

**From:** [Tom Lilly](#)  
**To:** [Tina Berger](#); [James Boyle](#); [Bob Beal](#)  
**Subject:** [External] Proposed addendum  
**Date:** Friday, April 24, 2026 9:28:17 AM

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Sent from my iPhone

Tina and James will you please post this comment for the menhaden board meeting and also send a copy now to the plan development team, considering the proposed addendum. Please acknowledge receipt.

To the board

I would like to express my concern for any change that would increase the amount of factory fishing in the bay in the spring rather than decreasing it or closing the season in May and June as recommended by the protective options group. As you know from the catch charts the amount of Menhaden coming into Chesapeake Bay in the spring is decreasing rapidly, and it would seem a “no-brainer“ that all of this limited forge must be protected as this is when it is needed most by our striped bass spawning stock and nesting ospreys . This was the finding and recommendation of your protective options, work group and Osprey sub group, which I am very hopeful you will not ignore.

As I have expressed before, wouldn't it be much better to leave the destructive factory fishing for the summer only and substantially reduce it in the spring and the fall. In the spring, for the reasons stated and in the fall because the reduction fishery is currently allowed to catch all or all almost all of the potential breeding stock as it leaves the bay in the fall. 70% of the catch is age 1 or younger Fish that have never spawned. The wholesale unprotected catch of these young fish that have never spawned one time migrating from the bay in the fall could be the root of the problem in the spring when so few fish are now coming in.

Thanks for your consideration Tom Lilly, White Haven, Maryland

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**From:** [ASMFC](#)  
**To:** [Comments](#)  
**Subject:** [New] [External] New public comment for 2026 Spring Meeting  
**Date:** Wednesday, April 29, 2026 5:06:43 AM

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## 2026 Spring Meeting

<b>Action Title</b>
2026 Spring Meeting
<b>Action URL</b>
<a href="https://asmfc.org/events/2026-spring-meeting/">https://asmfc.org/events/2026-spring-meeting/</a>
<b>Name</b>
joe spirio
<b>Email</b>
<a href="mailto:joespirio@gmail.com">joespirio@gmail.com</a>
<b>State</b>
New York
<b>Comment</b>
<p>I have lived, boated, and fished on the south shore of Long Islands Great South Bay and offshore waters from Rockaway to the eastern Fire Islands' shoreline for 50 plus years.</p> <p>I have enjoyed the abundance of natural beauty and respect the rules that the fishery provides.</p> <p>I realize my perspective is limited by my singular experience. However, in a very short amount of time, even I see the stark difference in the Manhaden population that has gone from abundant to scarce!</p> <p>As I understand it, out-of-state commercial vessels have been licensed to scour the Long Island south shore waters and remove large schools at will, even using drones to locate and remove schools that used to appear abundantly on the surface.</p> <p>As you know, they are a food source for numerous species and a natural bait that nature provides to catch more palatable table fare.</p> <p>Please make legislative adjustments in a timely fashion to address this issue.</p> <p>Sincerely J,Spirio</p>

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April 28, 2026

James Boyle  
Fishery Management Plan Coordinator  
Atlantic States Marine Fisheries Commission  
1050 N. Highland St., Suite 200 A-N  
Arlington, VA 22201

Dear Mr. Boyle and Members of the Menhaden Management Board,

As organizations representing hundreds of thousands of stakeholders from the recreational fishing, boating, and conservation community in Chesapeake Bay and along the Atlantic, we urge the Menhaden Management Board to approve Atlantic Menhaden Draft Addendum II for public comment. We strongly support the range of alternatives in the draft addendum that would reduce the Bay Cap to more precautionary levels and better distribute seasonal harvest. These options would better align management of the fishery with the Board's coastwide ecosystem-based management goals and help ensure sufficient forage availability for iconic species within Chesapeake Bay.

Atlantic menhaden are a critical forage species, and nowhere is their ecological importance more evident than in Chesapeake Bay. However, the current Chesapeake Bay Reduction Fishery Cap does not adequately account for the localized impacts of the fishery on predators that rely on menhaden during key spawning, breeding, and nursery periods. In following with the Commission's commitment to coastwide ecosystem-based management, it is now time to revisit the Bay Cap to better distribute harvest throughout the season to benefit menhaden predators during times of peak biological demand.

In addition, from our perspective, there is strong justification for considering more precautionary harvest measures in the Bay from an economic standpoint, until we have better science to understand Bay menhaden population dynamics and localized impacts from industrial fishing. Recreational and commercial fisheries in the Bay depend on menhaden availability throughout the season, and the economic contributions of these fisheries are substantial and widely distributed across coastal communities, making them an important consideration for the Board, when discussing future Bay-specific menhaden management options.

The two categorical management options proposed in Draft Addendum II – a decrease in the Bay Cap and establishing quota periods – are not mutually exclusive and may be evaluated together as part of a comprehensive strategy to better align menhaden management with the needs of the broader ecosystem. **Importantly, advancing these options for public comment does not predetermine their adoption, but ensures that stakeholders have the opportunity to**

**weigh in on various approaches that reflect both the science and community interest in this public resource.**

By advancing Draft Addendum II into the public comment period, the Board will take an important step toward fulfilling its responsibility to manage Atlantic menhaden for the benefit of the entire ecosystem and all user groups. Given the ecological and economic importance of Atlantic menhaden, it is essential that this process move forward without delay.

We appreciate the Board's continued commitment to science-based management and stakeholder engagement. We strongly encourage you to approve Draft Addendum II for public comment in May 2026.

Thank you for your consideration.

Sincerely,

American Bird Conservancy

American Sportfishing Association

Angler Action Foundation

BoatU.S.

Bonefish & Tarpon Trust

Coastal Conservation Association

Guy Harvey Ocean Fund

International Game Fish Association

Marine Retailers Association of the Americas

Rhode Island Saltwater Anglers Association

Sportsmen's Alliance Foundation

Theodore Roosevelt Conservation Partnership

Virginia Saltwater Sportfishing Association

Wild Oceans

April 28, 2026

John D. Held  
*Executive Vice President,  
General Counsel and Secretary*

E-mail: [jheld@omegaproteininc.com](mailto:jheld@omegaproteininc.com)

**Via Electronic Mail**

Mr. Joseph Cimino, Chair  
Atlantic Menhaden Management Board  
Atlantic States Marine Fisheries Commission  
1050 N. Highland St., Suite 200 A-N  
Arlington, VA 22201

Dear Chairman Cimino,

Omega Protein echoes Ocean Harvesters' call to delay any further action on Addendum II to Amendment 3 of the Atlantic Menhaden Interstate Fishery Management Plan until the Menhaden Technical Committee ("TC") has had an opportunity to determine if the proposed actions have any basis in science. The Plan Development Team ("PDT") also made this recommendation. It makes sense to scientifically review the premise of the Addendum before investing resources in further developing a management action that very likely lacks a rational basis.

The Addendum is premised on the supposed need to "reduce the concentration and volume of reduction harvest within Chesapeake Bay from recent levels to allow the ingress of menhaden to distribute throughout Chesapeake Bay." It assumes a problem rather than considering scientific evidence to determine if there is, in fact, any relationship between the reduction fishery and Maryland poundnet catches. All preliminary evidence suggests this is not the case. The lack of any empirical inquiry thus far leads us to conclude that main purpose of the action is to hamstring Omega Protein's and Ocean Harvesters' businesses rather than achieve a legitimate management goal. This is unbecoming of a law- and science-guided management body.

Federal law and the Atlantic States Marine Fisheries Commission's ("ASMFC") guiding documents require management measures to be "based on the best scientific information available."<sup>1</sup> The preliminary research provided by the PDT found no support for proposition that reduction fishery harvest impact poundnet catches in Maryland.

The best it could say was that in 2023 and 2024 – years that menhaden showed up much later than usual (a trend that continued into 2025) – the reduction fishery had "higher than average catch rates in weeks 23-33." Only in 2024, however, does the PDT note that catch-per-unit-of-effort ("CPUE") for the Maryland poundnet fishery "is generally below the 2018-2022

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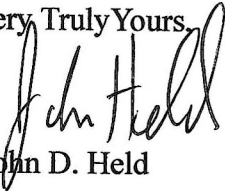
<sup>1</sup> 16 U.S.C. § 5104(a)(2)(A); *see also* Interstate Fisheries Management Program ("ISFMP") Charter, Sec. Six(a)(2).

average.”<sup>2</sup> Based on that observation, it surmises that “it is possible that these higher than normal [2024 reduction fishery] catch rates may have affected availability of fish in the upper bay, thereby affecting pound net catches.” By contrast, “weekly CPUE [for the Maryland poundnet fishery] in 2023 is generally equal to or greater than the 2018-2022 average, suggesting little influence of the reduction fishery on pound net catches.”

Why a similar level of effort by the reduction fishery a little later in the season would impact Maryland poundnet catches one year, but not the other, is unexplained. A more likely culprit is the change in the environment that influenced the late arrival of menhaden over the past three years, a phenomenon that has led to lower catches in all Chesapeake Bay menhaden fisheries.

Ocean Harvesters provided two sets of research that is far more granular than the initial work undertaken by the PDT. Generally speaking, all three sources of data tend to show that Maryland and Virginia catches tend to go up and down together. The work by Dr. Arnoldo Valle-Levinson, professor of Coastal Physical Oceanography at the University of Florida, looks at environmental factors that help explain why these catches tend to covary, as well as changes in CPUE. Before any action is taken that would adversely affect Omega Protein and Ocean Harvesters, the Board should make an effort to determine if such economic harm would actually solve the problem it has identified.

We thus urge you and your fellow Board members to refer this research to the Menhaden TC for further analysis before taking any further action on the Addendum.

Very Truly Yours  
  
John D. Held

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<sup>2</sup> But notably, Figure 7 in the PDT Memo shows that CPUE in 2024 exceeded the 2018-2023 average in several weeks, confounding the message that prior reduction fishery catch kept menhaden out of Maryland waters.



April 23, 2026

**Atlantic Menhaden Management Board**  
Atlantic States Marine Fisheries Commission  
1050 N. Highland St., Suite 200 A-N  
Arlington, VA 22201

Dear Chairman Cimino,

We submit this letter regarding the Board's Plan Development Team's ("PDT's") continued preparation of an addendum to the Atlantic Menhaden Fishery Management Plan ("FMP") focusing on the purse seine fishery in the lower Chesapeake Bay. We respectfully request that this letter, and the exhibits included herein, be included in the supplementary materials in advance of the Board's May meeting and be distributed to Board members.

