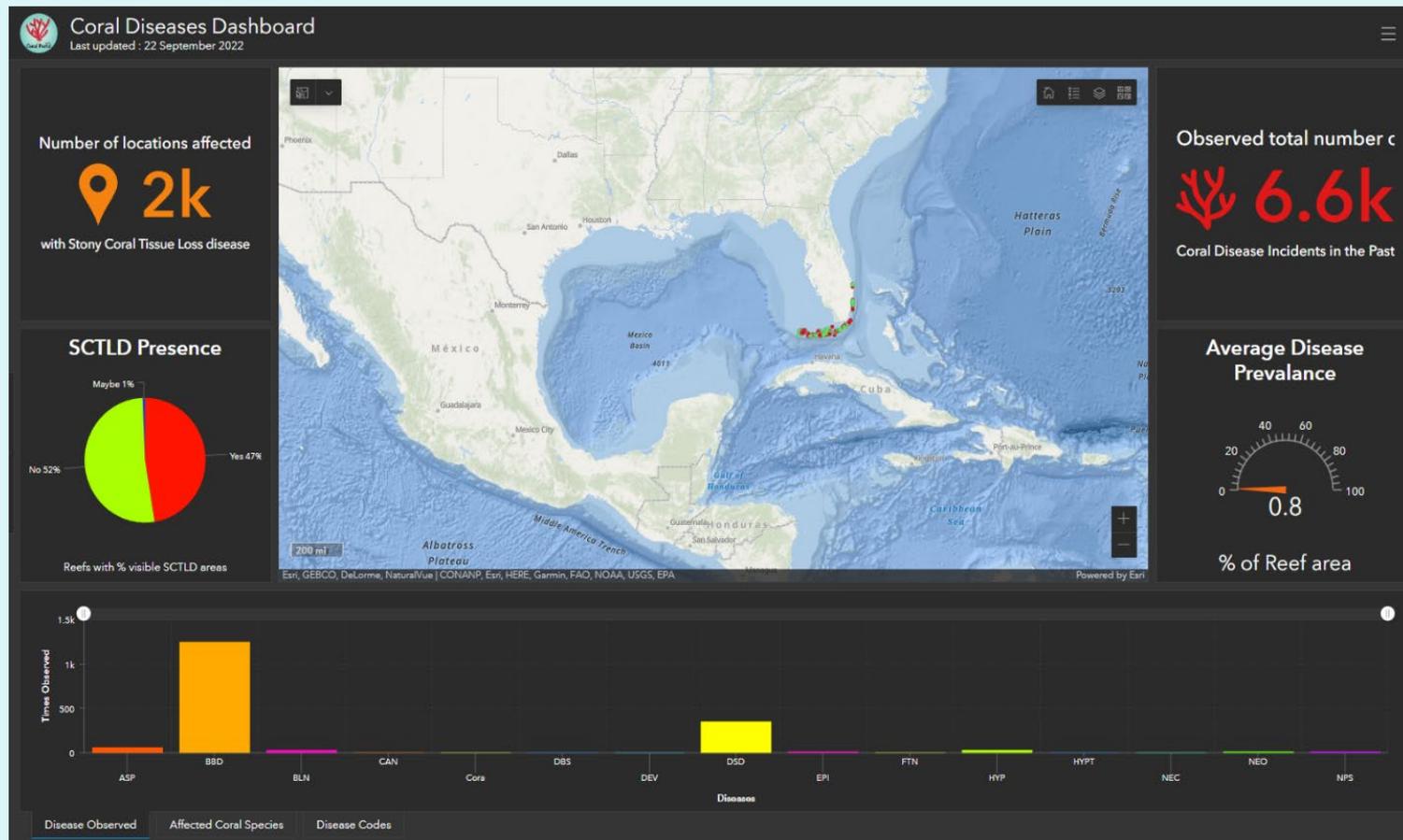
Coral reef stakeholders, mostly fishers draw on their ecological knowledge and everyday experiences to decide where to fish and not to fish. Perception-based research can complement scientific assessments of change to highlight which changes are meaningful within different social-ecological contexts.

