NOAA Technical Memorandum NMFS-NE-306

Summary Report
NMFS Atlantic Coast Science Coordination Workshop
August 17-19, 2021

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts
October 2023

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Editorial Notes

Information Quality Act Compliance: In accordance with section 515 of Public Law 106-554, the Northeast Fisheries Science Center (NEFSC) completed both technical and policy reviews for this report. These pre-dissemination reviews are on file at the NEFSC Editorial Office.

Species Names: The NEFSC Editorial Office's policy on the use of species names in all technical communications is generally to follow the American Fisheries Society's lists of scientific and common names for fishes, mollusks, and decapod crustaceans and to follow the Society for Marine Mammalogy's guidance on scientific and common names for marine mammals. Exceptions to this policy occur when there are subsequent compelling revisions in the classifications of species, resulting in changes in the names of species.

Statistical Terms: The NEFSC Editorial Office's policy on the use of statistical terms in all technical communications is generally to follow the International Standards Organization's handbook of statistical methods.

Citation: Saba V and Kellison T. 2023. Summary Report NMFS Atlantic Coast Science Coordination Workshop August 17-19, 2021 US Dept Commer Northeast Fish Sci Cent Tech Memo 306. 44 p.

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EXECUTIVE SUMMARY

Changing climate is altering the nature of physical, chemical, biological, and social links between the Northeast and Southeast U.S. Continental Shelf ecosystems, and increasing the magnitude and number of those links. For example, the geographical distribution of some species has changed in recent decades, and additional changes are likely with continued climate change. For some species, assessment of whether distribution shifts have occurred is difficult due to limited data or inconsistency of data collection programs across geographical and management regions. Strengthening the degree of coordination and collaboration in science and management along the U.S. Atlantic coast is a priority.

A virtual workshop was held from August 17-19, 2021, that included staff from NOAA Fisheries' Office of Science and Technology, Northeast Fisheries Science Center (NEFSC), Southeast Fisheries Science Center (SEFSC), Greater Atlantic Regional Fisheries Office (GARFO), and Southeast Regional Office (SERO). Staff from Federal and State fishery management councils and commissions and from academia were also part of the workshop. Within the context of changing climate, ocean ecosystems, and species distributions, the objectives of the workshop were to (1) assess the degree of coordination of National Marine Fisheries Service (NMFS) science activities across regional and regulatory boundaries along the U.S. Atlantic Coast, and (2) identify opportunities to improve coordination and related support for fisheries and protected species management.

Workshop discussion focused on the following subject areas:

- Oceanography of the U.S. East Coast, including:
    - recent trends in ocean physics;
    - physical and lower trophic observations and trends; and
    - the current state of climate models and projections.
- Observed and projected shifts in fish and invertebrate distributions
- A blueline tilefish (*Caulolatilus microps*) case study
- Fishery-independent surveys – fish and invertebrates
- Coastal sharks – surveys and science
- Fishery-dependent surveys – fish and invertebrates
- Marine mammals and sea turtles – surveys and science
- Social sciences and human dimensions – surveys and science
- Stock assessments – considerations regarding changing species distributions
- Fishery management perspectives – Fishery Management Councils and the Atlantic States Marine Fisheries Commission (ASMFC)
- The DisMAP: Distribution Mapping and Analysis Portal
- State of the Ecosystem and Ecosystem Status Reports

For each subject area listed above, opportunities and priorities for improving coastwide coordination and support for cross-regional management are summarized in the "Workshop outcomes and recommendations" section of this report. Major recommendations include increasing cross-regional coordination and consistency of fishery-independent, fishery-dependent, and protected species surveys; identifying and addressing economic data needs for species

exhibiting cross-jurisdiction distribution shifts; and creating a framework for stock assessment coordination for species that are managed across geographical and management boundaries. Additionally, it was clear from discussions across the workshop focal areas that there is a pressing need for better science to clarify the extent to which species distributions are changing, particularly in relation to geographical and management boundaries.

Since the completion of this workshop in the summer of 2021, the NOAA Climate, Ecosystem, and Fisheries Initiative (CEFI) has been funded by the Inflation Reduction Act of 2022. Beginning in 2023, this initiative will produce new regional ocean model simulations that will cover the domain of the entire U.S. East Coast, the Gulf of Mexico, the Caribbean, and farther north to the southern portion of the Labrador Sea. These advances will allow new research to explore historical and future ocean conditions and how climate is impacting fisheries and protected species. Given the shared model domain for the northeast and southeast U.S. and Gulf of Mexico, enhanced coordination between NOAA Fisheries in the northeast and southeast will be critical.

BACKGROUND, NEED, AND WORKSHOP OBJECTIVES

Changing climate is altering the nature of physical, chemical, biological, and social links between the Northeast and Southeast U.S. Continental Shelf ecosystems, and increasing the magnitude and number of those links. For example, the geographical distribution of some species has changed in recent decades, and additional changes are likely with continued climatic changes. For some species, assessment of whether distribution shifts have occurred is difficult due to limited data or inconsistency of data collection programs across geographical and management regions. Strengthening the degree of coordination and collaboration in science and management along the U.S. Atlantic coast is a priority.

The objectives of the 2021 National Marine Fisheries Service (NMFS) Atlantic Coast Science Coordination Workshop, within the context of changing climate, ocean ecosystems, and species distributions, were to:

- assess the degree of coordination of NMFS science activities across regional and regulatory boundaries along the U.S. Atlantic Coast, and
- identify opportunities to improve coordination and related support for fisheries and protected species management.

WORKSHOP DETAILS, AREAS OF FOCUS, AND PARTICIPANTS

The workshop was held virtually from August 17-19, 2021, coordinated by Vince Saba (Northeast Fisheries Science Center [NEFSC]) and Todd Kellison (Southeast Fisheries Science Center [SEFSC]). The workshop agenda is included in Appendix 1. Agenda topics were based on planning-phase input from NMFS leadership and from New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), and Atlantic States Marine Fisheries Commission (ASMFC) representatives. Areas of focus are listed below, followed by topic-specific summaries of the information conveyed during related workshop presentations. Not addressed during the workshop were efforts related to life-history, wind energy development, and habitat science and management. Additionally, there was limited focus on Highly Migratory Species (HMS).

Areas of focus:

- Oceanography of the U.S. East Coast, including:
    - recent trends in ocean physics;
    - physical and lower trophic observations and trends; and
    - the current state of climate models and projections.
- Observed and projected shifts in fish and invertebrate distributions
- A blueline tilefish (*Caulolatilus microps*) case study
- Fishery-independent surveys – fish and invertebrates
- Coastal sharks – surveys and science
- Fishery-dependent surveys – fish and invertebrates

- Marine mammals and sea turtles – surveys and science
- Social sciences and human dimensions – surveys and science
- Stock assessments – considerations regarding changing species distributions
- Fishery management perspectives – Fishery Management Councils and the Atlantic States Marine Fisheries Commission (ASMFC)
- The DisMAP: Distribution Mapping and Analysis Portal
- State of the Ecosystem and Ecosystem Status Reports

Because the workshop was intended to focus primarily on NMFS science activities, a majority of workshop participants were NMFS personnel. Invited non-NMFS participants included representatives from management councils and commissions (NEFMC, MAFMC, SAFMC, and ASMFC), staff from state agencies representing key data collection efforts, and individuals from academia and industry. An average of 84 participants a day (range: 81-87) attended the 3-day workshop.

AREAS OF FOCUS SUMMARIES

Summaries of the information conveyed during workshop presentations, by area of focus, are below. The presentation leads for each section are listed in the workshop agenda (Appendix 1).

Oceanography of the U.S. East Coast

Physical and lower trophic observations and trends

Ocean circulation is changing in the Northwest Atlantic. The Gulf Stream is shifting north, and the Labrador Current is less influential on the U.S. Northeast Shelf. This shift in regional circulation combined with global warming is suggested to be causing the enhanced warming of the U.S. Northeast Shelf relative to other regions in the country. Changes in the Gulf Stream may also be impacting the Southeast U.S. where overall warming has been less pronounced, particularly in the South Atlantic bight where there appears to be a dipole of cooling/warming along the coastline/shelf break. Surface pH measurements in the Northwest Atlantic suggest the ocean is becoming more acidic on the comparable scale to global change due to enhanced CO_2 uptake by the oceans.