In its recent memorandum to the Board, the PDT "recommends to the Board that the Technical Committee would be a more appropriate avenue to conduct a detailed analysis" of the main scientific theory driving the addendum. Specifically, "that a recent shift in timing of the Chesapeake Bay menhaden reduction fishery has resulted in reduced availability of fish in the upper bay and consequent reductions in Maryland pound net harvest of menhaden."

We agree with the PDT. The Board should remove the draft Addendum from the rule-making track and send it to the Menhaden Technical Committee ("TC") because all management actions should be based on the best scientific information available. And as we lay out below, initial analysis by outside scientific and technical experts finds that the factual allegations on which the draft Addendum are based are almost certainly false. There is no purse seine "gauntlet" in the lower Chesapeake that is preventing menhaden from making it up the Bay to Maryland pound nets. Further, as these analyses show, a preliminary physical oceanographic analysis indicates environmental factors may strongly influence menhaden availability to pound nets.

The Board should ensure its deliberations are informed by science and empirical data. Thus, we respectfully request that it task the TC to review this new information and investigate whether other environmental factors determine menhaden availability to pound nets in Maryland, as the PDT recommended.

We attach to this letter two exhibits containing the results of investigations that have been performed. Exhibit A contains the results of a supplemental regression analysis comparing Maryland pound net CPUE with Virginia menhaden purse seine net sets performed by Georgetown Economic Services ("GES") of Washington D.C., using data collected from the Atlantic Coastal

Cooperative Statistics Program (“ACCSP”), and public data contained in last year’s Menhaden Task Force Report previously presented to the Board.

Exhibit B is a report prepared by Dr. Arnolando Valle-Levinson, professor of Coastal Physical Oceanography at the University of Florida. His report, attached as Exhibit B, used data on freshwater flow into the Bay, salinity, temperature, and dissolved oxygen profiles, and Maryland menhaden pound net catch rates to assess the impact of environmental factors such as shifting hypoxia and stratification on pound net catches over the past 12 years. Exhibit C is Dr. Valle-Levinson’s *curriculum vitae*.

Exhibit D, included for completeness, is a copy of the letter on the same subjects Ocean Harvesters submitted to the Board for its winter meeting in January. The new analyses attached to this letter confirm and buttress the serious concerns with the underlying gauntlet predicate for this draft Addendum we raised in January.

Maryland pound net catches have indeed decreased, but so has Maryland pound net effort, and the decrease is proportional. Dr. Valle-Levinson’s report explains:

Menhaden catches in Maryland have had a decreasing trend in the last 12 years. Similarly, the trips in Maryland to catch Menhaden show a decreasing trend. Menhaden catches and number of trips in Maryland go hand in hand. However, the catch per unit of effort has not changed over time, despite the marked decrease in 2024.

(Citations omitted.) The data thus fully belies claims of decreasing catch rates in Maryland pound nets being tied to any supposed purse seine “gauntlet.”

Further, as to catch per unit of effort (“CPUE”), statistical analyses contained in Exhibit A show that Maryland pound net CPUE and Virginia purse seine net sets are directly related, and the relationship is statistically significant over the entire 13-year time series. By comparing Maryland pound net harvests with Virginia purse seine nets sets, GES found a strong positive relationship between the number of nets set by the Virginia purse seine reduction fishery and Maryland pound net CPUE. When this effort in Virginia is high, the Maryland harvest per trip also tends to be high. The converse is also true.

If the gauntlet hypothesis on which the draft Addendum is fully predicated had any merit, pound net CPUE would be lower when purse seine net sets were higher (that is, the variables would be inversely related). The gauntlet theory may be a convenient talking point to galvanize the Board to initiate the addendum process, but it utterly lacks an empirical foundation. This unsupported hypothesis was coupled with the claim (made in response to a Board member’s question when the proposal for the Addendum was first raised) to the effect that Maryland pound net effort had not declined. That claim is also not true. In fact, Dr. Valle-Levinson demonstrates the declines in pound net catches and the decline in pound net effort “go hand in hand.” Indeed, when depicted visually in Dr. Valle-Levinson’s Figure 2, the correspondence between the two is startlingly clear.

Ocean Harvesters also commissioned Dr. Valle-Levinson to undertake an examination of the broader physical oceanographic variables that may affect menhaden catches in the Bay. In summary, Dr. Valle-Levinson's analysis found correlations between changes in environmental conditions and the availability of menhaden to Maryland pound nets. His report concluded, as follows:

Results indicate that river discharge in the upper Chesapeake Bay relates to water column stratification in the middle bay, at periods of around 1 and 6 years. Results also show a relationship between river discharge and hypoxic depth at periods of 1 year. Moreover, water column stratification seems related to Menhaden catches. Furthermore, there seems to be a linkage between hypoxia depth and fish catches (and CPUE) in Maryland. In essence, increased discharge leads to increased water column stratification, enhanced hypoxia (decreased hypoxic depth), and reduced fish habitat with increased catches.

Ocean Harvesters respectfully submits that Dr. Valle-Levinson's findings strongly counsel for the Menhaden TC to examine and ground-truth all the predicates for the draft Addendum before the Board proceeds to any further consideration of the proposed damaging and likely unwarranted management measures it contains. Accordingly, the Board should remand this draft Addendum to the Technical Committee for further consideration in light of the information presented in this submission and in light of other equally valid concerns PDT members have raised in working on this ill-conceived Addendum.

Thank you for your consideration of this letter and the issues it presents. Our representatives will be available at the Board meeting to discuss these matters in more detail.

Respectfully submitted,

  
Ben Landry  
Vice President of Public Affairs  
Ocean Fleet Services

## Exhibit A

### Analysis of Maryland Harvest Sizes Per Trip and the Number of Virginian Nets Set

I used the following data:

1. Semi-monthly number of nets set by Virginian fisheries for the period 2016 to 2024 (Table 2 in Lynn Fegley’s August 2025 Atlantic Menhaden Board Presentation); and
2. Monthly Maryland Pound Net Harvest and Number of Trips for the period 2016 to 2024.

I aggregated the number of nets set by year and month in order to transform it from a semi-monthly series to a monthly series. Further, I divided the monthly Maryland Pound Net Harvest by the monthly Number of Trips in order to obtain a monthly Maryland harvest per trip.

Next, I regressed the monthly Maryland harvest per trip (the dependent variable) on the following independent variables:

1. The monthly number of nets set by Virginian fisheries,
2. The one-month lag of the Maryland harvest per trip; and,
3. Twelve-month lag of the Maryland harvest per trip. I included the lagged independent variables because the monthly harvest per trip data show strong seasonality and autocorrelation. That is, the size of the harvest per trip in one month affects the harvest per trip in subsequent months.

The table below shows the results of the regression:

	Estimate	Standard Error	t value	p value
<b>Intercept</b>	521.3436	546.6616	0.954	0.3439
<b>Nets Set by VA Fisheries</b>	2.4063	1.0756	2.237	0.0289
<b>1-month Lag of MD Harvest per Trip</b>	0.4669	0.1016	4.594	2.19E-05
<b>12-month Lag of MD Harvest per Trip</b>	0.1878	0.1245	1.508	0.1367

The coefficient of the number of nets set variable is 2.4063 and—with a p value of 0.0289—is statistically significant at the 5 percent level. This result indicates a strong, positive relationship between the number of nets set by Virginian fisheries and the Maryland harvest per trip. Thus, when the number of Virginian nets set is high, the Maryland harvest per trip also tends to be high. Conversely, when the number of Virginian nets set is low, then the Maryland harvest per trip also tends to be low. Since it is highly unlikely that the number of Virginian nets set could be causing the size of the Maryland harvest per trip (or vice versa), the most likely interpretation of this positive relationship is that both variables are responding to a common cause—namely, the extent of the fish presence in the bay.

**Exhibit B**

**Linkage Between Environmental Variables and Menhaden Catches in Mid-Chesapeake Bay**

Arnoldo Valle-Levinson

Civil and Coastal Engineering Department

University of Florida

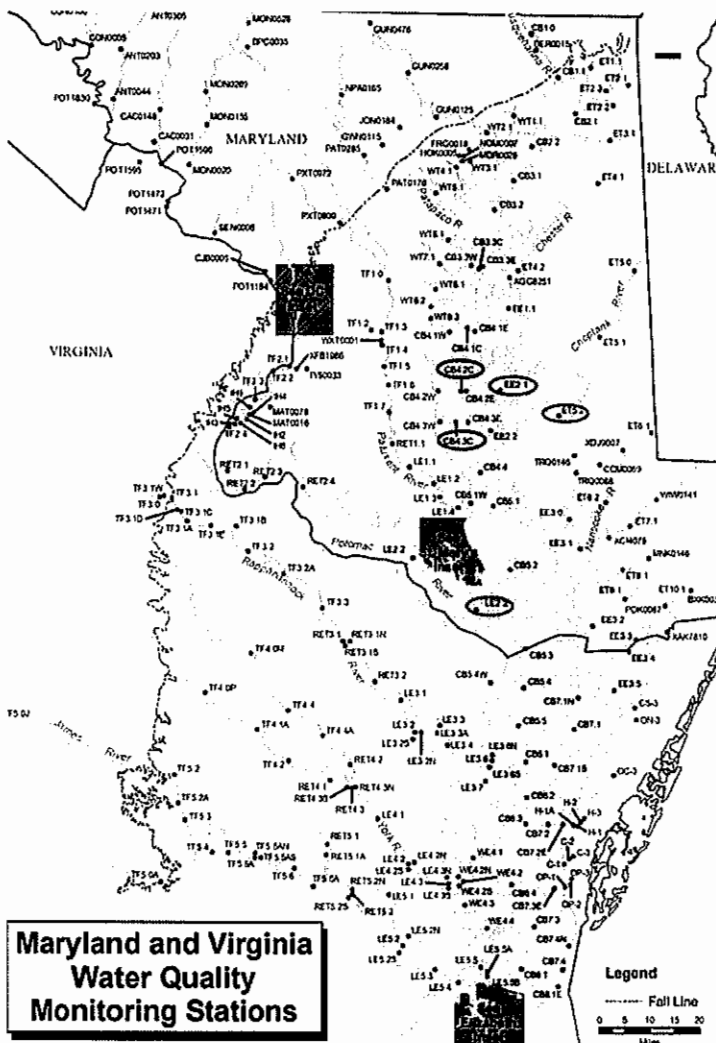
[arnoldo@ufl.edu](mailto:arnoldo@ufl.edu)

## Overview

This report uses data from the Chesapeake Bay Program to explore possible linkages between environmental variables and Menhaden catches in Chesapeake Bay. The main findings are synthesized in a Summary section at the end of this report.

