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Transportation

Margaret Chase Smith Policy Center

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Marine Living Resource Needs and Opportunities in Transportation and Logistics

Janet Horsager Kathryn Ballingall Jonathan Rubin Report to the Seafood Economic Accelerator (SEA Maine):

Marine Living Resource Needs and Opportunities in Transportation and Logistics

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Acknowledgments and Disclaimers

The views and opinions expressed in this report are solely those of the individual authors. They do not represent those of SEA Maine or any other individuals or organizations that have provided information or assistance. We would like to thank the Maine Department of Marine Resources, SEA Maine, and our industry participants for sharing their insights.

Executive Summary

Seafood is the leading source of wild protein in the global market, with nearly all other sources of protein being farmed. One of the major obstacles in the seafood industry is the highly perishable nature of its product. This poses challenges for Maine with its approximately 3,500 miles of coastline from New Hampshire to New Brunswick. While innovative technologies to increase the shelf-life of seafood products continue to become more available and are adopted by larger companies, small harvesters feel the challenge of bringing their product to market faster.

As a state of small harvesters, Maine has faced an uphill battle to bring fresh seafood to market in a competitive timeline. While the exact percentage of seafood spoilage in Maine is unknown, it's cause is not helped by its expansive network of islands, and peninsulas. While harvesting some of the world's most desirable seafood products, Maine harvesters face the demanding logistical issue of moving perishable products through its islands and peninsulas.

Most wild seafood and aquaculture in Maine is currently captured and then transported to the port via boat. From a port, the product is typically transported to a dealer or processor by truck. . Another challenge for the industry is present here because, as the U.S. Department of Transportation reported that trucking services saw the largest price increase in 2021(12.8%)¹.

While some larger dealers use privately owned and operated refrigerated trucking services, commercial carriers remain limited. For smaller dealers, the size of their haul makes it difficult to find an economically and logistically viable solution to transport their product to market. Our study shows that members of the seafood industry expressed a desire for a solution such as a trucking cooperative in Maine, especially one designed to serve smaller harvesters and dealers.

Accompanying this written report is an interactive mapping dashboard that helps to visualize the seasonal distribution of marine harvests in Maine as well as the location of seafood dealers across the state. The dashboard includes a tool to calculate the nearest dealers for each port and the nearest ports for each dealer, as well as the driving time to the Araho Transfer facility in Boston, MA (a key seafood market of the northeastern seaboard where all products travel for further distribution).

We recommend that SEA Maine consider the following in greater detail:

- Aggregated cold storage sites: support community cold storage facilities for small harvesters to aggregate their harvest and prepare for sale.
- Aggregated transportation services for small harvesters: support community transportation services for small harvesters to coordinate the transportation of their product to market.

¹ Air transportation saw the smallest increase of 0.9% after experiencing a decrease of 10.9% in 2020.

- A simplified licensing overview online: create a user-friendly online tool whereby harvesters and dealers can understand which licenses and permits are needed (and how to comply with the related requirements) for various distribution strategies, such as selling shellfish online and shipping directly to customers.
- An organized effort to promote the new federal Safe Driver Apprenticeship Pilot Program for young drivers: coordinated efforts to encourage transport companies operating in Maine, in particular companies that offer refrigerated trucking services, to enroll in the pilot as well as recruit young drivers in partnership with workforce development programs and organizations across the state.

Table of Contents

Executive Summary	3
Table of Contents	5
Introduction	6
Purpose/Project Scope of Work	6
Organization of the Report	6
Background on Maine's Marine Living Sector	7
Seafood Transportation	8
Seafood Dealer and Harvesters Licenses	9
Commercial Harvester	9
Dealers	10
Transportation Modes	11
Trucking	11
Fish and Seafood Transfer Markets: Portland and Boston	13
Shipping - Ground Transportation	13
Shipping - International Freight	14
Challenges in the Seafood Supply Chain	14
Transport of Seafood	14
Increasing Costs Across the Supply Chain	15
Workforce	16
Future Productivity of Fisheries	17
Mapping of Seafood Landings	18
Data Gathering & Methods	18
Seasonality of Landings by Port	20
Seafood Dealer Locations & Dashboard Visualization Logic	23
Seafood Transportation Dashboard	24
Recommendations	28
Aggregated Transport and Cold Storage Sites	28
Simplified Licensing	28
Workforce Development for Commercial Drivers	29
New Data Collection of Seafood Supply Chain	29
References	30
Supplemental Materials	33
Stakeholder Interviews	33

Introduction

The Seafood Economic Accelerator for Maine (SEA Maine), is an industry-led initiative committed to growing Maine's seafood economy by developing a roadmap and action plan to ensure a vibrant, innovative and resilient marine economy. Funded by the U.S. Economic Development Administration, Maine Technology Institute, and FocusMaine, SEA Maine brings together leaders from aquaculture and commercial fishing to identify strategies and targeted investments to help transition our heritage seafood economy into a modern engine for sustainable and local economic growth.