The majority of Atlantic Coast plankton survey effort occurs in the U.S. Northeast, north of Cape Hatteras (Figure 1). The NEFSC has sampled ichthyoplankton along the continental shelf each year since 1977, whereas the majority of sampling across the Southeast Continental Shelf occurred from 1973-1980.

Gulf of Maine and Georges Bank plankton trends are as follows:

- Declining and negative in the early 2000s
- Positive since 2009-2010
- Similarities to fish conditions of NEFMC stocks, including
    - lower condition from 2001-2010 and
    - increasing since 2012.

Mid-Atlantic Bight plankton trends are as follows:

- No trend in the early 2000s
- Highly variable since 2009
- Not correlated to Georges Bank or Gulf of Mexico

Ichthyoplankton takeaways:

- The priority is to maintain long-term surveys and the indices that feed directly into stock assessments (e.g., Atlantic mackerel [*Scomber scombrus*]).
- Periodically expanding our survey footprint would let us answer many emerging questions.
- Integrating plankton work into established surveys/ship transits is one of the more efficient ways to increase the footprint.

Current state of climate models and projections

High-resolution climate models and/or coupled regional ocean models are needed to resolve the regional circulation of the Northwest Atlantic, mesoscale dynamics (eddies), and fine-scale bathymetry. Climate change projections from NOAA GFDL's high-resolution global climate model (CM2.6) show non-uniform ocean warming of the U.S. East Coast as opposed to the coarser resolution climate models assessed by the Intergovernmental Panel on Climate Change (IPCC) that project uniform ocean warming (Figure 2). The enhanced warming along the shelf break (as far south as Florida) and the Gulf of Maine is due to a northern shift in the Gulf Stream, which corroborates with contemporary observations.

Since the completion of this workshop in the summer of 2021, the NOAA CEFI has been funded by the Inflation Reduction Act of 2022. Beginning in 2023, this initiative will produce new regional ocean model simulations that will cover the domain of the entire U.S. East Coast, the Gulf of Mexico, the Caribbean, and farther north up to the southern portion of the Labrador Sea. Using NOAA's state-of-the-art ocean model MOM6, simulations will be run in hindcast (historical), forecast (seasonal to annual), and future projection (decadal to century scale) modes. Ocean physics and biogeochemistry up through zooplankton will be resolved at a very high resolution. This will allow new research to explore historical and future ocean conditions and how climate is impacting fisheries and protected species. These regional models are also critical to fill in spatial and temporal gaps from NOAA surveys. Associations between living marine resources and climate cannot be derived without a time-series of historical ocean conditions at the resolution needed to resolve coastal and shelf ocean processes. Given the shared model domain for the Northeast and Southeast U.S. and the Gulf of Mexico, enhanced coordination between NOAA Fisheries in the northeast and southeast will be critical. Therefore, the implementation of the NOAA CEFI will require U.S. East Coast MOM6 regional model developers and regional decision support teams to meet regularly throughout each year to validate models with observations and build research collaborations that utilize the new regional MOM6 Northwest Atlantic model simulations to improve the management of living marine resources throughout the U.S. East Coast and the Gulf of Mexico.

Observed and projected shifts in fish and invertebrate distributions

In the U.S. Northeast, marine taxa sampled in the NEFSC fall survey have been shifting north and into deeper water. When examined sub-regionally, species in the Gulf of Maine have been shifting into deep water to the southwest whereas species in the mid-Atlantic bight have been shifting northward. Projections of species distribution shifts have been mostly based on thermal habitat, but new studies are exploring additional variables (salinity, pH, sea surface height). These projections, which are primarily based on GFDL's CM2.6, suggest continued change in species habitat distribution as the ocean continues to warm.

In the U.S. Southeast:

- increasing numbers of estuarine community shifts have been linked to climate;
- there are still few compared to other regions;
- some coastal species respond rapidly;
- shifts in reef fishes occur with changes in local density;
- projections of southeast species is lacking; and
- minimum temperature tolerance is expected to be important for future distributions of Southeast reef fishes.

Blueline tilefish case study

Takeaways:

- A directed fishery for blueline tilefish has operated in the U.S. South Atlantic for decades (c. 1980).
- Commercial landings increased in North Carolina north of Cape Hatteras beginning in 2006.
- Recreational landings increased in the Mid-Atlantic beginning in 2003 and again in 2014 as deep-drop fishery gained popularity and records were awarded.
- Perception has emerged that the blueline tilefish is expanding its range northward.
- Reasons it has proven difficult to evaluate the hypothesis of blueline tilefish range expansion include:
    - The understanding of spatial distribution at any point in time is poor.
    - Patchy distribution in deep water habitat makes it possible that pockets of local abundance are periodically discovered and exploited.
    - Landing locations are difficult to associate with catch locations.
    - Most of the landings in the Southeast are from northern North Carolina, so major fishing grounds are within reach of ports from several Mid-Atlantic states.
    - Other hypotheses for increased landings in the north need to be evaluated (increased effort, increased catchability).

- Probably not a top candidate for rapid northward range shifts or expansion because it is long lived, non-migratory, and strongly associated with deep water but does have pelagic larvae.

- Information needed to identify a range expansion or shift include:

  - the historical distribution of the stock and amount of year-to-year variability in stock distribution;
  - spatial patterns in abundance (e.g., patchiness) within the stock area (in the case of blueline tilefish, fine-scale patterns in abundance due to spatial patchiness and association with jurisdictional boundaries);
  - evaluation of multiple alternative hypotheses if information is primarily from landings (e.g., increased effort, q, fisher behavior);
  - a hypothesized mechanism(s) or particular life stage underlying distribution shifts (e.g., change in temperature, transport processes); and
  - a statistical method to evaluate what constitutes an expansion or shift.

Fishery-independent surveys – fish and invertebrates

Fishery-independent surveys are large-scale surveys carried out using consistent methodologies over space and time. They are intended to generate indices of abundance and biological information (i.e., age, growth, diet, and reproduction).

- NEFSC and partner surveys

  - Fall and Spring Bottom Trawl
  - Ecosystem Monitoring (EcoMon; plankton- and environmental data-focused)
  - Sea Scallop
  - Atlantic Surfclam/Ocean Quahog
  - Northeast Area Monitoring and Assessment Program (NEAMAP) Coastal Trawl Survey(s)
  - MAFMC Longline Tilefish Survey
  - Subregional surveys not included in discussion:

    - Gulf of Maine Northern Shrimp
    - Gulf of Maine Bottom Longline

- SEFSC and partner surveys

  - Southeast Reef Fish (trap-video) Survey
  - SEFSC Bottom Longline Survey
  - Cooperative-with-industry Deepwater Longline Survey
  - Southeast Area Monitoring and Assessment Program – South Atlantic (SEAMAP-SA) Coastal Trawl Survey

- Note: Southeast U.S. ichthyoplankton surveys are restricted to the Gulf of Mexico; there is no sampling on the Southeast U.S. continental shelf.

- Coordination challenges

  - Priority species and the habitats utilized generally vary across regions, potentially necessitating different survey approaches.
  - Exceptions include coastal species, tilefishes, and black sea bass (*Centropristis striata*).
  - There are no fully cross-regional surveys.
  - There are no inter-survey calibration efforts to date (opportunity for collaboration).
  - The length of time series of existing surveys and their respective importance to stock assessments, make survey changes consequential.
  - Cross-regional coordination has been somewhat limited, potentially limiting data awareness for region-specific stock assessments (opportunity).

- Coordination successes

  - Coastal trawl surveys: ASMFC summits to discuss NEAMAP and SEAMAP-SA sampling activities
  - Life-history:

    - Aging workshops to standardize collection, processing, and assignments; led to development of an aging manual.
    - Maturity determination and diet sampling training sessions were developed.