This learning module summarizes the perception of various stakeholders on the status and condition of coral reefs in the Gulf of Mexico based on a survey conducted through a questionnaire among the stakeholders. The results of the



# Information Dashboard

A comprehensive information dashboard for coral disease in the Gulf was created using disease occurrence data sourced from partner agencies. The dashboard can be accessed at <https://portal.gulfcouncil.org/coraldisease>

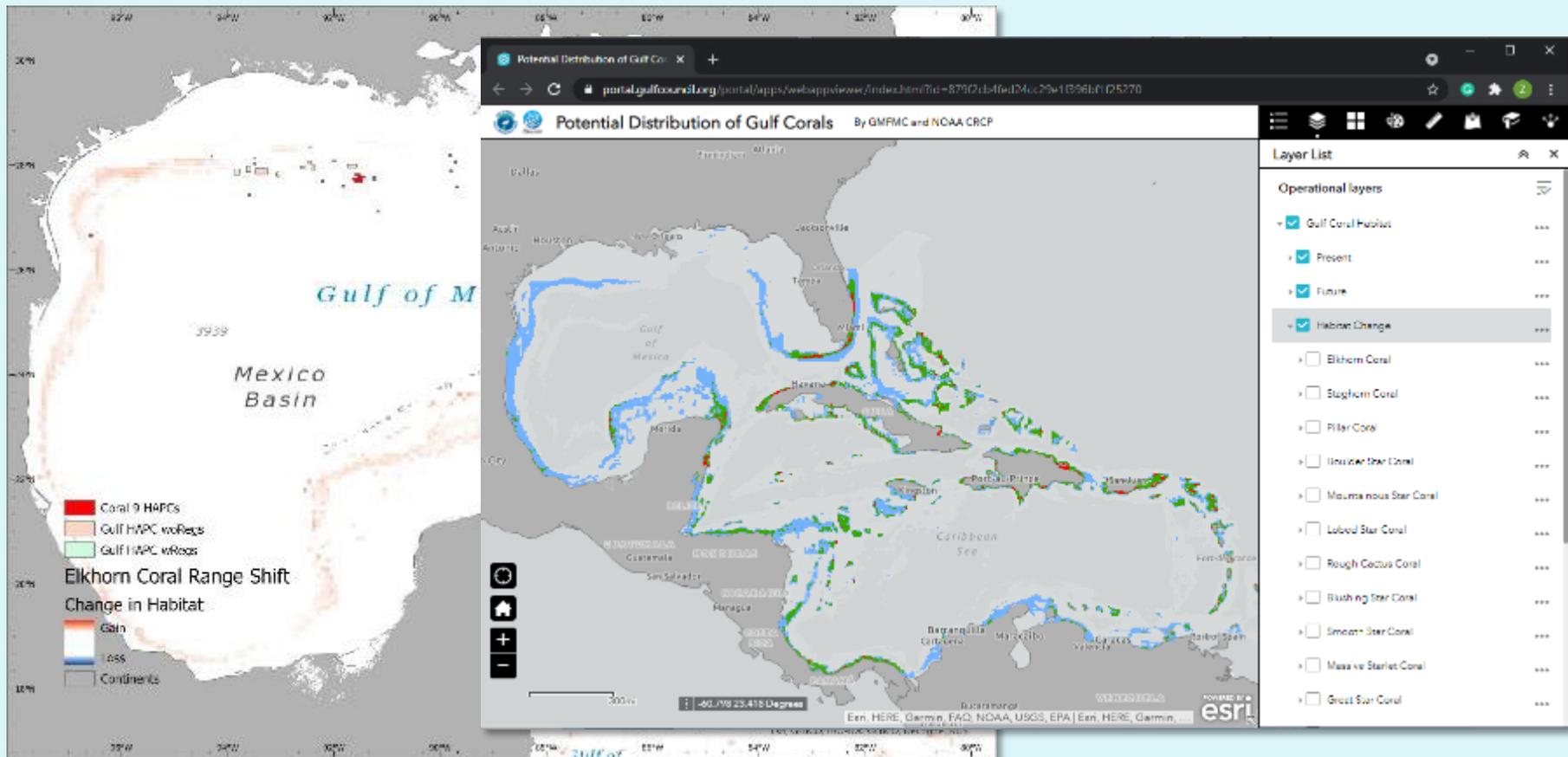


# **CRCP PROJECT DELIVERABLES**

## **HIGHLIGHT**

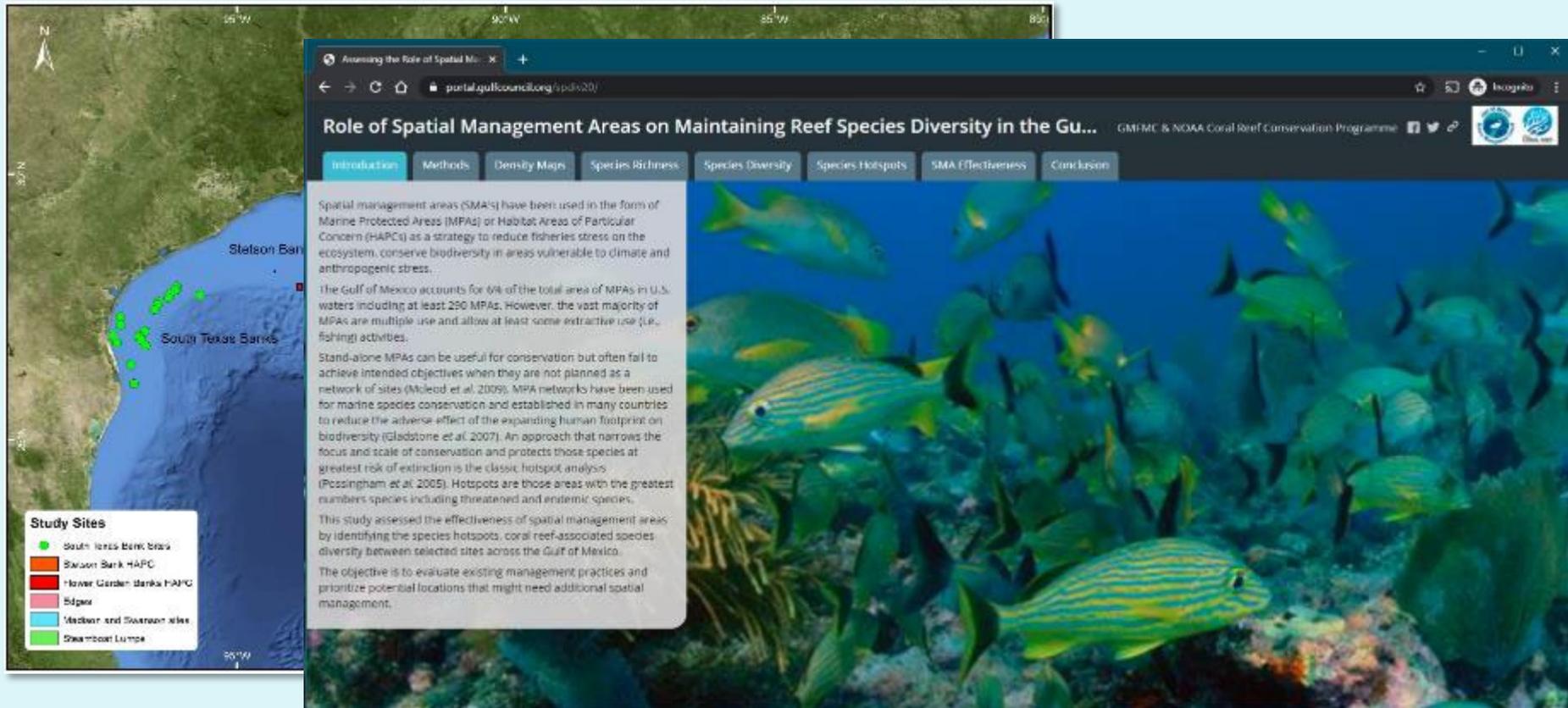
# Predictive Models for Gulf Corals

Spatially explicit models for common coral species in the Gulf including the projection for future habitat range shift due to the effect of climate change. Results from the models could be explored using an interactive web application from <https://bit.ly/3sFf9s3> and detailed analysis and results are available from the [whitepaper](#).