The SEA Maine steering committee is co-led by Curt Brown (Ready Seafood) and Sara Radamaker (American Unagi), and is made up of approximately 35 members located across the state. Members are drawn from public and private entities including industry, associations, non-profits, academia, and research and development organizations. Maine Development Foundation serves as the project manager for SEA Maine.

The SEA Maine New Opportunities and Emerging Technologies Subcommittee hired the Margaret Chase Smith Policy Center at the University of Maine to develop a study on the needs and opportunities in logistics and transportation for Maine's marine living resource economy. Marine living resources are defined as any marine organism coming out of the ocean, or land-based systems, from which value is derived, including both seafood and non-seafood uses.

Purpose/Project Scope of Work

The purpose of this project is to develop a better understanding of the current transportation practices and challenges in Maine. To do this, we collected and synthesized existing and accessible data about transportation infrastructure, material handling needs, and shipping processes for Maine's marine living resource products. From this foundation, we identified several opportunities for new efficiencies.

This project was initiated in recognition that individual harvesters have had trouble finding suitable transportation for their products, both fresh and frozen (particularly those operating outside of Portland). We sought to research and create strategies for how products could be transported together, saving costs; we asked those in industry what the real transportation needs of producers are, mapping the distance from harbor to dealer; finally, we researched potential replicable approaches and gave recommendations for sustaining the ability of Maine's marine living resource economy to efficiently reach relevant markets.

Organization of the Report

This report first provides an overview of the current understanding of Maine's seafood market. This includes the market value, cultivation methods and production quantities for species. Based on best data availability from Maine's Department of Marine Resources, we focused our research on lobsters, oysters, soft shell clams and scallops. We also provide an overview of the journey of Maine's seafood from harvester to consumer.

Background on Maine's Marine Living Sector

In 2021, Maine has the second-highest total dollar value landings in the United States. Commercial landings in Maine, as reported in March 2022, were \$890,668,873.² Seafood consumption in the United States was 6.3 billion pounds of seafood in 2019³ with 80-90% of seafood consumed in the United States being imported.⁴ The United States imports \$22.2 billion, exports \$5.2 billion, creating a global trade deficit of shellfish of \$16.9 billion. While over half of all imported seafood is farmed⁵, aquaculture in Maine accounts for just 20% of seafood production.⁶ In 2014, Maine's aquaculture sector produced an output of \$73 million.⁷



Figure 1. Total Value (\$) of Lobster Landed in Maine from 2008 – 2021 Data from Maine Department of Marine Resources

Lobster is Maine's highest value fishery, where harvesters land between \$400 million and \$550 million annually⁸. In 2021, the landed value of oysters, mussels and scallops was \$24 million, approximately 2.7% of the US market⁹.

⁵ The Nature Conservancy, 2015

² Most Recent Maine Commercial Landings, Maine DMR, 2022

³ Fisheries of the United States, 2019, 2021

⁴ Coastal Enterprises Inc, 2015

⁶ Maine Aquaculture Roadmap, 2021

⁷ Maine Aquaculture Market Analysis, 2014

⁸ Fisheries of the United States, 2021

⁹ Maine Farmed Shellfish Market Analysis, 2016, The Hale Group

While the oyster market experiences variability in demand, with a drop in the autumn after the tourism season, national and regional demand remains relatively constant throughout the year. Mussel supply and demand is reported to have minimal seasonal variation of demand or supply.



Figure 2. Landings Value 2008-2011 for Soft Clams, Oysters, Sea Scallops Data Source: Maine DMR

A survey reported in the 2016 Maine Farmed Shellfish Market Analysis asked 107 aquaculture businesses to disclose the end destination of their produce (see Table 1 below). Some 31% of respondents reported that the majority of their sales are made in Maine, with the shellfish subsector reporting the highest proportion of in-state sales.

Table 1. Percent of survey respondents (n=107) whe	o sell to wholesale, processor and retail end users, by
aquaculture sub-sector	

	Finfish	Shellfish	Sea vegetable
Wholesalers or distributors in Maine	29%	84%	25%
Direct to end users in Maine (restaurants)	29%	54%	50%
Maine Processors	-	-	25%
Wholesalers or distributors in the US	29%	35%	50%
Direct to end users in the US (restaurants)	14%	13%	25%
United States Processors	-	3%	-
International Processors	14%	-	-

Data Source: Maine Farmed Shellfish Market Analysis, 2016, The Hale Group

Seafood Transportation

It is a 292 mile drive from Kittery to Lubec; but the coastline between these two towns runs approximately 3,500 miles¹⁰. As the famous Maine adage goes: "You can't get there from here." As a rural state with an expansive network of islands, Maine has 22,815 miles of public roads,¹¹ 1,077 miles of freight railroad, and 2 major ports in Portland and Searsport.¹² Additionally, there are 12 points of entry via land border, including borders with New Brunswick, Quebec, and New Hampshire, as well as ferry service from Bar Harbor to Nova Scotia.¹³

Because Maine's seafood supply chain is expansive and complex, our report focuses on the collection of product from harvesters and the movement of that product by truck from the harvester to its destination. Figure 3 illustrates the general process of the flows from harvesters to consumers.





