Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: **Atlantic Menhaden Management Board**

FROM: **Committee on Economics and Social Sciences**

DATE: **April 20, 2026**

SUBJECT: **Evaluation of potential employment and economic impacts resulting from a TAC reduction**

Executive Summary

In the fall 2025, the Committee on Economics and Social Sciences (CESS) was tasked with looking into how changes in menhaden management could impact jobs within the fishery. This memorandum provides a summary of available information, including model-based approaches used to estimate the economic impacts of changes in Atlantic menhaden landings. Key findings from these prior studies are highlighted, along with study limitations, data gaps, and considerations for future work.

Leontief input–output models are commonly used to evaluate how changes in production by one sector or industry affect regional economies. These models apply fixed production relationships to estimate how output changes in one industry translate into direct, indirect, and induced effects on output, employment, and income across all sectors. While these models can be useful for understanding inter-industry responses and evaluating short-run economic impacts of marginal output changes, the approach assumes constant input proportions in industry production functions, no price adjustments, and no behavioral responses or business adaptation. As a result, firms are assumed to not substitute inputs, shift sourcing, or modify production processes in response to changing constraints (e.g., input prices, output constraints, etc.). Thus, use of this modeling approach to evaluate large-scale or long-term policy changes may overstate impacts.

There were two studies identified that address employment impacts associated with landings changes in the Atlantic menhaden fishery: Kirkley et al. 2011 and Whitehead and Harrison 2017.

Kirkley et al. (2011) assessed the economic importance of the reduction sector under alternative harvest scenarios in the Chesapeake Bay, including an approach that allowed for increasing costs associated with shifting harvest to coastal waters in response to reductions in the Chesapeake Bay quota. The study estimated that the reduction sector supported approximately 519 full- and part-time jobs in Maryland and Virginia, including 347 in Northumberland County, Virginia, associated with total landings of about 141,000 metric tons, of which roughly 85,000 metric tons were harvested from the Chesapeake Bay. Under an extreme scenario in which no harvest was allowed in the Bay and effort could not be shifted to

coastal waters, employment losses in Northumberland County were estimated at up to 176 jobs, including 98 direct losses in the reduction sector. The analysis also indicated that a reduction of 1,000 metric tons in the Chesapeake Bay quota corresponded to an estimated loss of approximately 3.7 total jobs, including 2.1 direct jobs in the reduction sector. Whitehead and Harrison (2017) applied a similar modeling framework and produced employment impact estimates consistent with Kirkley et al. (2011). In addition, this study estimated that employment changes in Northumberland County scale with output at approximately one job per $45,000 in landings (roughly $60,000 in 2026 USD).

These estimates should be interpreted cautiously in a management context. Because Leontief input–output models do not account for market adjustments or adaptive behavior, they likely overstate long-term employment effects. It is likely that economic impacts and employment effects associated with output reductions would respond non-linearly and be characterized by threshold triggers due to high fixed costs in the industry. This would suggest that there are critical output levels, past which employment could change dramatically. Importantly, these studies note that the reduction industry is a critical and central sector for the local economy around Reedville, Virginia. Job losses in this sector could, potentially lead to structural unemployment rather than frictional transition, as we might expect in larger or more diversified economies.

The CESS recommends additional socioeconomic research to support menhaden management decisions. In particular, studies that evaluate industry employment over time and in relation to changes in quota, landings, or other exogenous factors, assess costs and estimate production functions for the reduction sector, or expand consideration of the bait sector, including its costs, demand drivers, and economic contributions, would be strongly supported.

I. Introduction

The Atlantic menhaden (*Brevoortia tyrannus*) fishery serves as an important component for the Atlantic Coast. It is characterized by a geographically concentrated reduction fishery based in Reedville, Virginia, and a more geographically diverse bait sector that supports various other fisheries. While the Atlantic menhaden stock is not overfished, there has been a downward trend in TAC to help maintain ecosystem level and predator-prey balance. Management actions are driven by updated stock assessments that have indicated higher than estimated fishing mortality and the full implementation of ERPs.