## Data compilation

I have compiled data for daily river discharge (Susquehanna River at Conowingo, MD) from October 1, 1967 to March 19, 2026. I have also compiled data from the Chesapeake Bay program since 1984 for salinity, temperature and dissolved oxygen profiles (<https://www.chesapeakebay.net/what/downloads/cbp-water-quality-database-1984-present>) at stations CB4.2C, CB4.3C, EE2.1, ET5.2, and LE2.3 (Fig. 1).



**Figure 1.** Chesapeake Bay map showing sampling stations of the Chesapeake Bay program. The following analyses are over the five stations with color ovals.

I also used monthly data for Menhaden catches and fishing trips in Maryland from 2013 to 2024 (Fig. 2). Any comparisons between environmental variables and catches in Maryland were made for that 12-year period.

## Data Analyses

Comparisons between compiled variables were done through direct inspection of the time series, and through correlations in time and for different periodicities. These correlations are achieved with a technique, *wavelet transform*, that first involves the decomposition of each time series in terms of their periods of greatest variance and assessing how that variance changes over time. Then

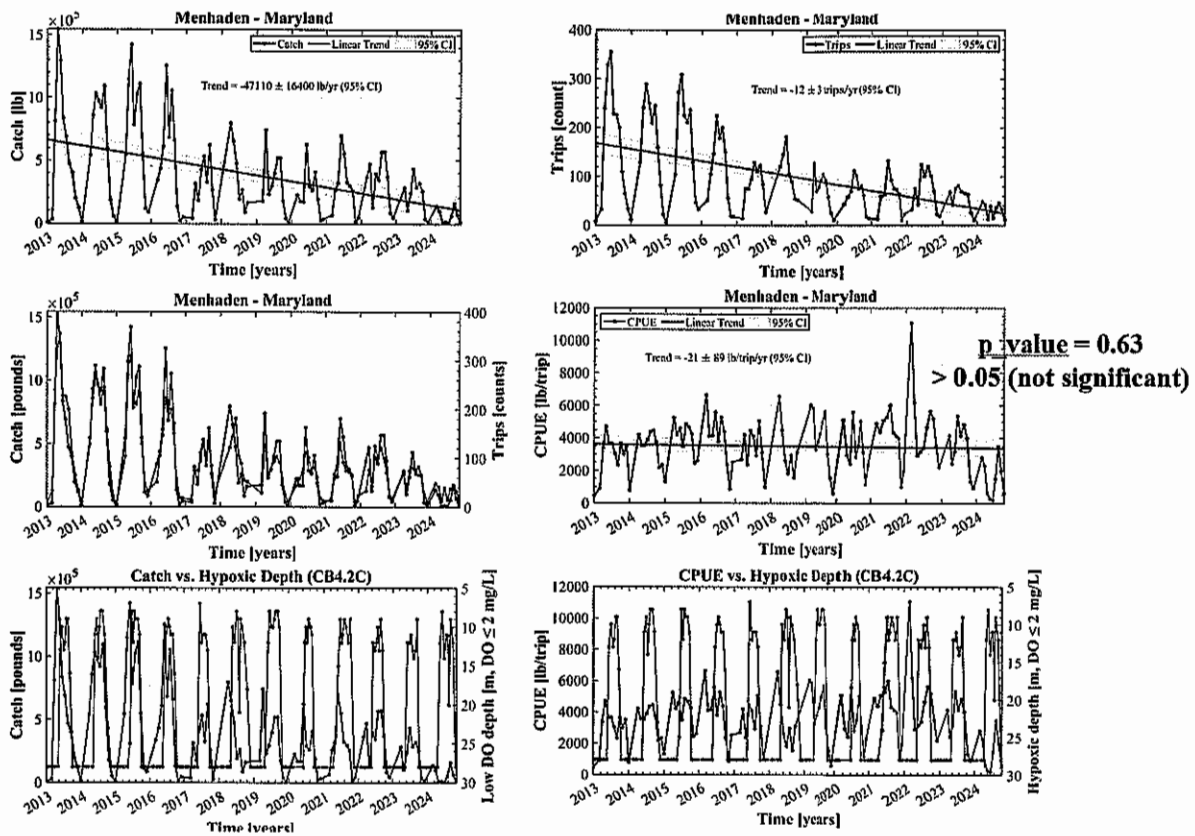
two *wavelet transforms* are compared with each other to assess how the variance of each time series correlates with each other over the period of measurements. Comparisons of *wavelet transform* are carried out through *cross wavelets* and *wavelet coherences*. *Cross wavelets* quantify

the co-variability of the two time series being compared, while the *wavelet coherences* provide correlation coefficients for different periods of variability and their change over time.

## Results

Data analyses yielded the following results for Maryland.

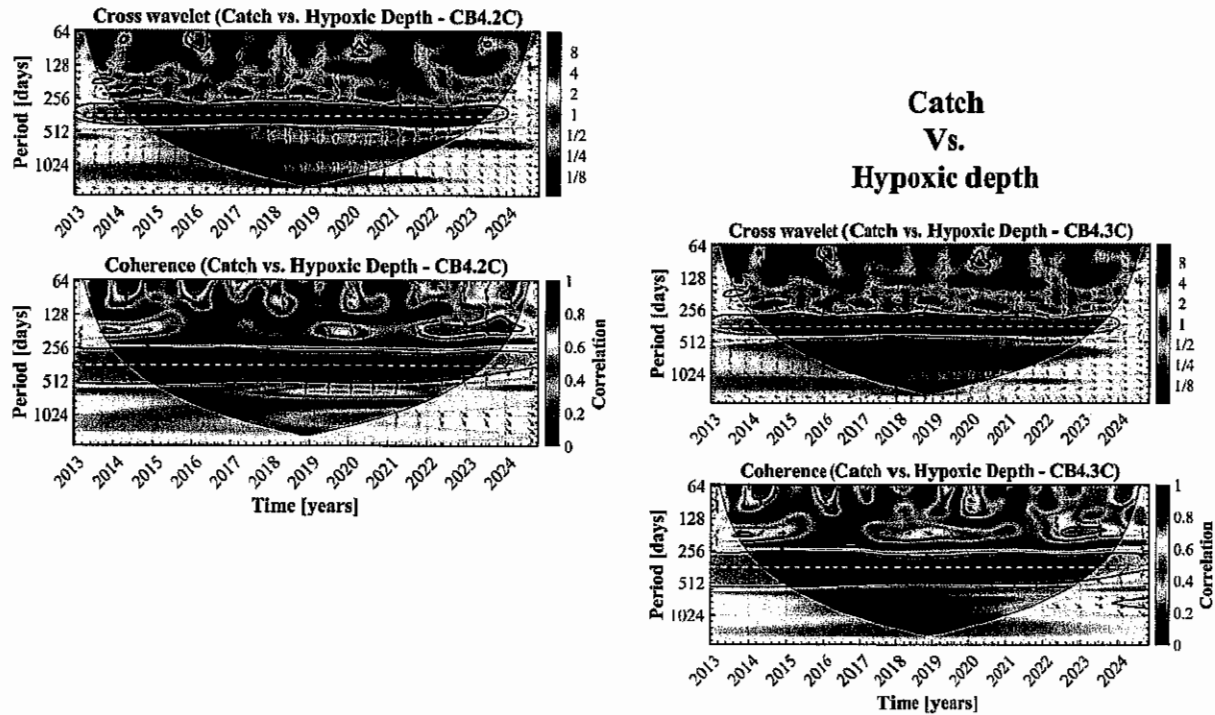
Menhaden catches in Maryland (upper left in Figure 2) have had a decreasing trend in the last 12 years. Similarly, the trips in Maryland to catch Menhaden (upper right of Figure 2) show a decreasing trend. Menhaden catches and number of trips in Maryland (middle left of Figure 2) go hand in hand. However, the catch per unit of effort (catch/trip – middle right of Figure 2) has not changed over time, despite the marked decrease in 2024. A prominent result is that the catches of Menhaden (lower left of Figure 2) and the catch per unit of effort (lower right of Figure 2) show resemblance with the depth of hypoxia. This hypoxia depth was determined as the depth where dissolved oxygen showed values of 2 mg/l and below which, dissolved oxygen decreases.



**Figure 2.** Upper panels display the trends for Menhaden catches and trips in Maryland. Middle panels illustrate the relationship between catches and trips, and the trend of catch per unit of effort (CPUE) in Maryland. Lower panels show the linkage between catches and hypoxic conditions, and catch per unit of effort and hypoxic conditions.

