

# Framework for Narrowing the Scope of NMFS Management and Science in a Risk/Value Matrix

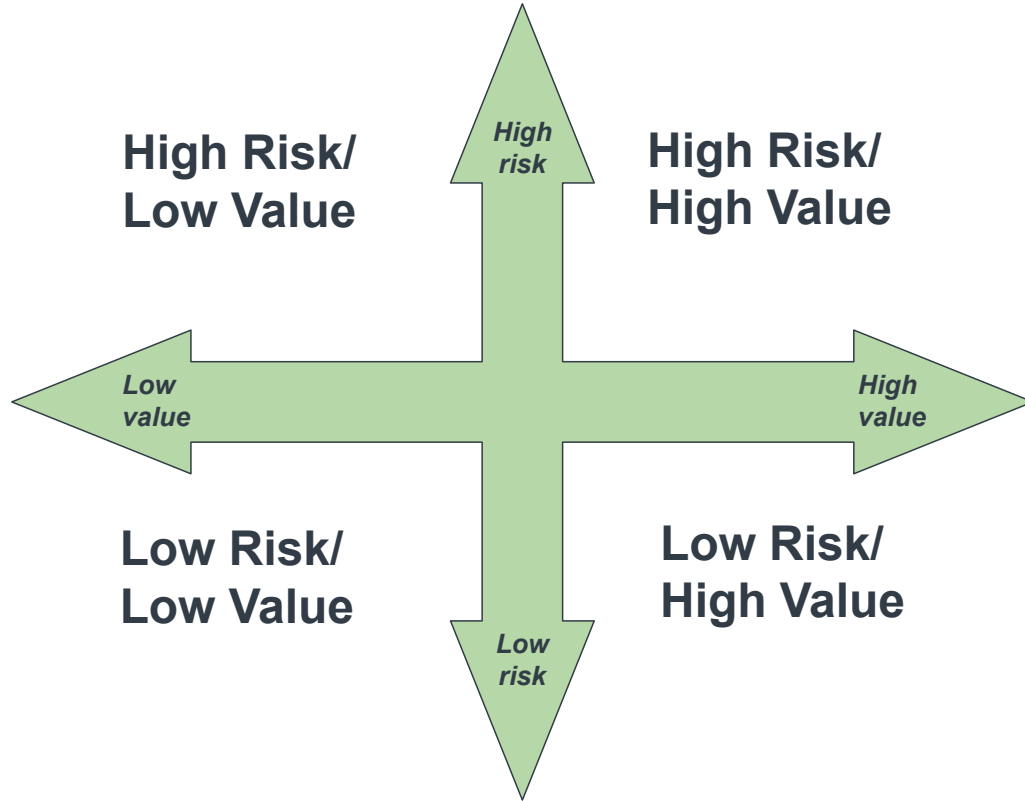
Calculating Economic Value, Social Value, Environmental Risk



# Species Groups

CFMC	GFMC	SAFMC	HMS / Other
<ul style="list-style-type: none"> <li>• Deepwater Bottomfish</li> <li>• Shallow Water Reef Fish</li> <li>• Small Pelagics</li> <li>• Spiny Lobster</li> <li>• Queen Conch</li> </ul>	<ul style="list-style-type: none"> <li>• Coastal Pelagics</li> <li>• Deepwater Bottomfish</li> <li>• Dolphin/Wahoo</li> <li>• Red Drum</li> <li>• Shallow Water Reef Fish</li> <li>• Shrimp</li> <li>• Spiny Lobster</li> </ul>	<ul style="list-style-type: none"> <li>• Coastal Pelagics</li> <li>• Deepwater Bottomfish</li> <li>• Dolphin/Wahoo</li> <li>• Shallow Water Reef Fish</li> <li>• Golden Crab</li> <li>• Shrimp</li> <li>• Spiny Lobster</li> </ul>	<p><b>HMS</b></p> <ul style="list-style-type: none"> <li>• Sharks</li> <li>• Tunas/Billfish</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>• Gulf Menhaden</li> <li>• SA Menhaden</li> </ul>