Seafood Dealer and Harvesters Licenses

The harvesting and distribution of marine living organisms in Maine is jointly regulated by the Department of Marine Resources (DMR) and the US Food and Drug Administration (FDA). In general, the purpose of these regulations and management systems is to maintain a healthy ecosystem for marine wildlife and for human use (e.g., tracking lead, mercury, PCBs and consumption advisories due to biotoxins).

Commercial Harvester

To harvest seafood in Maine, a harvester must register with the DMR. Harvesters must hold a valid federal permit for their boat and the harvester is not considered licensed until the Licensing Division is able to verify boat ownership. However, boat ownership is not required for harvesters to receive a license; if the harvester does not own the boat, they must show proof either 1) they

¹⁰ <u>https://www.maine.gov/legis/general/facts/facts.htm</u>

¹¹ 77.7% of them listed as good or fair condition

¹² U.S. Department of Transportation, Table 1-13: Maine Water Ports Ranked by Tonnage, 2000

¹³ U.S. Department of Transportation, 2022

have permission to use the boat and that the owner will be present on the boat while fishing or 2) the harvester is a family member of the boat owner. The permit and vessel number for harvesters are verified through National Marine Fisheries Service (NMFS) Permit Database and US Coast Guard (USCG) Documentation Database.¹⁴

Dealers

Maine state law requires harvesters to sell shellfish only to certified shellfish dealers. Dealers in Maine can purchase different types of licenses for their operations. Maine offers two types of seafood licenses: *retail* and *wholesale*. Retail licenses generally mean selling directly to the consumer; in other words, selling directly to the person who will eat the seafood. For example, a restaurant or a small fish market would also be categorized as a retail establishment, because they sell directly to consumers. Wholesale licenses broadly refer to selling to another business, not directly to a consumer. Wholesale can mean selling to a retail establishment like a restaurant or a grocery store, or it can mean selling to another wholesale operation like a processor or distributor. Wholesale licenses are split into two types: Wholesale Seafood License with no lobster and Wholesale Seafood License with lobster.¹⁵

Types of Seafood Dealer Licenses

Retail Seafood: selling directly to the person who will consume the seafood.

- **Retail Seafood** The DMR states that if a facility is a retail business that wants to buy shellfish from a certified dealer, they only need the Retail Seafood license. Purchasing clams, mussels, oysters, and mahogany quahogs only from certified shellfish dealers
- **Enhanced Retail** Additional qualification that allows restaurants, convenience stores, or similar facilities to purchase shellfish from harvesters.
- Shellfish Sanitation Certificate Dealers that work with clams, mussels, or oysters need an additional Shellfish Sanitation Certificate that involves a facility inspection proving that it fulfills safe food handling practices. As of 2018, this certification requires an additional cost to the dealer.¹⁶

Wholesale Seafood, without Lobster¹⁷

- **Shellfish Transportation** The holder of a shellfish transportation license may buy certified shellfish and transport them beyond the state limits, to the extent these activities are expressly authorized by a shellfish certificate or its equivalent from another state.
- **Shucker Packer** licenses allow the holder to shuck and pack shellfish. A shucker-packer may act as a shellstock shipper or reshipper or may repack shellfish originating from other certified dealers.

¹⁴ (Department of Marine Resources, 2022a)

¹⁵ Gulf of Maine Research Institute, 2018

¹⁶ Department of Marine Resources, 2022a

¹⁷ FDA, 2023

- **Shellstock Shipper** A shellstock shipper license allows the holder to grow, harvest, buy, or repack and sell shellstock. It does not authorize the holder to shuck shellfish nor to repack shucked shellfish, however, the holder may ship shucked shellfish.
- **Reshipper** A person who purchases shucked shellfish or shellstock from other certified shippers and sells the product without repacking or relabeling to other certified shippers, wholesalers, or retailers.

Wholesale Seafood, with Lobster

- **Lobster Transportation** This license authorizes a wholesale seafood license with lobster permit holder to transport lobsters beyond the state limits.
- **Lobster Processor** This license authorizes a wholesale seafood license with lobster permit holder to remove lobster tails, lobster parts in the shell, and lobster meat from the lobster.
- Lobster Processor Tails Only This license authorizes a wholesale seafood license with lobster permit holder to remove lobster tails in the shell from the lobster
- Lobster Meat Permit This license authorizes a wholesale seafood license with lobster permit holder or a retail seafood license holder to remove lobster meat from the shell for sale

Transportation Modes

In Maine, most wild seafood and aquaculture is captured and then transported to port via boat. From the port, the product is typically transported to the dealer or processor by truck. There are several proposals for land-based aquaculture, such as those in Jonesport and Belfast, which will remove the boat-to-port segment. From the marine port or land-based aquaculture site, the product can be moved to market by truck, ship, or air. Many dealers utilize airfreight through UPS and FedEx. The options most utilized in these three forms of transportation are described in the section below.