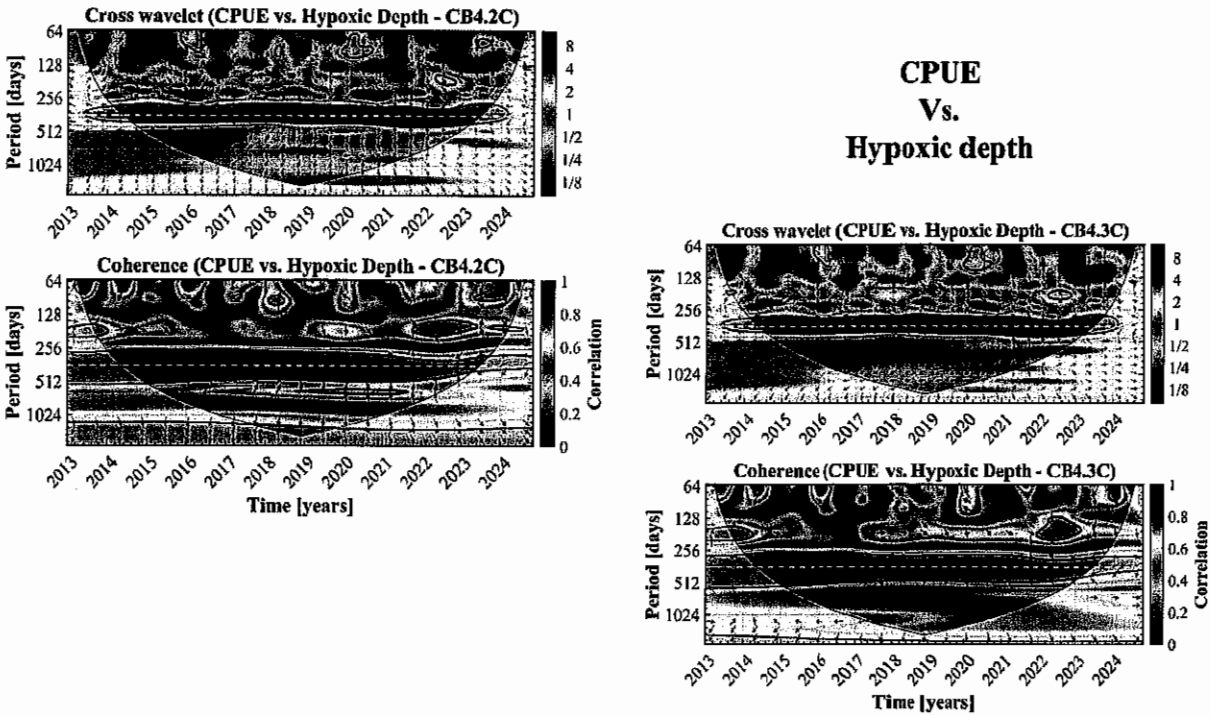
More specifically, and using wavelet techniques, Menhaden catches in Maryland seem to be impacted by hypoxia at CB4.2C and CB4.3C over periods of one year (Fig. 3). The *cross-wavelet*

and *wavelet-coherence* analyses (Fig. 3) indicate an antiphase relationship (arrows pointing to the left) between these two variables (catch and hypoxic depth) throughout the 12-year period of data. This means that increased fish catches occur when the hypoxic depth becomes shallower – during summer months.



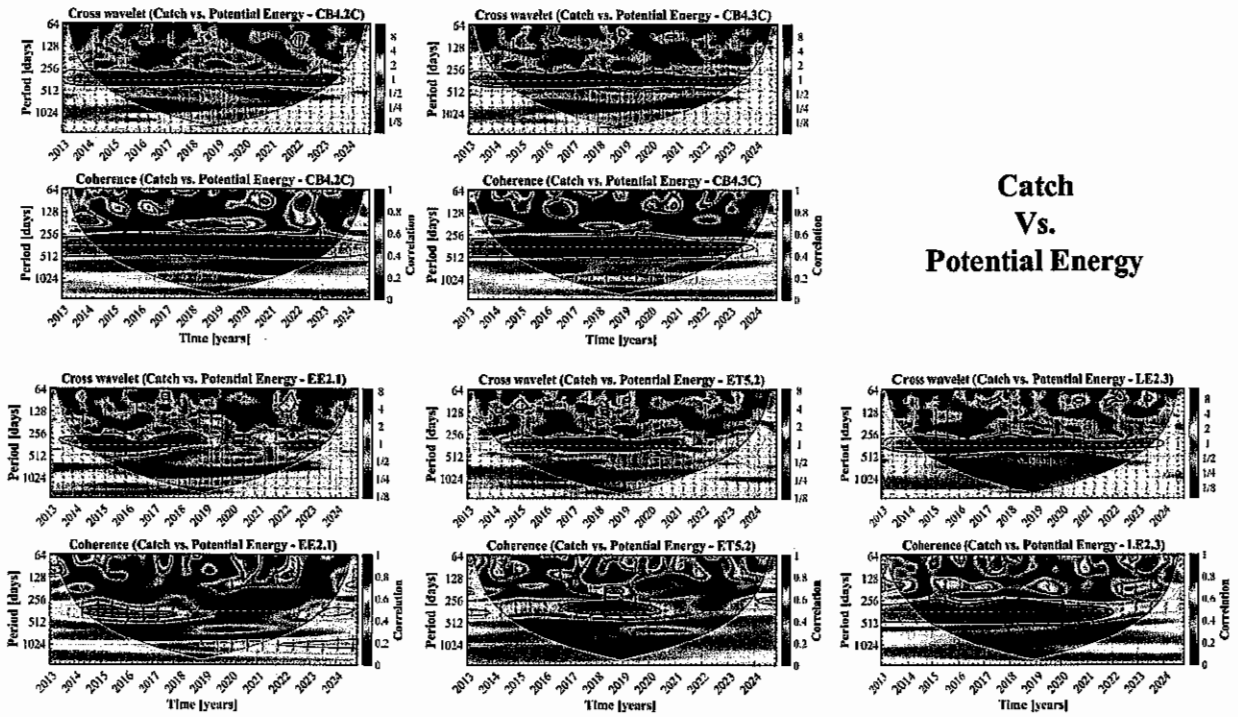
**Figure 3.** Cross-wavelet and wavelet coherence between Menhaden catch in Maryland and hypoxic depth at two stations (4.2 and 4.3) in the middle of the Chesapeake Bay. The **cross-wavelet** plots illustrate how two parameters **covary** over time (horizontal axis) and at what periods (vertical axis) show their greatest covariance. Cross-wavelets here illustrate marked covariance between the two parameters at periods of 1 year (red bands at 365 days – white dashed line) and throughout the period 2013-2024. The wavelet **coherence** plots show the correlation squared (values from 0 to 1) between the same two parameters, and how this correlation changes between 2013 and 2024, and at what periods the correlation is strongest (typically 365 days). In all panels, arrows pointing to the right imply direct correlation, while arrows pointing to the left indicate anticorrelation.

Exploring the menhaden catch per unit of effort (CPUE – catch divided by number of trips) in Maryland, CPUE also seems to be impacted by hypoxia at CB4.2C and CB4.3C over periods of one year (Fig. 4). The response is consistent with that of Figure 3, throughout the entire span of the data available.



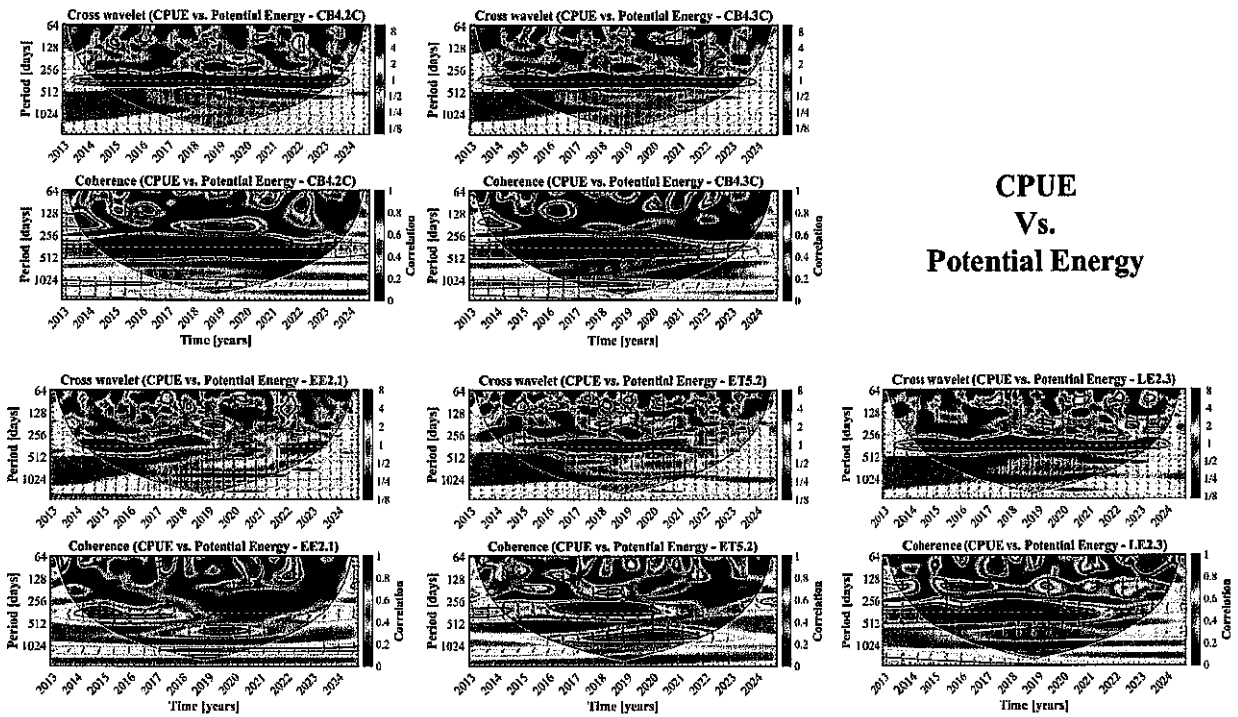
**Figure 4.** Cross-wavelet and wavelet coherence between Menhaden CPUE in Maryland and hypoxic depth at two stations (4.2 and 4.3) in the middle of the Chesapeake Bay. Explanations are the same as for Figure 3.

Moving on to other environmental variables, Menhaden catches and CPUE in Maryland seem related to water column stratification at the deepest stations scrutinized, i.e., at 4.2C, 4.3C and LE2.3 (Fig. 5 & 6). Water column stratification was quantified as the energy required to mix the water column (in Joules per cubic meter), or *potential energy anomaly*. Increased stratification at those stations indicated increased catches and CPUE. Water column stratification at EE2.1 and ET5.2 was not linked to catches or CPUE, likely because it is not well developed at those relatively shallow stations.