# General approach



## Value Categories

- Commercial
- Recreational
- Social (over and above economics)

## Risk Categories

- Susceptibility to env. Phenomenon and fishing (CVA/PSA)
- Ecosystem impact

# National Working Group of Economists Met Last Year

- After several months of meeting we decided on Value-Added
- Commercial and recreational estimates can be added
- Relatively easy to calculate for the entire country
- Readily available
- Reasonable snapshot

# Value-Added Chain: Commercial vs. Recreational Fishing

## COMMERCIAL FISHING

(Higher Multiplier)



## RECREATIONAL FISHING

(Lower Multiplier)

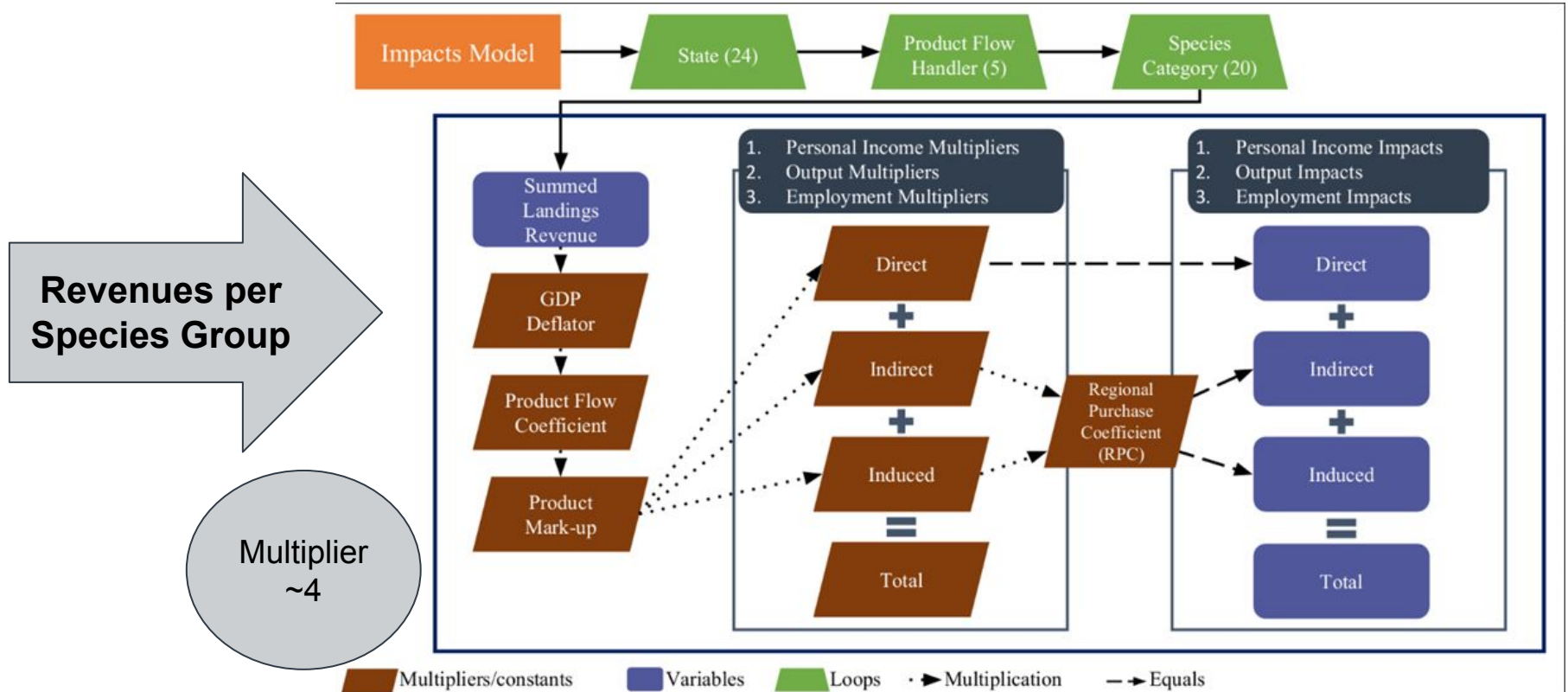


Commercial chain has more stages of intermediate production, creating value at each step. Recreational expenditures are mostly for final consumption, with a shorter supply chain.