# Assessing The Role of Spatial Management

The effectiveness of selected spatial management areas was evaluated and at the same time analyzed species (coral, fish, and invertebrate) diversity of these sites. Outputs from the analysis are available as a [whitepaper](#) and results can be explored using an interactive web application available from <https://portal.gulfcouncil.org/spdiv20/>





# Deep Sea Coral Learning Modules

Learning modules on the deep sea coral species in the Gulf.

The screenshot shows a webpage titled "Lophelia pertusa: A Closer Look" from the Gulf of Mexico Fishery Management Council and OCEP. The text describes Lophelia pertusa as a prominent deep-sea coral in the Gulf of Mexico, playing a significant role in the designation of Habitat Areas of Particular Concern. It mentions that the species is being profiled in storyboards. The page includes a large image of the coral and a section titled "Why white?" with a small inset image of a white coral.

Lophelia (*Lophelia pertusa*)

The screenshot shows a webpage titled "A closer look at the Ivory Tree Coral" from the Gulf of Mexico Fishery Management Council and OCEP. The text describes the Ivory Tree Coral (*Oculina varicosa*) as a slow-growing branching coral found in shallow and deep waters. It notes that the coral is often found in a semi-isolated, low-growing colony on a coarse sandy reef. The page includes a large image of the coral and a section titled "Where you can find them?" with a small inset image of the coral.

Ivory Tree Coral (*Oculina varicosa*)

The screenshot shows a webpage titled "Deep Sea Soft Corals" from the Gulf of Mexico Fishery Management Council and OCEP. The text describes deep-sea soft corals as some of the most abundant and diverse structure-forming species in deep-sea ecosystems. It notes that these corals are often found in extensive fields of colonies in the upper bathyal region (1-650-3280 feet). The page includes a large image of the coral and a section titled "Where you can find them?" with a small inset image of the coral.

Soft Corals (*Callogorgia* spp.)

The screenshot shows a webpage titled "Orange Sea Fans of the Deep" from the Gulf of Mexico Fishery Management Council and OCEP. The text describes orange sea fans (*Swiftia exserta*) as red polyp octocorals that belong to the group of non-photosynthetic colonial species. It notes that these sea fans are found in fairly deep water (e.g., 50 to 100 feet) and nutrient-rich waters experiencing moderate currents along coastal areas. The page includes a large image of the coral and a section titled "Where you can find them?" with a small inset image of the coral.

Orange Sea Fans (*Swiftia exserta*)

The screenshot shows a webpage titled "Deep Sea Black Corals" from the Gulf of Mexico Fishery Management Council and OCEP. The text describes deep-sea black corals (*Antipathes* sp.) as a group of branching corals often associated with deep reef habitats. It notes that although their exterior flesh is usually red, white, or orange, their internal skeleton is black. Black corals can live for thousands of years, with some from the Gulf of Mexico being more than 2000 years old. The page includes a large image of the coral and a section titled "Where you can find them?" with a small inset image of the coral.

