

Economic Contributions of the Virginia Seafood Industry and the Effects of Virginia Seafood Products in Retail Stores and Restaurants in 2023



Economic contributions of the Virginia seafood industry

About the Study

This document provides an updated and comprehensive assessment of the economic contributions of Virginia's seafood industry and its retail and restaurant sales of Virginia seafood products, using 2023 data. This report is derived from the peer-reviewed publication, "The Economic Contributions of the Virginia Seafood Industry and the Effects of Virginia Seafood Products in Retail Stores and Restaurants in 2023," published in *Fishes* journal <https://doi.org/10.3390/fishes10080373>. By quantifying the direct and ripple effects across production and consumer sectors, it offers valuable insights for policymakers and stakeholders to inform evidence-based decisions and support sustainable investment in the state's seafood supply chain. The study also evaluates the economic role of Virginia seafood products sold in retail stores and restaurants, based on secondary data sources. The results provide evidence-based insights to guide decision-making, inform stakeholders, and support continued investment in Virginia's seafood supply chain and related economic activities.

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Cover photo: Virginia oysters by Keri Rouse for Virginia Tech.

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About the Virginia Seafood AREC

The Virginia Seafood Agricultural Research and Extension Center provides education, scientific and technical guidance, support, and leadership to the commercial seafood and aquaculture industries throughout Virginia and the United States.

About SEAMaR

The Seafood Economic Analysis and Marketing Research (SEAMaR) team at VSAREC spans areas of business development, policy, marketing, and economics.



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Executive Summary

This document provides an updated and comprehensive assessment of the economic contributions of Virginia's seafood industry and its retail and restaurant sales of Virginia seafood products, using 2023 data. This report is derived from the peer-reviewed publication:

Gonçalves, F. H., van Senten, J., & Schwarz, M. H. (2025). The Economic Contributions of the Virginia Seafood Industry and the Effects of Virginia Seafood Products in Retail Stores and Restaurants in 2023. *Fishes*, 10(8), 373. <https://doi.org/10.3390/fishes10080373>

By quantifying the direct and ripple effects across production and consumer sectors, it offers valuable insights for policymakers and stakeholders to inform evidence-based decisions and support sustainable investment in the state's seafood supply chain. Virginia's coastal location and abundant marine resources make its seafood industry a vital contributor to the state's economy, supporting both local communities and tourism. This study applied input-output models and updates the economic contributions of the Virginia seafood industry using 2023 data, building on models developed for 2019 that capture both direct effects and broader economic ripple effects. In 2023, the industry generated \$1.27 billion in total economic output and supported over 6500 jobs—including watermen, aquaculture farmers, processors, and distributors—resulting in \$238.3 million in labor income. Contributions to state GDP totaled \$976.7 million, and tax revenues exceeded \$390.4 million. The study also evaluates the economic role of Virginia seafood products sold in retail stores and restaurants, based on secondary data sources. In 2023, these sectors generated \$458 million in economic output, supported more than 3600 jobs, produced \$136.7 million in labor income, and \$280.8 million in value added. Combined tax contributions surpassed \$74 million. Importantly, the analysis results for the Virginia seafood products from retail and restaurant should not be summed to the seafood industry totals to avoid double-counting, as seafood products move as output from one sector as an input to another. These results provide evidence-based insights to guide decision-making, inform stakeholders, and support continued investment in Virginia's seafood supply chain and related economic activities.

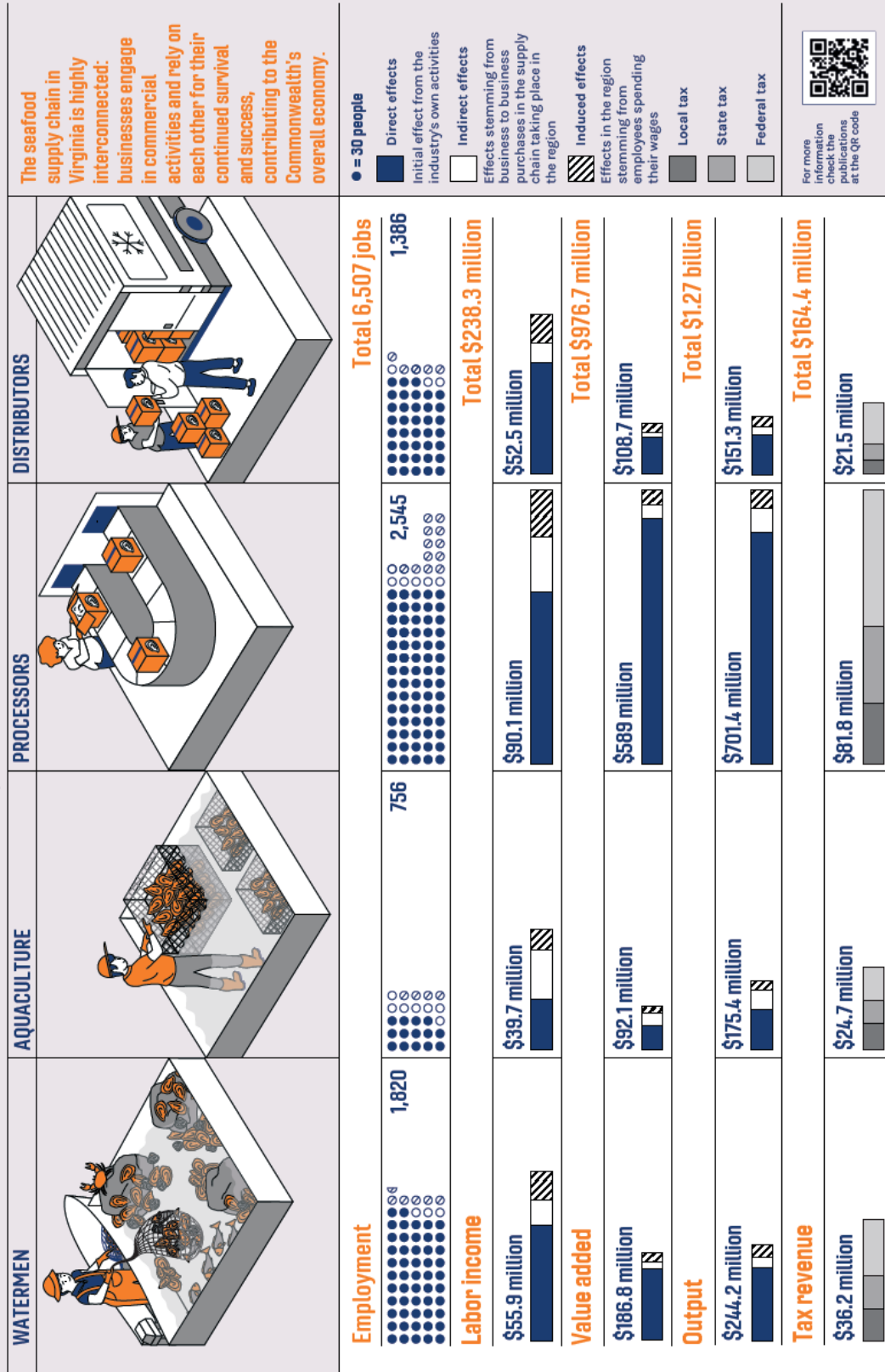
Highlights

- Total economic output of the Virginia seafood industry in 2023 was over \$1.27 billion.
- The Virginia seafood industry supported a total of 6,507 jobs.
- The direct effect accounted for 5,224 jobs.
- Seafood processors had the greatest impact on employment, labor income, and output within the supply chain.
- The industry's output multiplier was 1.29 in 2023, meaning every dollar spent contributed an extra 29 cents to the state's economy.
- In 2023, Virginia's seafood industry generated a total of \$164.4 million in taxes from federal, state, and local sources.
- The analysis for retail and restaurant sectors was kept separate to avoid double-counting with the seafood industry totals.
- Combined, Virginia seafood products from retail stores and restaurants generated \$74.7 million in taxes.

Visual summary - infographic

ECONOMIC CONTRIBUTIONS OF THE VIRGINIA SEAFOOD INDUSTRY IN 2023: \$1.27 BILLION

For economic effects from VA seafood products in retail and restaurants, see the back page.



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Visual summary - infographic

ECONOMIC CONTRIBUTIONS OF VIRGINIA SEAFOOD PRODUCTS IN 2023: \$458 MILLION

Economic effects in the state of Virginia only.



For more information check the QR code at the bottom of the infographic.