# Why Do Value-Added Multipliers Differ Between Commercial and Recreational Fishing?

Feature	Commercial Fishing Revenue	Recreational Fishing Expenditures
<b>Economic Position</b>	<b>Intermediate Good:</b> The start of a production chain.	<b>Final Good:</b> The end of a consumption chain.
<b>Primary Driver</b>	<b>Processing &amp; Distribution:</b> Fish are filleted, shipped, and cooked.	<b>Retail Sales:</b> Anglers buy gas, food, and gear.
<b>Leakage Risk</b>	<b>Moderate:</b> (Fuel, Gear), but offset by high domestic labor in processing.	<b>High:</b> Many goods (tackle, engines) are imported; money leaves the economy.
<b>Value Added</b>	<b>Cumulative:</b> Includes value added by processors, truckers, and restaurants.	<b>Singular:</b> Mostly limited to the retail margin and service industry wages.

# Commercial Sector Value Added



# Data Sources for Commercial Analysis

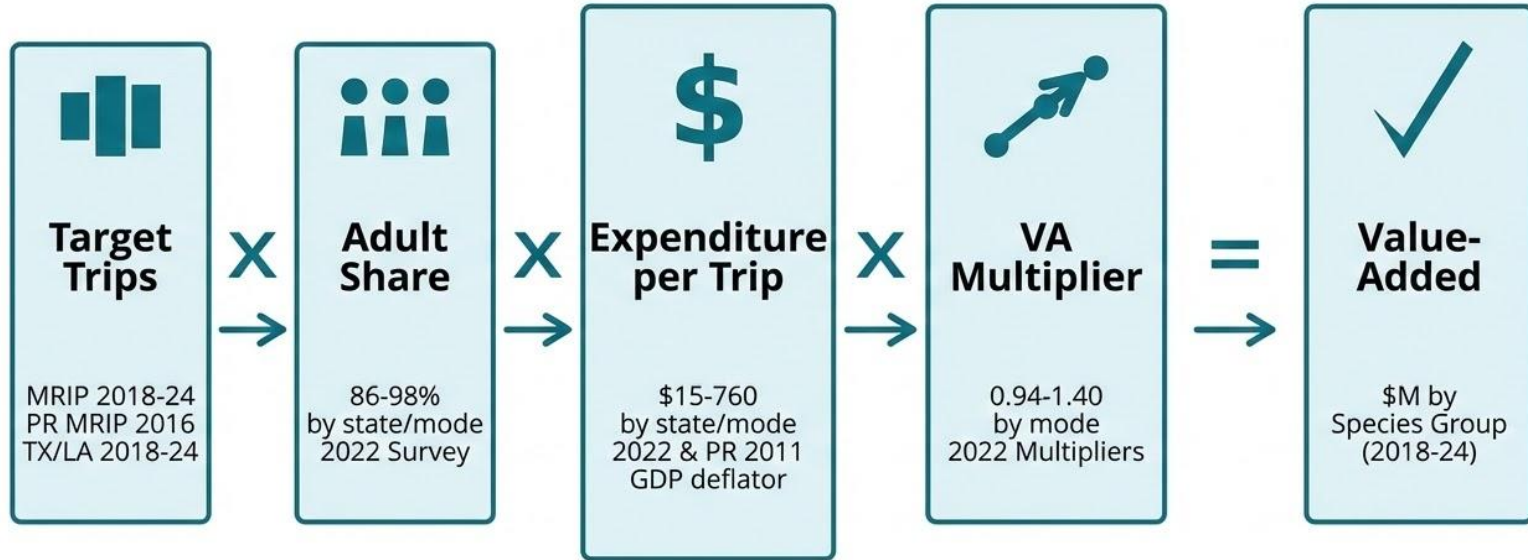
<b>Region / Fishery</b>	<b>Database</b>
<b>Gulf</b>	<b>Shrimp Database, SEDAT</b>
<b>South Atlantic</b>	<b>Shrimp Database, SEDAT</b>
<b>Caribbean</b>	<b>Accumulated Landings System (ALS)</b>
<b>HMS</b>	<b>HMS Database, Pelagic &amp; Shark Quota Tracking</b>
<b>Menhaden</b>	<b>Fisheries One Stop Shop (FOSS)</b>