## Catch Vs. Potential Energy

*Figure 5. Cross-wavelet and wavelet coherence between Menhaden catches in Maryland and water column stratification at several stations in the middle of the Chesapeake Bay. Water column stratification is quantified as the potential energy anomaly, in other words, the energy required to mix the water column (appearing simply as 'Potential Energy' on the figures). Explanations are the same as for Figure 3.*



**CPUE  
Vs.  
Potential Energy**

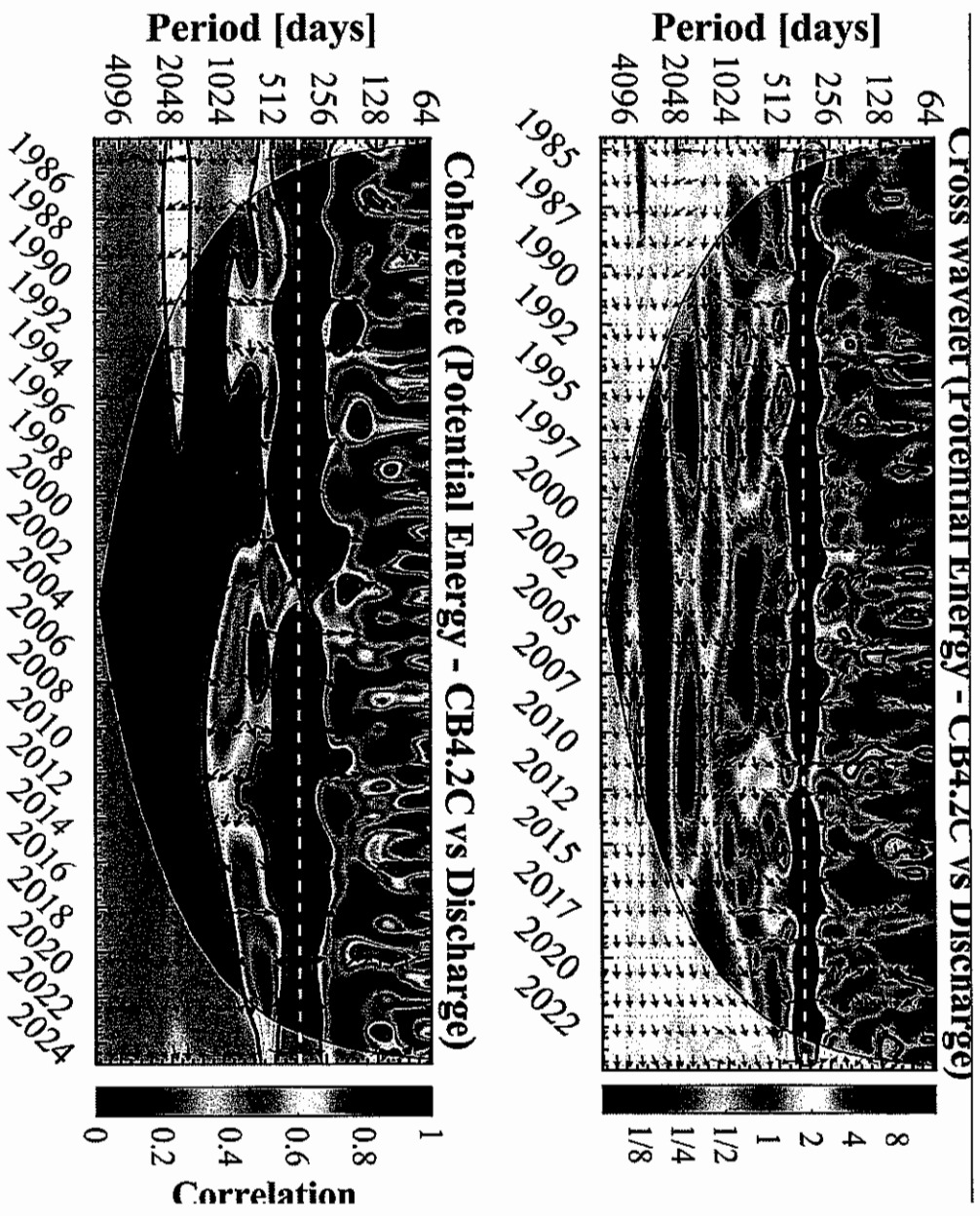
**Figure 6.** Cross-wavelet and wavelet coherence between Menhaden CPUE in Maryland and water column stratification at several stations in the middle of the Chesapeake Bay. Explanations are the same as for Figure 3.

*River discharge impacts on stratification in the Bay*

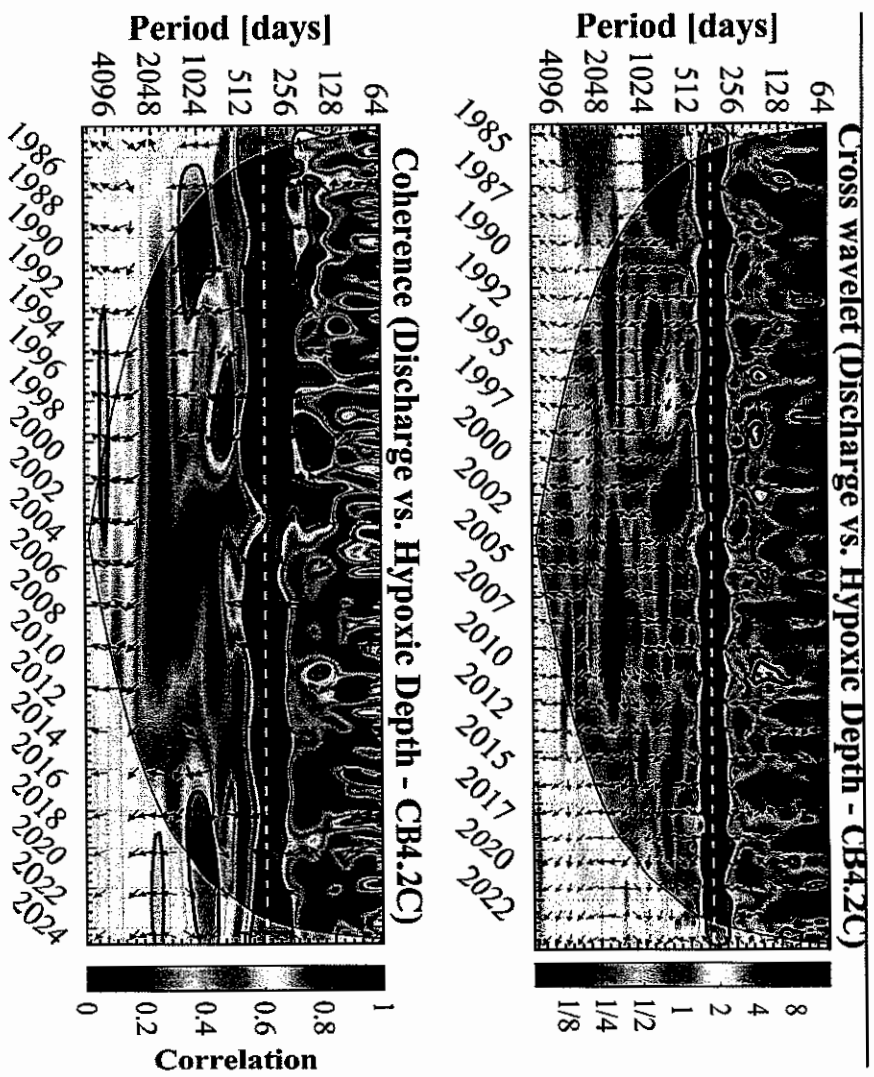
As expected, the stratification in the middle Chesapeake Bay is related to Susquehanna River discharge at periods of around 1 and 6 years. Although Figure 7 shows the relationship with station 4.2C, the same results are observed for 4.3C. Furthermore, river discharge is also linked to hypoxic depth (Fig. 8). The phases in Figure 8 suggest that when discharge increases, the hypoxic depth decreases, i.e., an expansion of the hypoxic zone.

*River discharge impacts on Menhaden catches*

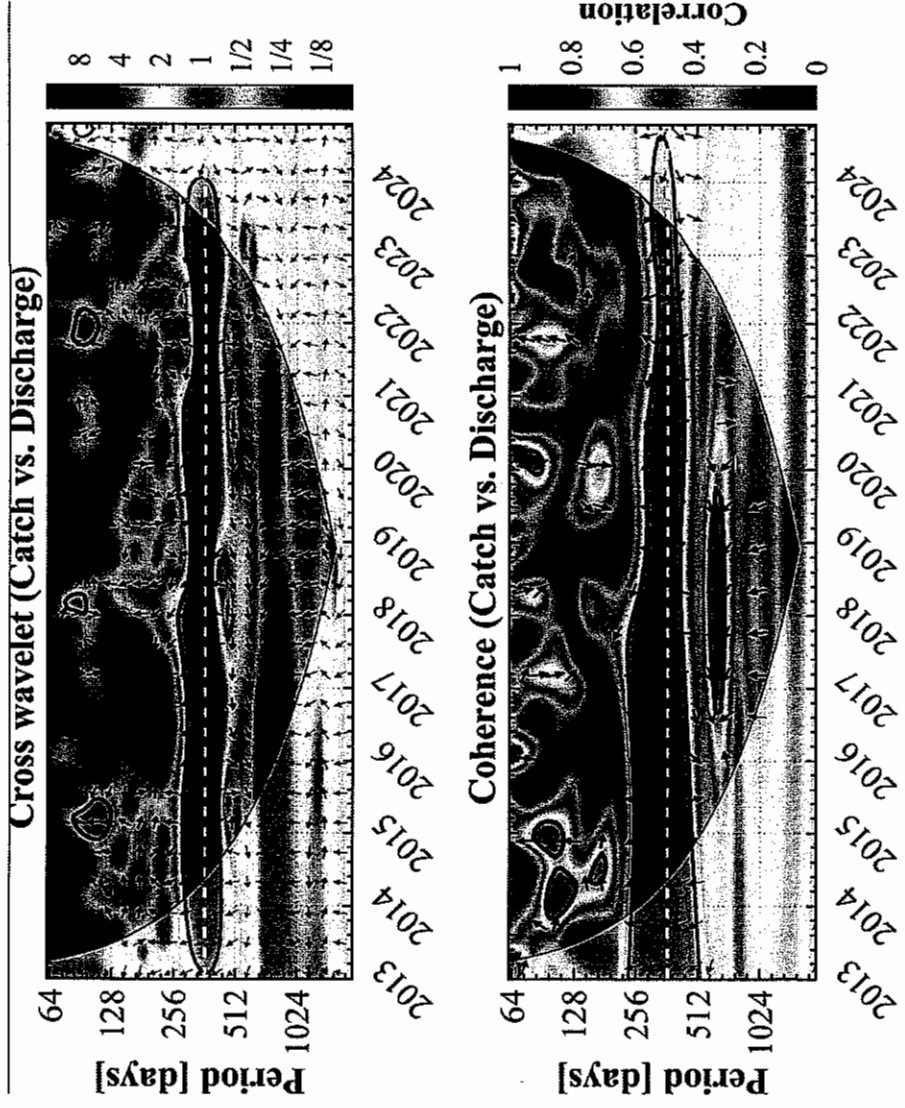
Finally, there seems to be a relationship between Susquehanna River discharge and Menhaden catch in Maryland (Fig. 9). The phase of the wavelet coherence and cross-wavelet calculations suggests that these relationships are nearly direct, with a delay: increased discharge is linked to increased captures, but with a lag in time of 3-4 months.