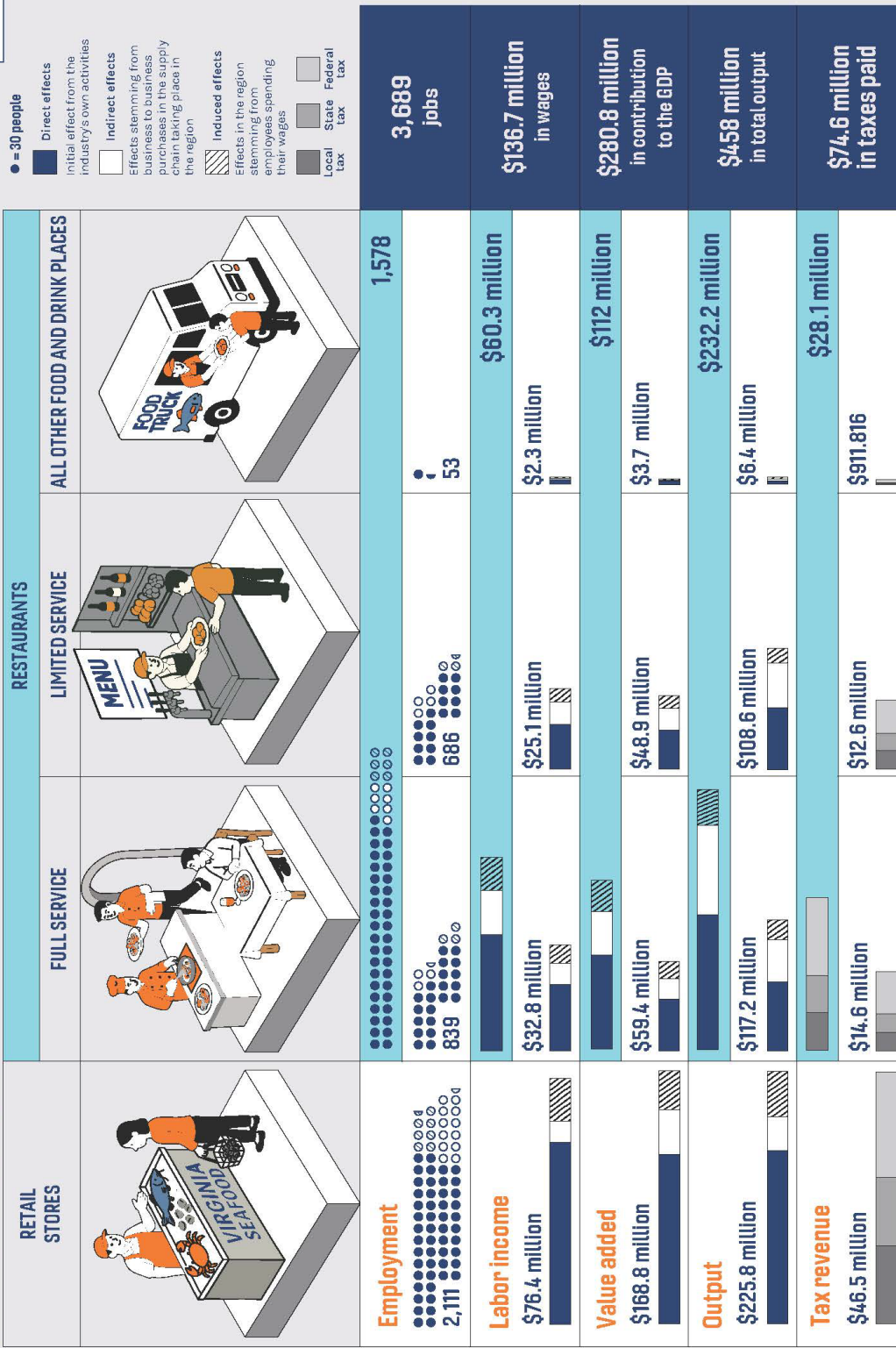


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Introduction

Economic contribution studies provide a robust framework for quantifying the ripple effects of industry activity, including direct, indirect, and induced effects (Hegde et al., 2022; Kumar et al., 2024). The findings of this line of research studies help stakeholders and policymakers understand how industry expenditures flow through local and regional economies, generating employment, income, and tax revenues (Gonçalves et al., 2024). Due to the quality and accessibility of datasets, IMPLAN is one of the most used modeling software to perform economic impact and contributions analysis based on input-output (I-O) models (Hegde et al., 2022; Kumar et al., 2023; Leontief, 1936). Recent studies have quantified the economic contributions of Virginia's seafood industry, though many assessments focus primarily on production, processing, and distribution activities. For instance, Virginia's seafood industry contributed approximately \$1.1 billion in total economic output and supported over 7000 jobs in 2019, representing industry expenditure patterns developed from pre-COVID-19 data (Gonçalves et al., 2024). However, these estimates did not account for the retail and restaurant sectors, where seafood products ultimately reach consumers, thereby limiting the understanding of the seafood industry's full impact, particularly given the scale and significance of these downstream sectors. Due to budgetary and time constraints, the economic contributions from local seafood product sales in restaurants and retail stores in Virginia were not considered in the previous study. Similarly, other studies examining the economic contributions of seafood industry sectors often overlook or fail to consider retail and restaurant sectors in their analysis (National Marine Fisheries Service, 2024a; National Restaurant Association, 2025; National Retail Federation, 2024). Virginia ranks as the third-largest seafood producer in the nation (National Marine Fisheries Service, 2024a); retail stores and dining establishments link consumers to regional seafood offerings, acting as intermediaries between fishermen or aquaculture producers and end customers. They also provide distinctive gastronomic experiences that appeal to both locals and visitors, helping to enrich Virginia's lively culinary scene. (National Restaurant Association, 2025). Although their significance is clear, the role of seafood sales within these retail and food service businesses has not been extensively studied.

The retail sector is the biggest private employer in the United States, supporting over 55 million jobs and serving as a foundational pillar of the national economy (National Retail Federation, 2024). In Virginia alone, the total economic impact of retail was \$128.1 billion in 2022, supporting more than 835,000 jobs and generating over \$19 billion in labor income (National Retail Federation, 2024). Similarly, the restaurant industry generated an estimated \$24.4 billion in economic output and supported more than 366,000 jobs in 2023 (National Restaurant Association, 2024). These figures highlight the potential scale of seafood's economic footprint beyond the dockside and processing plant. By not accounting for these downstream transactions, traditional seafood economic analyses risk underestimating the industry's true contribution to Virginia's economy. Incorporating seafood-specific retail and restaurant expenditures into economic contribution studies provides a more complete approach, considering the value of raw seafood products and their transformation into consumer-ready goods and dining experiences. However, conducting such studies presents several challenges, namely the availability of accurate and representative primary data. Industry-specific data are often proprietary, inconsistently collected, or unavailable, particularly in downstream sectors such as restaurants and retail seafood markets (Hegde et al., 2022). Analysts need to rely on informed assumptions, proxy data, and mixed-methods approaches to address these limitations. Thoughtful survey design, stakeholder engagement, and validation techniques are necessary for developing credible and defensible estimates. Moreover, the capacity to adjust approaches from the originally intended strategies is crucial for alleviating potential negative outcomes stemming from data collection, low respondent engagement, and insufficient coverage. Additionally, the assumptions embedded within I-O models, such as local purchase coefficients, margins, and labor intensities, can significantly influence results and must be transparently documented (Gonçalves et al., 2024). Despite these methodological complexities, economic contribution studies offer critical insights for investment decisions, policy development, and public communication. In Virginia, a state that leads the nation in hard clam production and ranks among the top producers of oysters on the U.S. Atlantic coast (National Marine Fisheries Service, 2024b; VMPB, 2025), local seafood is not only a vital source of income for fishers and processors but also a

valued component of culinary identity, tourism, and cultural heritage (VMPB, 2025). By integrating retail and restaurant expenditures on local seafood into economic contribution analysis, this study aims to fill an important gap and present a more holistic estimate of the seafood industry's role in Virginia's economy that was not covered in the previous study (Gonçalves et al., 2024). However, models that capture retail and restaurant expenditures associated with local seafood purchases and sales can only be developed through effective data collection that achieves statistical significance in its coverage. Therefore, we updated the estimates of the economic contributions of the seafood industry for output, jobs, labor income, and tax revenue for the year 2023. This approach considered an update on the production side (commercial fisheries and aquaculture), processors, and distributors. Additionally, this study provides the economic contributions of Virginia seafood products sold by retailers and purchased by restaurants and were estimated separately rather than summed, as their inputs are part of the production side's output; integrating the results would lead to double-counting effects. Our study also revealed how different supporting economic sectors are interconnected and their collective impact on the overall economy of the Commonwealth. Therefore, this study aims to quantify the economic contributions of the Virginia seafood industry and the impact of Virginia seafood products in retail stores and restaurants for 2023, providing reference values that can inform decision-making policies supporting industry activities.