Trucking

The majority of Maine harvested seafood is either transported by truck or by air. Currently privately owned and operated refrigerated trucking is used by some larger dealers, but commercial carriers are limited. For smaller dealers, it remains difficult to transport their product to market. Our study found that members of the seafood industry feel a desire for a trucking cooperative in Maine, especially one designed to serve the needs of smaller harvesters and dealers.

Northeast Transport Inc, is an important example of the logistical challenges facing Maine's smaller seafood dealers and shippers. A refrigerated commercial carrier, Northeast Transport moved seafood directly from Maine to Portland, Boston, New York, and Philadelphia six days a week with multiple daily trips. However, Northeast Transport suspended seafood transportation

services in 2014 due to the profitability of shipping smaller volumes of seafood, as well as the closure of the groundfish fisheries in the Midcoast region.¹⁸

Trucking primarily utilizes diesel as its energy source and the trucking refrigeration technology remains limited.¹⁹ However, incentives for medium-duty trucks would substantially increase if Maine adopts the California regulation known as the California Advanced Clean Trucks (ACT) Rule.²⁰ Five states, Oregon, Washington, New Jersey, New York and Massachusetts, have adopted ACT, while Maine is still considering such a decision.²¹

Trucking costs are likely to remain high due to a number of factors including the high cost of diesel, increasing emission and fuel economy standards for new medium and heavy-duty trucks, and a lack of new drivers entering into the trucking business. This last issue bears further comment for its relevance to Maine.

Trucking companies across the industry are experiencing difficulties specifically in hiring young drivers. State regulations only require a person to be 18 years old to get a commercial driver's license (CDL),²² but a federal regulation prohibits drivers less than 21 years of age from carrying commercial loads across state lines.²³ This is an ongoing issue because it means products originating in Maine and moving across state lines cannot be hauled by a driver under 21 years of age unless the product changes through a value-added process. Given the aging population in both Maine and in the trucking industry, this becomes an extremely important policy area to explore in order to bring in more drivers for the seafood industry.

Some businesses, such as seafood buyers, own and operate their own trucks or contract out their trucking needs. But cultural and generational challenges arise for new seafood companies looking to evaluate their shipping options due to the lack of online presence by trucking companies. Many owners of trucking companies rely on word of mouth or existing relationships for their employment.²⁴ That being said, larger carriers do exist in Maine, including AC Inc, Crown of Maine, D.C. Air, Galway Bay Transport, Northeast Transport, and RC Moore. But even though these companies are considered the major players, some of them have suspended their seafood transportation services in certain areas because of the lack of product being moved.

Fish and Seafood Transfer Markets: Portland and Boston

In Maine, the Portland Fish Exchange serves as an intermodal facility for seafood products. But its use is affected by a steady decline in product being landed at it's facility. There are

¹⁸ J. Payson, personal communication, November 15, 2022

¹⁹ U.S. Department of Transportation, 2022

²⁰ California Air Resources Board, 2022

²¹ ACT News, February 8 2022

²² Applicants under 18 years of age must meet Driver's Education requirements and are eligible to move product within the state.(Bureau of Motor Vehicles, 2022)

²³ CEI, 2015

²⁴ CEI, 2015

approximately 15 federally regulated species that are landed at the Exchange and approximately 10 other species that are sporadically landed.²⁵ In 2012, approximately 40 marine vessels landed directly at the Exchange and a number of other fishermen trucked their products to the Exchange for sale at the auction. In 2003, the Exchange was landing 19.4 million pounds of fish annually, with a steady decline in volume²⁶. In 2019, 1.8 million pounds of seafood passed through the Exchange, and is only 0.77 million pounds arrived in 2022²⁷.

Amidst these changes, Boston remains a major hub on the East Coast for intermodal refrigerated transportation of seafood products and is home to two major third party handlers of seafood products: Araho Transfer, and Peninsula of Boston, Inc. They both offer similar services and hire many seafood carriers with regularly scheduled routes along the Eastern Seaboard. Fry Trucking, Galway Bay Transport, Hannaford, and Wade are among the main carriers between Maine and Boston.²⁸

Shipping - Ground Transportation

Ground shipping of packaged seafood originating from coastal Maine is primarily shipped by Federal Express (FedEx) and United Parcel Service (UPS), each competing for the least expensive delivery service. Most of the product is shipped within New England and parts of downstate Eastern New York.²⁹

In industry interviews, FedEx is shown to be the preferred carrier. Many packages are delivered in one day if they originate within eastern Maine (e.g. Eastport to Belfast). The dividing line for an origination location that determines whether it will take one or two days in transit seems to fall between Camden and Lincolnville on the eastern side of Penobscot Bay.