  - Longline surveys: recent survey coordination discussions between MAFMC, NEFSC, and SEFSC personnel
  - Intra-regional - many examples

- Coordination opportunities

  - Establish a framework (e.g., quarterly check-ins) for increased cross-regional coordination and communication.
  - Cross-regional survey participation.
  - Standardization and coordination of environmental and acoustic data collections.
  - Survey-specific
  - Plankton surveys:

    - There is currently no survey in the South Atlantic; this would need to be funded and established.
    - A South Atlantic plankton survey would fill a large spatial gap in plankton survey coverage between Northeast/Mid-Atlantic waters and

the Gulf of Mexico (the SEFSC manages the spring and fall Gulf of Mexico plankton surveys)

- Coastal trawl surveys:
  - Potential for intercalibration among Atlantic Coastal Trawl Surveys
  - Similarities between regions:
    - Seasonal survey timing
    - Approximate sizes of sampling gears and vessels
    - Species compositions
  - Differences between regions:
    - Survey trawl configurations
    - Depths sampled
    - Species compositions
  - Challenges:
    - Financial resources
    - Calibration timing
    - Cross-regional-scale coordination
- Deepwater longline surveys:
  - Potential for Atlantic Coast-scale deepwater longline survey targeting deepwater, demersal species
  - Similarities:
    - Cooperative with industry
    - Focal species (tilefishes)
    - Timing
    - Depths
    - Gear – 150 hooks per mile
    - Hook sizes (overlap with some differences)
  - Differences:
    - Mainline length
    - Deployment/retrieval methodology
  - Challenges:
    - Funding/institutional priorities

- Framework for cross-regional coordination and data sharing

- Trawl and trap-video surveys:

  - Potential for southward expansion of trawl survey

    - Considerations:

      - Funding/institutional priorities
      - Protected species bycatch
      - Impacts to hard bottom habitats
      - Potential for northward expansion of trap-video survey

    - Considerations:

      - Video may have limited utility with increasing latitude due to reduced water clarity
      - Trap efficiency varies by species
      - The South Atlantic survey targets hard bottom habitats
      - Target similar habitats farther north
      - Requires knowledge of habitat spatial distributions

  - Potential for calibration studies between trawl and trap-video surveys

      - Establish a framework for increased cross-regional coordination and communication; a cross-regional working group (NMFS and partners) to pursue further discussions and recommendations.

Coastal sharks – surveys and science

- NEFSC data collection programs:

  - Coastal Shark Bottom Longline Survey
  - Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) Program
  - Cooperative Shark Tagging Program
  - Northeast Fisheries Observer Program

- SEFSC data collection programs:

  - SEFSC Bottom Longline Survey
  - Shark Bottom Longline Observer Program

        - Shark Research Fishery

- Coordination challenges:

    - Current surveys do not cover the spatiotemporal extent of coastal shark distributions.

        - NEFSC Coastal Shark Bottom Longline Survey – timed with spring migration, but weather delays cause loss of fishable sea days, and the survey ends before it reaches northern extent.
        - COASTSPAN Surveys – sampling is missing in some state waters; currently not enough funds to support other cooperators.
        - SEFSC Bottom Longline Survey – the sampling area only covers the southern extent of summer range for many species.
        - All surveys are limited by available funding, time, and staff.

- Coordination successes:

    - All data collection programs reported in this presentation contribute to shark stock assessments through the SouthEast Data, Assessment, and Review (SEDAR) process.
    - Life history research in support of stock assessments is often coordinated between the NEFSC and SEFSC using multiple data collection programs.

Fishery-dependent surveys – fish and invertebrates

- Coordination challenges:

    - Overall

        - Coordination is ad hoc and not a framework.
        - Systems are isolated within offices.
        - Regional offices now collect half of the fishery-dependent data.

    - Regulatory

        - Data transmission frequency (e.g., prior to offload, 48 hours, weekly, monthly)
        - Timing with management actions
        - Paperwork Reduction Act (PRA) inhibits rapid data changes
        - Council involvement

    - Communications and Technology

        - Data flow into systems (multiple pathways)

        - Security connecting systems (e.g., virtual private network approval, Federal Information Security Management Act (FISMA) approval)
        - Standards (e.g., depth, trip, effort calculations)
        - Metadata/historical account
        - Coding uniformity – translation tables and automation

    - Scientific compatibility

        - Calibration
        - Data access
        - Time series consistency and length

    - Resources limiting

        - Technical debt and resources
        - Paper versions still exist

    - Permits

        - Similar yet different systems
        - Vessel identification between regions
        - Data sharing between regions and HMS

- Coordination successes

    - FIS funded One Stop Reporting project (SE, NE, HMS, and ACCSP).

        - Dual region permitted vessels can report with a single app via ACCSP's eTrips.
        - GARFO's Fish Online will do the same next summer.
        - Still to address: data fields, QA/QC, permit structure, data flows, data edits, and data sharing.

    - Move toward electronic reporting by all.

        - ACCSP is working on aggregating commercial catch data and making eTrips more flexible
        - Still to address: fishermen buy-in, different levels of data collection

    - SEFSC/SERO Management History database

        - One-stop shop to see all federal management actions
        - Working to incorporate state regulations
        - Identified as a stock assessment need but benefits data sharing and management

- Northeast continued integration of fishery-dependent data systems
    - Initiatives are under way to create a single unique trip identifier (UTID).
    - System prerequisites needed but lag to technical debt and resource limitations
- Vessel Monitoring Systems (VMS)
    - New cellular VMS units are cost efficient and expand data collection capabilities (store and forward).
    - Industry concerns of usage and storage locations
- Southeast For-Hire Integrated Electronic Reporting (SEFHIER)
    - Census-style data collection with complemented intercept survey (Gulf of Mexico only)
    - Successes: Working with GARFO and ACCSP
    - Still to address:
        - Council-determined data fields limit flexibility.
        - Paperwork Reduction Act hurdles are challenging.
        - Technical debt is inhibiting data collection processes.

- Coordination opportunities:
    - Fisheries Information Systems (FIS)
        - Build on FIS's years of data coordination experience (since 2013)
        - Cross-disciplinary and cross-region collaboration through Professional Specialty Groups (PSG)
        - Coordination and awareness of nation-wide electronic technology and emphasis on sharing resources, knowledge, and expertise
        - FIS Request for Proposals – one-time funds for system modernization, electronic monitoring, electronic reporting, quality management/continuous improvement, and fisheries information networks
        - Coordination of Electronic Technology Professional Specialty Group with Electronic Technology Working Group
    - Decrease technology debt
        - All regions mentioned technology debt in regional Electronic Technology Implementation Plans
        - Cloud technology acceptance
        - Decrease silo data collections isolation

- Data governance policy will aid in sharing data within and across regions
- Northeast mandate for electronic reporting of commercial species catch/effort (Nov 2021) for MAFMC and NEFMC managed species
- Regional offices now collecting at least half of fishery-dependent data in each region
- Need to include HMS in future discussions
- More studies combining fishery-dependent and fishery-independent data (or combining different fishery-independent surveys)
- These can serve as a blueprint for combining data across regions
- Electronic Technology Implementation Plans now available

Marine mammals and sea turtles – surveys and science

- Coordination successes:
    - Marine mammal and sea turtle stranding network – cross-region response
    - Management – cross-region Take Reduction Teams (TRTs), Stock Assessment Reports (SARs), bycatch reduction
    - Section 7 consultations
    - Vessel strike reduction efforts
    - Climate (e.g., vulnerability assessments and scenario planning)
    - Case studies:
        - Right whales – research and recovery
        - AMAPPS
        - Rice's whale (*Balaenoptera ricei*) drone surveys
- Coordination challenges and opportunities:
    - Data management
        - U.S. Animal Telemetry Network – not all tag data contributed yet
        - Acoustics and NCEI – limited funding
        - Tobey Curtis – acting program manager increasing focus on HMS species
    - Mission
        - Documenting extinction with precision vs. defining critical ecosystem functions.
    - Other anadromous species
        - No one asked for sturgeon, shad, and river herring update.