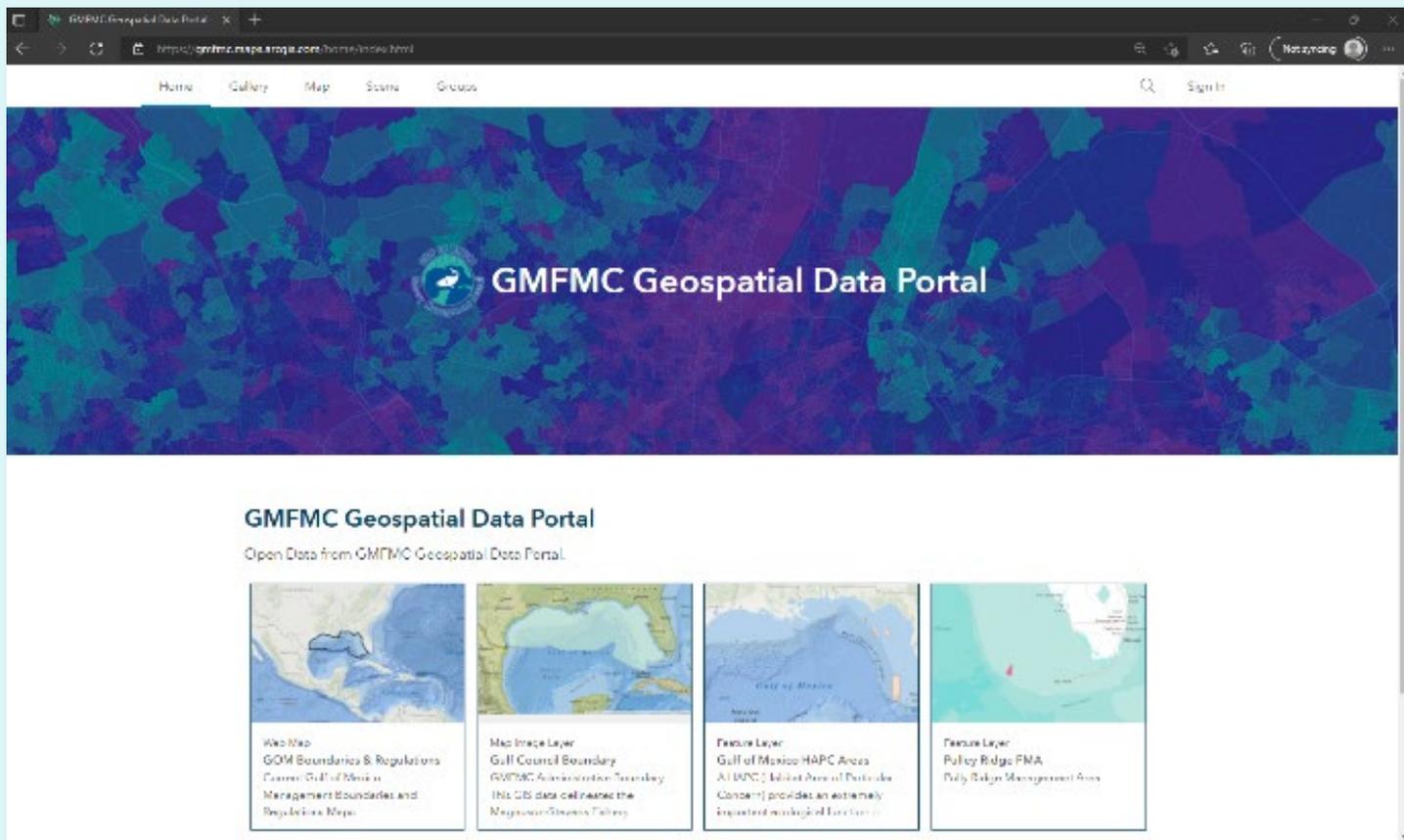
Black Corals (*Antipathes* sp.)

The screenshot shows a webpage titled "Ancient Deep-Sea Corals" from the Gulf of Mexico Fishery Management Council and OCEP. The text describes ancient deep-sea corals (*Leiopathes* spp.) as some of the most ancient and longest-lived corals in the world. It notes that these corals are found in deep water (e.g., 1000 to 2000 feet) and nutrient-poor waters. The page includes a large image of the coral and a section titled "Where you can find them?" with a small inset image of the coral.

Ancient Corals (*Leiopathes* spp.)