Methods

The estimates of the economic contributions derived from local seafood expenditures from retail stores and restaurants required efforts for obtaining data from multiple sources, assessment of expenditure data at a firm level, and the design and execution of surveys to collect additional information to fill gaps, in line with previous publications (Gonçalves et al., 2024; Hegde et al., 2022; Kumar et al., 2024), following the framework described below:

Identification of Required Data and Gaps

Identifying sources of information about restaurants and retail stores dealing with seafood in Virginia involved consulting seafood distributors and state agencies to determine the number of business entities. Regulatory bodies including government agencies like the Virginia Department of Taxation and the Virginia Department of Tourism (virginia.org), as well as other organizations overseeing restaurants and retail establishments, as well as restaurant associations, were consulted to obtain the number of active permits and commercial licenses within the state and to obtain contact lists. Some secondary data was only accessible via a formal request and was not publicly available online. Data from secondary sources and literature reviews were used to verify and validate the number of restaurants and retail stores selling seafood in Virginia and to identify potential data gaps necessary for conducting an economic contribution assessment of Virginia's seafood sector.

Data for direct effects and expenditure data

The direct economic effects encompass the overall production value produced by the main sectors under review. For the seafood sector in Virginia, these effects involve revenue from commercial fishing, aquaculture operations, seafood processing plants, distribution channels, retail stores, and dining establishments. The economic contributions for commercial fisheries, aquaculture, processors, and distributors were estimated based on updates and secondary data applied to the existing primary-data models developed for the year 2019 (Gonçalves et al., 2024). The updates on the direct effects on the existing 2019 models considered applying the newest values of seafood landings for commercial fishers of \$186 million (NOAA Fisheries, 2025) and \$104 million for aquaculture (USDA-NASS, 2024). The number of active licenses in operation for both commercial fishers and aquaculture farmers who reported production of \$1,000 or more was obtained for the estimates of direct effects on employment (Virginia Marine Resources Commission (VMRC), 2024). Data on direct effects on labor income covers payments to proprietors and employees. The survey asked about total payroll costs, including income for both groups.

To focus on Virginia's economic contributions and exclude leakages, we collected data on the percentage of sales and employment occurring within the state, ignoring out-of-state transactions. In this setting, economic leakages pertain to imported goods—whether from other countries or different states—that Virginia's seafood companies buy. These imports do not produce further direct impacts within Virginia and are viewed as economic spillovers (Gonçalves et al., 2024).

For retail sales, we obtained scanner data from Nielsen IQ. Since collecting primary data from businesses was expected to be challenging, our analysis utilized seafood sales figures from retail outlets in Virginia, gathered through barcode scanning data provided by NielsenIQ, a firm renowned for its expertise in marketing analytics and consumer insights. The dataset for 2023 covers 80-82% of retail activities in Virginia. In addition, existing expenditure models for both the retail and restaurant sectors are available on the IMPLAN modeling software through their subscription-based platform. Unlike other sectors, such as aquaculture, which is aggregated to industry 14 - Animal production, except for cattle, poultry, and eggs, the retail industry 389 - Retail - Food and beverage stores does not require disaggregation. Similarly, for the food service industry, industries 491 - Full-service restaurant, industry 492 - Limited-service restaurant, and industry 493 - All other food and drinking places are fully disaggregated, highly detailed, and provide reliable and defensible data for 2023, necessary to perform the economic contribution analysis.

Survey Design and Data Collection

Data not available from secondary sources or consultations with stakeholders was collected through a survey (administered using QuestionPro online) to gather economic information from retail stores, restaurants, and blended services that combine retail and restaurant elements, following the guidelines set by the Virginia Tech Institutional Review Board (IRB #24-680). The survey was pre-tested and reviewed by restaurant owners and representatives from restaurant associations. After receiving insightful feedback, adjustments were made to enhance the accuracy and representativeness of the survey to capture retail and restaurant business expenditures. The expenditure pattern model was built using intermediate input, employee compensation, and total output, while also integrating the corresponding local purchase percentages (LPP).

Scope of data collection

The survey was designed to collect primary data that accurately represents businesses across the entire state entities, applying best practices in data collection. It aimed to gather sufficient observations for retail stores and restaurants within the overall dataset, recognizing the differences in spending and revenue patterns at various supply chain levels. To support the development of economic contribution models in IMPLAN, each item collected with the survey was summed for each individual business. The total values were subsequently converted into coefficients, serving as the basis for creating new models or adjusting existing IMPLAN models for the retail and restaurant sectors.

List frame, recruitment of participants and survey activities

Virginia has over 118 thousand retail establishments (National Retail Federation, 2024) and over 17 thousand eating and drinking place locations (National Restaurant Association, 2024). Contact lists were obtained from the Virginia Department of Tourism, responsible for the listing directory on the portal virginia.org. Google searches helped locate and contact some businesses in the state of Virginia. We obtained a list of 5,982 establishments, and only 810 of them had email addresses, which were used as a list frame for applying the survey instrument. The Virginia Beach Restaurant Association, the Virginia Restaurant Lodging Travel Association, the County of Louisa, through their community engagement manager, and other industry stakeholders shared the survey instrument with their members and contacts. Our recruitment strategy involved emailing eligible entities from the contact lists that described the study, emphasized the voluntary nature of participation and data confidentiality, and requested their involvement.

Furthermore, in the recruitment process, in-person meetings were arranged with individual business owners. Each survey response was recorded and coded to protect respondent identities and ensure confidentiality. Data collection spanned 55 days, with the survey being active from February to April 2025. Various efforts were undertaken to reach out to individuals within the intended groups during this period. After survey activities concluded, the data were input into Microsoft Excel spreadsheets, thoroughly cleaned, and analyzed.

Accounting for non-responses

As anticipated by Virginia's numerous retail and restaurant establishments, obtaining statistically significant coverage of the survey data presented the biggest challenge. Therefore, we accounted for non-responses by adjusting the NielsenIQ dataset derived from scanner data, which represents 80-82% of retail activities in Virginia for 2023, making it a robust and reliable data source. In this instance, we opted for the most conservative rate of 80%. Considering the dataset from NielsenIQ, total seafood sales in Virginia's retail stores for 2023 were estimated at \$154.9 million. This figure accounted for coverage adjustments and included only local Virginia seafood, where we applied a local purchase percentage (LPP) of 26.49% from the IMPLAN sector 389 (IMPLAN, 2024) and was seen as the overall output for the sector in this economic contribution analysis. In relation to restaurants, we used the IMPLAN data for fish and seafood items from the system's industry demand commodity balance sheets, along with their respective LPP, to define the total local Virginia seafood expenditure as a baseline for intermediate inputs in the economic modeling of its contribution to the Virginia seafood industry. IMPLAN is a widely used economic modeling tool that is considered a reliable and robust data source in economic modeling due to its tradition and partnerships with official data sources. The total value of locally purchased fish and seafood items for full-service, limited-service, and all other food and drinking establishments was \$57.8 million in 2023 (IMPLAN, 2024)..

Economic contributions assessment - Theory of input-output modelling

This research utilized an Input-Output (IO) methodology grounded in the IMPLAN framework, referencing the IMPLAN data from 2023. This database includes matrices of technical coefficients that reflect both backward and forward linkages related to all economic activities in Virginia. IMPLAN models produce linear production functions, which link an industry's outputs to the inputs needed to generate those outputs. The mathematical rationale outlined below was used in previous studies (Gonçalves et al., 2024; Hegde et al., 2022; Kumar et al., 2024). The model assumes a straight-line connection between the total output q of sector i , depicted in a generalized input-output model as the aggregate of goods and services sold to other sectors (z_{ij}) and to the final demand sector (f_i). This relationship can be formulated as:

$$q_i = \sum_1^N (z_{ij} + f_i)$$

The variable z_{ij} , which denotes intermediate sales across all sectors j , is a unique linear expression based on q_j , the output from intermediate industries. Dividing this function by q_j produces a matrix of technical coefficients used in the input-output model. The indices i and j can take any values from 1 to N . Inverting this matrix enables the depiction of the input-output relationships:

$$q = [I - A]^{-1} * F = \begin{pmatrix} m_{ij} & \dots & m_{ij} \\ \vdots & \ddots & \vdots \\ m_{ij} & \dots & m_{ij} \end{pmatrix} * F = M * F$$

In the second equation, the symbol I stands for an identity matrix, while A is the technical coefficient matrix, typically obtained by dividing z_{ij} by q_j . The element m_{ij} refers to the supply-chain

interaction coefficients within the multiplier matrix M . However, in this research, A was derived by dividing z_{ij} by z_j , as the detailed data available only covered commodity purchases and did not include labor costs or taxes (IMPLAN, 2024). F denotes the matrix of final demand for all sectors in the economy. The output multiplier for each sector j is obtained by dividing M by I , which illustrates the magnitude of economic effects, particularly the rates at which production levels change. These multipliers are useful for assessing the direct, indirect, and induced impacts of spending activities throughout each stage of the Virginia seafood supply chain. Additionally, similar to the output multiplier, there are employment, labor income, and value-added multipliers that indicate the rate at which these variables change due to their influence on the core level of economic activity (Hegde et al., 2022). These multipliers provide insight into how economic activities within the Virginia seafood sector impact various parts of the economy.

