Progress Update on the Menhaden Single-Species and Ecological Reference Point Benchmark Stock Assessments

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Assessment Timeline 2019

Pre-Modeling Workshop Check-In Call – progress update on follow-up tasks	**ERP SAS**	**January 23 January 24**
Production model review call	ERP	March 28
Assessment/Modeling Workshop I	ERP & SAS	April 1-5
Board Meeting – progress update on benchmarks	Board	May
Modeling Workshop Follow-up Tasks Webinar – progress update	SAS, ERP	May/June
Assessment/Modeling Workshop II	SAS, ERP	June 25-28
Final webinar to approve stock status determination	SAS, ERP	July
All Draft Report components due to staff	SAS, ERP	August
Call/Webinar with TC to discuss assessment findings & approve reports	TC	September
Board Meeting – progress update on benchmarks	Board	October
Submit report to external peer-review panel	ASMFC	October 21
Peer Review	SEDAR	November 4

Synthesis of Scientific Findings of Atlantic Menhaden's Role in the Chesapeake Bay Ecosystem

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Background

- Commission leadership requested a synthesis of literature on Atlantic menhaden and the Chesapeake Bay ecosystem to help inform discussion about the Bay reduction cap

- Review was conducted by ASMFC staff

- Not a product of the Menhaden TC, SAS, or ERP WG

Background

- Review of existing literature, much of which went into the development of the last benchmark stock assessment and Amendment 3

- Does not reflect the current, ongoing work of the ERP WG, which will be part of the 2019 benchmark assessment

History of the Bay Cap

- Late 1990s: reduction plants close along the coast and the number of vessels in the reduction fleet declines

  → Effort concentrates in the Chesapeake Bay area

  → Higher proportion of coastwide landings come from the Bay, but overall landings (Bay and total) decline

History of the Bay Cap

- Raised concerns about “localized depletion” in the Bay, so a cap on the removals of Atlantic menhaden from the Bay for reduction purposes was implemented through Addendum II (2005) and has been in place ever since

History of the Bay Cap

- Cap size has varied over time:
  - 2006: 109,020 mt (average of 2001 – 2005 landings)
  - 2013: 87,216 mt (20% reduction through Am. 2)
  - 2018: 51,000 mt (Am. 3, average of 2012 – 2016)

→ Reduction landings from the Bay have not exceeded 51,000 mt since 2012, even under the higher caps

Menhaden & the Ecosystem

- Menhaden recruitment dynamics
- Menhaden as consumers of production
- Menhaden as forage

Menhaden Recruitment

- Atlantic menhaden are a single stock
- Menhaden spawn in the ocean all along the Atlantic coast as they migrate
- Larvae are carried into bays and estuaries where they settle as new recruits

Menhaden Recruitment

- Recruitment to Chesapeake Bay is likely driven by:
  - Large scale climate regimes like the AMO
  - Annual variability in environmental conditions, phytoplankton and zooplankton abundance within the Bay, etc.
  - Total coastwide SSB, although the relationship between SSB and recruitment is weak

Menhaden as Consumers

- As larvae, menhaden feed on zooplankton, but as juveniles and adults, they are filter feeders, feeding on phytoplankton with specialized gill rakers

- Can reduce the extent of algal blooms, but are unlikely to remove nitrogen from the Bay overall

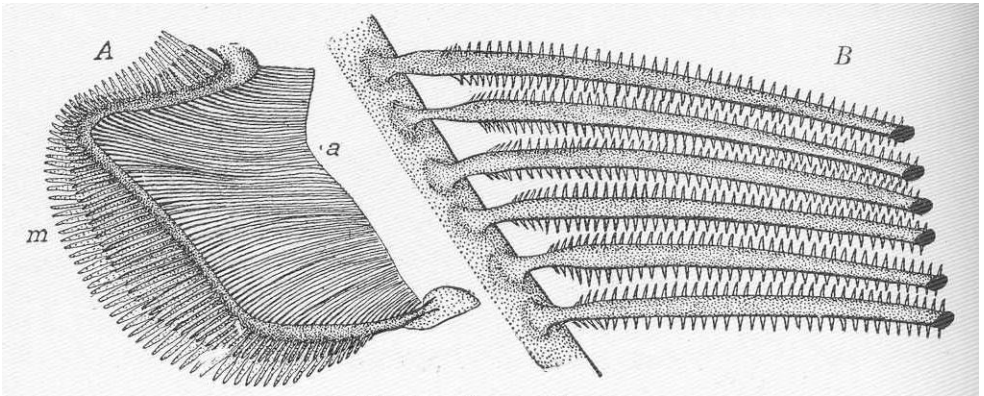


Fig. 45. Gill of Menhaden.
A. First gill-arch, natural size. *a*. Gill-rakers. *m*. Branchiæ, or gill proper. B. Six gill-rakers, enlarged 50 times, showing projecting rows of hooks.

