Use of Ecosystem Status Reports and Climate Vulnerability Assessments to Support Fishery Management

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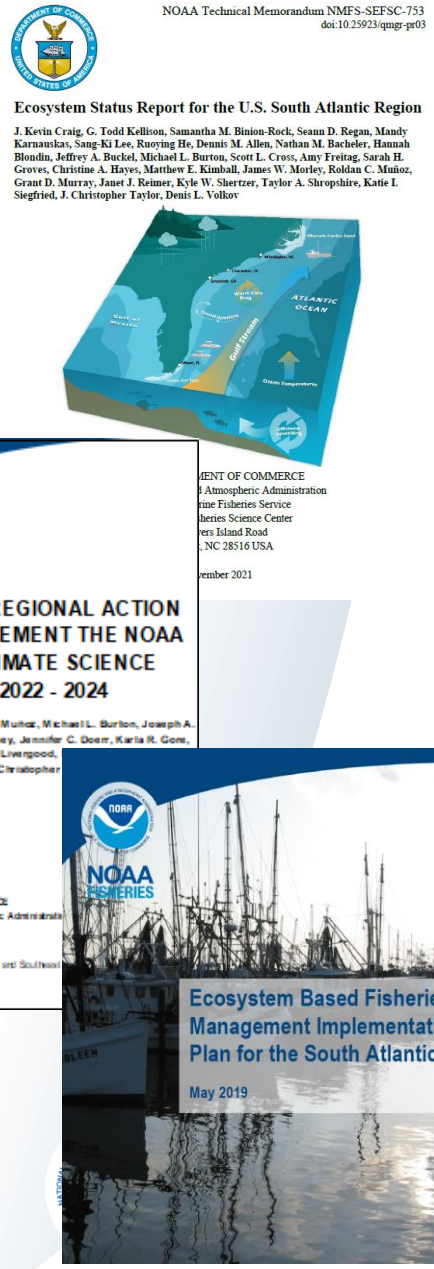
What are They?

- Ecosystem Status Report (ESR): Synthesis of scientific information that provide information on past and possible future conditions of marine ecosystems based on a suite of indicators

  (Available: https://repository.library.noaa.gov/view/noaa/33280)

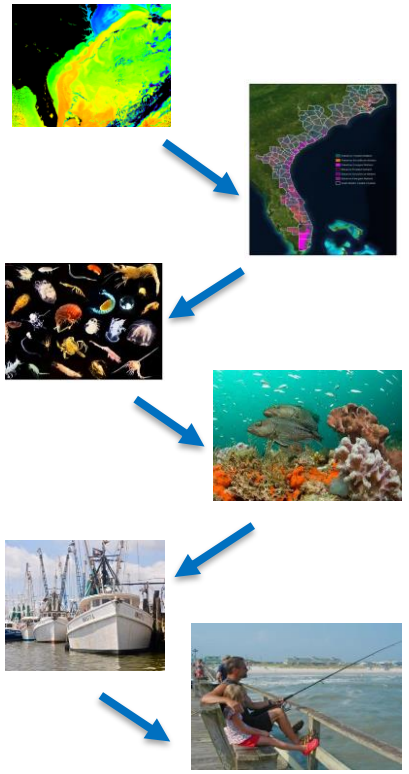
- Climate Vulnerability Assessment (CVA): A process to determine the relative vulnerability of fish stocks to a changing climate that may affect a species' productivity, abundance, or distribution

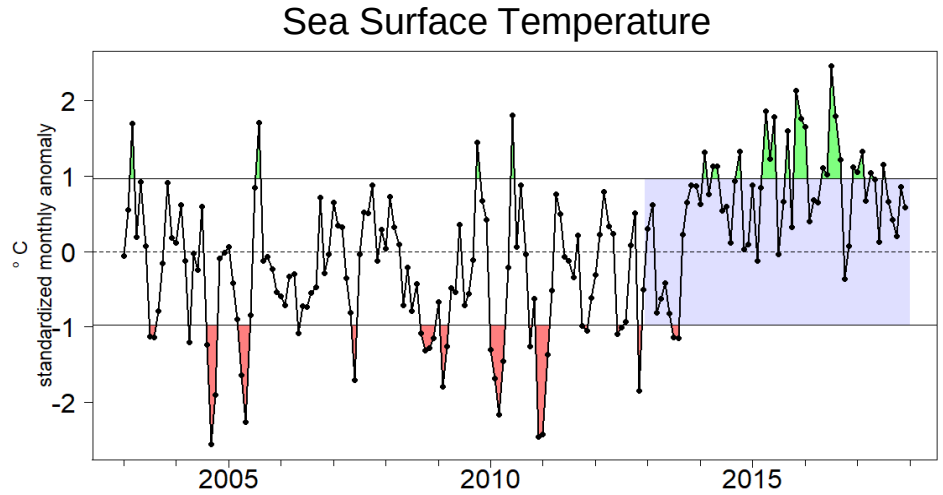
  (Available early 2023)