*Figure 7. Cross-wavelet and wavelet coherence plots illustrate the relationship between Susquehanna River discharge and potential energy anomaly (stratification) at Station CB4.2C. Conditions are essentially the same for station CB4.3C. See Fig. 3 for explanation of plots.*



*Figure 8. Cross-wavelet and wavelet coherence plots illustrate the relationship between Susquehanna River discharge and hypoxic depth at Station CB4.2C. Conditions are essentially the same for station CB4.3C. See Fig. 3 for explanation of plots.*



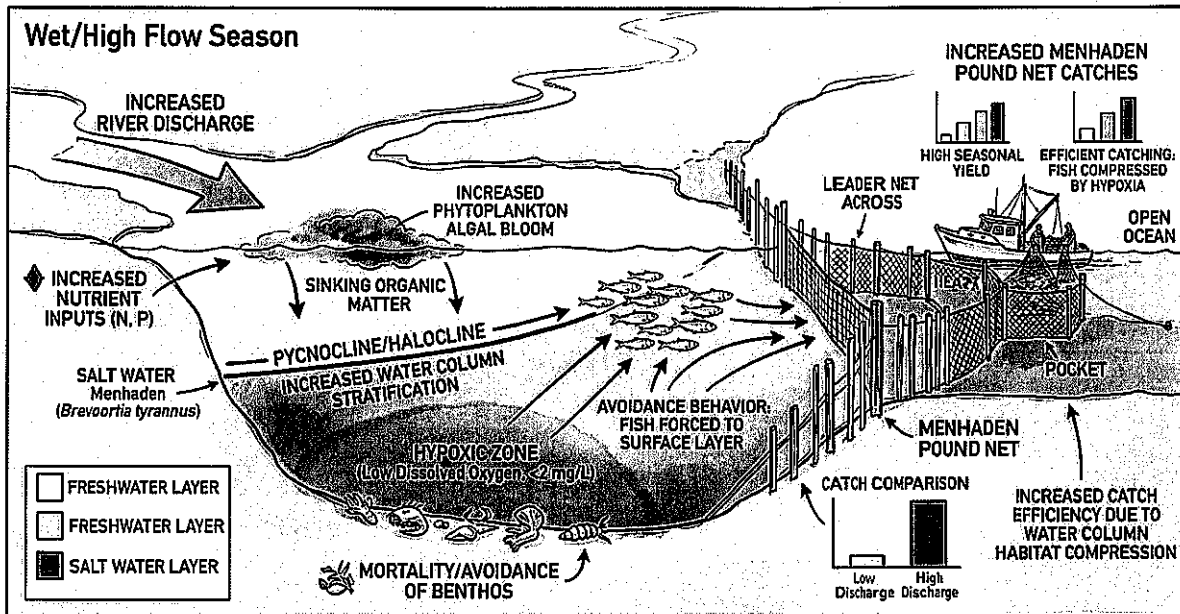
*Figure 9. Cross-wavelet and wavelet coherence plots illustrate the relationship between Susquehanna River discharge and Menhaden catches in Maryland (see Fig. 3 for explanation of plots).*

### Summary

Results indicate that river discharge in the upper Chesapeake Bay relates to water column stratification in the middle bay, at periods of around 1 and 6 years. Results also show a relationship between river discharge and hypoxic depth at periods of 1 year. Moreover, water column stratification seems related to Menhaden catches. Furthermore, there seems to be a linkage between hypoxia depth and fish catches (and CPUE) in Maryland. In essence, increased discharge leads to increased water column stratification, enhanced hypoxia (decreased hypoxic depth), and reduced fish habitat with increased catches (Fig. 10).

Additional analyses could explore the linkage river discharge to nutrient concentrations to hypoxic depth to fish catch.

## IMPACT OF HIGH RIVER DISCHARGE ON ESTUARY: STRATIFICATION, HYPOXIA, & POUND NET CATCHES



## THE ESTUARY CASCADE: WHEN HIGH FLOW BOOSTS CATCHES

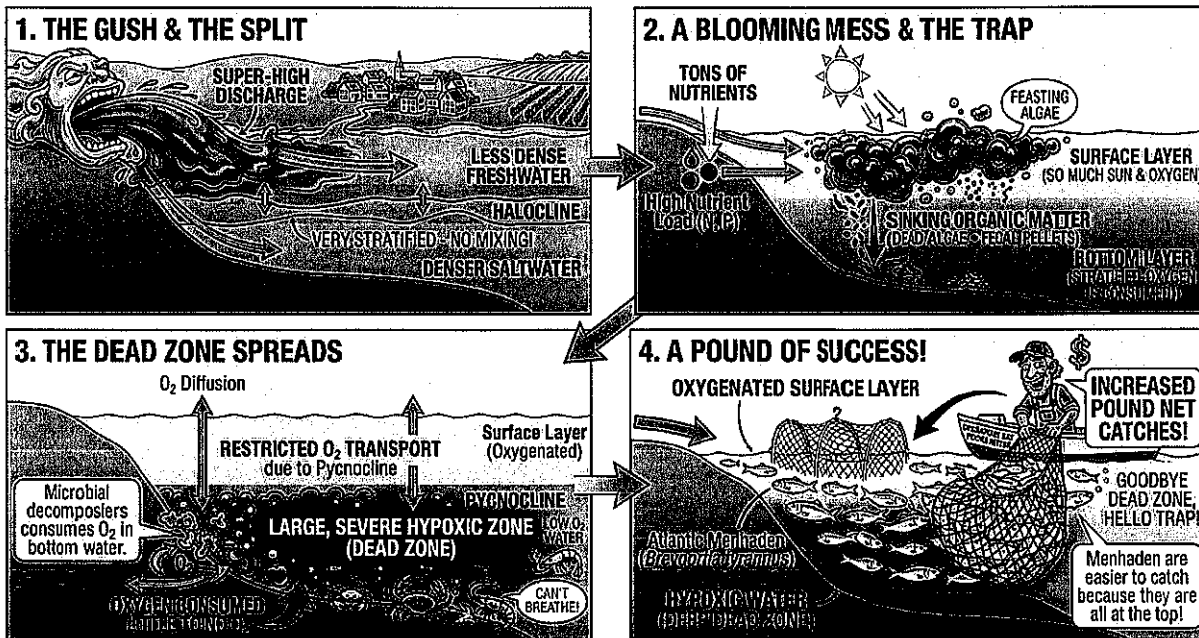


Figure 10. Schematics of the sequence of events suggested by the analyses described above.



## **Exhibit C**

### **Doctor Arnoldo Valle-Levinson – Curriculum Vitae**

University of Florida

Department of Civil and Coastal Engineering

365 Weil Hall

P.O. Box 116580

Gainesville, FL 32611

Phone: 352-359-0248

Fax: 352-392-3394

e-mail address: [arnoldo@ufl.edu](mailto:arnoldo@ufl.edu)

#### **EDUCATION**

1985 B.S., Oceanology, Universidad Autónoma de Baja California, México

1988 M.S., Marine Environmental Sciences, SUNY at Stony Brook, NY.

1992 Ph.D., Oceanography, SUNY at Stony Brook, NY.

#### **EXPERIENCE**

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## HONORS, AWARDS, AND PRIZES

Recipient of the University of Baja California President's Award to the highest grade point average of the Class	1985
Valedictorian of the School of Marine Sciences, Baja California	1985
Recipient of the Kenneth P. Staudte Award in recognition of innovative and important research contributing to the resolution of an environmental problem, Marine Sciences Research Center	1991
Recipient of the Sea Grant Association Student Abstract Award	

Competition, Environmental Studies	1992
1998 Editors' Citation for Excellence in Refereeing for Journal of Geophysical Research-Oceans	1999
Recipient of CAREER grant (U.S. National Science Foundation's most prestigious award for new faculty)	2000
Seminar Presenter as part of the Florida Sea Grant Elise B Newell Seminar Series, Florida Gulf Coast University	2008
Recipient of Fulbright Fellowship (Senior Specialists Program) to Chile	2008
Recipient of Gledden Fellowship from University of Western Australia	2009
Distinguished Professor, Universidad Catolica del Norte, Chile	2010
Distinguished Professor Visit, Mexican Academy of Sciences	2010
Level III (highest possible) Scientist in the Mexican System of Research	2010
Visiting Professor, CINVESTAV, Merida	2010
Visiting Professor, CINVESTAV, Merida	2011
Visiting Fellowship awarded by the Chilean Science and Technology Council	2011
Visiting Professorship awarded by Utrecht University	2012
Fulbright Senior Fellowship to Spain	2012
Corresponding Member of the Mexican Academy of Sciences	2012
Departmental Outstanding Faculty Mentor Award, U. of Florida	2012
Distinguished Visiting Professor, University of Bordeaux	2014
Visiting Professorship, Kyushu University, Japan	2014
Senior International Educator of the Year, U. of Florida	2014
Departmental Research Mentor Award, U. of Florida	2015
Visiting Professor, University of Pernambuco, Brazil	2015
Water Institute Fellow, University of Florida	2016

Term Professor, University of Florida	2017
Departmental Research Mentor Award, U. of Florida	2018
Visiting Professor, University of Padova	2019
NSF Rotator in the Physical Oceanography Program	2021-24
Robert and Maude Gledden fellowship from the University of Western Australia	2024
Erasmus Mundus Visiting Professor, University of Genova	2025