The economic analysis is enhanced by integrating a Social Accounting Matrix (SAM), offering a more comprehensive view of the region's economic interactions (Kaliba and Engle, 2004). The SAM encompasses exchanges among different economic agents, offering a better insight into how household income is produced (Kaliba and Engle, 2004). The online IMPLAN platform allows for seamless incorporation of the input-output framework and social accounting matrix, offering an intuitive and adaptable method to assess the direct, indirect, and induced economic effects of Virginia's seafood sector. In summary, the IMPLAN multipliers from its SAM is responsible for estimates of the ripple effects of how much each supporting sector is being benefited by the direct expenditures of the seafood industry activities.

Regarding the description of economic effects, direct effects refer to outcomes within the industry under study, such as employment and sales by seafood companies. Indirect effects occur in connected sectors, such as how watermen's fuel purchases impact the larger oil and gas industry. The induced effects involve changes in household spending driven by variations in income across related sectors, including salaries paid, which stimulate further economic activity through expenditures on housing, utility bills, groceries, and other goods and services (Kaliba and Engle, 2004).

Industry Impact Analysis

County-level IMPLAN datasets for Virginia in 2023 were obtained via a one-year subscription to The IMPLAN Group's cloud-based platform (IMPLAN, 2024). The IMPLAN datasets now include 528 industries, such as commercial fishing (industry 17), seafood product preparation and packaging (industry 92), and truck transportation (industry 417) (IMPLAN, 2024). Aquaculture is not assigned to a specific sector as it falls under animal production (industry 14), excluding cattle, poultry, and eggs. Additionally, industry 417 (Truck transportation) is not solely linked to seafood distribution. In the case of retail stores, IMPLAN has aggregated food and beverage stores in industry 389. For the restaurant sector, IMPLAN has three dedicated industries with a high level of detailing: Full-Service restaurants (Industry 491), Limited-Service restaurants (Industry 492), and all other food and drinking places (Industry 493).

For estimating the 2023 economic contributions of the Virginia seafood industry and the economic effects of Virginia seafood products sales and purchases in retail stores and restaurants, we utilized IMPLAN's Industry Impact Analysis (Detailed) tool. The Industry Impact Analysis (IIA) is an updated analytical tool available in the IMPLAN system derived from the Analysis by Parts (ABP) (Gonçalves et al., 2024; Hegde et al., 2022; Kumar et al., 2024) that allows for the input of separate components of direct effects and the customization of expenditure patterns for each industry being studied. Thus, it was feasible to refine the commodity inputs specification, specify a share of local labor income, establish local purchase percentages (LPP), and apply IMPLAN's spending data patterns.

To utilize this model effectively, it is crucial to first identify the direct impacts of Virginia's seafood sector. These impacts were derived from survey responses and adjusted for non-respondents. Data on labor income per worker from the survey, combined with industry averages from IMPLAN for Taxes on Production and Imports (TOPI) and Other Property Income (OPI), were used to calculate the direct value-added impact. An expenditure pattern within the industry was established to estimate indirect effects, considering spending within the seafood supply chain at each stage—watermen, aquaculture farmers, processors, and distributors. Coefficients for these patterns were calculated by dividing each specific input cost by the total cost of all intermediate inputs at each level. These coefficients were then mapped to relevant NAICS

industry codes and corresponding IMPLAN commodity codes. Separate expenditure patterns were created for each activity, excluding seafood expenses purchased from processors and distributors, as these expenses are offset by the revenue obtained from watermen and aquaculture farmers. Including these costs as expenses for processors and distributors would result in double-counting in the estimates. The Industry Impact Analysis (IIA) method captures total revenue at each stage of the supply chain without double-counting sales, considering it only as part of the gross revenue at the gate, and excluding it from expenses in forward linkages. To assess the induced effects of the Virginia seafood industry, a labor income component was incorporated into the model to represent employee compensation. After development, the economic impact scenarios were carried out without implementing any scaling modifications. The IMPLAN platform provides a user-friendly and adaptable environment for integrating the input-output analysis with the social accounting matrix (Hegde et al., 2022; Kaliba and Engle, 2004). This combination enables the creation of estimates covering the Virginia seafood industry's direct, indirect, and induced economic impacts.

As survey responses did not present statistical representativeness, the models developed for retail and restaurants can be considered questionable due to the reduced number of observations of economic data provided by businesses. Therefore, we utilized the level of seafood items purchased available on the IMPLAN system, and estimated the economic contributions of these purchases as the only item in the spending pattern. The values cannot be incorporated into the economic contributions of the Virginia seafood industry because these intermediate inputs (fish and seafood-related items) are the output of production from fishers and aquaculture farmers and should not be double-counted. Therefore, this manuscript provides an updated value of the economic contributions of the Virginia seafood industry for 2023 and the economic contributions of Virginia seafood purchases and sales from retail stores and restaurants in 2023.

Study Area Characteristics

Virginia is in the Mid-Atlantic region and borders the District of Columbia, Maryland, West Virginia, Tennessee, Kentucky, North Carolina, and the Atlantic Ocean. Its population exceeds 8.7 million residents and 3.4 million households. Virginia's Gross Domestic Product (GDP) was \$721 billion in 2023. This was generated by 498 of the 528 existing industries, sustained over 5.7 million jobs, produced \$633 billion in personal income, and yielded a total output of \$1 trillion (IMPLAN, 2024). Most seafood production occurs in Eastern Virginia, which is situated between the Chesapeake Bay and the Atlantic Ocean, serving as a hub for seafood consumers.

Results

Response and coverage rates

The survey was sent to 810 email addresses of restaurant and retail businesses in Virginia. The QuestionPro platform showed 350 recipients had accessed the survey instrument, and a 12.8% completion rate. The survey received 39 responses, representing 50 business locations in Virginia. Of these, 53.1% were full-service restaurants, 34.4% were limited-service restaurants, 3.1% were retail stores, and 9.4% were retail stores with limited-service restaurants. The businesses represented by respondents were distributed as follows: 44% from Hampton Roads / Southeastern Virginia (Tidewater), 28% from Northern Virginia, 24% from Central Virginia, 4% from Shenandoah Valley / Western Virginia, and 4% from Central / South-Central Virginia. 38.1% of these businesses had seafood sales responsible for 51% or more of their total revenue (28.6% between 51% and 75%, and 9.5% more than 75%). Additionally, 61.9% of these businesses had up to 50% of their total revenue originating from seafood sales (9.5% less than 10%, 38.1% between 11% and 25%, and 14.3% between 26% and 50%).

The survey responses indicated that 74% of restaurant owners know which seafood species they purchase are Virginia seafood products, and 56% of them (or 41.4% of all respondents) distinguish Virginia

seafood from other seafood for marketing purposes. Shrimp (10%) and salmon (9.5%) are the leading species offered in restaurants, followed by oysters (8.6%) and scallops (8.6%). Finfish such as Mahi-Mahi (7.7%), tuna (7.3%), striped bass (5.9%), and flounder (5.9%) follow in rank. Squid (5.5%), cod (5%), lobster (5%), blue crabs (4.1%), and clams (3.6%) come next, along with black seabass (3.2%). Farm-raised catfish (2.3%), blue catfish (1.8%), tilapia (1.4%), croaker (0.9%), and spot (0.9%) follow. Moreover, 2.7% responded with other options, including octopus, grouper, halibut, and haddock. These seafood products are purchased mainly from large corporation distributors (48.8%), followed by local Virginia distributors (22.6%), local Virginia aquaculture farms (12.2%), and 3.3% from local Virginia fishers.

The survey captured business owners' perceptions regarding the importance of factors influencing a customer's decision to visit a seafood business, along with the challenges they face that affect their business's success. These perceptions were measured on a scale from 0 to 10, where zero is not relevant and 10 is very relevant. In terms of significant factors, the quality of seafood scored the highest with 9.2 points, followed by the variety of seafood products at 8.8, price at 8.4, atmosphere at 7.4, and location at 7.2. Among the lowest-ranked factors in importance to business owners, community engagement in hosting events and hiring teens and the elderly scored 6.6, while proximity to the coast ranked 5.5, and offering local Virginia seafood was shown to have the least importance on the scale, with a score of 5. Among business owners' challenges, tight margins and overhead costs are tied as the highest score of 9, followed by price volatility at 8, and labor availability/reliability at 7.8. Next are inflation, steady supply, and weather, tied at 7.4.