# Improved Web Services

Publicly accessible Geospatial Data Portal at  
<https://gmfmc.maps.arcgis.com/>

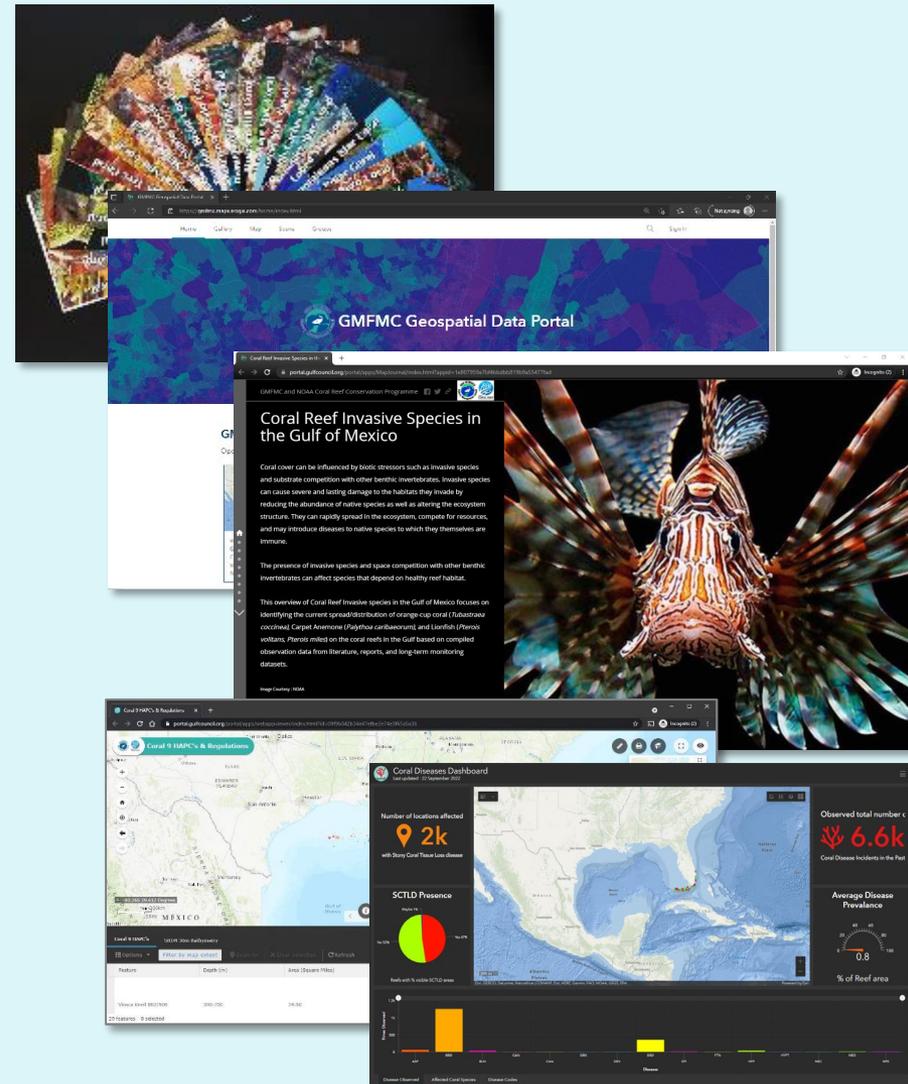


The screenshot shows a web browser window displaying the GMFMC Geospatial Data Portal. The browser's address bar shows the URL <https://gmfmc.maps.arcgis.com/home/index.html>. The page features a navigation menu with links for Home, Gallery, Map, Scenarios, and Groups. A search bar and a 'Sign In' button are also visible. The main content area has a dark blue and green map background with the GMFMC logo and the text 'GMFMC Geospatial Data Portal'. Below this, there is a section titled 'GMFMC Geospatial Data Portal' with the subtitle 'Open Data from GMFMC Geospatial Data Portal'. This section contains four data service cards, each with a map thumbnail and a description:

- Web Map:** GOM Boundaries & Regulations, Current Gulf of Mexico Management Boundaries and Regulatory Maps.
- Map Image Layer:** Gulf Council Boundary, GMFMC Administration Territory, IHO CS data call name the Navigation/Steering Tables.
- Feature Layer:** Gulf of Mexico HAPC Areas, All HAPC listed Area of Particular Concern provides an extremely important ecological function.
- Feature Layer:** Policy Ridge FMA, Policy Ridge Management Area.

# Outreach Materials Summary

- Coral Guide booklet
- Coral Portal & Geospatial Data Hub
- Learning modules & whitepapers
- Interactive web applications



# Future Activities

- Continue work on the new CRCPC grant activities which focus on the identification of factors influencing coral health, associated fisheries, and the development of key indicators to assess the coral reef vulnerability in the Gulf.
- Producing new learning modules, decision support tools, web applications, and white papers from ongoing activities.



# Questions & Discussion