# Commercial Analysis Acknowledgments

- **SEFSC:** Yanet Jimenez (Gulf and South Atlantic fisheries), Alan Lowther (Gulf and South Atlantic shrimp, menhaden, golden crab), Kim Johnson and Stephanie Martinez (Caribbean fisheries), Kyle Dettloff (South Atlantic shrimp fisheries)
- **HMS:** George Silva (Highly Migratory Species fisheries)
- **SERO:** Maria Lopez (Caribbean fisheries)
- **FMCs:** Assane Diagne (Gulf fisheries), John Hadley (South Atlantic fisheries), Graciela Garcia-Moliner (Caribbean fisheries)
- **HQ:** Amy Djukanovich (Input-Output analysis), Ben Fissel, and Cameron Speir.

# Recreational Fishery Value-Added Calculation Formula

Target Trips × Adult Share × Expenditure × VA Multiplier = Value-Added



# Recreational Fishing Value-Added Calculation Data



## 1. Target Trip Data

**Primary Source:**  
MRIP Survey Data (2018–2024) for the Atlantic and Gulf Coasts (Maine to Mississippi).

- **Texas:** Texas Parks and Wildlife Department (TPWD) Creel Surveys.
- **Louisiana:** Louisiana Department of Wildlife and Fisheries (LDWF) Creel Surveys.
- **Puerto Rico:** NMFS 2016 Proxy Data (used to fill 2018 data gaps post-Hurricane Maria).



## 2. Expenditures

**US National:**  
Lovell et al. (2025) – The economic contribution of marine angler expenditures (Base 2022 data inflated to 2024 dollars).

**Puerto Rico:** Lovell et al. (2013) – (Base 2011 data inflated to 2022 dollars).

**HMS Tunas/Billfish:**  
Specialized expenditure estimates (Hutt) used to reflect the higher costs of these specific offshore trips.