While survey respondents provided insights into general aspects of their businesses, the survey questions related to economic data led to a substantial drop in participation; with only five responses representing full-service restaurants, nine limited-service restaurants, and one single retail store. This limited response poses challenges to defend the validity of the models generated due to the lack of statistical relevance of the sample size. Therefore, we decided to approach the analysis of the retail and restaurant sectors in a different way, considering the economic contributions of Virginia seafood purchases and sales from retail stores and restaurants in 2023, utilizing secondary data sources from INPLAN datasets and NielsenIQ scanner data. This information is presented separately from the economic contributions of the Virginia seafood industry, considering watermen, aquaculture farmers, seafood processors, and distributors for 2023.

Economic contributions of the Virginia seafood industry, 2023

In 2023, Virginia's seafood sector contributed an overall economic output of approximately \$1.27 billion, encompassing activities from watermen, aquaculture operations, seafood processing, and distribution channels. This figure comprises a direct contribution of \$986.7 million, an indirect contribution of \$157.2 million, and an induced contribution of \$128.5 million. The industry supported around 6,507 jobs in total, with direct employment accounting for 5224 positions, indirect for 580, and induced for 703. The total labor income generated was estimated at \$238.3 million, while the total value added was approximately \$976.7 million.

Table 1 highlights the industry's economic impacts segmented into direct, indirect, and induced effects for the year 2023. All monetary values are inflation-adjusted to 2023 standards and rounded to the nearest whole number.

Table 1. Economic contributions of the Virginia seafood industry activities in 2023. Values expressed in 2023 dollars.

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	5,224	\$147,679,352	\$811,637,573	\$986,703,783
Indirect Effect	580	\$49,215,728	\$82,653,390	\$157,223,744
Induced Effect	703	\$41,436,023	\$82,439,558	\$128,479,826
Total Effect	6,507	\$238,331,103	\$976,730,521	\$1,272,407,353

Seafood processors have the greatest impact on employment, labor income, and output, followed by watermen, aquaculture, and seafood distributors (Table 2). This study of the Virginia seafood sector highlighted its overall impact but excluded expenses related to seafood purchased by processors and distributors from commercial fisheries and aquaculture to avoid counting the revenue from producers as input for processing and distribution.

The Virginia seafood sector's output multiplier was 1.29 in 2023, indicating that every dollar spent contributed an extra 29 cents to the state's economy. The employment and labor income multipliers stood at 1.25 and 1.61, respectively. This suggests that for every five direct jobs created, one additional job is supported, and each dollar invested in wages generates an extra 61 cents in economic value. Additionally, the value-added multiplier of 1.20 signifies that each dollar produced by the industry yields 20 cents in labor income (including wages and proprietor earnings), other proprietary income (OPI), and taxes on production and imports (TOPI). A comprehensive breakdown of the supply chain's economic impact is available in Table 2.

Table 2. Economic contributions of the Virginia seafood industry activities for each level of the supply chain in 2023, expressed in 2023 dollars.

Total Impact	Employment	Labor Income	Value Added	Output
Watermen	1820	\$55,926,829	\$186,831,211	\$244,234,108
Direct	1571	\$37,890,309	\$153,593,400	\$186,653,808
Indirect	84	\$8,319,317	\$13,904,307	\$27,449,670
Induced	165	\$9,717,202	\$19,333,504	\$30,130,630
Aquaculture	756	\$39,735,750	\$92,114,626	\$175,471,201
Direct	419	\$16,526,981	\$50,465,055	\$104,225,000
Indirect	219	\$16,240,540	\$27,790,798	\$49,646,603
Induced	118	\$6,968,229	\$13,858,773	\$21,599,599
Processors	2545	\$90,103,093	\$589,064,589	\$701,403,082
Direct	2089	\$56,681,019	\$528,362,990	\$593,261,318
Indirect	193	\$17,931,618	\$29,867,880	\$60,091,388
Induced	263	\$15,490,456	\$30,833,719	\$48,050,375
Distributors	1386	\$52,565,432	\$108,720,095	\$151,298,962
Direct	1145	\$36,581,043	\$79,216,128	\$102,563,657
Indirect	84	\$6,724,253	\$11,090,405	\$20,036,083
Induced	157	\$9,260,136	\$18,413,562	\$28,699,222
TOTAL	6507	\$238,331,104	\$976,730,521	\$1,272,407,353

The Virginia seafood industry affects 480 (91%) of the 528 existing industries in the state through economic linkages. The Virginia seafood industry impacts different sectors differently, depending on factors such as employment, labor income, value-added, and economic output. Table 3 presents the economic contributions of the Virginia seafood Industry to the top 15 industries in 2023, ranked by output.

The seafood industry supports jobs in 479 industries, representing 91% of the 528 industries listed in Virginia in 2023. Nondepository credit intermediation and related activities; commercial and industrial machinery and equipment repair and maintenance; and insurance agencies, brokerages, and related activities were the most affected sectors based on employment, with an estimated 63, 60, and 48 jobs affected, respectively. While the owner-occupied housing sector is supported with value added and output in excess of \$20 million, this industry does not benefit from jobs and labor income.

Table 1. Economic contributions of the Virginia seafood industry to supporting sectors in 2023, ranked by economic output, expressed in 2023 dollars.

Industry description	Employment	Labor Income	Value Added	Output
Nondepository credit intermediation and related activities	63	\$10,960,448	\$16,524,684	\$26,891,547
Owner-occupied housing	0	\$0	\$20,408,048	\$23,131,605
Insurance agencies, brokerages, and related activities	48	\$4,730,684	\$7,506,122	\$15,109,213
Commercial and industrial machinery and equipment repair and maintenance	60	\$4,742,691	\$5,268,634	\$8,349,706
Polystyrene foam product manufacturing	13	\$922,776	\$1,435,925	\$6,625,427
Hospitals	31	\$3,009,601	\$3,660,714	\$6,436,174
Other real estate	32	\$837,226	\$2,686,566	\$6,142,422
Air conditioning, refrigeration, and warm air heating equipment manufacturing	12	\$1,030,657	\$1,831,887	\$5,631,221
Monetary authorities and depository credit intermediation	11	\$1,144,335	\$3,238,249	\$4,770,293
Electric power generation - Nuclear	4	\$775,067	\$2,687,925	\$4,514,392
Water, sewage and other systems	16	\$1,935,320	\$2,873,537	\$4,506,452
Other animal food manufacturing	3	\$204,154	\$735,925	\$4,330,616
Electric power generation - Fossil fuel	2	\$395,652	\$2,376,040	\$4,275,647
Data processing, hosting, and related services	11	\$1,605,346	\$2,554,180	\$4,270,775
Limited-service restaurants	38	\$1,070,505	\$1,980,938	\$4,230,234
All other industries*	6,164	\$216,534,169	\$920,282,285	\$1,143,191,628
Indirect and induced impact	1,284	\$90,651,751	\$165,092,947	\$285,703,570

* Include commercial fishing, seafood product preparation and packaging, truck transportation, and animal production, except for cattle, poultry, and eggs.

Tax revenue generated by the Virginia seafood industry in 2023

In 2023, Virginia's seafood industry generated a total of \$164.4 million in taxes from federal, state, and local sources (see Table 4). Of this, 24% (\$39.5 million) was local tax revenue, derived from sub-county general, sub-county special districts, and county levels. The state contribution was 27% (\$45 million), while the federal government accounted for 49% (\$79.9 million).

Table 4. Tax revenue generation by the Virginia seafood industry activities in 2023, expressed in 2023 dollars.

Tax	Watermen	Aquaculture	Processors	Distributors	Total
Local tax*	\$9,556,157	\$7,927,187	\$17,931,200	\$4,130,964	\$39,545,508
State tax	\$9,893,745	\$6,958,179	\$23,149,663	\$5,024,333	\$45,025,921
Federal tax	\$16,832,195	\$9,884,516	\$40,780,367	\$12,374,080	\$79,871,159
Total tax	\$36,282,098	\$24,769,882	\$81,861,230	\$21,529,378	\$164,442,588

*includes sub-county general, sub-county special districts, and county level

Economic contributions of Virginia seafood products from retail stores and restaurants in 2023

Retail stores selling Virginia seafood generated an output of \$225.8 million in 2023, supporting 2111 jobs, labor income of \$76.4 million, and value-added of \$168.8 million. The combined economic effects of Virginia seafood purchases by each segment of restaurants generated an output of \$232.2 million in 2023, supporting 1578 jobs, labor income of \$60.3 million, and value-added of \$112 million. Table 5 shows the breakdown of direct, indirect, and economic effects of Virginia seafood sales in retail stores and Virginia seafood purchases in all restaurant segments in 2023.

Table 5. Economic contributions of Virginia seafood products from retail stores and restaurants in 2023. Values expressed in 2023 dollars.