While UPS does not appear to be utilized as often by our interviewees, their services were considered comparable. The Maine Seafood Study published by CEI in 2015 reported that UPS appeared to offer advantages over FedEx in delivery speed by ground service for towns in Waldo County, Hancock County, and eastern Washington County. Both UPS and FedEx charge a shipping rate and pick-up fee in a combined bill. The pick-up fee may be as low as \$10/visit for regular high volume shippers or a higher pick-up fee of \$11-22 depending on the shipping volumes and frequency of shipments. Consolidating multiple packages for shipment will lower the pick-up fee on a per pound basis.³⁰

Shipping - International Freight

Eimskip is an Icelandic shipping company which provides primarily seabased shipping, but also provides a service transporting products by air. Eimskip is one of the leading transportation

²⁵ CEI, 2015

²⁶ <u>https://www.pfex.org/price-landing-tool/</u>

²⁷ <u>https://www.pfex.org/price-landing-tool/</u>

²⁸ CEI, Maine Seafood Study, 2015

²⁹ CEI, 2015

³⁰ CEI, 2015

companies in the North Atlantic, providing an extensive worldwide network of refrigerated logistics services.³¹ They continue to offer services in Maine, but were not playing a crucial role in delivery logistics for the Maine industry representatives with whom we interviewed.

Challenges in the Seafood Supply Chain

Transport of Seafood

Marine living organisms are traded internationally, nationally, regionally and locally depending on the species, season, rules and regulations, and changing demand. This demand reflects consumers' tastes as well as the product's need in other areas such as bait, aquaculture feed, fertilizers and cosmetics. In the last decade, the seafood industry has seen an increase in all forms of trade facilitated by technological innovations and improved logistics. These technologies include innovative packaging products such as modified atmosphere packaging, vacuum packaging, and active packaging at both the bulk and retail packaging levels.³² Accompanying these packaging, storing and handling technologies is the rise in remote monitoring of aquaculture net pens, some with accompanying Integrated Pest Management plans to better understand and reduce disease transmission.

The standardization of products has also allowed economies of scale to be exploited through the supply chain, particularly in the retail sector where retail chains have replaced fishmongers and local markets as the main outlet.³³

Perishability remains one of the key areas around which to find innovative seafood solutions in the state of Maine. While the percent of wastage in Maine is not known, globally, 20% of seafood spoils before it reaches the consumer.³⁴ Without a better estimate for the Maine context, we recommend the best practices for reducing spoilable are identified by the University of Maine's Agricultural Extension.³⁵

After harvesting, seafood products must either be stored on ice or flash-frozen. This is driven, in large part, by consumer demand for high-quality, lightly processed products with minimal changes in nutritional and sensory properties. It is critical to keep seafood cool and moist while in transit which requires a cold location below 45 degrees Fahrenheit³⁶. As noted by Kontominas et al. (2021), seafood preservation now includes chilling (at 0–1 °C), freezing (<1

³¹ CEI, 2015

³² Kontominas et al., 2021

³³ Anderson et al., 2018

³⁴ The Nature Conservancy, 2015

³⁵ University of Maine, 2022

³⁶ ISSC Chapter IX.05, Chapters XI, XIII, & XIV – Receiving CCP

°C), drying, smoking, salting, fermenting and canning. When kept cold, live seafood (lobsters, clams, mussels, oysters) requires less oxygen to survive the trip.³⁷

In addition to requiring a cold and moist environment, seafood packaging is difficult. Live seafood freezes at approximately 29 degrees and any melting water can damage their shells in addition to killing the seafood. Dry ice (solid CO₂) which does not have a liquid state, but sublimates directly into a gaseous state also presents issues because it can suffocate the seafood without proper ventilation and handling. Currently, the most common shipping method is to use spill-proof plastic or Styrofoam containers packed inside heavy-duty cardboard shipping boxes. While many shipping companies have sustainability commitments, we were not able to analyze any data to understand how often styrofoam containers are reused or recycled. We believe this is another important area for future research. More recent methods of seafood preservation include the use of natural preservatives, high hydrostatic pressure treatment, ozonation, irradiation, pulse light technology, retort pouch processing and packaging in combination with refrigeration or freezing.³⁸

Freezing technology has improved to such an extent that many product forms can be frozen twice, allowing products to be processed in locations with competitive advantages in processing fish rather than in locations close to where the fish is caught.³⁹ Most traded seafood is sold as frozen, which allows the use of the world's shipping lanes, and it generally costs less than USD 0.50/kg to carry fish any distance on ship.⁴⁰ We were not able to access data about the amount of seafood frozen in Maine. As such, we recommend this area, as well as the other unknown data point of Maine seafood spoilage, as valuable datasets to invest in. Once understood, these datasets could help expand Maine's market share both domestically and internationally.

In conversation with Maine stakeholders, most seafood is transported in a fresh and refrigerated condition. However, we were not able to access data (due to data privacy protection) that specified the amount of seafood sold within the state nor the amount of seafood sold cold or frozen. As such, we believe that this is an area that could be explored further.