This literature review was conducted to support the Board's evaluation of potential employment and economic impacts resulting from the reduction in the TAC for the 2026 fishing year, as well as proposed changes to the Chesapeake Bay harvest cap under Addendum II. The review synthesizes the key findings from two documents: Kirkley et al. (2011) and Whitehead & Harrison (2017).

II. Review of Economic Assessments

A. Establishing the Baseline: Kirkley et al. (2011)

The study serves as the foundational text for understanding the localized economic dependency of the Chesapeake Bay region on the menhaden reduction fishery. It should be noted that the study characterizes the fishery using data from the United States Bureau of Census for the years 2000 and 2008 cost and earnings data from Omega Protein. These data represent conditions prior to recent management shifts (such as Ecological Reference Points ERPs) or any changes in the industry that may have occurred over the last two decades.

Key findings:

- The study highlights the extreme concentration of economic activity in Northumberland County, Virginia (Reedville).
- The study demonstrates that unlike many other fisheries where infrastructure is diffused, the reduction fishery acts as a "monopsony-like" anchor for the local economy.
- The study notes the closure of other processing plants along the coast left Reedville as the sole processor for reduction landings, creating a high degree of vulnerability to regulatory changes.
- The study estimates the ripple effects of the various quota reduction scenarios on employment using an Input-Output model and generating estimates using the software platform IMPLAN.
- The study estimates that the reduction sector supported approximately 519 full- and part-time jobs in Maryland and Virginia, including 347 in Northumberland County, Virginia, associated with total landings of about 141,000 metric tons, of which roughly 85,000 metric tons were harvested from the Chesapeake Bay.
- The study suggests robust multipliers for the reduction sector, indicating that for every job directly in harvesting or processing, a significant number of support jobs (mechanics, logistics, local services) were sustained in the rural Virginia economy.
- The study underscores that alternative employment opportunities in the immediate vicinity of the reduction plant were limited, suggesting that job losses in this sector could lead to structural unemployment rather than frictional transition.
- Under an extreme scenario in which no harvest was allowed in the Bay and effort could not be shifted to coastal waters, employment losses in Northumberland County were estimated at up to 176 jobs, including 98 direct losses in the reduction sector.
- The analysis also indicates that a reduction of 1,000 metric tons in the Chesapeake Bay quota corresponded to an estimated loss of approximately 3.7 total jobs, including 2.1 direct jobs in the reduction sector.

B. Analysis and Valuation of Sectors: Whitehead and Harrison (2017)

The study was commissioned to update the economic understanding of the fishery and provide a more detailed analysis between the reduction and bait sectors. Whitehead and Harrison constitute the "best available economic science" currently on record for the Commission.

Key findings:

- The study characterizes the reduction sector as high-volume, low-unit-price, and high-fixed infrastructure cost, while the bait sector had a lower volume and a higher unit price and infrastructure cost, which were more diffuse across the Atlantic Coast.
- Similar to Kirkley et al. (2011), the study utilizes IMPAN software to generate economic impact estimates.
- The study provides estimates on the total economic contribution (i.e., direct, indirect, and induced effects) across the coastal states.
- In addition, this study estimates that employment changes in Northumberland County, Virginia scale with output at approximately one job per $45,000 in landings.
- The report provides specific employment numbers per metric ton of fish landed.
- These ratios have historically been used by the ASMFC to estimate “jobs at risk” for every percentage point cut in the total allowable catch.
- The assessment suggests that as volume decreases, profitability and employment stability may decline non-linearly.

III. Studies Relevance to 2026 TAC Reductions

Kirkley’s work provides the historical baseline for the "Reedville dependency" argument. However, the data reflects the economic landscape prior to 2010. The cost structures, fuel prices, and labor markets have evolved, meaning the raw dollar values from this report must be inflation-adjusted and contextually updated.