South Atlantic Ecosystem Indicators

- Climate drivers *(AMO, NA Tripole, NAO)*
- Physical & chemical pressures *(SST, acidification, SLR)*
- Habitat state *(wetland, seagrass, oyster cover)*
- Lower trophic levels *(primary/secondary productivity)*
- Upper trophic levels *(fish abundance/diversity)*
- Ecosystem services *(fishery landings, revenues, protected species)*
- Human dimensions *(popn trends, fishing effort, social indicators)*





- 46 indicators
- 2-page summary
- Synthesis and research recommendations

Climate Vulnerability Assessment Framework

Exposure

Sea surface temperature
Air temperature
Salinity
Ocean acidification
Precipitation
Currents
Sea level rise

Sensitivity

- Complexity in Reproduction
- Dispersal of Early Life Stages
- Early Life History Survival and Settlement Requirements
- Habitat Specificity
- Prey Specificity
- Adult Mobility
- pH preferences
- Thermal preferences
- Population Growth Rate
- Stock Size/Status, etc.

Resilience

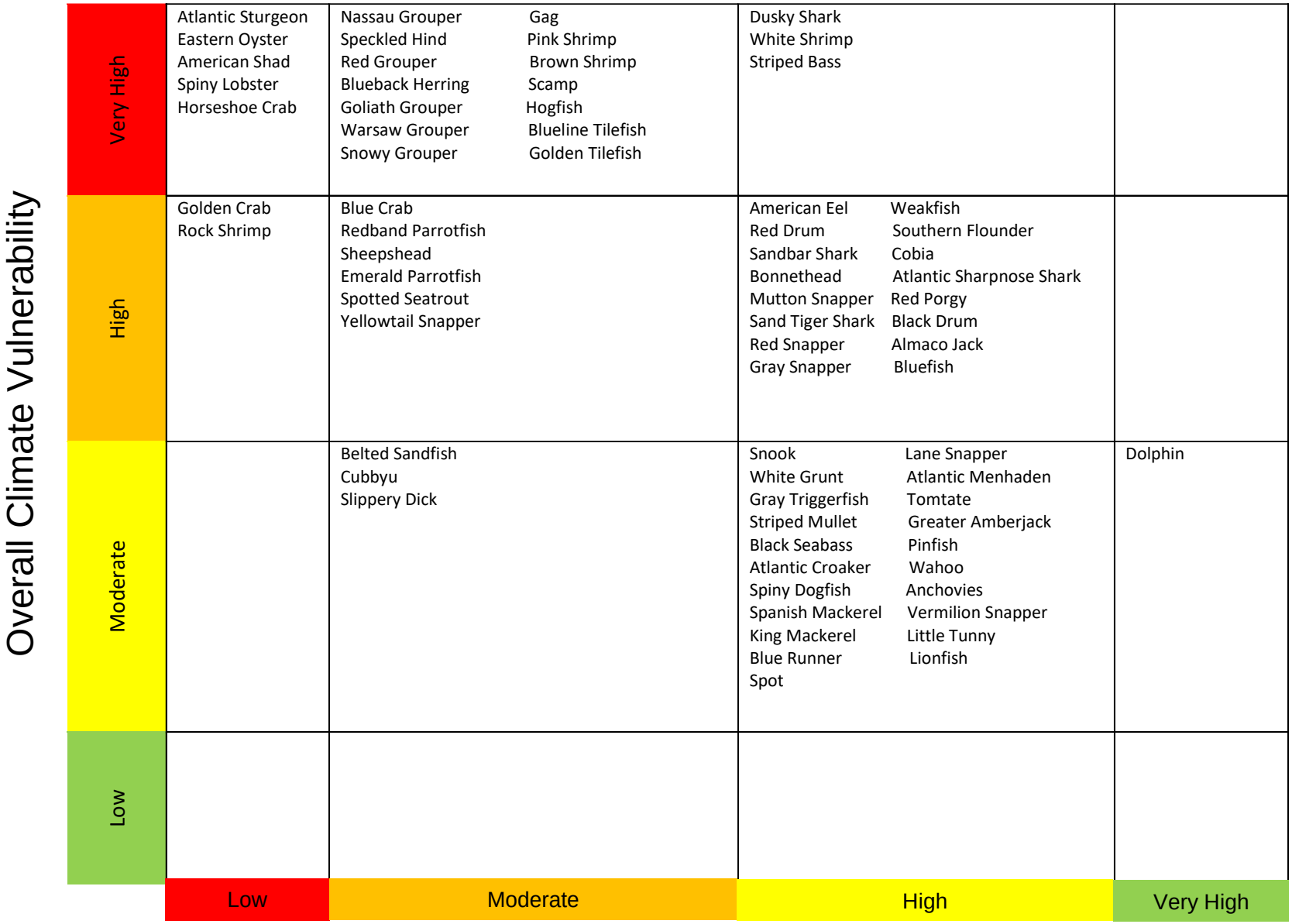
Adaptive capacity

- Based on existing knowledge & expert opinion
- 71 Species (e.g., reef fishes, coastal pelagic, diadromous, forage species, etc.)
- Expert scoring panel (low, moderate, high, very high)