Increasing Costs Across the Supply Chain

Maine's lobster industry is experiencing higher costs for both bait and fuel, cutting into harvesters' profits. The lobster industry requires strong regional demand for live product and depends on the Canadian processing market for its economic health. ⁴¹ Development of Mainebased processing facilities for lobster and advanced transport systems for live lobster will diversify the market for lobster and increase demand, blunting the full impact of lowered lobster prices and rising fuel and bait costs. In addition, an expansion of refrigerated bait storage

³⁷ UPS, 2021

³⁸ Kontominas et al., 2021

³⁹ Anderson et al., 2018

⁴⁰ Gulf of Maine Research Institute, 2018

⁴¹ CEI, 2015

facilities would make lobstermen less vulnerable to swings in bait prices, since frozen bait can be stockpiled when purchase prices are low.⁴²

In 2021, the U.S. Department of Transportation reported that truck transportation services saw the largest price increase of 12.8%, with air transportation experiencing the smallest increase of 0.9% after experiencing a decrease of 10.9% in 2020. The largest year-over-year price increase in the last 20 years for truck transportation occurred in 2021, with the rest of the transportation modes experiencing their largest increases in 2008.⁴³

Many stakeholders interviewed in the project were interested in cold storage aggregation sites that would allow for operation flexibility. These sites could include cold storage locations and/or offices for transportation cooperatives where small harvesters could bring their products to then be shipped together to market. Presently, flash freezing is only occurring at the industrial level and does not appear to be a viable solution in Maine due to the size of boat fleets. The current solution is cold storage and cooperative shipping.

Stakeholders also suggested during interviews that improved communication of the licensing and permitting process would allow smaller producers to expand production, marketing, and revenue sources from expanding market access. The DMR currently has many resources for attaining licenses; however, in conversations with some harvesters, it was communicated that it is difficult to navigate the licensing and permitting process to both harvest and then sell your product locally. A simple flow chart for licensing clarity would be helpful for small scale harvesters.

Workforce

A previous SEA Maine report lists the seafood industry as an aging and white male dominated workforce; however, demographics appear to be changing to better reflect Maine's broader demographics, particularly in Southern Maine.⁴⁴ The Maine Aquaculture Market Analysis in 2014 stated that there were 571 jobs and \$35.7M in labor income. Businesses in the 2014 survey said that they expect to see significant growth in their business, so those values are most likely higher today.

In 2021, the U.S. Department of Transportation advocated for a ruling expanding the number of hours a trucker can drive when transporting live seafood. Maine's delegates – Collins, King, Pingree, and Golden – requested that commercial truck drivers transporting live lobster be exempt from the Hours-of-Service rules.⁴⁵ The Interim Final Rule "Hours of Service of Drivers: Definition of Agricultural Commodity" (FMCSA-2018-0348) sought to clarify the definition of "agricultural commodity" for the purposes of Hours-of-Service rules, which set maximum hours

⁴⁴ USM, 2021

⁴² CEI, 2015

⁴³ U.S. DOT, 2022

⁴⁵ Stockford, 2021

and other safety standards for commercial truck drivers. Drivers transporting agricultural commodities, including livestock, from the source of the commodities to a location within 150 air miles of the source during harvest and planting seasons are exempt from Hours-of-Service requirements. The 2018 Farm Bill amended the statutory definition of "livestock" referenced in the Hours-of-Service regulations to include alpacas, llamas, live fish, and crawfish, but did not explicitly include lobster.⁴⁶

The Maine delegation asked that the amendment define "caught or harvested" to include aquatic animals and ensure that lobster and other shellfish from Maine receive the agricultural exemption to the Hours-of-Service rules. This would allow the Maine seafood products to reach their key domestic markets without having to make long stops along the way.

Future Productivity of Fisheries

Prior to COVID-19, over 80% of seafood in the US was consumed in restaurants. Seafood sales for home consumption rose during the pandemic and the reopening of businesses has increased restaurant sales.⁴⁷ While the value of US seafood overall has declined by 4%, oysters become popular for new and younger consumers and are expected to rebound to restaurants. Online retailing of aquaculture has also increased partially due to new consumers (Maine Aquaculture Association, 2022).

Most industry participants expect that the seafood industry *as a whole* in Maine will increase significantly. At the same time, some of Maine's traditional marine species may experience a plateau or decline in harvest. This is due in part to the fact that the Gulf of Maine waters are warming faster than the global average, driving away certain species, changing the harvesting season, as well as potentially creating a favorable climate for invasive species, loss of food sources and new diseases.⁴⁸ Federal regulations currently under consideration might significantly reduce the lobster catch volumes in Maine by increasing costs. For example, industry experts interviewed for this report stated that lobster fishermen have already started to diversify by starting oyster cultivation as well as sea vegetable farming due to policy changes in federal regulations of lobstering practices.