### **Ph.D. Chair**

1. Adviser for K. Holderied (now at NOAA)
2. Adviser for Cristobal Reyes (Ph. D. 2001, now at Universidad del Mar, Mexico)
3. Adviser for Mario Caceres (Ph. D. 2001, now at Universidad de Valparaiso, Chile)
4. Adviser for Rosario Sanay (Ph.D. 2003, now at Universidad Veracruzana, Mexico)
5. Adviser for Andres Sepulveda (Ph.D. 2004, now at Universidad de Concepcion, Chile)
6. Adviser for David Salas-Monreal (M.S. 2002; Ph.D. 2006 now at Universidad Veracruzana, Mexico)
7. Adviser for Jung Woo Lee (Ph.D., 2010, now at East Carolina University)
8. Adviser for Amy Waterhouse (Ph.D., 2010, now at Scripps Institution of Oceanography)
9. Adviser for Berkay Basdurak (Ph.D., 2010, now in Middle-East Tech Univ, Turkiya)
10. Adviser for Chloe Winant (Ph.D. 2011, now at Howard Bishop Middle School)
11. Adviser for Kim Huguenard (Arnott) (Ph.D. 2013, now at University of Maine)
12. Adviser for Sangdon So (Ph.D. 2013, now at St Johns Water Management District)

13. Adviser for Lauren Ross (Ph.D. 2014, now at University of Maine)
14. Adviser for Sabrina Parra (Ph.D. 2014, now at Johns Hopkins University)
15. Adviser for Jackie Branyon (Ph.D. 2015, now at Kimley-Horn)
16. Adviser for Armando Laurel (Ph.D. 2016, now at Mexican Water Directorate)
17. Adviser for Fernanda Nascimento (Ph.D. 2017, now at Warnemunde University)
18. Adviser for Ahmad Yousif (Ph.D. 2017, now at Kuwait University)
19. Adviser for Mohammad Alkhaldi (Ph.D. 2018, now at Kuwait Institute for Scientific Research)
20. Adviser for Gisselle Guerra (Ph.D. 2019, now at Instituto Tecnológico de Panama)
21. Adviser for Braulio Juarez (Ph.D. 2019, now at Instituto de Investigaciones Oceanológicas, Mexico)
22. Adviser for Maria Fernanda Gastelu (PhD 2023, now at Virginia Tech)
23. Adviser for Juan Torres
24. Adviser for Xavier Sanchez

### **M.S. Chair**

1. Adviser for Mayra Riveron-Enzastiga (M.S. 2006)
2. Adviser for Andrea Piñones (M.S. 2006)
3. Adviser for Diego Narvaez (M.S. 2006)
4. Adviser for Hande Caliskan (M.S. 2006)
5. Adviser for Ruth Lane (M.S. 2007)
6. Adviser for Kimberly Arnott (M.S., 2009)
7. Adviser for Nick Zwemer (M.S., 2011)
8. Adviser for Krista Henrie (M.S., 2012)
9. Adviser for Gisselle Guerra (M.S., 2012)

10. Adviser for Kirsten Nielsen (M.S. 2013)

11. Adviser for Patrick Miskel (M.S. 2014)

12. Adviser for Zak Bedell (M.S. 2017)

13. Adviser for Matlack Gillin (M.S. 2018)

Current Ph.D. students: Juan Guillermo Torres, Xavier Sanchez, Celeste Delgado

### **PROFESSIONAL SERVICE**

- Editor in Chief of Continental Shelf Research. Associate Editor of Estuaries and Coasts, Journal of Oceanography
- NSF Program Director Physical Oceanography 2021-2023
- Co-Vice Chair Gordon Research Conference on Coastal Dynamics 2025
- Co-Chair Gordon Research Conference on Coastal Dynamics 2027
- Co-Chair CERF Meeting 2027

## Exhibit D

January 27, 2026, Letter to the Atlantic Menhaden Management Board



### **Atlantic Menhaden Management Board**

Atlantic States Marine Fisheries Commission  
1050 N. Highland St., Suite 200 A-N  
Arlington, VA 22201

Dear Chairman Clark:

We submit this letter regarding the Board's Plan Development Team's preparation of an addendum to the Atlantic Menhaden Fishery Management Plan ("FMP") focusing on the purse seine fishery in the lower Chesapeake Bay. We respectfully request that this letter, and the exhibits included herein, be included in the supplementary materials in advance of the Board's meeting, and also distributed to Board members.

As it stands, the premise for the Board's proposed addendum is that the recent decline in Maryland menhaden pound net catches can be ascribed to Ocean Harvesters' purse seine fishery in the lower Bay creating a "gauntlet" that has prevented the fish from reaching pound nets in the mid and upper Bay. Significantly, neither the Board nor the PDT have examined this premise, but rather have just accepted it as fact. Ocean Harvesters respectfully submits that the Board should task the PDT to examine the premise because the information presented below demonstrates that other more plausible factors may be causing declining pound net catches.

### **Pound Net Effort in the Bay Has Declined Dramatically in Recent Years**

We recently received data from the Atlantic Coastal Cooperative Statistics Program ("ACCSP") Data Warehouse pursuant to an August data request of a month-by-month data pull of Maryland pound net effort and catches. Please refer to Exhibit A for a condensed version of the raw data.<sup>1</sup> That data highlighted a trend that can directly explain declining catches. Maryland's pound netting enterprise is in decline. From the years 2013 to 2024, the total number of trips reported by Maryland pound net fisherman decreased from 1,835 in 2013 to a mere 284 in 2024. A substantial drop-off occurred between 2016 and 2017, when Maryland pound net catches stair-stepped down.

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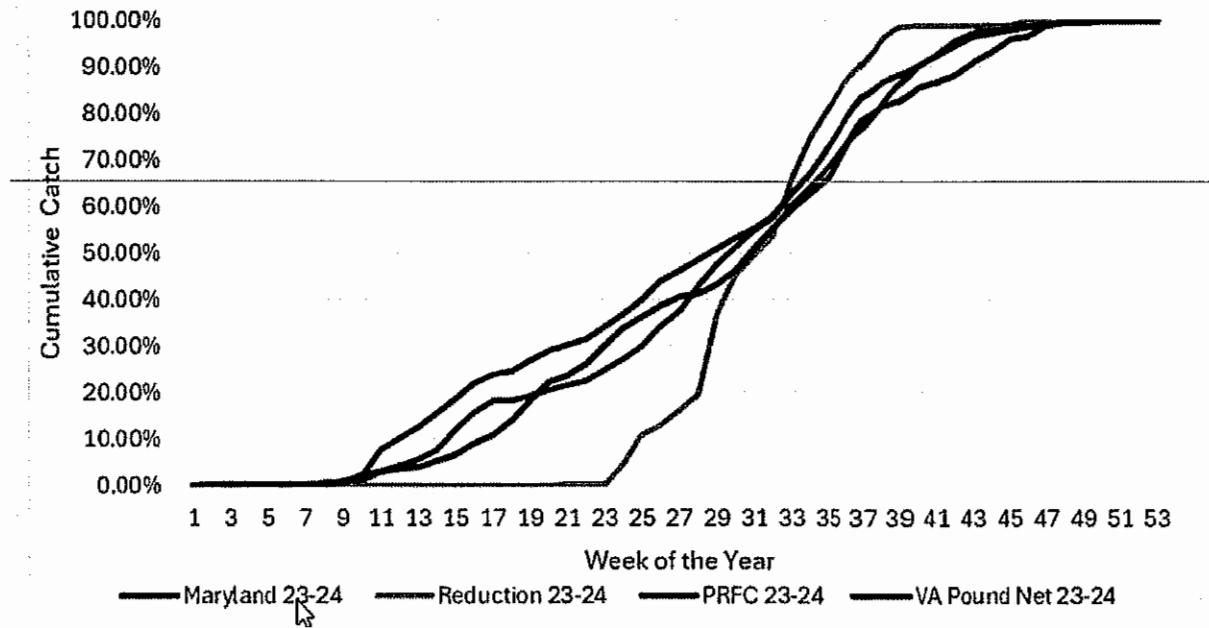
<sup>1</sup> The raw excel data files received pursuant to the ACCSP data pull are available upon request.

The maximum number of vessels operating in any month during these years also decreased, from a high of 25 in 2013, to 6 in 2024, with the total number of fishermen associated with these pound nets decreasing at the same level.

In years where catches for the purse seine fleet decreased, such as in 2017, when ASMFC lowered the catch cap for Atlantic menhaden by more than 40%, pound net landings in 2018 and 2019 did not proportionately skyrocket in response. Thus, to the extent a gauntlet exists (and it doesn't), the gauntlet should have been more of an impediment to pound net fishing when both pound net effort and catches were higher.

**Catch Rates and Fishing Effort Do Not Show Negative Correlation or Causation**

The graph below was presented to the PDT last week. As indicated, the graph lays out weekly catch rates for the reduction and pound net fisheries. In particular, we draw the Board's attention to weeks 21 through 40 of the year as indicated on the X-axis. If the purse seine fleet was indeed creating a gauntlet preventing Atlantic menhaden from traveling into the upper-Bay during those weeks, the Bay's pound net fishery numbers *should* indicate a corresponding steep decline in catch rate during these weeks. Instead, the catch rates remain on a relatively steady increase throughout the year; put differently, the slope of the lines depicting pound net catch rates from week 9 to week 45 is remarkably consistent.



The relationship, or lack thereof, demonstrated in this graph aligns with a preliminary analysis we asked Georgetown Economic Services of Washington, D.C. to conduct using public data presented

to the Board in August 2025.<sup>2</sup> Based on records of reduction purse seine effort, which is indicative of menhaden's presence in the lower Bay, in the months during 2022-2024 when the number of reduction purse seine net sets exceeded its 10-year average, the Maryland pound net harvest size also tended to be above its 10-year average. The converse was also true. In fact, the direct relationship was statistically significant over these years. Attached hereto as Exhibit B is the more detailed memorandum of the statistical analysis prepared by Georgetown Economic Services. As with the chart included above, if the so-called gauntlet theory posed by Maryland were the reason behind the falling landings of Atlantic menhaden by Maryland pound-netters, the relationship between purse seine effort and pound net landings would instead be inversely related. However, the relationship does not bear out such a conclusion. The PDT should conduct its own examination using the biweekly purse seine set data that Director Fegley excerpted from the April Work Group Report and the ACCSP data pull providing monthly Maryland pound net menhaden landings.