## 3. Economic Multipliers

2022 Recreational/Angler Expenditure IO Models (sourced from Lovell et al. 2025)

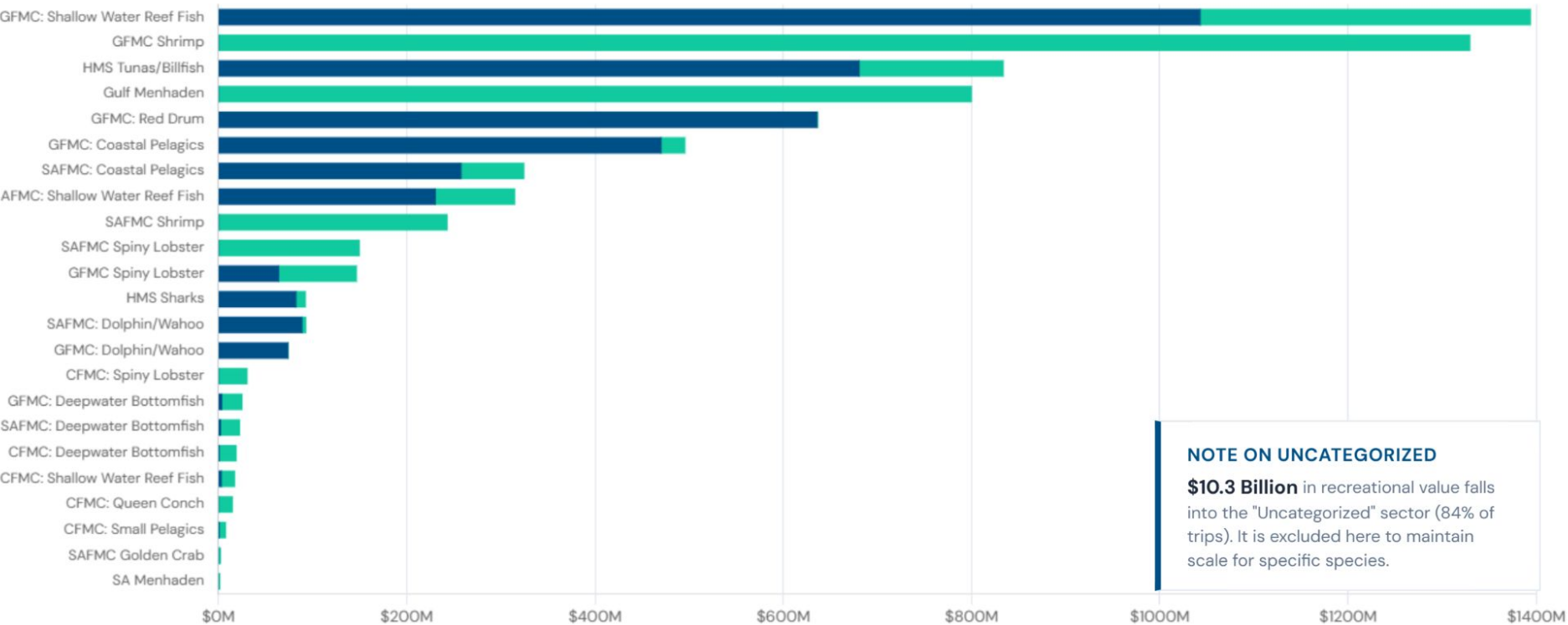


## 4. Adjustments

**Inflation:** All economic values were standardized using the GDP Deflator.

# 2024 Value Added

Comparison by Species Group (Millions \$)



**NOTE ON UNCATEGORIZED**  
**\$10.3 Billion** in recreational value falls into the "Uncategorized" sector (84% of trips). It is excluded here to maintain scale for specific species.

● Recreational Value ● Commercial Value

# Social value approach

Methodology developed in consultation with social scientists from NEFSC, PIFSC, AFSC, and Headquarters, and draws on structured expert knowledge

## Key Characteristics:



**Metric:** Qualitative (High, Medium, Low)



**Criteria:** Defined sociocultural criteria



**Implementation:** Standardized Qualtrics survey



**Pilot Phase:** 5–10 experts per region (Gulf, South Atlantic, Caribbean)



**Unit of Analysis:** Species group by region








**Classification Rule:** Species groups are classified as “High Social Value” if they meet a predefined supermajority threshold (e.g.,  $\geq 60\%$  of experts rating “High”).

# Scoring Criteria

CRITERIA	DEFINITIONS
<b>Heritage and Traditions</b>	This species is tied to the history of the area. It is central to long-standing customs, ancestral harvests, or rituals that have been practiced for generations.
<b>Community Identity and Connection</b>	This species is a local icon that people are proud of. It brings the community together through clubs, local events, or simply by being a common topic that connects neighbors.
<b>Subsistence Use and Food Security</b>	This species is a vital source of healthy, affordable food. It is relied upon to feed the household or is shared with others in the community to ensure no one goes hungry.
<b>Recreational Well-being (non-commercial)</b>	This species is important for fun, relaxation, and mental health. It provides a reason to get outdoors, de-stress, and enjoy the challenge of the catch.
<b>Teaching and Knowledge</b>	This fishery is used to pass down specific skills or environmental wisdom. It is a way for elders or experts to teach the next generation how to "read the water" and respect nature.

# Scoring Criteria

Assign one ranking (none, low, medium, high) based on extent to which species in group contribute to regional sociocultural value. Consider:

-  Geographic scope across the region
-  Number and diversity of communities or user groups
-  Frequency and consistency of recognition or use
-  Cultural depth or identity linkage
-  Degree of substitutability

LIKERT SCALE	
Score	Definition
None (0)	No meaningful contribution at the regional scale
Low (1)	Limited or localized contribution; relevant to a few communities or user groups
Medium (2)	Meaningful contribution across multiple communities/subregions; not broadly defining at the regional level
High (3)	Broad, consistent, regionally defining; central to identity, tradition, or social function