- Species vulnerability narratives

Species Vulnerability

Inform science and management actions

Climate Vulnerability and Species Distribution Change



Support for Management: Performance and Risk

1. Tracking performance relative to fishery management objectives

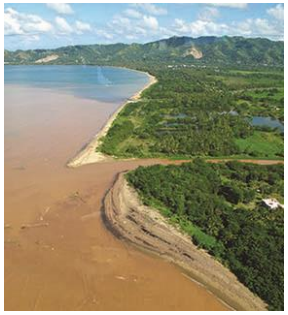
Example from New England
https://www.fisheries.noaa.gov/new-england-mid-atlantic/ecosystems/state-ecosystem-reports-northeast-us-shelf

Gulf of Maine (GOM)

OBJECTIVE (INDICATOR)	Seafood production (total and NEFMC managed landings)	Commercial profits (NEFMC managed revenue)		Stability (fishery and ecosystem diversity maintained over time)	
		Total	Managed	Fishery	Ecosystem
30 YEAR TREND	↘	↔	↘	↘	⇄
		Total	Managed	Fishery: Comm / Rec	Ecosystem
CURRENT STATUS	−	+	−	− / •	+

2. Tracking risks to meeting fishery management objectives





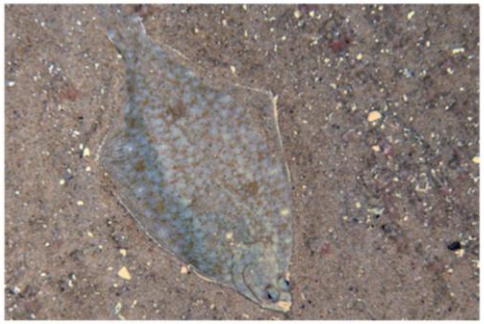

Support for Management: Stock Assessments

Ocean Models Help Link Environmental Conditions to a Fishery Stock Assessment

July 22, 2022

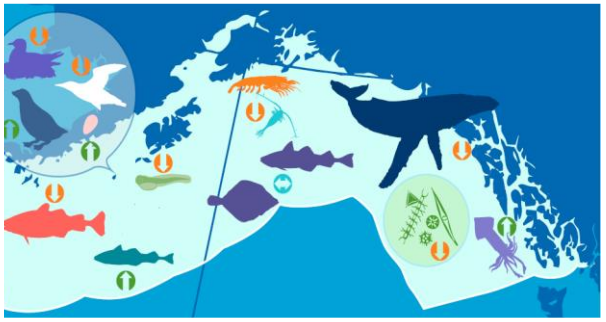
We are one step closer to using ocean and climate information to improve stock assessments and management measures.