In conclusion, our brief submission only scratches the surface of what appears to be a more complicated set of reasons for the decline in Maryland pound net menhaden catches. Before ascribing blame to Ocean Harvesters and implementing further restrictions in the Bay via a premature addendum, the Board should task the PDT to examine a range of considerations, including environmental and economic conditions, that may be a more direct cause of declining pound net catches.

Thank you for your consideration of this letter and the issues it presents. Our representatives will be available at the Board meeting to discuss these matters in more detail.

Respectfully submitted,

Ben Landry  
Vice President of Public Affairs  
Ocean Fleet Services

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<sup>2</sup> See Atlantic Menhaden Board Presentations, Slides as Presented by Lynn Fegley (MD DNR), at [https://asmfc.org/wp-content/uploads/2025/08/AtlMenhadenBoardPresentations\\_August2025.pdf](https://asmfc.org/wp-content/uploads/2025/08/AtlMenhadenBoardPresentations_August2025.pdf).

**Exhibit A – Condensed Data Pull of Pound Net Catches and Effort from the Atlantic Coastal Cooperative Statistics Program**

<b>YEAR</b>	<b>MONTH</b>	<b>LIVE POUNDS</b>	<b>DOLLARS</b>	<b>TOTAL FISHERMEN</b>	<b>TOTAL VESSELS</b>	<b>TRIP COUNT</b>
2013	JANUARY	3153	378.36	3	3	7
2013	MARCH	29326	3225.86	4	4	33
2013	APRIL	811000	98827.31	21	23	239
2013	MAY	1543416	170094.95	25	23	328
2013	JUNE	1292318	184752.25	28	25	355
2013	JULY	833336	93911.32	17	16	228
2013	AUGUST	690168	89430.24	20	17	226
2013	SEPTEMBER	468509	60997.64	17	17	200
2013	OCTOBER	398620	51820.6	7	6	109
2013	NOVEMBER	194753	21422.83	10	9	65
2013	DECEMBER	119455	14334.6	5	5	34
2014	JANUARY	8730	785.7	5	4	11
2014	APRIL	543687	71968.17	17	16	129
2014	MAY	857710	112749.08	21	19	241
2014	JUNE	1031236	155653.72	22	22	289
2014	JULY	972667	167804.37	19	18	250
2014	AUGUST	919085.67	210418.66	17	15	210
2014	SEPTEMBER	1092636	282085.11	22	16	245
2014	OCTOBER	594188	154902.88	16	14	159
2014	NOVEMBER	179532	23219.16	14	11	82
2014	DECEMBER	51650	5681.5	5	5	22
2015	JANUARY	6650	864.5	3	3	5
2015	APRIL	545015	81752.25	10	11	104
2015	MAY	1148126	149373.42	19	20	272
2015	JUNE	1421704	227603.92	18	17	309
2015	JULY	784689	125619.68	16	14	225
2015	AUGUST	1025680	163558.8	15	16	211
2015	SEPTEMBER	1110189	177915.24	17	15	237
2015	OCTOBER	549020	87843.2	11	11	129
2015	NOVEMBER	115980	15193.4	9	8	47
2015	DECEMBER	86720	12975.2	8	7	33
2016	MARCH	339075	50861.25	9	7	51
2016	APRIL	433176	68888.16	13	11	105
2016	MAY	609640	90966	15	10	147
2016	JUNE	1253667	188410.05	17	13	224
2016	JULY	682170	115968.9	14	8	179

2016	AUGUST	1054217	284638.59	14	8	200
2016	SEPTEMBER	660337	79240.44	10	8	150
2016	OCTOBER	132150	21144	7	6	56
2016	NOVEMBER	16770	2683.2	4	3	19
2016	DECEMBER	45553	7288.48	4	4	18
2017	MARCH	37621	5643.15	4	3	14
2017	APRIL	314830	53521.1	6	4	75
2017	MAY	178413	28546.08	7	4	75
2017	JUNE	424190	68327.4	7	7	95
2017	JULY	530662	122052.26	10	6	129
2017	AUGUST	325802	74934.46	13	9	111
2017	SEPTEMBER	621406	99424.96	10	9	123
2017	OCTOBER	262240	86539.2	7	6	84
2017	NOVEMBER	26375	8703.75	9	6	27
2018	APRIL	794300	127344	13	9	121
2018	MAY	650790	104126.4	12	8	145
2018	JUNE	475682	80865.94	14	11	181
2018	JULY	191730	34511.4	11	7	105
2018	AUGUST	262990	36818.6	8	5	89
2018	SEPTEMBER	85900	15462	7	6	55
2018	OCTOBER	161740	27495.8	7	7	52
2019	MARCH	174740	24463.6	7	4	29
2019	APRIL	740970	103735.8	12	9	127
2019	MAY	230600	36896	6	4	70
2019	JUNE	295350	44302.5	10	6	78
2019	JULY	397570	59635.5	10	7	93
2019	AUGUST	518040	82886.4	11	6	104
2019	SEPTEMBER	519697.5	83151.6	9	6	92
2019	OCTOBER	176270	28203.2	6	6	58
2019	NOVEMBER	38980	5067.4	6	6	25
2019	DECEMBER	6570	1051.2	4	3	11
2020	MARCH	224280	35884.8	8	7	44
2020	APRIL	172430	27588.8	10	7	58
2020	MAY	169830	30569.4	7	5	70
2020	JUNE	626760	125352	10	9	112
2020	JULY	290350	232280	7	5	102
2020	AUGUST	264420	87258.6	7	5	75
2020	SEPTEMBER	407690	163076	7	5	81
2020	OCTOBER	190924	30547.84	6	5	61
2020	NOVEMBER	22210	3553.6	6	5	19
2020	DECEMBER	32890	5262.4	5	4	14
2021	MARCH	63750	9562.5	4	4	13
2021	APRIL	259134	41461.44	9	7	59

2021	MAY	320902	64180.4	10	8	63
2021	JUNE	698086	111693.76	11	10	132
2021	JULY	553935	88629.6	8	6	92
2021	AUGUST	325630	52100.8	7	5	75
2021	SEPTEMBER	298214	47714.24	9	7	72
2021	OCTOBER	254650	40744	8	7	64
2021	NOVEMBER	10820	1731.2	4	4	11
2021	DECEMBER	45120	7219.2	5	4	23
2022	MARCH	365270	65748.6	5	4	33
2022	APRIL	471150	89518.5	6	5	76
2022	MAY	125963	20154.08	6	5	43
2022	JUNE	395126	79025.2	12	9	125
2022	JULY	343940	61909.2	10	8	101
2022	AUGUST	565990	101878.2	11	8	121
2022	SEPTEMBER	571080	114216	11	8	101
2022	OCTOBER	369740	44368.8	8	6	71
2022	NOVEMBER	80600	13702	5	4	23
2022	DECEMBER	42030	7145.1	4	3	19
2023	APRIL	282120	64887.6	8	5	68
2023	MAY	102450	24588	7	5	42
2023	JUNE	238020	57124.8	9	7	75
2023	JULY	432930	86586	8	6	81
2023	AUGUST	286420	63012.4	6	6	69
2023	SEPTEMBER	318940	70166.8	6	5	66
2023	OCTOBER	253400	55748	6	5	63
2023	NOVEMBER	34320	7550.4	5	5	26
2023	DECEMBER	10160	2032	4	3	11
2024	MARCH	134510	29592.2	6	5	48
2024	APRIL	96020	20164.2	6	5	42
2024	MAY	8022	2165.94	5	4	13
2024	JUNE	10696	2353.12	7	6	39
2024	JULY	2965	1719.7	6	5	15
2024	AUGUST	55240	13257.6	7	6	37
2024	SEPTEMBER	156925	36092.75	5	5	45
2024	OCTOBER	64780	13603.8	4	3	33
2024	NOVEMBER	7540	1583.4	5	4	12

## Exhibit B – Analysis of Maryland Harvest Sizes and the Number of Virginian Nets Set

I was provided the following data:

- 1) semi-monthly number of nets set by Virginian fisheries for the period 2015 to 2024, along with the ten-year average for each month (Table 2 in Atlantic Menhaden Board Presentation); and
- 2) monthly Maryland Pound Net Harvest for the period 2022 to 2024, along with the 10-year average harvest for each month (Figure 11 in Atlantic Menhaden Board Presentation).

I aggregated the number of nets set by year and month in order to transform it from a semi-monthly series to a monthly series. Further, both the nets set, and the Maryland harvest data, show monthly seasonality. I de-seasonalized the data by subtracting the 10-year average for each month from each series. This resulted in two series of deviations: (1) the monthly deviation of the number of nets set from the 10-year average number of nets set and (2) the monthly deviation of the Maryland harvest size from the 10-year average harvest size.

Next, I regressed the monthly Maryland harvest size deviation (the dependent variable) on the following independent variables: (1) the monthly number of nets set deviation and (2) the one-month lag of the Maryland harvest size deviation. I included the second independent variable because the monthly harvest size deviations show strong autocorrelation. That is, the size of the harvest deviation in one month affects the harvest deviation in the following month.

The table below shows the results of the regression:

	Estimate	Standard Error	t value	p value	
Intercept	-24.1612	23.0497	-1.048	0.30239	
Number of nets set deviation	0.6742	0.2165	3.115	0.00387	**
1-month lagged harvest size deviation	0.8164	0.1141	7.152	4.05E-08	***

The coefficient of the number of nets set deviation variable is 0.6742 and – with a p value of 0.00387 – is statistically significant at the 1 percent level. This result indicates a strong, positive relationship between the number of nets set deviation and the Maryland harvest deviation. Thus, when the number of Virginian nets set exceeds its 10-year average, the Maryland harvest size also tends to be above its 10-year average. Conversely, when the number of Virginian nets set is below its 10-year average, then the Maryland harvest size also tends to be below its 10-year average. Since it is highly unlikely that the number of Virginian nets set could be causing the size of the Maryland harvest (or vice versa), the most likely interpretation of this positive relationship is that both variables are responding to a common cause – namely, the extent of the fish presence in the bay.