- Declining return on survey investment
    - As stocks shrink, stakeholders demand increased precision.
- We need better integration with fisheries and ecosystem groups

- Other considerations
    - Wind, climate, and distribution shifts
    - Aquaculture and fishing futures
    - Ocean space management and coordination
    - Ecosystem-based management and ocean productivity
    - Managed keystone species

Social sciences and human dimensions – surveys and science

- NEFSC and partner programs:
    - Commercial fisheries economics
        - Observer program trip costs
        - Social Sciences Branch Fixed Cost Survey
    - Recreational fisheries economics
        - SandT Marine Recreational Expenditure Survey (National Rollout)
    - Other Social Science Data available
        - Social Sciences Branch Owner Survey
        - Social Sciences Branch Crew Survey
        - Social Vulnerability Indicators (National Rollout)

- SEFSC and partner programs:
    - Commercial fisheries economics
        - Coastal Logbook Program Econ add-on (continuous 20% sample)
        - Annual cost surveys for shrimp; periodic surveys for other fleets
    - Recreational fisheries economics
        - SandT Marine Recreational Expenditure survey (National Rollout)
        - Headboat Logbook fuel consumption and passenger info
        - Charter E-logbook starting and has some economic information
        - Contingent behavior online surveys

- Social Science
    - Social Vulnerability Indicators (National Rollout)
    - Crew survey (pilot)

- Coordination challenges:
    - Many surveys differ in years administered
        - Relatively short time span/patchiness of most social science surveys
    - Difficulties in "drilling down" to very specific fleets due to rising percent standard error unless you have census-level data
    - Spatial data disparity
        - Southeast uses grids for landings, almost no VMS.
        - NE Vessel Trip Reports include latitude/longitude, and VMS is generally available for the recent past.
    - Data collection not necessarily representative for all fisheries
        - Likely different holes between Southeast and Northeast
    - Changes in MRIP modes and calibration
    - Office of Management and Budget – time constraints for survey reviews

- Coordination successes:
    - Social Indicators are now national.
        - Census and fisheries indicators for community vulnerability
    - NOAA/Council social scientists meet regularly to discuss issues.
    - National level social science workgroups
        - Ecosystem Services Working Group, Integrated Ecosystem Assessment (IEA) Human Dimensions Working Group, etc.
        - R Workshop for social scientists
        - Cross-regional scientific papers
            - Income diversification, productivity measures, survey of NOAA Fisheries coupled modeling, safety at sea, etc.
    - Not many of us, so we know who to communicate with

- Coordination opportunities:
    - Cross-jurisdiction distribution shifts – blueline tilefish, dolphinfish (mahi; *Coryphaena hippurus*)
        - Fishery spillover and displacement effects
    - Allocation issues between regions – summer flounder
    - Startup for discussion: Joint work should focus on species most at risk and largest repercussions of change
        - Assessment should be coordinated across disciplines
        - What areas are changing, which species are affected, what are the management implications
            - Dolphin (mahi) is contentious and important economically
                - No fisheries-independent data
                - International component, HMS issue
                - Disparity in data collection and analysis

Stock assessments – considerations regarding changing species distributions

- General issue: What will happen with stock assessments if distribution shifts occur?
    - Distribution shifts may result in:
        - Changes in spatial structure within stock boundaries
        - Shift in spatial distribution across stock/jurisdictional boundaries (Figure 3)
        - Expansion of spatial distribution to new areas
- Fundamental assumptions with respect to space
    - Dynamic Pool assumption: single homogenous stock, which implies the same:
        - Availability/density
            - Encounter rates and catch rate (mortality)
        - Age structure/recruitment
            - Single production function (spawner-recruit relationship)

        - Life history characteristics
            - Growth (length at age, weight at age, length-weight)
            - Maturity and fecundity
    - Closed population
        - No immigration or emigration
        - Recruitment within area is from spawning stock in area
        - Population only affected by processes in stock boundaries

- Current assessments
    - Northeast
        - Many age structured
            - Most Implemented in Age-Structured Assessment Program (ASAP), Stock Synthesis, Woods Hole Assessment Model (WHAM) (future)
            - Some downgraded due to model diagnostics (retrospective patterns)
        - Some species with multiple stock/management areas
            - Examples: cod, haddock, yellowtail and winter flounder, silver and red hake
        - Some stocks include spatial considerations
            - Examples: sea scallops, black sea bass, surfclams, ocean quahogs
        - Some stocks/species are binational
            - Examples: Georges Bank cod, haddock, yellowtail flounder, Atlantic herring and mackerel, Illex squid
    - Southeast
        - Most age structured
            - Most implemented using the Beaufort Assessment Model (BAM) framework
            - Production model as supplement

        - Occasionally data poor methods

    - Most ignore space

        - Exceptions:

            - Menhaden (fleets as areas)
            - Blueline tilefish (split at Cape Hatteras; North surplus production)

    - Separate Southeast and Mid-Atlantic assessments are spatial models

        - Practically, they assume independence of stocks and fishing

    - If boundaries are modeled, the boundaries are usually jurisdictionally, not biologically, driven, to facilitate within-jurisdiction management decisions

- Implications of changing spatial distributions

    - Stock size and reference point estimates would change with separate assessments even if total is unchanged
    - Could impact management

        - Status determination (rebuilding)
        - ACL
        - Allocation

- Considerations for spatial stock assessments

    - Options for dealing with distribution shifts
    - Incorporating space into assessments

        - Spatially implicit

            - Fleets as areas
            - Spatially structured data components (indices)

        - Spatially explicit

            - Determination of boundaries

    - Driven by biology or management
    - Data-dependent

        - Determination of number of spawning stocks

        - Requires fine scale biological information

    - Assessment of frequency and extent of boundary crossing?

        - Movement of adults, sub-adults
        - Dispersal of eggs, juveniles

- Challenges with spatial assessments

    - Data needs to contain spatial information

        - Inform fishing mortality and abundance (landings, abundance indices)
        - Inform population age structure (age comp, length comp)
        - If multiple spawning stocks need biological information spatially stratified

    - Model

        - Movement difficult to estimate (tagging data?)
        - Separate stock recruitment relationships
        - Increased model complexity lead to difficulties in interpretation

    - Management

        - Reference points and status determination not straightforward
        - Increased uncertainty usually comes with more complex models
        - Bias-variance tradeoff
        - Projections become more complex

Fishery management perspectives – Fishery Management Councils and ASMFC

This portion of the workshop was discussion only, with the following management representatives providing perspectives accompanied by group discussion:

- NEFMC - Michelle Bachman
- MAFMC - Brandon Muffley
- SAFMC - John Carmichael and Chip Collier
- ASMFC - Pat Campfield

Focal areas of discussion during this portion of the workshop are addressed in the "Management perspectives" component of the "Workshop outcomes and recommendations" section below.

DisMAP: Distribution Mapping and Analysis Portal

- A national online portal providing visualization and analysis tools to allow users to view, download, and dynamically interact with data to track and understand past and projected future distributions of marine species.
- Objectives:
    - Make information on marine species distributions more accessible, usable, and useful to stakeholders.
    - Provide species distribution information across biogeographic and jurisdictional boundaries.
    - Provide consistent nationwide tracking and analysis of species distributions.
    - Support and track development and advances in the field of species distribution modeling.
    - Leverage and amplify investments and efforts.
- Planned capabilities
    - Single species distributions
    - Multispecies overlap and interactions
    - Species shifts and human interactions
    - Regional summary
    - Data download
- Phases of development
    - Version 1.0 (released April 2022)
        - Providing information on species distributions based on NMFS regional bottom trawl survey data
    - Version 2.0 +
        - 2 additional modules (port availability and multispecies overlap)
        - Additional species distribution information from other survey data (e.g., Canadian regions)
        - Projections of possible future species distributions
- Anticipated users:
    - Primary: NOAA stock assessment and ecosystem scientists; managers and decision-makers
    - Secondary: Academics (K-12, university); general public

- Planned for future releases

    - Interpolated maps and distribution metrics updated annual
    - Multispecies Overlap and Interactions, and Species Shifts and Human Interactions
    - Developing plan to review and pull in statistical species distribution model output developed by science center staff and partners
    - Other survey data sources
    - Additional layers to include on map (e.g., sea surface temperature, salinity, ocean acidification, protected areas)

State of the Ecosystem and Ecosystem Status Reports

- Ecosystem Status Report

    - Definition:

        - Synthesis of scientific information on a range of ecosystem components (physics to fish to humans and back)
        - State of the Ecosystem (SOE) Reports: shorter, focused, tailored to defined management interests
        - Core component of NOAA Ecosystem-Based Fisheries Management (EBFM) Road Map, regional EBFM Implementation Plans, Climate Science Strategy (NCSS), and Integrated Ecosystem Assessment (IEA) regional plans

    - Objectives:

        - Provide a broad-level overview of the current state of an ecosystem with respect to recent and historical trends using a suite of indicators (quantitative time series, regional scale).
        - Transfer knowledge to managers to provide context and information for a range of decisions affecting marine ecosystems.
        - Facilitate communication and information exchange between scientists, managers, and stakeholders.