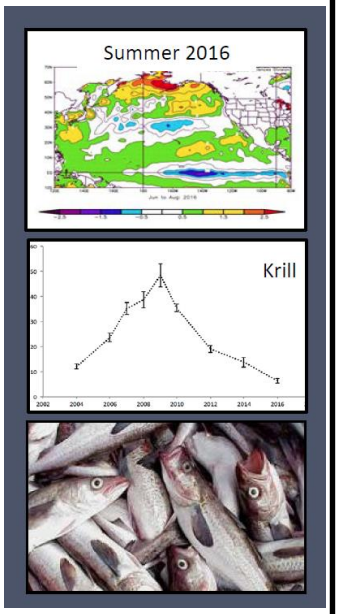
Feature Story | New England/Mid-Atlantic



Caption: Yellowtail flounder on a sandy bottom photographed by a towed sampling array called HabCam. Photo Courtesy Woods Hole Oceanographic Institution

Cooler and more persistent 'cold pool' associated with lower yellowtail flounder recruitment

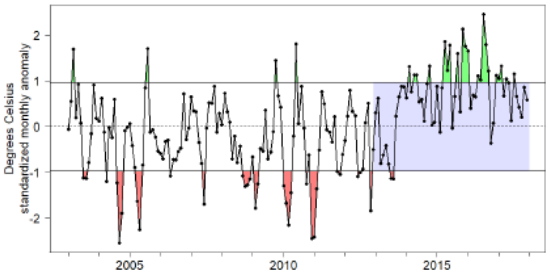




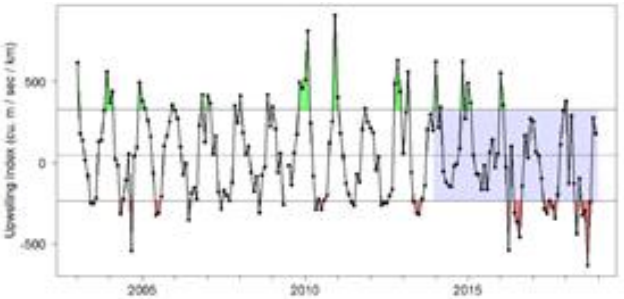
Single-species quota setting in the context of ecosystem information

South Atlantic

SST increasing



Nutrient Upwelling decreasing



Recent recruitment declines

Support for Management: Ecosystem Level Risk Assessment

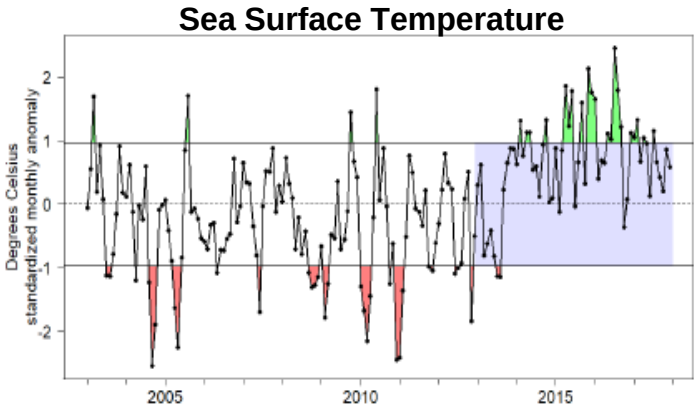
Prioritize species and issues that pose risk to management objectives

	"Fishing"			"Ecosystem"			"Climate"		
Species	**Assess**	**Fstatus**	**Bstatus**	**FW1Pred**	**FW1Prey**	**FW2Prey**	**Climate**	**DistShift**	**EstHabitat**
Ocean quahog	l	l	l	l	l	l	h	mh	l
Surfclam	l	l	l	l	l	l	mh	mh	l
Summer flounder	l	h	lm	l	l	l	lm	mh	h
Scup	l	l	l	l	l	l	lm	mh	h
Black sea bass	l	l	l	l	l	l	mh	mh	h
Atl. mackerel	l	h	h	l	l	l	lm	mh	l
Butterfish	l	l	l	l	l	l	l	h	l
Longfin squid	lm	lm	lm	l	l	lm	l	mh	l
Shortfin squid	lm	lm	lm	l	l	lm	l	h	l
Golden tilefish	l	l	lm	l	l	l	mh	l	l
Blueline tilefish	h	h	mh	l	l	l	mh	l	l
Bluefish	l	l	lm	l	l	l	l	mh	h
Spiny dogfish	lm	l	lm	l	l	l	l	h	l
Monkfish	h	lm	lm	l	l	l	l	mh	l
Unmanaged forage	na	na	na	l	lm	lm	na	na	na
Deepsea corals	na	na	na	l	l	l	na	na	na

