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**
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
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

- Private Recreational
- Federal For-Hire
- Commercial

Positive
Negative
Neutral

Stock Condition Sentiment by Sector

- Private Recreational
- Federal For-Hire
- Commercial

Positive
Negative
Neutral
An Example of Outputs: Red Snapper

Overall Sentiment by Location
Stock Condition Sentiment by Location
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.
## Fisherman Feedback Efforts

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

**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
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
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
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
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
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
Coral Reef Invasive Species

Non-climatic Stressors of Corals

Spiny Lobster
Closed Areas

Coral Reef Invasive Species

Black Corals (Antipathes sp.)

Soft Corals (Callogorgia spp.)

Ancient Corals (Leiopathes spp.)

Non-climatic stressors for corals in the Gulf

Coral reefs are susceptible to climate (i.e. temperature, salinity) and non-climatic 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. 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: spills, namely, oil disasters, and hurricanes.
**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/](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](https://portal.gulfcouncil.org/coraldisease)
Engagement and Outreach

Online Surveys

Interactive Web Modules

Geospatial Data Portal

White Papers

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 fisheries have also perceived changes happening with reef, fisheries, the barriers, are directly impacted by 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 fishermen, draw on their social and political knowledge and every day experience to determine where to fish and how 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 perceptions of various stakeholders on the risk and condition of coral in the Gulf of Mexico based on activities conducted through a series of surveys and individual interviews.
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

<table>
<thead>
<tr>
<th>Fisherman Feedback:</th>
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<th>Ecosystem Modeling</th>
<th>Coral Grant</th>
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<tr>
<td>• Reaches recreational anglers that don’t usually participate in the Council process</td>
<td>• Developed rigorous, collaborative review process for integrating novel science into management</td>
<td>• Made progress towards integrating environmental factors into management and catch advice</td>
<td>• Improves understanding of linkage between habitat and associated fisheries to support ecosystem management</td>
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<td>• Large ROI</td>
<td>• Can be applied to future efforts</td>
<td></td>
<td>• Provides resources to develop interactive stakeholder tools</td>
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<td>• Ground truthing trends identified in stock assessments</td>
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<td>• Identifies ecosystem indicators</td>
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