- Ecosystem reporting

    - NEFSC

        - Ecosystem Status Reports (ESRs) and SOE Reports

            - Comprehensive ESRs 2002, 2009, 2012, 2015 online update
            - 2016: Fishery management council-focused, shorter SOE based on California Current prototype

- Restructured based on Council feedback, presented annually 2017-2021
- Structured around management objectives, risks to meeting objectives
- Used in MAFMC EAFM risk assessment
- Stock level Ecosystem Socio-economic Profile (ESP) reporting spinning up

- SEFSC

  - Ecosystem Status Reports

    - Gulf of Mexico ESR completed in 2013, updated in 2017
    - Gulf report and key indicators available online: https://www.aoml.noaa.gov/ocd/ocdweb/ESR_GOMIEA/
    - South Atlantic ESR in final review stages
    - Caribbean ESR in development

  - Engagement efforts

    - Early stage of stakeholder engagement in the Southeast
    - Briefings to South Atlantic Council Habitat and Ecosystem Advisory Panels, other stakeholders [ASMFC, Southeast Coastal Ocean Observing Regional Association (SECOORA), NOAA Southeast and Caribbean Regional Team (SECART)] during report development
    - SAFMC presentation scheduled for upcoming Council meeting
    - Plan(s) for updates to ESRs or transition to SOE reports (TBD)

- Coordination successes

  - Now have ecosystem reports for all regions along the Atlantic seaboard
  - No formal coordination to date, but common indicators identified

- Coordination challenges

  - Common data gaps across regions

    - Benthos poorly sampled
    - Habitat information spotty
    - State and local level data difficult to access, integrate

  - Different federal fishery-independent survey methods (e.g., trawl vs. trap/video) across regions

- Some lower trophic levels comprehensively surveyed only in Mid-Atlantic and New England regions
- Climate impacts and severity may differ by region
- Different interests of managers in different regions

- Coordination opportunities
  - Streamline report production to facilitate coordination
    - Automate data pulls to produce indicators for each region (e.g., SST, heatwaves)
    - Similar frameworks for data management [R data package, Environmental Research Division Data Access Program (ERDDAP) server)]
    - Similar process for updates
  - Coordinate selected indicators
    - Understanding coastwide ecosystem data in biophysical drivers, climate drivers relevant to ecosystem considerations across regions
    - Stock-specific ecosystem data products for coastwide species (bluefish, black sea bass)
    - South Atlantic species stock identification vs. range shifts
    - Management needs could prioritize other indicators to coordinate
  - Develop avenues of communication
    - Knowledge transfer (identify approaches that have been effective in engaging managers in Mid-Atlantic and New England) to apply to the southeast

- Current and potential uses of ecosystem reporting
  - Ecosystem-level risk assessment
    - Mid-Atlantic EAFM annual updates
  - Direct incorporation into stock assessments ("front end")
    - Gulf of Mexico grouper-Red tide; WHAM
  - Inform single species decision-making ("back end")
    - Bering Sea pollock ABC adjustment
  - Rebuilding plans, reference points

- Protected species management

WORKSHOP OUTCOMES AND RECOMMENDATIONS

Challenges to, and opportunities for improving, coastwide coordination that were identified during and following the workshop are summarized below.

Scientific enterprise

Fishery Independent Surveys

- Establish a framework for increased cross-regional coordination and communication.
    - Establish and maintain communication between the NEFSC and SEFSC on fishery-independent survey-related developments and opportunities (e.g., related to wind energy development)
- Establish a South Atlantic plankton survey, which would fill a spatial gap between the areas covered by the NEFSC's ECOMON plankton surveys in the New England and Mid-Atlantic regions, and the SEFSC SEAMAP plankton surveys in the northern Gulf of Mexico
- Establish a collaborative, methodologically consistent NEFSC-SEFSC deepwater longline survey across management boundaries along the Atlantic coast, targeting tilefish and other deepwater demersal species of management importance
- Pursue methodological consistency in coastal trawl (state, NEAMAP, and SEAMAP) surveys, which could result in a consistent coastal trawl survey occurring from Maine's northern coastal border with Canada to Cape Canaveral, FL
- Comparatively evaluate spatially overlapping (south of Cape Hatteras) NEFSC trawl and SEFSC trap-video data
- Explore the potential for calibration studies between NEFSC trawl and SEFSC trap-video surveys
- Assess the extent to which more southerly species are increasing in frequency and abundance in Mid-Atlantic waters

Coastal Sharks – Surveys and Science

- Coordination Challenges
    - Current surveys do not cover the spatiotemporal extent of coastal shark distributions
        - NEFSC Coastal Shark Bottom Longline Survey – timed with spring migration, but weather delays cause loss of fishable sea days and survey ends before reaches northern extent

        - COASTSPAN surveys – sampling missing in some state waters; currently not enough funds to support other cooperators
        - SEFSC Bottom Longline Survey – sampling area only covers southern extent of summer range for many species
        - All limited by available funding, time, and staff

- Coordination Successes

    - All data collection programs reported in this presentation contribute to shark stock assessments through the SEDAR process
    - Life history research in support of stock assessments is often coordinated between the NEFSC and SEFSC using multiple data collection programs

Fishery Dependent Surveys

- Leverage Fisheries Information Systems (FIS)

    - Build on FIS's years of data coordination experience (since 2013)
    - Cross-disciplinary and cross-region collaboration through Professional Speciality Groups (PSG)
    - Coordination and awareness of nation-wide electronic Technology and emphasis on sharing resources, knowledge and expertise
    - FIS Request for Proposals – one-time funds for system modernization, Electronic Monitoring, Electronic Reporting, Quality Management/Continuous Improvement, and Fisheries Information Networks
    - Coordination of Electronic Technology Professional Speciality Group with Electronic Technology Working Group

- Decrease technology debt

    - All regions mentioned technology debt in regional Electronic Technology Implementation Plans
    - Cloud technology acceptance
    - Decrease silo data collections isolation

- Other Priorities

    - Data governance policy will aid in sharing data within and across regions
    - Northeast mandate for electronic reporting of commercial species catch/effort (November 2021) for MAFMC and NEFMC managed species
    - Regional offices now collecting at least half of fishery-dependent data in each region
    - Need to include HMS in future discussions
    - More studies combining fishery-dependent and fishery-independent data (or combining different fishery-independent surveys)
    - These can serve as a blueprint for combining data across regions

- Electronic Technology Implementation Plans now available
- Spatial data prioritization – collecting location information on where fishing occurs
- Standardization of priority data elements across regions and fisheries

Marine Mammals and Sea Turtles – Surveys and Science

- Don't get stuck on a "survey" needing a ship – there are smart ways to answer a lot of questions with fewer ships and people
- Consider ways to do more research – overlapping/integrating efforts
- Get more data in common locations like Animal Telemetry Network
- Focus on habitats or Large Marine Ecosystems (LMEs) to evaluate species interactions and threats, ecosystem connectivity, and top-down/bottom-up processes in relation to ocean conditions. By getting past taxa-specific studies to habitat-based studies that encompass critical ecosystem metrics and species parameters, we may overcome the fragmented approach of the past. None of this precludes understanding the movement of nutrients and dynamic threats for highly mobile species such as HMS, marine mammals and turtles, or singular species studies. There is space for both but in lieu of climatic variability and impacts, our single-species or taxa-specific approach doesn't offer the answers that managers and policymakers need.