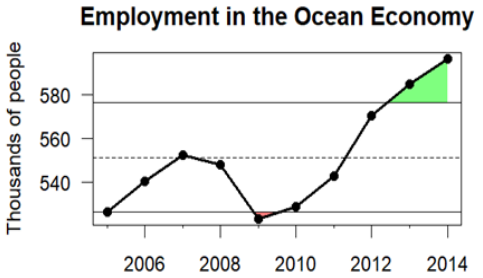
Gaichas et al. (2018) Implementing Ecosystem Approaches to Fishery Management: Risk Assessment in the US Mid-Atlantic Frontiers in Marine Science doi: 10.3389/fmars.2018.00442

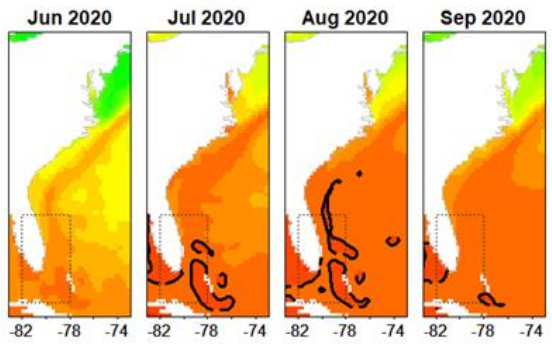
Risk
Green = low
Yellow = low-moderate
Orange = moderate-high
Red = high

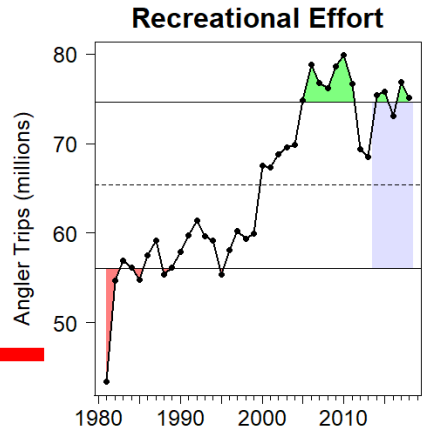
Support for Management: Adaptive Approaches

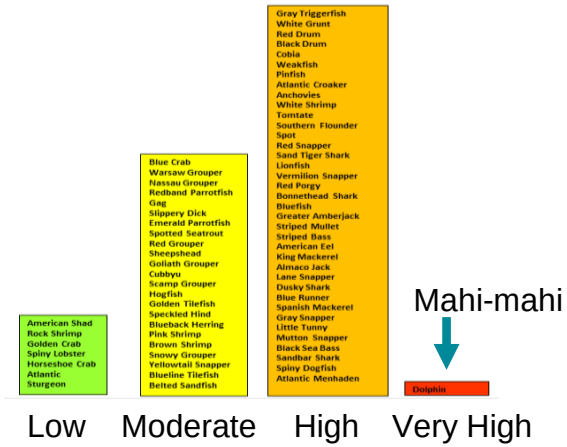


Distribution changes
and localized depletion

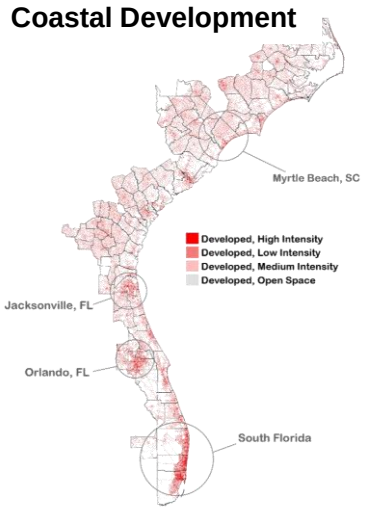




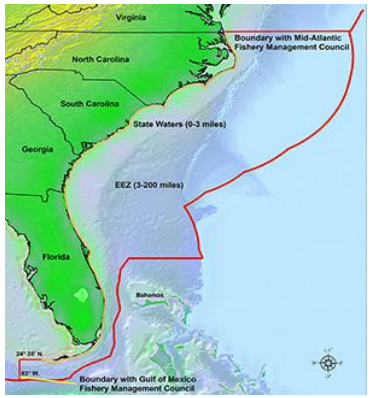




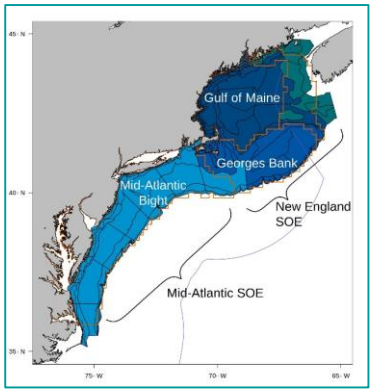
Alternative Hypotheses
Management Strategy Evaluation