⁴⁶ Stockford, 2021

⁴⁷ Maine Aquaculture Association, 2022

⁴⁸ Gulf of Maine Warming Update: Summer 2021, 2021

Mapping of Seafood Landings

Data Gathering & Methods

Our analysis uses publicly available datasets from the DMR to display seafood landings in the state of Maine. We analyzed annual data for total weight (lbs), total value (\$), total number of trips, and total number of harvesters for 13 species, using a timeframe of 2008 to 2021. For some species– lobster, oysters, soft shell clams, and scallops–we are able to infer monthly landings via the following metric characteristics:

- Total weight is measured in pounds
- Total value is measured in US nominal dollars (ex-vessel)
- Total number of trips is the number of dealer's boat outings
- Total number of harvesters is the number of harvesters from the port

There are 13 species or groups of species that are identified as representative of Maine's marine living resources (listed in Table 4). After we reviewed the data for completeness, we refined our focus to only include lobsters, oysters, soft-shell clams, and scallops.

Table 2. Maine's Representative Marine Species and Groups

Species and Groups of Species Re	epresenting the Majority of Seafoo	od Production in Maine
 Lobster Crab Mussels (wild and farmed Scallops (wild and farmed) Soft-shell clams Oysters(farmed) 	 Atlantic salmon Groundfish (e.g. hake, haddock, cod, pollock) Tuna Elver/eel Monkfish 	 Quahogs Seaweed (wild and farmed)

The Maine Seafood Guide listed on the UMaine SeaGrant website identifies the peak months for the fishing of these species (shown in *Figure 5*). We can see that lobsters and oysters share a peak season from July to November, whereas soft-shell clams and scallops only overlap at their peaks in March.

Table 3. Focus Species Seasonality⁴⁹

Species	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Fishing Months	Peaks Months
Soft Shell Clams	x	x	р	р	р	x	x	x	х	x	x	х	12	3

⁴⁹ Data from DMR Database

Lobster American	x	x	x	x	x	x	р	р	р	р	р	x	12	5
Oyster Eastern / American	х	х	х	х	х	р	р	р	р	р	р	р	12	7
Scallop Sea	р	р	р	x	x	x	x	х	x	x	x	р	12	4

The ports with the most activity for the above four species are ranked by landed weight. Figure 6 locates the top five ports for lobsters and oysters, and Figure 7 locates the top ports for scallops and clams. Table 2 lists the top ten ports by species.

	Lobster	Softshell Clam	Oyster	Scallop
1	Stonington	Waldoboro	Damariscotta	Other Maine
2	Other Maine	Freeport	Trenton	Lubec
3	Vinalhaven	Deer Isle	Portland	Jonesport
4	Beals	Brunswick	Harpswell	Machiasport
5	Friendship	Machiasport	Newcastle	Pembroke
6	Spruce Head	Scarborough	Brooksville	Stonington
7	Portland	St. George	West Bath	Beals
8	Jonesport	Harrington	Brunswick	Cutler
9	Milbridge	Harpswell	South Bristol	Portland
10	Harpswell	Lubec	Freeport	Eastport

Table 4. Top 10 port landings by weight, 2021







Figure 5. Map of Top 5 port landings for Soft-Shell Clams and Scallops in 2021

Seasonality of Landings by Port

In order to understand the seasonal variation of seafood harvest, we requested monthly landing data from the DMR by lobster zone instead of by port. The DMR maintains high data confidentiality, requiring a minimum of 3 harvesters and 3 processors at each geographic location in order to make data available. This understandable caution limited our ability to obtain monthly data by port, as mentioned above, and left us instead with data by lobster zone, a more aggregated set, but still useful. It also meant that several species in the original list were missing from the monthly landings data from DMR. Therefore we focused our analysis on lobsters, oysters, softshell clams and scallops, species with a greater number of harvesters and processors.

Figure 6. Maine Lobster Zones⁵⁰



Using the monthly lobster zone dataset, we approximated the estimated landings by county for each species by month (see Figures 7-10).

⁵⁰ Data Source: <u>https://mlcalliance.org/all-about-lobster/lobster-2-3-season-and-licensing/</u>



Figure 7. Monthly Lobster Landings by weight in 2021, by Lobster Zone





Figure 9. Monthly Soft-Shell Clam Landings by weight in 2021, by County





Seafood Dealer Locations & Dashboard Visualization Logic

The list and addresses of all registered seafood dealer license holders is available upon request from the DMR⁵¹. Since there were 2,196 dealers registered in 2021, and 12 license types, the dashboard is designed to display each type of dealer's license separately. To aid in comparability, the dealers can be displayed at the same time as port landings. The original list of 2,196 dealer licenses includes 937 unique businesses. A multi-step geocoding process was used to generate longitude and latitude coordinates for 1,871 locations, or 85% of locations. Many licenses are registered to P.O.Boxes, and so a randomly generated point location near the town's center was used.