Social Sciences and Human Dimensions

- Discuss potential economic data needs for species exhibiting cross-jurisdiction distribution shifts such as blueline tilefish and dolphin (mahi)

    - Commercial data collection may not be in temporal or methodological sync between southeast, northeast, and HMS data collection programs
    - Check for overlap in data streams to prevent double counting or biased results
    - There are also potential fishery spillover and displacement effects into other fisheries when some species are no longer commercially available or viable in a region

- Provide relevant economic and social data if there are allocation issues between regions
- Discuss species most at risk and largest repercussions of change

    - Assessment should be coordinated across disciplines
    - What areas are changing? Which species are affected? What are the management implications?

Stock Assessments

Recommendation below are in order of increasing difficulty or funding needs:

1. Create a framework for coordination of species that are cross-managed between areas (e.g., black sea bass, tilefish, monkfish, etc.) to share assessment model results and techniques.
2. Analyze bottom trawl data from sampling conducted south of Cape Hatteras to compare species observed between reef survey and bottom trawl survey and how these observed species have changed over time. Analyze the NEFSC Bottom Trawl survey data in the southern strata (Virginia/North Carolina) to assess whether southeast species have increased in occurrence or abundance in more recent years.
3. Generate an inventory of historical data sources [e.g., Marine Resources Monitoring, Assessment, and Prediction (MARMAP) experimental surveys] and analyze related data to assess historical distributions.
4. Increase understanding of stock structures and mechanisms of recruitment and movement to enable incorporation of spatial mechanisms into the assessments, which requires spatially extensive biological sampling (i.e., genetics, meristics, etc.). Stock assessment methods are in place to address many possible movement and production dynamics, but data are needed to confirm the mechanisms occurring in the populations.
5. Assess the potential for ongoing, expanded, and new survey approaches to assess changes in species distributions over time?

State of the Ecosystem Reporting

1. Streamline report production to facilitate coordination

    - Automate data pulls to produce indicators for each region (e.g., SST, heatwaves)
    - Similar frameworks for data management (R data package, ERDDAP server)
    - Similar process for updates

2. Coordinate selected indicators

    - Understanding coastwide ecosystem data in biophysical drivers, climate drivers relevant to ecosystem considerations across regions
    - Stock-specific ecosystem data products for coastwide species (bluefish, black sea bass)
    - South Atlantic species stock identification vs. range shifts
    - Management needs could prioritize other indicators to coordinate

3. Develop avenues of communication

    - Knowledge transfer (identify approaches that have been effective in engaging managers in Mid-Atlantic and New England) to apply to the southeast.

- Note that coordination identified for all groups above benefits ecosystem reporting in general and provides further opportunities for coordinated ecosystem reporting

Management perspectives

ASMFC

Challenges identified in "ASMFC Policy, Management, and Science Strategies for Adapting Fisheries to Climate Change" (2018)[1]

- For Stocks at Persistent Low Biomass:
    - When to change reference points due to changes in stock productivity?
    - When to close a fishery/declare a moratorium for declining stocks?
    - How is sustainable yield determined and at what level of biomass will harvest be permitted?
    - What are the economic and ecological tradeoffs of continuing to harvest at lower levels vs. a moratorium?

- For Stocks with Changing Spatial Distributions:
    - When to change quota levels between jurisdictions? Consider using a representative fishery-independent survey(s) to statistically determine distribution shift, trigger adaptive management, and determine new quota levels in each jurisdiction.

Additional challenges

Detecting distribution shift changes is relatively easy and straightforward. Current NMFS, state, and regional surveys and modeling are good at detecting distribution shifts. How do we detect changes in productivity due to climate change? They often require understanding the underlying mechanism for increasing/decreasing productivity. How do we distinguish productivity changes due to climate vs. due to regulations/harvest levels, or a combination of both?

- Example 1) Chesapeake Bay may be less productive for striped bass, menhaden, and other stocks recently, while more northern estuaries are increasingly productive for the same stocks. Why? What are the drivers, mechanisms? Are Chesapeake Bay and its striped bass spawning tributaries now too warm? Wet springs/years historically good for striped bass. Do we now have too much rainfall with an increased precipitation pattern on the Atlantic coast/in the northeast?
- Example 2) Stocks like red drum, Spanish mackerel, and cobia seem to be more prevalent in the Mid-Atlantic in recent years than in historical years. As predominantly recreational fisheries, what is the best survey/source of information

[1] http://www.asmfc.org/files/pub/ClimateChangeWorkGroupGuidanceDocument_Feb2018.pdf

to evaluate potential distribution and/or productivity shifts? Consider the MRIP data analyses Beaufort Lab mentioned during the workshop.

- Example 3) Lobster Gulf of Maine – past decade has observations of smaller size at maturity, enhances total egg production, and booming recruitment/stock productivity. However, in the last few years, recruitment is dropping. Is it now too warm and passing the preferred temperature range of lobster in the Gulf of Maine?

Goals: continue developing distribution and productivity projections with uncertainty caveats. Future conditions are the questions fisheries managers, industry, and other stakeholders are asking us. Where will the fish be? Will they trend down/up? When should we adapt fisheries management and onshore infrastructure? Reasonably accurate projections provide managers with a tool to manage proactively, rather than reactively.

MAFMC

- Capacity and resources (time, personnel, and money) at both the science center and Council necessary to identify, understand, and address climate driven impacts and implications
    - The science and management needs and priorities continue to grow and change while resources have remained relatively flat or declined.
    - Stock assessment demands for "basic" fisheries management needs remain limited – need to begin to incorporate and account for climate related effects (stock productivity, stock structure, recruitment, BRPs) in stock assessment models and process but will only add to the resource issues
- Still operate/manage/set catch limits at single species level with very defined timelines and processes that require Best Scientific Information Available (BSIA) – how to provide the right/relevant information at the time needs for management
- Stock assessments and basic information for data poor stocks – how to manage and these species/fisheries are becoming more common – blueline tilefish (north of Cape Hatteras), chub mackerel, squid(s)
- Offshore wind – greater understanding of the biological, fishery (social/economic), and science implications
- Guidance for rebuilding stocks (particularly forage species like herring, mackerel) – when fishing mortality may not be the driving issue; science and policy considerations, knowing when regime shift/threshold reached, greater understanding on driving declines and true management options to help
- Distribution shifts – have a good understanding of identifying and/or likelihood of change but need a greater understanding of the biological implications of these shifts. Also need more work on understanding those changes under shorter time periods to align with management needs and additional socioeconomic information to help inform potential management and governance options.

- Emerging fisheries – monitoring and data collection needs to understand changes in fishery dynamics and biological implications of new and/or expanding fisheries

- Continued development and capacity needs for ecosystem models (e.g., habitat, climate velocity, multispecies) and tools (e.g., MSE); however (to the 1st bullet above), as these more complex, data hungry, higher resolution models are developed, resource demands will likely increase. So this information is/has the potential to be very valuable and important for management, but is it sustainable?

    - Understanding if the current surveys the right ones (design, gear, timing) for the future and what those implications might be for assessments, catch limits, and management.