Total Impact	Employment	Labor Income	Value Added	Output
Retail stores	2,111	\$76,422,996	\$168,835,178	\$225,826,595
Direct	1,509	\$56,579,779	\$112,994,846	\$154,926,269
Indirect	378	\$6,684,900	\$29,650,432	\$30,086,372
Induced	224	\$13,158,317	\$26,189,900	\$40,813,954
Full-service restaurants	839	\$32,847,343	\$59,387,211	\$117,233,380
Direct	638	\$20,683,835	\$34,448,612	\$61,889,727
Indirect	105	\$6,511,627	\$13,688,960	\$37,812,450
Induced	96	\$5,651,881	\$11,249,639	\$17,531,203
Limited-service restaurants	686	\$25,156,361	\$48,908,633	\$108,605,469
Direct	500	\$13,899,236	\$25,720,127	\$54,924,579
Indirect	112	\$6,925,137	\$14,566,300	\$40,244,162
Induced	74	\$4,331,989	\$8,622,206	\$13,436,728
All other food and drink places	53	\$2,277,731	\$3,741,194	\$6,377,802
Direct	42	\$1,606,615	\$2,376,150	\$3,547,371
Indirect	5	\$279,538	\$585,611	\$1,615,783
Induced	7	\$391,578	\$779,434	\$1,214,648
Total Effect	3,689	\$136,704,431	\$280,872,216	\$458,043,246

The sales of Virginia seafood products by retail stores affect 480 (96%) of the 498 existing industries in the state through economic linkages. The retail seafood sales in Virginia impacted different sectors depending on metrics such as employment, labor income, value-added, and overall economic output. Table 6 presents the economic contributions of the Virginia seafood sales from retail stores to the top 15 industries in 2023, ranked by output. Commercial fishing is the industry that received the highest levels of supporting employment, labor income, value added, and output from Virginia seafood sales by retail stores. Owner-occupied housing sector is next in the rank by output, but this industry does not benefit from jobs and labor income. Hospitals, other real estate, offices of physicians, limited-service restaurants, and full-service restaurants follow the list of most supported industries from Virginia seafood sales by retail stores.

Table 6. Economic impact on supporting sectors of Virginia seafood sales from retail stores in 2023, ranked by output. Values expressed in 2023 dollars.

Industry description	Employment	Labor Income	Value Added	Output
Commercial fishing	375	\$6,491,199	\$29,314,842	\$29,486,185

Owner-occupied housing	0	\$0	\$4,916,955	\$5,573,148
Hospitals	10	\$956,558	\$1,163,505	\$2,045,645
Other real estate	7	\$188,862	\$606,038	\$1,385,613
Offices of physicians	8	\$927,039	\$893,940	\$1,340,134
Limited-service restaurants	12	\$334,060	\$618,169	\$1,320,081
Full-service restaurants	12	\$385,149	\$641,461	\$1,152,436
Retail - Motor vehicle and parts dealers	4	\$307,255	\$661,985	\$892,832
Monetary authorities and depository credit intermediation	2	\$213,865	\$605,197	\$891,521
Tenant-occupied housing	2	\$55,907	\$818,076	\$873,720
Insurance carriers, except direct life	2	\$146,757	\$331,959	\$752,491
Other financial investment activities	4	\$169,204	\$189,593	\$721,819
Management of companies and enterprises	2	\$405,793	\$490,405	\$712,562
Data processing, hosting, and related services	2	\$248,784	\$395,827	\$661,851
Retail - General merchandise stores	7	\$252,091	\$451,309	\$643,582
All other industries*	1,662	\$65,340,471	\$126,735,919	\$177,372,975
Indirect and induced impact	602	\$19,843,217	\$55,840,332	\$70,900,326

* Include the industry retail – food and beverage stores.

The purchase of Virginia seafood products by restaurants affects 480 (96%) of the 498 existing industries in the state through economic linkages. The sectors most impacted by Virginia seafood purchases by restaurants varied depending on employment, labor income, value-added, and economic output. Table 7 presents the economic contributions of the Virginia seafood purchases from restaurants to the top 15 industries in 2023, ranked by output. Seafood product preparation and packaging is the industry that received the highest levels of supporting employment, labor income, value added, and output from Virginia seafood purchases by restaurants. Owner-occupied housing sector is next in the rank by output, but this industry does not benefit from jobs and labor income. Truck transportation and commercial fishing follow the list of most supported industries from Virginia seafood purchases by restaurants.

Table 7. Economic impact on supporting sectors of Virginia seafood purchases from restaurants in 2023, ranked by output. Values expressed in 2023 dollars.

Industry description	Employment	Labor Income	Value Added	Output
Seafood product preparation and packaging	96	\$6,381,887	\$15,444,137	\$58,632,059
Owner-occupied housing	0	\$0	\$3,876,547	\$4,393,892
Truck transportation	15	\$1,059,540	\$1,471,975	\$3,189,140
Commercial fishing	38	\$660,334	\$2,982,128	\$2,999,558
Management of companies and enterprises	10	\$1,653,477	\$1,998,244	\$2,903,461
Wholesale - Grocery and related	10	\$806,651	\$1,583,546	\$2,789,933
Other real estate	9	\$230,064	\$738,250	\$1,687,896
Hospitals	8	\$754,279	\$917,464	\$1,613,061
Offices of physicians	6	\$731,015	\$704,915	\$1,056,760

Monetary authorities and depository credit intermediation	2	\$238,711	\$675,507	\$995,095
Insurance agencies, brokerages, and related activities	3	\$290,027	\$460,183	\$926,311
Electric power transmission and distribution	1	\$95,115	\$414,456	\$855,397
Data processing, hosting, and related services	2	\$297,625	\$473,536	\$791,786
Insurance carriers, except direct life	2	\$151,231	\$342,078	\$775,428
Retail - Motor vehicle and parts dealers	3	\$247,375	\$532,973	\$718,832
All other industries*	1,524	\$46,684,106	\$79,421,099	\$147,888,041
Indirect and induced impact	398	\$24,091,749	\$49,492,149	\$111,854,973

* Include full-service restaurants, limited-service restaurants, and other food and drink places.

Tax revenue generated by Virginia seafood products from retail stores and restaurants, 2023

Virginia seafood products from retail stores and restaurants generated \$74.7 million in federal, state, and local taxes in 2023 (Table 8). Retail stores selling Virginia seafood accounted for 62.2% (\$46.5 million) of the total tax revenue, while restaurants purchasing Virginia seafood contributed 37.8% (\$28.2 million). Local taxes include revenue generated at the sub-county general, sub-county special districts, and county levels, totaling \$21.4 million, or 28.7% of the total taxes generated. The state of Virginia generated 26% (\$19.4 million), while the federal government generated 45.4% (\$33.9 million).

Table 4. Tax revenue generation by the Virginia seafood industry activities in 2023, expressed in 2023 dollars.

Tax category	Retail stores	Full-service restaurants	Limited-service restaurants	All other food and drink places	Total
Local tax*	\$14,418,608	\$3,391,512	\$3,395,179	\$187,739	\$21,393,038
State tax	\$12,592,431	\$3,410,165	\$3,175,719	\$199,436	\$19,377,751
Federal tax	\$19,458,058	\$7,792,721	\$6,107,644	\$524,640	\$33,883,063
Total tax	\$46,469,097	\$14,594,398	\$12,678,542	\$911,816	\$74,653,853

*includes sub-county general, sub-county special districts, and county level

Seafood sales trend in retail stores

Scanner data from NielsenIQ on seafood products sold by Virginia retail stores indicates that since 2020, total seafood sales, including imports, have experienced a downward trend (Figure 1). 2024 observed an accumulated decline of 7.2% of total seafood sales compared to 2020. When analyzing EQ unit sales, the accumulated decline was 17.2% compared to 2020.