Whitehead and Harrison constitute the "best available economic science" currently on record for the Commission. However, the ASFMC Menhaden Board should note that the reduction sector's economic footprint is highly sensitive to economies of scale. The study suggests that as volume decreases (e.g., via the 2026 TAC cut), the profitability and thus employment stability of the capital-intensive reduction plant may decline non-linearly.

IV. Methodological Limitations

Leontief input–output models are commonly used to evaluate how changes in production by one sector or industry affect regional economies. These models apply fixed production relationships to estimate how output changes in one industry translate into direct, indirect, and induced effects on output, employment, and income across all sectors.

While these models can be useful for understanding inter-industry responses and evaluating short-run economic impacts of marginal output changes, the approach assumes constant input proportions in industry production functions, no price adjustments, and no behavioral responses or business adaptation. As a result, firms are assumed to not substitute inputs, shift sourcing, or modify production processes in response to changing constraints (e.g., input prices, output constraints, etc.). Using this type of modeling approach to evaluate large-scale or long-term policy changes may overstate impacts.

Both Kirkely et al. (2011) and Whithead and Harrison (2017) utilize Input-Output models, which, as noted above, assume a linear relationship between input (fish landings) and output (revenue

or employment). In reality, a processing plant would require a minimum volume of fish to cover its fixed costs of operation (e.g., maintaining shore-side facilities, maintaining its fleet, insurance). If the TAC reduction pushes landings below this break-even threshold, the result is not a 20 percent layoff but potentially a 100% shutdown of the facility. Under this linear relationship, the employment impact for the reduction sector would likely be scaled incorrectly due to its high fixed cost, while the bait sector with lower volume, higher unit price, and lower infrastructure cost is more dispersed across the Atlantic Coast.

These estimates should be interpreted cautiously in a management context. Because Leontief input–output models do not account for market adjustments or adaptive behavior, they likely overstate long-term employment effects. Results are also sensitive to parameterizations of costs and industry production functions, including assumptions regarding the ability of the reduction sector to shift harvest outside the Chesapeake Bay.

V. Conclusions and Recommendations

Based on Kirkley et al. (2011), the economic hardship of a TAC reduction will be acutely felt in Northumberland County (Reedville), Virginia. However, Whitehead and Harrison (2017) suggests that the bait sector, while economically valuable, has more elasticity and geographic diversity to absorb shocks. The CESS recommends the following considerations when assessing the forthcoming TAC reductions:

Whitehead and Harrison (2017) should be a directional guide, acknowledging that the employment figures are likely overestimates for marginal TAC changes.

While Kirkley et al. 2011 is more dated, it is more contextually relevant to Chesapeake Bay-related decisions as it specifically explores reductions in the Chesapeake Bay quota cap.

For comparison purposes, it's important to note that the inflation-adjusted estimates and caveats reflect change in current market conditions.

VI. Future Research Needs

The CESS recommends additional socioeconomic research to support menhaden management decisions. We strongly support additional studies that focus on the following core areas: Analysis of employment changes over time in relation to quota and landings changes, controlling for other factors. Information on the reduction fishery (vessel and plant cost structures) should be updated.

VII. References

Kirkley, J.E., Hartman, T., McDaniel, T., McConnell, K. and Whitehead, J., 2011. An assessment of the social and economic importance of menhaden (*Brevoortia tyrannus*)(Latrobe, 1802) in Chesapeake Bay region. Virginia Institute of Marine Science, College of William and Mary, School of Marine Science, Department of Fisheries

Whitehead, J.C. and Harrison, J., 2017. Socioeconomic Analysis of the Atlantic Menhaden Commercial Bait and Reduction Fishery: A Report to the Atlantic States Marine Fisheries Commission. Arlington, VA: Atlantic States Marine Fisheries Commission, 180.