NEFMC

- We need to understand shifts in distribution/abundance of fishes and invertebrates so we can continue to manage those resources effectively. The NEFSC needs to create a closer relationship between assessments used for setting ABCs on a short-term basis and the ongoing climate studies. Ideally, we would get advice that tells us the likely effects of climate in the short term and how it should influence catch advice. This would need to take into account not only distribution but anticipated impacts on productivity.
- Related to that but not as demanding, the NEFSC needs to figure out how to take into account the effects of climate change on our status determination criteria and how that can be incorporated into our management track assessments more rapidly. Our current paradigm assumes what we saw in the past is what we will see in the future, and this may not be the case. We need to develop the ability to recognize when that is not the case and know how to respond/adjust when that is determined.
- Do we need to reconsider fisheries survey approaches? Offshore wind development will have a large impact on surveys and will force us to adopt alternative solutions in some areas. The Atlantic herring resource is in a rebuilding plan but is no longer an acoustic survey focused on herring and other similar species.
- Can we be more holistic about gathering environmental information to support an ecosystem approach to management? Specifically, can we holistically quantify habitat availability and apply that to our understanding of stocks and development of catch advice, and conduct ecosystem sampling of all areas used by fishes, including inshore areas?

SAFMC

1. Fundamental fishery data are lacking in the South Atlantic

    - Basic, fundamental data are needed for all FMPs and all managed stocks – accurate and reliable landings, effort, and length/age sampling; representative abundance surveys of all life stages; up to date life history (only 16 of 68 stocks have assessment-based catch levels)

- Complete habitat characterizations and mapping
- "Management-relevant" climate and ecosystem data that meets BSIA standards and can be used to inform management actions per MSA guidelines
- Completion of mandatory reports on climate, ecosystem, and fisheries – Ecosystem Status Reports, Climate Vulnerability Analysis, SAFE reports
- Expanded Economic and Social information with increased resolution
- Regional compatibility for all of the above information; Equal access to the above information by all participants (Councils, Commissions, Centers, ROs)

2. The long-term lack of fundamental data results in an inadequate historic baseline to identify and evaluate climate impacts.

    - The lack of baseline information on stocks, due to past data deficiencies, will create considerable hurdles to addressing climate change impacts
    - New data collection efforts cannot resolve this issue. Instead, creative approaches to filling such gaps and supplementing available information—such as using historic photos, business records, scientific references, or fishermen's recollections to describe past fishing practices and catches—should be supported.
    - Better understanding of which species are likely to experience changes in productivity or distribution due to climate changes

3. New attitudes are needed that place less faith in the past as a primary indicator of how to respond in the present and future.

    - New approaches and attitudes toward the basic concept of "MSY": past performance and trends may not reflect current and future productivity; the species composition of tomorrow's ecosystem may differ from the composition of today's, of 20 or 40 years ago, so attempting to rebuild the past fishery with today's ecosystem is destined for failure
    - Better understanding of what drives recruitment and improved projection approaches to ensure the relevance of stock projections and support incorporating climate impacts in projections

4. Increased resources to address increased challenges

    - Increased resources are needed at the Council and agency level
    - It is unrealistic to expect climate change to be addressed when so many basic MSA expectations remain unaddressed due to resource limitations
    - Consistent and effective guidance is needed from the agency, at the entire Atlantic Coast level, on basic principles such as BSIA, data treatments, and MSA requirements
    - For many species, it will be difficult to tell the difference between climate-related negative impacts and overfishing without improved data collection

- Expand fishery-independent surveys based on potential species distribution and adjust fishery-dependent surveys to align with management and stock boundaries

TABLES AND FIGURES

Table 1.

GARFO / Northeast

Objectives: CO=Compliance, FE=Fishing Effort, H=Harvest, O=Other; Sampling Frame: V=Vessel registration, S=State Permit, F=Federal Permit, O=Other, S=Site List; Census: C=Census, SP=Probabilistic Sample, SL=Sample Longitudinal

Name	Objectives	States Covered	Waters	Sampling Frame	Frequency Survey	Census	Species
GARFO Vessel Trip Reporting	FE, H, O	Maine to North Carolina	State and Federal	F	Weekly	C	All managed
Northeast Fisheries Observer Programs	FE, H, O	Maine to North Carolina	State and Federal	F	Daily	SP	All
Cooperative Research and Study Fleet	FE, H, O	Maine to North Carolina	State and Federal	F	Daily	SL	All managed
GARFO Dealer Data Sets	H, O	Maine to North Carolina	State and Federal	F	Weekly	C	All managed
GARFO Port Sampling Program	O	Maine to North Carolina	State and Federal	F	Daily	SP	All managed
Northeast Electronic Monitoring Programs	FE, H, O, CO	Maine to Rhode Island	State and Federal	F	Weekly	SP	Specific managed
Vessel Monitoring Systems	CO	Full Atlantic	State and Federal	F	Minutes	SL	Specific managed
Automatic Identification System	CO	Full Atlantic	State and Federal	V	Minutes	SL	-

Table 2.

SERO/Southeast

Objectives: CO=Compliance, FE=Fishing Effort, H=Harvest, O=other; Sampling Frame: V=Vessel registration, S=State Permit, F=Federal Permit, O=Other, S=Site List; Census: C=Census, SP=Probabilistic Sample, SL=Sample Longitudinal

Name	Objectives	States Covered	Waters	Sampling Frame	Frequency Survey	Census	Species
SEFSC Paper Coastal Vessel Logbooks	CO, FE, H, O	Florida to North Carolina	State and Federal	F	Monthly	C	All
Wreckfish ITQ reporting	CO, FE, H	Florida to North Carolina	State and Federal	F	Monthly	C	Wreckfish
SEFSC Paper Pelagic Vessel Logbooks	CO, FE, H, O	Florida to Maine	State and Federal	F	Monthly	C	All
Golden Crab Vessel Logbooks	CO, FE, H, O	Florida to North Carolina	State and Federal	F	Monthly	C	All
SE Dockside biosampling	O	Florida to North Carolina	State and Federal	F	Daily	SP	All
Southeast Fisheries Observer Programs	FE,H,O	Florida to Maine	State and Federal	F	Daily	SP	All
Vessel Monitoring Systems	CO	Full Atlantic	State and Federal	F	Minutes	SL	Specific managed
Automatic Identification System	CO	Full Atlantic	State and Federal	V	Minutes	SL	-
Menhaden Reduction Sampling	CO, FE, H, O	Full Atlantic	State and Federal	V	Daily	C	Atlantic menhaden

Regional / State surveys

Objectives: CO=Compliance, FE=Fishing Effort, H=Harvest, O=other; Waters: F=Federal, S=State, A=All (Federal and State); Sampling Frame: V=Vessel registration, S=State Permit, F=Federal Permit, O=Other, S=Site List; Vessels Sampled: H=Headboat, C=Charter; Frequency Survey: D=Daily, M=Monthly, BM=Bimonthly, W= Weekly, BW=Biweekly, A=Annual; Species: BT=Bluefin Tuna, BF= Billfish, SF=Swordfish, S=Sharks, T=Tunas, D=Dorado, W=Wahoo, A=Amberjack

Name	Objectives	States Covered	Waters	Vessels Sampled	Sampling Frame	Frequency Survey	Census or Survey	Species
Atlantic HMS Non-Tournament Reporting	H	Maine to Texas	F	H, C	F	D	C	BF, SF. BT
Recreational Bluefin Tuna Landings	H	Maine to Texas	F	H, C	F	D	C	BF, SF. BT
Access Point Angler-Intercept Survey (APAIS)	H	Maine to Mississippi	A	H, C	F, S	BM	S	All
For-Hire Telephone Survey Gulf (charter only)	FE	Georgia to Maine	A	H, C	V, F	BM	S	All
Large Pelagic Survey	FE, H, O	Maine to Virginia	A	C	F	BM	S	T, S, BF, SF, D, W, A
GARFO Vessel Trip Reporting	FE, H, O	Maine to North Carolina	A	H, C	F	D	C	All
HMS Catch Card Census Program	CO, FE, H	Maryland and North Carolina	A	H, C	F	A	C	BT, BF, S
Southeast Region Headboat Survey (SRHS)	CO, FE, H, O	North Carolina to Texas	A	H	F, O	W	C	All
eTRIPS	CO, FE, H	A	A	H, C	V, S, F, O	D	S (not DE, NC, FL)	F