# Sample survey page for South Atlantic



### Coastal Pelagics:

Species group includes: Cobiki, Mackerels (Buliet, Frigate, King, Spanish)

	Ranking					Primary species (if applicable) Write species name(s)	Click to write Column 3 Comments/Examples (Optional)
	None	Low	Medium	High	Don't know		
Heritage and Traditions	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	<input type="text"/>
Community Identity and Connection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	<input type="text"/>
Subsistence Use and Food Security	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	<input type="text"/>
Recreational Well Being (non-commercial)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	<input type="text"/>
Teaching and Knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	<input type="text"/>

[Instructions](#) [Queen Conch](#)

# Coastal Pelagics: Social Value Analysis

## Social Value Dimensions



### Heritage and Traditions

→ Medium (2)

**Primary species:** King mackerel

**Comments:** Regional kingfish tournaments and seasonal runs are part of coastal fishing traditions, though not as deeply rooted as reef fisheries.



### Community Identity and Connection

→ Medium (2)

**Primary species:** King mackerel

**Comments:** Important to charter fishing communities and tournament circuits; contributes to local coastal identity in some areas.



### Subsistence Use and Food Security

→ Low (1)

**Primary species:** Spanish mackerel, cobia

**Comments:** Consumed locally but not a major subsistence species, more relevant for recreational and commercial markets.



### Recreational Well-Being (non-commercial)

→ High (3)

**Primary species:** King mackerel, cobia

**Comments:** Highly valued by recreational anglers; supports fishing trips, tournaments, and seasonal targeting that contribute strongly to enjoyment and tourism.



### Teaching and Knowledge

→ Low (1)

**Primary species:** Spanish mackerel

**Comments:** Used to teach basic fishing methods (e.g., trolling), but not a major focus of cultural or ecological knowledge systems.

## Analysis Summary

### Sample Calculations:

- Heritage and Traditions = Medium (2)
- Community Identity = Medium (2)
- Subsistence = Low (1)
- Recreational Well-Being = High (3)
- Teaching and Knowledge = Low (1)

**Total = 9**

### Overall Rank:



→ **Overall Rank: Medium**

### Interpretation:

- Strongly driven by recreational value (one high score)
- Lacks depth in heritage, subsistence, and knowledge dimensions
- ✓ Lands squarely in the middle overall

# Risk categories

- Susceptibility to environment (climate vulnerability)
- Susceptibility to fishing (productivity-susceptibility)
- Ecosystem importance

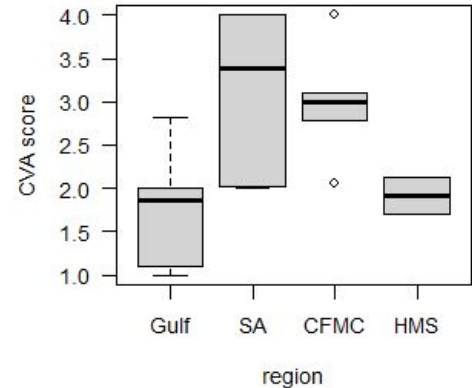
## Methods and caveats:

- Scores calculated species-specific level for each metric
- For species grouping scores, used averages of individual scores weighted by recent commercial revenues (last 20 years)
- Scores not available for all species (larger gaps for Caribbean region)
- Scores within species groupings were similar, thus weighted averages not heavily influenced by selection of years for revenues or missing species