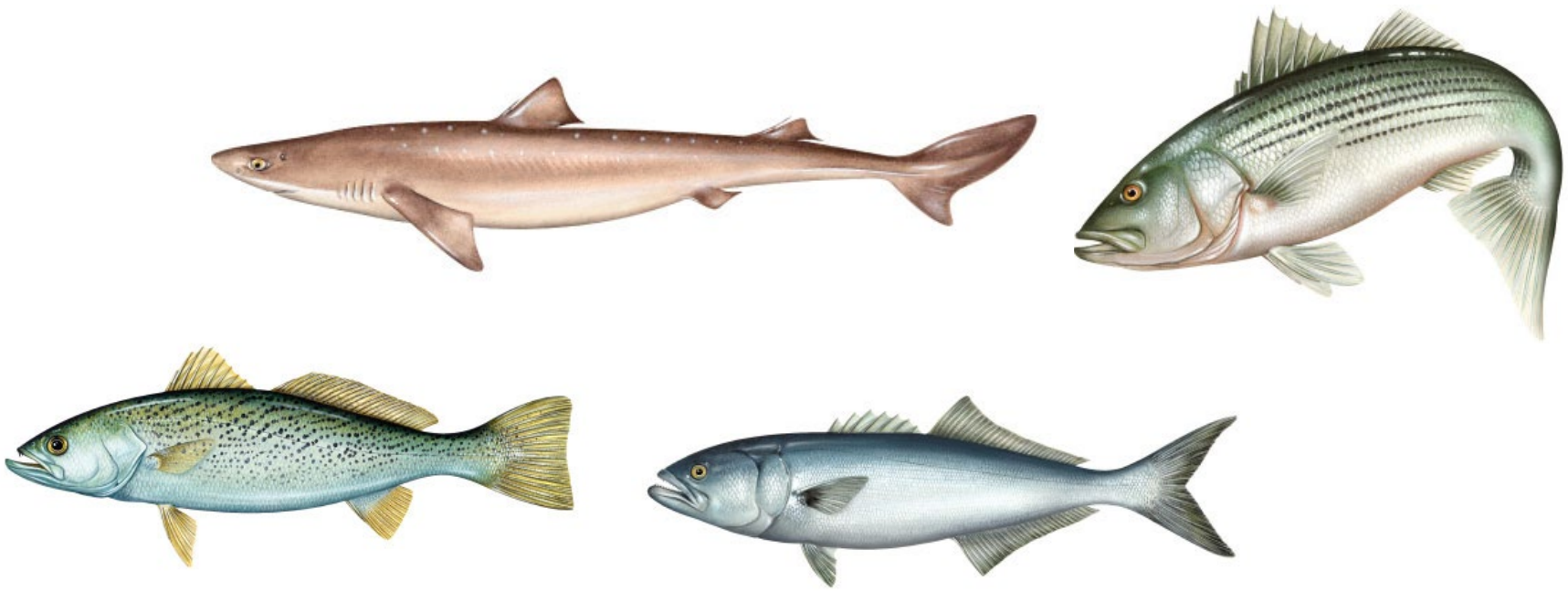
Menhaden as Prey

- Extensive studies on fish diets within Chesapeake Bay, both short term studies and long term monitoring programs

- Difficult to directly compare across studies, because they occur in different years and different seasons, cover different age ranges of predators, and use different metrics to estimate diet composition and consumption

Menhaden as Prey

- Menhaden TC synthesized the existing diet data for Atlantic menhaden by season and region for several key predators for the last benchmark assessment



Menhaden as Prey

Striped Bass					
		Jan-Mar	Apr - Jun	Jul - Sep	Oct - Dec
Age	0	--	0%	0%	0%
	1	0%	0%	16%	8%
	2	10%	8%	14%	66%
	3	33%	15%	24%	71%
	4	54%	17%	27%	73%
	5	63%	18%	29%	73%
	6	75%	23%	25%	74%
	7	83%	30%	14%	74%
	8	89%	25%	29%	75%
	9	94%	29%	44%	75%
	10	92%	46%	31%	75%
	11	94%	34%	43%	75%
	12	94%	36%	77%	75%
	13+	93%	36%	36%	75%

Menhaden as Prey

- Diet studies of non-fish predators are much less extensive

- Menhaden prevalence in bald eagle diets in the Bay change by season: high prevalence in summer, low occurrence in the winter

- Menhaden prevalence in osprey diets varies by nest location (higher in high saline nesting sites)

Menhaden as Prey

- Atlantic menhaden can make up a significant proportion of many predators diets' for specific seasons, size/age classes, and locations within the Bay

- The prevalence of Atlantic menhaden in predators' diets changes with changing menhaden abundance

Menhaden as Prey

→ What is the impact of reduced menhaden abundance on predator populations?

Population Impacts

- Modeling work provides estimates of predatory demand for one or more predators within the Bay

- No estimates of menhaden abundance within the Bay, so no way to measure whether there are enough menhaden within the Bay to provide forage

Population Impacts

- Negative population metrics can be correlated with low menhaden abundance for some species

- Low menhaden abundance has been associated with:
  - An outbreak of myco in striped bass within the Bay
  - An increase in M for weakfish
  - Lower population growth rates for osprey

Population Impacts

- Other factors are also linked to those negative population metrics:
  - Increased myco prevalence has also been associated with warmer water temperature
  - Environmental factors and shrimp trawl bycatch may also contribute to weakfish population declines
  - Osprey population growth rates are higher in low salinity areas where menhaden are not a major component of osprey diets

Conclusions

- The overall complexity of the Chesapeake Bay food web, changing environment, and population dynamics makes it difficult to prove that lower levels of menhaden abundance directly cause negative population consequences for predators

- We also can’t prove that they aren’t related

Conclusions

- Recruitment to Chesapeake Bay does not appear to be correlated with abundance of age-2 and age-3 Atlantic menhaden within the Bay; as long as environmental conditions and total coastwide fecundity are favorable, recruitment to the Bay can occur.

Conclusions

- The projections used to set the coastwide quota were conducted with the proportion of removals from the Bay equal to current levels; if that proportion changes, the impact of those removals on the total population will change even if the coastwide quota is not exceeded, because the overall selectivity pattern will be different.

Conclusions

- There is currently no estimate of Atlantic menhaden abundance specifically within Chesapeake Bay and there is no quantitative determination of an appropriate depletion threshold, therefore there is no quantitative determination of whether localized depletion is or is not occurring.

QUESTIONS