RIDFW eTrips/eLog	CO, O	Rhode Island	S	H, C	V	A	C	Tautog
CT-Party and Charter Vessel Black Sea Bass Program	H	Connecticut	S	H, C	S	O	C	BSB
NYSDEC	CO, FE, H, O	New York	A	H, C	S	A	C	All
NJ- Party/Charter Boats participating in the Striped Bass Bonus Program	FE, H	New Jersey	S	H, C	Not determined at time of workshop	A	S	All
Maryland Charter Fisheries Logbook	CO, FE, H	Maryland	S	H, C	S	D	C	All
South Carolina Department of Natural Resources Charter Logbook Program	CO, FE, H	South Carolina	A	C	S	BW	C	All
MRIP At Sea Headboat Discard Program: ME-VA	H, O	Maine to Virginia	A	H	S	M	S	All
MRIP At Sea Headboat Discard Program: NC to FL	H, O	North Carolina, Georgia, and Florida	A	H	V, F	M	S	All
Southeast For-Hire Integrated Electronic Reporting (SEFHIER)	CO, FE, H, O	Maine to Texas	A	C	F	W	C	All

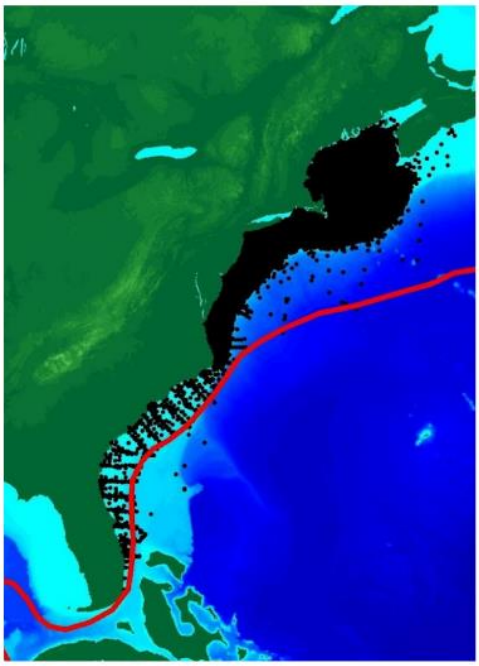

Figure 1. Stations sampled (black circles) from NOAA research cruises that measure plankton biomass and diversity across the U.S. east coast.

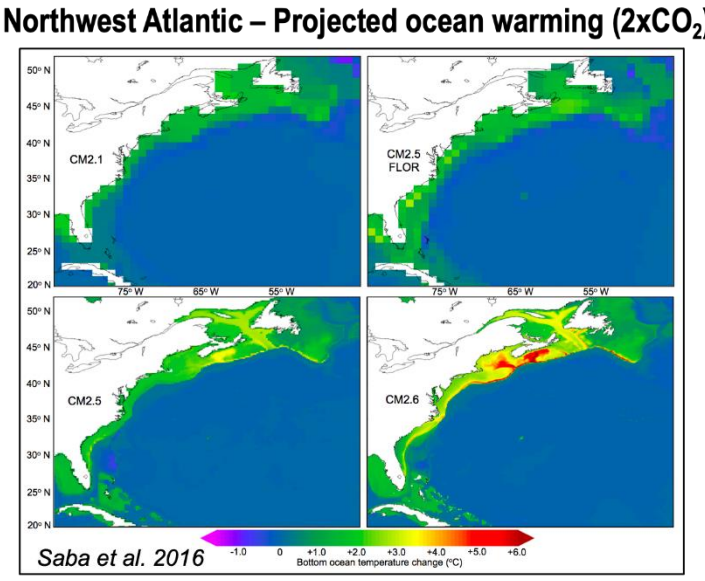

Figure 2. Ocean bottom temperature change under a 1% increase in atmospheric carbon dioxide per year for 70 years based on 4 global climate models of varying resolution. Model resolution ranges from coarse (CM2.1) to high (CM2.6). The highest resolution model projects enhanced and non-uniform warming in the U.S. northeast.

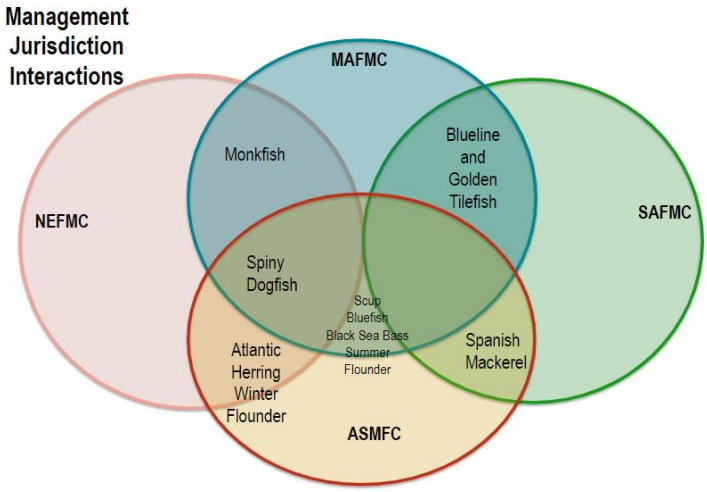

Figure 3. Venn diagram showing overlap in species managed between the New England, Mid-Atlantic, and South Atlantic Fishery Management Councils (NEFMC, MAFMC, and SAFMC, respectively), and the Atlantic States Marine Fisheries Commission (ASMFC).

APPENDIX 1. WORKSHOP AGENDA

Day 1	Time (Eastern)	Discussion lead(s)	Description
Tuesday (August 17)	8:30 AM	Vince Saba Todd Kellison	Welcome and Introductions ● Rationale and major objectives ● Guidelines for participants - questions and input, rules of the road ● Agenda review ● Anticipated products (workshop report) and next steps
	8:50 AM	Vince Saba David Richardson	● Oceanography of the U.S. East Coast: Recent trends in ocean physics ● Current status of climate models and climate change projections for the U.S. East Coast ● Lower trophic levels - status and trends
BREAK	9:50 AM	BREAK	
	10:05 AM	Vince Saba Jim Morley	Observed and projected shifts in fish and invertebrate distributions
	10:50 AM	Nikolai Klibansky Kevin Craig Scott Crosson	Blueline tilefish case study
	11:20 AM	Vince Saba Todd Kellison	Day 1 synthesis, questions, and discussion
	Noon	End of Workshop - Day 1	

Day 2	Time (Eastern)	Discussion lead(s)	Description
Wednesday (August 18)	8:30 AM	Vince Saba Todd Kellison	Day 2 introduction
	8:40 AM	Peter Chase Jim Gartland Todd Kellison	Fishery-independent surveys - fish and invertebrates
	9:10 AM	Cami McCandless John Carlson	Coastal sharks - surveys and science
	9:35 AM	Andy Jones Ken Brennan Jessica Stephen	Fishery-dependent surveys - fish and invertebrates
BREAK	10:05 AM	BREAK	
	10:20 AM	Sean Hayes Chris Sasso Jenny Litz Diane Borggaard	Marine mammals and sea turtles - surveys and science
	10:50 AM	Garet DePiper Scott Crosson	Social sciences and human dimensions - surveys and science
	11:20 AM	Vince Saba Todd Kellison	Day 2 synthesis, questions, and discussion
	Noon	End of Workshop - Day 2	

Day 3	Time (Eastern)	Discussion lead(s)	Description
Thursday (August 19)	8:30 AM	Vince Saba Todd Kellison	Day 3 introduction
	8:40 AM	Matt Vincent Russ Brown Kevin Craig Erik Williams Nikolai Klibansky	Stock assessments - considerations re: changing species distributions
	9:25 AM	Michelle Bachman Brandon Muffley Pat Campfield John Carmichael Chip Collier	Fishery management perspectives - Fishery Management Councils and ASMFC
BREAK	10:25 AM	BREAK	
	10:40 AM	Melissa Karp	DisMAP: Distribution Mapping and Analysis Portal
	11:10 AM	Sarah Gaichas Scott Large Kevin Craig Todd Kellison	State of the ecosystem and ecosystem status reports
	11:35 AM	Vince Saba Todd Kellison	Day 3 synthesis, questions, and discussion
	Noon	End of Workshop - Day 3	

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