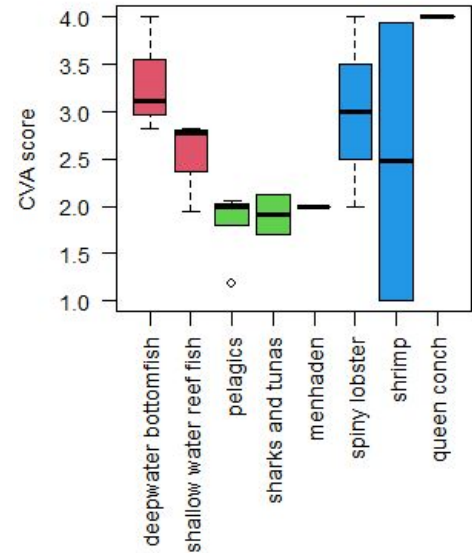
<b>RESULTS:</b>	<b>CVA</b>	<b>PSA</b>
CFMC Deepwater Bottomfish	3.11	
CFMC Shallow Water Reef Fish	2.78	2.80
CFMC Small Pelagics	2.06	
CFMC Spiny Lobster	3.00	2.64
CFMC Queen Conch	4.00	
GFMC Coastal Pelagics	1.79	2.46
GFMC Deepwater Bottomfish	2.82	3.62
GFMC Dolphin/Wahoo	1.18	2.46
GFMC Red Drum	1.00	3.00
GFMC Shallow Water Reef Fish	1.95	3.31
HMS Sharks	2.12	3.68
HMS Tunas	1.70	
SATL Coastal Pelagics	2.03	
SATL Deepwater Bottomfish	4.00	3.48
SATL Dolphin/Wahoo	2.00	
SATL Shallow Water Reef fish	2.82	3.14
GFMC Shrimp	1.00	2.46
GFMC Spiny lobster	2.00	2.46
Gulf menhaden	2.00	
Atlantic menhaden	2.00	
SAFMC Golden Crab	4.00	
SAFMC Shrimp	3.95	2.66
SAFMC Spiny lobster	4.00	

# Susceptibility to the environment

- Gulf, South Atlantic and HMS – used overall vulnerability scores (sensitivity x exposure) from published climate vulnerability analyses (CVAs)
- Caribbean – used preliminary sensitivity scoring and exposure analysis; calculated vulnerability according to published methods



PLOS climate



NOAA Technical Memorandum NMFS-SEFSC-767  
doi:10.2525/2545v07

RESEARCH ARTICLE

Climate vulnerability assessment of fish and invertebrates in the U.S. South Atlantic large marine ecosystem

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Abstract

This paper climate vulnerability assessment (CVA) is a rapid and repeatable approach to simultaneously assess the vulnerability of a large number of species to projected regional changes in climate. We conducted the first CVA in the U.S. South Atlantic Large Marine Ecosystem for 71 ecologically, economically, and culturally important fish and invertebrate species. The CVA was conducted by a 16-member panel based on scoring 12 biological sensitivity attributes and seven climate exposure factors. About two-thirds of the species were considered highly vulnerable to future climate projected under the RCP 8.5 emissions scenario, with dipterocarpaceae species, invertebrates, and invertebrates were the most vulnerable functional groups. Ocean acidification, sea surface temperature, and salinity were the exposure factors with the greatest influence on climate vulnerability, while population growth, population status, and early life history traits were the most important biological sensitivity attributes. More than two-thirds of the species had high potential for

RESEARCH ARTICLE

A climate vulnerability assessment for U.S. highly migratory fishes in the Atlantic Ocean

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**1** Azura Consulting, LLC, in support of Atlantic Highly Migratory Species Management Office of Sustainable Fisheries, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Hatteras, United States of America, **2** Atlantic Highly Migratory Species Management Office of Sustainable Fisheries, National Oceanic and Atmospheric Administration, Hatteras, United States of America, **3** Office of Public National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Hatteras, United States of America, **4** Office of Public National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Hatteras, United States of America, **5** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Hatteras, United States of America, **6** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Hatteras, United States of America, **7** Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **8** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **9** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **10** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **11** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **12** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **13** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **14** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America, **15** National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Beaufort, United States of America

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Abstract

Climate change will continue to alter key physical and biological processes throughout the global ocean, modifying environmental U.S. highly migratory fish species found in the Atlantic Ocean. The Migratory Species Climate Vulnerability Assessment evaluated 50 species and species to projected ocean conditions, using a 100- and quantitative analysis of species sensitivity (physiological, behavioral, and ecological) and estimated exposure to possible future. Key modeled environmental variables included bottom and sea level, sea surface oxygen, and ocean acidification (pH), whereas

