Climate Change Impacts on Fisheries: Panel Discussion

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Chesapeake Bay Program
Science. Restoration. Partnership.

Overview

* Introduction: 2008 STAC Report
* New Agreement Outcomes
* Panelist Remarks
* Discussion and Questions
  * What climate change impacts should the Fisheries GIT me most concerned about? Specific to New Agreement outcomes?
  * How should we be monitoring for these impacts?

2008 STAC Report

* 2008 Report from the Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC)
  * *Climate Change and the Chesapeake Bay: State-of-the-Science Review and Recommendations*

* Chesapeake Bay Program charge to STAC:
  * Review the current understanding of climate change impacts on the tidal Chesapeake Bay and
  * Identify critical knowledge gaps and research priorities

Impacts on Fish and Shellfish

5 Variables & Processes that Impact Fish and Shellfish Species in the Bay Ecosystem*:*

* Temperature
* Salinity
* Plankton production
* Dissolved oxygen
* Sea level

1. Temperature

Higher temperatures:

* **Affect fish embryos** with highly sensitive thermal tolerances
* **Reduce the prevalence of eelgrass**, the Bay's dominant SAV
* **Significantly alter interactions among trophic levels**, potentially favoring warm-water fish and shellfish Bay species (Atlantic croaker) while limiting native cold-temperate species (Atlantic Menhaden)
* **Induce changes** to the frequency of matched prey abundance with larval-feed demand, which can cause early life history stage mortality rates that affect annual recruitment in many fish populations [Houde, 1987]

1. Temperature

Higher temperatures:

* **Unpredictably alter coastal and Bay circulation patterns,** impacting the rate of spread by less mobile or coastal-spawning warm-water shellfish into the Bay

* **Increase parasite stress** in Bay species (e.g. *Eastern oyster, yellow perch)* through deterioration of the host body, enhanced parasite transmission, greater parasite diversity, and changes to eutrophication

* **May affect pollutant impacts**, such as temperature-induced mercury methylation (increased mercury uptake in fish)

2. Salinity

Changing Salinity Patterns Affect:

* **Eastern oysters** tolerance to salinity content, spatfall success (positively affected by higher salinity), parasite stress (inc. by higher salinity)

* **Zooplankton species:** altered consumption rates and abundance as prey and as predators

* **SAV** interannual variations in SAV distribution and abundance correspond to fluctuations in freshwater flow

3. Plankton

Plankton Production:

* **Vital** to Bay's primary production
* **Highly dependent** on spring freshet which is influenced by winter weather and spring streamflow
* **Impacts fishery production** of many economically-important species (summer flounder, striped bass, Atlantic menhaden); delayed spring freshet→ negative effect on fisheries production

4. Dissolved Oxygen

Seasonal Hypoxia:

* **Increases mortality** for species in deep water, so they are absent in summer

* **Alter trophic interactions** by excluding fish species from benthic feeding grounds and energetically favorable conditions

* **Increase extent and severity** of hypoxia on macrofauna as oxygen requirements tend to increase with increasing temperatures

5. Sea Level & CO_2 Concentration

* **Sea level Rise depletes tidal wetlands used as marsh habitat,** harming economically important forage fish that rely on wetlands and harming fish and crustacean populations using those areas for nursery and foraging

* **Increased CO_2 Concentration causes surface water acidification**, disrupting coral calcification key to bivalves and other organisms

New Agreement Fisheries Outcomes: Near-term Targets

* ***Blue Crab Abundance Outcome:***
  * Maintain a sustainable blue crab population based on the current 2012 target of 215 million adult females. Refine population targets through 2025 based on best available science.

* ***Blue Crab Management Outcome:***
  * Manage for a stable and productive crab fishery including working with the industry, recreational crabbers, and other stakeholders to improve commercial and recreational harvest accountability. By 2018, evaluate the establishment of a Bay-wide, allocation-based management framework with annual levels set by the jurisdictions for the purpose of accounting for and adjusting harvest by each jurisdiction.

New Agreement Fisheries Outcomes: Near-term Targets

* ***Oyster Outcome*:**
  * Continually increase finfish and shellfish habitat and water quality benefits from restored oyster populations. Restore native oyster habitat and populations in 10 tributaries by 2025 and ensure their protection.

* ***Forage Fish Outcome*:**
  * Continually improve the capacity to understand the role of forage fish populations in the Chesapeake Bay. By 2016, develop a strategy for assessing the forage fish base available as food for predatory species in the Chesapeake Bay.

New Agreement Fisheries Outcomes: Near-term Targets

* ***Fish Habitat Outcome*:**
  * Continually improve effectiveness of fish habitat conservation and restoration efforts by identifying and characterizing critical spawning, nursery and forage areas within the Bay and tributaries for important fish and shellfish and use existing and new tools to integrate information and conduct assessments to inform restoration and conservation efforts.

Discussion

* What trends/changes should we be most concerned about?
* What data or trends should we be monitoring now?
* How could climate change impact our ability to meet the targets set in the New Agreement?
* How should climate change be incorporated into management strategies and monitoring of the New Agreement outcomes?