Seafood sales in retail stores in Virginia

Source: NilsenIQ scanner data

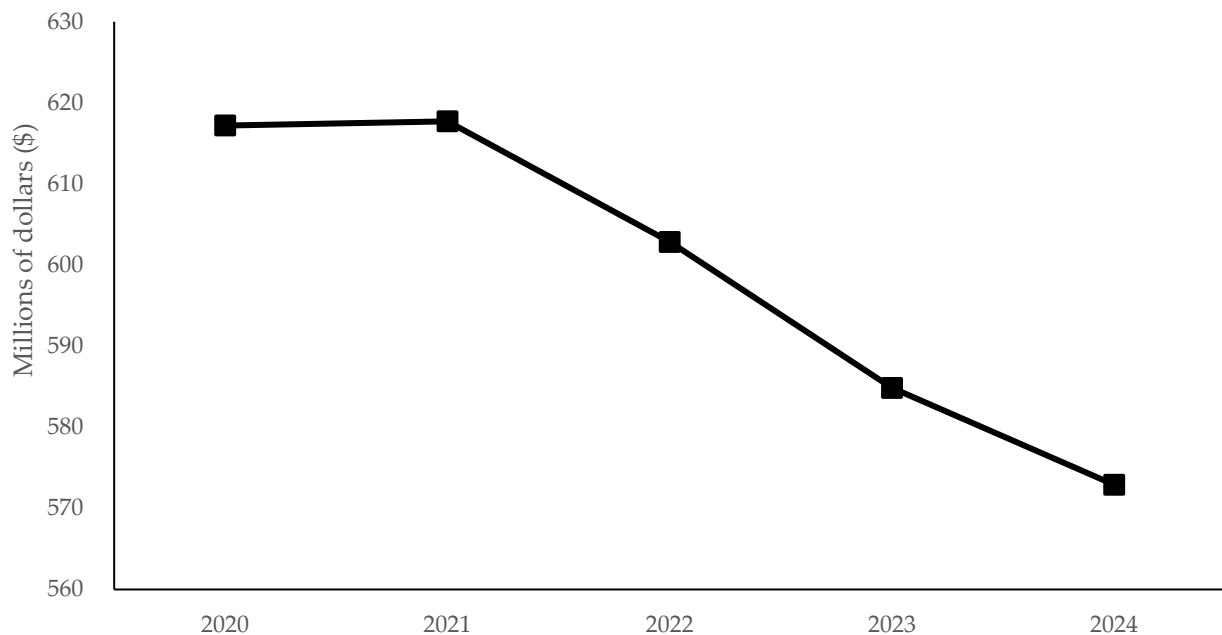


Figure 1. Seafood sales in retail stores in Virginia, adjusted to account for 80% coverage of the NielsenIQ dataset.

Discussion

Comparing the economic contributions of the Virginia seafood industry from 2019 (Gonçalves et al., 2024) to 2023 reveals a notable decrease in the number of active watermen and aquaculture farms, adversely affecting job numbers and labor income. The hardships of working on the water, the lack of social benefits, and the increased supply costs make seafood production, especially for wild harvesters, unattractive to the younger generation of watermen (Gonçalves et al., 2024). However, this updated analysis shows that the total output rose from \$1.1 billion in 2019 to \$1.27 billion in 2023, largely due to seafood processors' activities in producing value-added products. A simple inflation adjustment of the 2019 economic contribution would bring the total output to \$1.32 billion, reflecting the accumulated inflation rate of 19.37% from December 2019 to December 2023 (U.S. Bureau of Labor Statistics, 2025). Therefore, while the nominal output contribution has increased, the Virginia seafood industry remains relatively smaller than before the COVID-19 pandemic. This highlights the importance of periodic assessment of the economic contributions of industries to monitor how an industry responds to economic stressors, such as a pandemic, tariffs, environmental regulations, climate change, immigration policies, and other variables. Additionally, changes in the number of commodities and industries in the IMPLAN system required further adjustments to the 2019 models, which could potentially influence the analytical outcomes through the IMPLAN's social account matrix. Moreover, the increasing efficiency in food production systems, vertical integration, adoption of technological innovations, and acquisition of businesses by large corporations result in social implications where fewer people participate in the production processes. The decline in the labor workforce supply has been impacting the USA and other countries that send farm workers to the USA, such as Mexico. Labor conservation and management strategies are needed to mitigate the effects of the lack of labor availability (Taylor et al., 2012).

Fisheries communities connect and provide economic benefits to the tourism sector by supplying local seafood, leading to increased tourism-related expenditure, including the number of visitation days in coastal towns (Pascoe et al., 2023). This translates to the fact that Virginia, as a coastal state, attracts millions of visitors to seafood restaurants and family cookouts with seafood products from the Chesapeake

Bay. The connection between the seafood industry, the community, and tourists creates economic impacts from both the production and consumer sides, undeniably important to the state's economy, but has been underexplored. The survey results indicated that 41.4% of seafood restaurants participating in the survey advertise the availability of Virginia seafood products on their menus for marketing purposes. Additionally, 44% of seafood businesses aware of the origin of their products opted not to advertise or do not perceive value in promoting Virginia seafood products on their menus for marketing purposes. Menu information highlights what consumers prioritize or overlook at both casual and fine dining seafood restaurants. (Nguyen et al., 2022). The qualitative and quantitative results of this study can inform policies, marketing strategies, funding allocation, and other decisions that support the seafood industry, highlighting the interconnected sectors that shape Virginia's identity as a seafood destination.

Scanner data pointed out a decreasing trend in seafood sales in retail stores compared to previous years (Figure 1). The COVID-19 pandemic disrupted traditional seafood marketing channels (van Senten et al., 2021). With the closure of restaurants and food services and the lockdown of businesses, consumers experimented with more culinary recipes at home. According to the time series of scanner data for seafood sales, 2020 recorded the highest sales of seafood products in retail stores, with a yearly decline following the pandemic. Consumer behaviors post-COVID-19 have shifted demand for seafood products in both retail stores and restaurants. The choice between cooking at home and dining out can be influenced by factors such as age, social status, education level, urban residency (Landais et al., 2023), and ultimately, cost (Davis and You, 2010). In many low- and middle-income countries, the consumption of food prepared away from home has been rising (Landais et al., 2023), which diminishes the demand on retail stores for products requiring preparation. In the USA and other high-income countries, the consumption of food-away-from-home affects negatively individual's nutritional status and health (Landais et al., 2023). Additionally, value-added products, like ready-to-eat meals, are gaining in popularity due to their convenience and the costs of time involved in cooking at home, which can be 30% of total food cost for general population if the individual work in the market (Davis and You, 2010).

Scanner data from NielsenIQ on seafood products sold by retail stores in Virginia provides attributes such as product description, type, packaging materials, and country of origin, and may include information regarding domestic production. The details in the product description allow for identifying if the seafood product is a processed, prepared, or raw product. This scanner data can be used to estimate market trends, understand consumer preferences and demand, and guide marketing strategies (Sun et al., 2023). However, the datasets have information gaps, and for supposed domestic products, they lack the details necessary to identify which products are Virginia seafood. Due to the lack of information about the origin of seafood products, the IMPLAN LPP of 26.49% was used to estimate the value of Virginia seafood sold in retail stores.

The decision to separate the analysis approach focusing on Virginia seafood products from retail stores and restaurants from the Virginia seafood industry models is due to the reduced participation in sharing economic data, such as expenditure data associated with seafood preparation and sales. The reduced involvement can be attributed to the overwhelming nature of the survey questions requiring economic information that demands man-hours from busy workers to compile, and who may not see a direct benefit or incentive to participate voluntarily. For future studies, financial incentives should be accounted for when budgeting a project as an effort to increase participation. In addition, survey fatigue is a common issue in economic impact studies. Since the responses did not achieve a sufficient sample size to provide statistical significance, using secondary data from reliable datasets targeting the economic effects of seafood sales in retail stores and seafood purchases from restaurants allowed good analytical practices in economic modeling (Cerar et al., 2021; Watson et al., 2015). Therefore, the results of the economic contributions of Virginia seafood products from retail stores and restaurants should not be summed with the economic contributions of the Virginia seafood industry. The reason is that the inputs considered for retail stores and restaurants are outputs from watermen, aquaculture farmers, seafood processors, and distributors, and the dollars could be double-counted. Nevertheless, the insights into the economic contributions from the Virginia seafood products from retail stores and restaurants provided are a targeted snapshot of these very large industries. For example, the total output of \$225.8 million for retail stores analyzing Virginia seafood products accounts for 0.18% of the \$128.1 billion in economic contributions from the entire retail sector (National Retail Federation, 2024), which includes all products

and linkages. Similarly, the total output of \$232.2 million for restaurants analyzing Virginia seafood products makes up 0.95% of the \$24.4 billion in economic contributions from the overall restaurant sector (National Restaurant Association, 2024), considering all products and linkages.

Conclusion

In 2023, the total economic output of the Virginia seafood industry reached \$1.27 billion and supported over 6500 jobs, including those held by watermen, aquaculture farmers, seafood processors, and distributors. The wages and salaries for these jobs generated \$238.3 million in labor income. The value added, or contributions to GDP, amounted to \$976.7 million. The Virginia watermen, aquaculture farmers, seafood processors, and distributors paid over \$390.4 million in taxes in 2023. Retail stores and restaurants are large industries in Virginia, engaging with multiple sectors to provide various products and commodities. Based solely on Virginia seafood products, both retail stores and restaurants generated an economic output of \$458 million and supported over 3600 jobs in 2023. The total labor income amounted to \$136.7 million in wages and salaries, while the total value added, or contributions to the state's GDP, reached \$280.8 million. Retail stores and restaurants paid over \$74 million in local, state, and federal taxes in 2023. These numbers are conservative, and the economic contributions of Virginia seafood products from retail stores and restaurants cannot be summed with those of the Virginia seafood industry. Virginia seafood products are outputs from one industry and serve as input for retail stores and restaurants; therefore, they should not be double-counted. It is recommended that future research consider providing financial incentives to respondents, as compiling the requested data is time-consuming. These results are intended to support evidence-based decision-making, inform industry and government stakeholders, and strengthen the case for continued investment in Virginia's seafood supply chain.