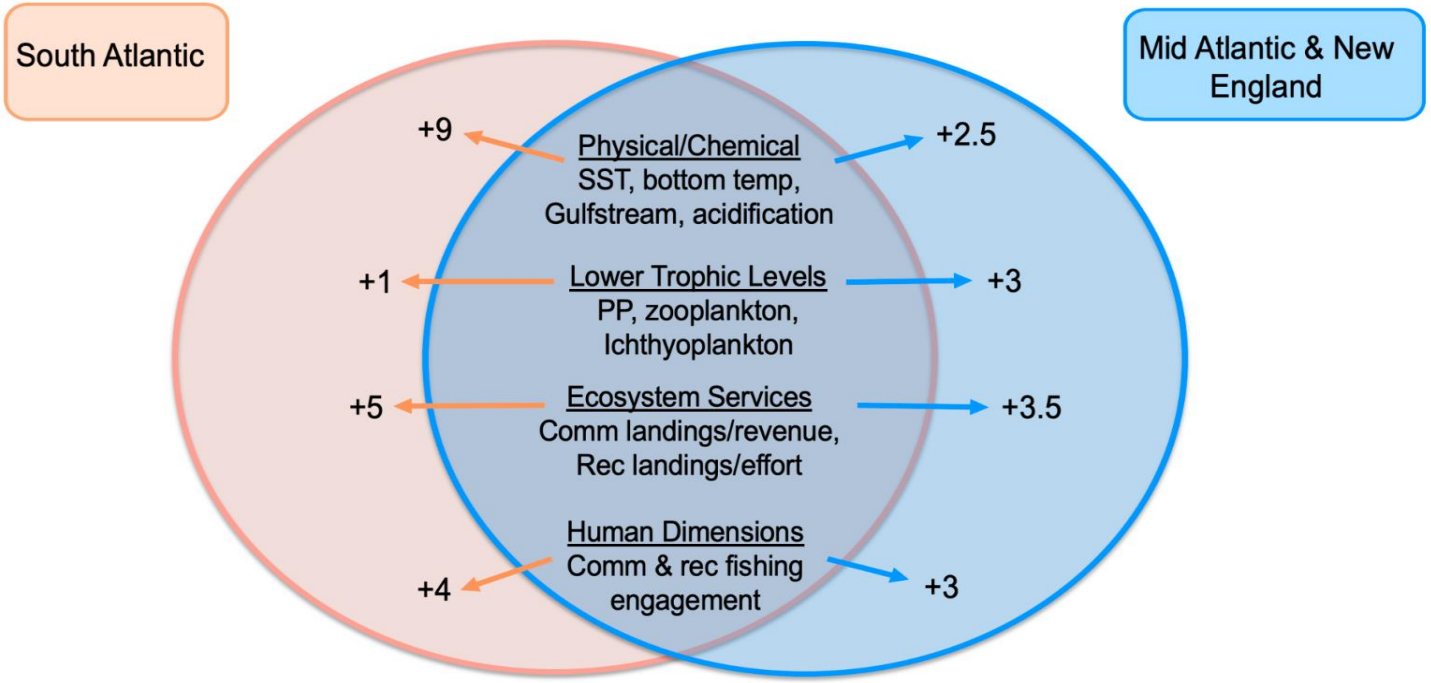


Support for Management: Cross Region Collaboration



ESRs and CVAs for all regions along Atlantic seaboard





Atlantic Coast Science Coordination Workshop (Aug 2021)

Support for Management: Summary

Decision Making:

- Provide information and context to support stock assessments
- Evaluate performance and risk relative to management objectives
- Help identify actions to reduce vulnerability and increase stock resilience
- Provide information to inform recovery plans, permitting decisions, environmental impact assessments, and other management tools (e.g., MSEs)

Planning:

- Scenario development and evaluation in the context of ecosystem change
- Help prioritizing species, habitats, and monitoring efforts
- Identify gaps in information for setting research and monitoring priorities
- Improve cross regional coordination of managed resources

NOAA FISHERIES

Thank you!

Questions and Feedback

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