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OPEN ACCESS

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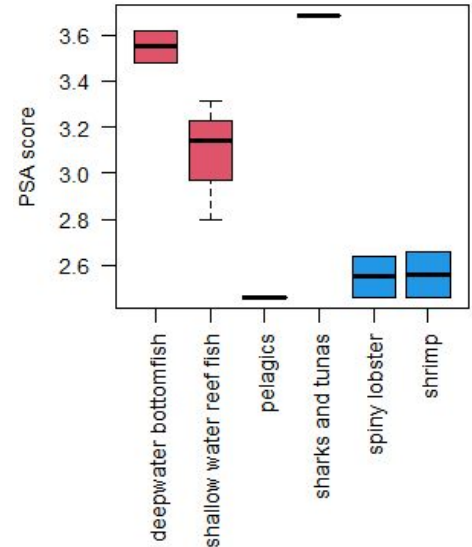
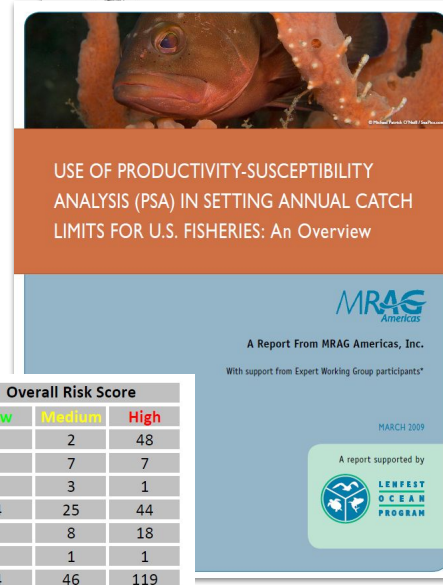
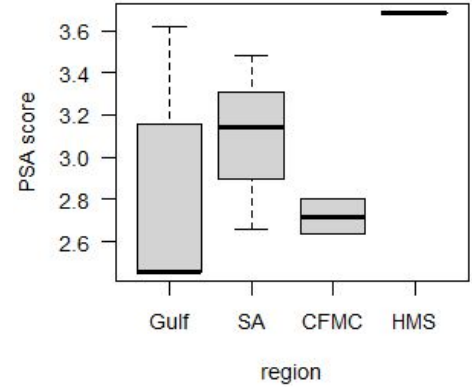
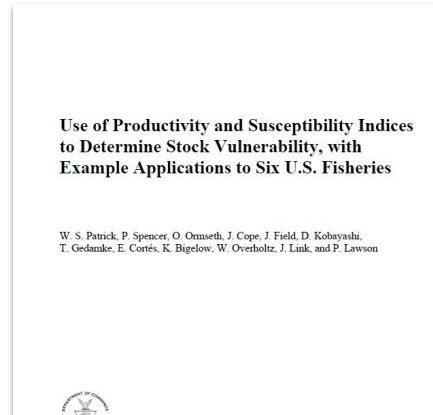
CLIMATE VULNERABILITY ASSESSMENT

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# Susceptibility to fishing

- Scores derived from a variety of outdated documents (~2011) using similar methods
- PSA is combination of productivity scores (life-history attributes) and susceptibility scores (catchability and management)
- Slightly different methods across regions; raw scores were standardized to a common scale
- Final results cross-referenced where possible to ensure correct interpretation/translation
- Caribbean based on few species (n=5)



	Overall Risk Score		
	Low	Medium	High
HMS (50)		2	48
Northeast (14)		7	7
Mid Atlantic (4)		3	1
South Atlantic (73)	4	25	44
Gulf of Mexico (26)		8	18
Western Pacific (2)		1	1
Total	4	46	119

# Ecosystem importance

- Ecosystem importance scores calculated using the SURF index (Plagányi and Essington 2014)
- Connectivity index weighted by Ecopath diet matrix proportions

$$SURF_i = \frac{\sum_{j=1}^S p_{ij}^2}{L}$$

$i$  = species

$p$  = diet composition proportion

$j$  = predator species

$S$  = total number of species

$L$  = total number of linkages in the food web



Ecosystem Importance Ranked by SURF Score

'Combined' = all Ecopath age stanzas combined