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Appendix – Consent sheet and survey



VIRGINIA AGRICULTURAL EXPERIMENT STATION
VIRGINIA SEAFOOD AGRICULTURAL
RESEARCH AND EXTENSION CENTER
VIRGINIA TECH.

Economic Contributions of the Virginia Seafood Industry: Restaurants and retail stores

Survey information and consent sheet

Principal Investigator: Dr. Fernando Goncalves
VT-IRB #24-680
Sponsor: Virginia Marine Products Board

You are invited to participate in our **SURVEY**, which will help us estimate the economic contributions of Virginia seafood sales in restaurants and retail stores. The information generated at the end of this study will be meaningful, giving visibility to the economic benefits of the seafood business to the Commonwealth of Virginia, such as jobs supported, taxes paid, total output, value-added, and support to other economic sectors.

In this survey, you will be asked about business expenditures related to local Virginia Seafood purchases and sales in 2023. It will take between 10 and 30 minutes to complete the questions from the survey questionnaire. Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for us to learn from you.

This study is the sequel to the effort that estimated the \$1.1B and over 7,000 jobs generated by watermen, aquaculture farms, seafood processors, and distributors in 2019. Now, it will estimate the contributions of restaurants and retail for the year 2023.

Your survey responses will be strictly **confidential**, and data from this research will be reported only in the aggregate. Your business information will be coded and will remain confidential. This survey can also be completed online at the link below:

<https://virginiatech.questionpro.com/seafood-econ>

If you have questions at any time about the survey or the procedures, you may contact Dr. Fernando Goncalves at 757-900-9914 or by email at ocfernando@vt.edu.

Thank you very much for your time and support.

Checking the box below and returning the completed survey implies consent to the use of your responses for this research.

☐

Q1) Please indicate which category best describes your business by specifying the number of locations you own or manage in each category. If your business doesn't fit a specific category, leave it blank or put "0".

Businesses categories	Number of locations
Restaurant – Full-Service	
Restaurant – Limited-Service	
Retail store – Chain Franchisee (Large Corp)	
Retail Store – Privately owned, not chain	
Retail store with full-service restaurant	
Retail store with limited-service restaurant	

Q2) In which county (or counties) is your business located?

If you own or manage more than one business, please provide the total (aggregate) values for all your businesses in response to the following questions.

Q3) What percentage of your business revenue came from seafood sales in 2023?

- ☐ Less than 10%

☐ More than 75%

☐ Between 11% - 25%

☐ Other (Specific rate) _____

☐ Between 26% - 50%

☐ N/A – I do not sell seafood

☐ Between 51% - 75%

Q4) Which of the following seafood products are offered in your business? Select all that apply.

- ☐ Blue Crabs

☐ Black Sea Bass

☐ Spot

☐ Tilapia

☐ Oysters

☐ Flounder

☐ Salmon

☐ Shrimp

☐ Clams

☐ Blue catfish

☐ Tuna

☐ Lobster

☐ Scallops

☐ Catfish

☐ Mahi-Mahi

☐ Squid

☐ Striped Bass

☐ Croaker

☐ Cod

☐ Other _____

Q5) **Virginia seafood** refers to **landed, produced, or processed** species in Virginia.

Do you know which seafood species purchased by your business are **Virginia Seafood**?

- ☐ Yes ☐ No

Does your business distinguish **Virginia Seafood** from other seafood purchases for marketing purposes? ☐ Yes ☐ No

Q6) Please complete the following information about your business for **2023** as accurately as possible. If you own or manage more than one business, please provide the total aggregate values for all of your businesses in response to the following questions.

All information will remain confidential.

EMPLOYMENT	2023
Total number of employees:	
Total labor compensation/payroll (annual \$):	
Number of employees working exclusively with seafood:	
EXPENSES	2023
Total general expenses (excluding payroll, annual \$):	
Total expenses for seafood (annual \$):	
Total expenses for Virginia-produced seafood (annual \$):	
SALES	2023
Total sales (annual \$):	
Total seafood sales (annual \$):	
Total Virginia seafood sales (annual \$):	

Q7) Please allocate the percentage of your seafood purchases from the following sources in 2023 (total should equal 100%):

Seafood sources	Percentage of purchases in 2023 (0-100%)
Large Corp Distributor	
Local Virginia Distributor	
Local Virginia Aquaculture Farm	
Local Virginia Fisherman	
Other _____	

FOR RESTAURANTS ONLY

If you do not operate a restaurant, please skip this section

Q8.R) Please complete the equipment list required for your RESTAURANT business and provide additional information in the columns where applicable.

Equipment items	Capital Invested	Year purchased	Useful life (years)	Purchased in VA?		Maintained in VA?		Maintenance cost/year
				Yes	No	Yes	No	
Building/Real Estate								
Freezer								
Cold storage								
Ice machine								
Seafood display case								
Stove								
Fryer								
Oven								
Steamer								
Dish Washer								
Special machinery (Vacuum sealer, etc.)								
Scale								
Metal prep table								
Kitchen gear (pots, pans, trays, etc.)								
Furniture								
Silverware								
Ceramic plates								
Glasses								
Vehicle								
Forklift								

FOR RESTAURANTS ONLY

If you do not operate a restaurant, please skip this section

Q9.R) Please complete the following operating cost items for your RESTAURANT in 2023. If any supplies were purchased outside of Virginia, indicate the % of the cost spent out of state.

Operating cost items	TOTAL COST 2023	% spent OUTSIDE VA, if applicable (0-100%)
Seafood purchases		
All other food items and soft drinks		
Alcoholic Beverages		
Packaging and "To-Go" supplies		
Plastic containers		
Styrofoam boxes and containers		
Electricity		
Gas (propane, natural, etc.)		
Vehicle fuel		
Water supply/Sewer		
Equipment loans or lease		
Real Estate loans or lease		
Operating loans		
Insurance		
Sanitary inspections		
Permits		
Accounting/Consulting fees		
Property taxes		
Sales taxes remittance		
Credit card processing fees		
Telephone/internet		
Advertising & Marketing		
Facility repairs & maintenance		
Linens and Uniforms		
Cleaning supplies		
Special services (cleaning, etc.)		
Perishable losses		
Waste management		
Security services		

FOR RETAIL STORES ONLY

If you do not operate a retail store, please skip this section

Q10.S) Please complete the equipment list required for your RETAIL STORE and provide additional information in the columns where applicable.

Equipment items	Capital Invested	Year purchased	Useful life (years)	Purchased in VA?		Maintained in VA?		Maintenance cost/year
				Yes	No	Yes	No	
Building/Real Estate								
Freezer								
Cold storage								
Ice machine								
Seafood display case								
Scale								
Special machinery								
Knives and utensils								
Metal prep table								
Vehicle								
Forklift								

FOR RETAIL STORES ONLY

If you do not operate a retail store, please skip this section

Q11.S) Please complete the following operating cost items for your RETAIL STORE in 2023. If any supplies were purchased outside of Virginia, indicate the % of the cost spent out of state.

Operating cost items	TOTAL COST 2023	% spent OUTSIDE VA, if applicable (0-100%)
Seafood purchases		
Packaging		
Plastic containers		
Styrofoam boxes and containers		
Electricity		
Water supply/Sewer		
Equipment loans or lease		
Real Estate loans or lease		
Operating loans		
Insurance		
Sanitary inspections		
Permits		
Accounting/Consulting fees		
Property taxes		
Sales taxes remittance		
Credit card processing fees		
Telephone/internet		
Advertising & Marketing		
Facility repairs & maintenance		
Cleaning supplies		
Perishable losses		
Waste management		
Security services		

Q12) Please rate how important the following factors, in your opinion, are in influencing a customer's decision to visit a seafood business.

	Not important			Slightly important			Important			Very important	
	0	1	2	3	4	5	6	7	8	9	10
Location	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Price	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Quality of seafood	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Variety of seafood products	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Atmosphere	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Community engagement (hosting events, hiring teens and elderly, etc)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Proximity to the coast	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Offering Local Virginia Seafood	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q13) Please rate how relevant the following challenges are to the success of your business.

	Not relevant			Slightly relevant			Relevant			Very relevant	
	0	1	2	3	4	5	6	7	8	9	10
Labor availability/reliability	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Steady seafood supply	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Seafood price volatility	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tight margins	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Overhead costs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Inflation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Weather	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Labor availability/reliability	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q14) Do you have any suggestions on research topics that could benefit your industry?

Q15) Contact Information

Business Name	
Contact Name	
Phone	
Email Address	
City location	