⁵¹ This data is also available in part on the FDA's website: <u>https://www.cfsanappsexternal.fda.gov/scripts/shellfish/sh/shellfish.cfm?&ad=a601cc2a-714b-4faa-84e8-</u>839feff71b53

	DMR Registration list	Geocoded in Dashboard	Percent geodoced
Enhanced Retail (RE)	57	56	98%
Lobster Meat Permit (LMP)	141	110	78%
Lobster Processor (LPL)	13	13	100%
Lobster Processor Tails Only (LPTO)	5	5	100%
Lobster Transportation (LT)	77	56	73%
Reshipper (RS)	8	8	100%
Retail Seafood (R)	773	621	80%
Shellfish Transportation (ST)	45	35	78%
Shellstock Shipper (SS)	108	105	97%
Shucker Packer (SP)	25	24	96%
Wholesale with lobster (WL)	277	244	88%
Wholesale with lobster supplemental (WLS)	667	594	89%
Total	2196	1871	85%

Table 5. Count of successfully geocoded seafood and lobster dealer licenses in 2021, by license type

Seafood Transportation Dashboard

We designed a dashboard tool for users in Maine's seafood industry that maps seafood landings and transportation related to those landings. The goal was to provide a tool for users to better understand the seasonal variability of the fisheries, including changes in volumes, different transport requirements per species, the location of end users (e.g., markets, restaurants, etc.), as well as the intermediate steps in the supply chain, including dealers, wholesalers, and processors. The dashboard–an interactive map–is available at: https://kabmapping.shinyapps.io/SEAMaine_Dashboard/

Industry interviews helped us understand how transportation costs and logistical options are essential issues for harvesters and processors looking to make the best choice possible with the

best possible data. The dashboard is meant to aid in this, visualizing annual landings by weight for each port and species, from 2018-2021.



Figure 11: Seafood landings and dealers page

When we asked industry representatives what information on logistics and transportation would be of best use to the sector, we received two suggestions. The first recommendation was to help businesses locate nearby dealers and ports in order to initiate discussions for finding transportation solutions, such as sharing a delivery truck. In response, we created a nearestfacility calculator in the mapping dashboard that allows a user to identify the nearest three dealers to a selected port, as well as the three nearest ports to a selected dealer.

Figure 12: Closest seafood dealer locator tools



Figure 14: About page

Maine Marine Living Resources Dashboard

A tool to explore the transportation of seafood products in Maine



The second recommendation was to plot the travel time to the Araho Transfer in Boston, a key distribution hub for major markets in the northeastern states, as well as the Portland Fish Exchange. In response, we created Figure 11 (below), which shows the driving travel time from locations in Maine to the Portland Fish Exchange. The color scale represents travel time, and darkens from yellow to dark purple as travel time increases.



Figure 15. Travel time to & from locations in Maine to the Portland Fish Exchange

Recommendations

Our report concludes with the following recommendations for the SEA Maine committee.

Aggregated Transport and Cold Storage Sites

The state of Maine supports many small and family-owned harvesters as well as providing opportunities for new harvesters across the state. To continue this important work, it is important for the state to address the difficulties harvesters experience in getting their product to market.

Small and large harvesters alike would be well served by community cold storage facilities. In Alaska, the Petersburg Community Cold Storage facility provides cold storage, blast freezing, ice sales, and packaging space to seafood processors and other businesses in the food industry. This facility provides smaller harvesters and processors a commercial option that keeps their product competitive in the market.⁵²

Additionally, the difficulties small harvesters experience transporting their seafood could be lessened by a community transportation network. Similar in approach to the cold storage facility, this solution would provide small harvesters with the opportunity to ship their product as a larger unit and, therefore, receive a lower shipping rate.

Simplified Licensing

The DMR maintains a website with information about licensing for harvesters, dealers, and processors. The information can be overwhelming and difficult to locate. As such, we recommend the DMR create a simplified flow chart to be maintained on the DMR website.

The 2018 report by the Gulf of Maine Research Institute, titled "A fisherman's guide to selling seafood in Maine" is an excellent resource, and should be further developed into a user-friendly online tool whereby harvesters and dealers can understand which licenses and permits are needed for various distribution strategies, such as selling shellfish online and shipping direct to customers.

In interviews conducted with industry members, many expressed frustrations at the struggle to navigate the licensing requirements. For some, it was far from immediately clear which licenses were required for a harvester to sell their product at a local market. For example, currently, shellfish growers not holding a wholesale dealers license must first sell their product to a licensed dealer and then buy it back in order to sell to the public.

The Maine Aquaculture Roadmap, 2022-2032, summarizes the outcomes of a focus group with a large number of stakeholders, and the DMR aquaculture staff recognize the need for better

⁵² (Petersburg Economic Development Council, 2022)

communication about the licensing process. We recommend that the DMR also improve communication about the dealer and harvester licensing process.

By creating a simplified online system to understand the current licensing requirements, both small and large harvesters would be able to more easily maintain and potentially expand their operations. This would also decrease barriers some harvesters experience to selling their product locally. By decreasing this barrier, Maine may see an increase in local sales and thereby an increased visibility of harvesters.

Workforce Development for Commercial Drivers

Maine has one of the oldest demographics in the United States and relies on an older workforce. A component of supporting the adequate supply of commercial drivers is to decrease barriers and create incentives for younger generations and newcomers.

Commercial drivers under 21 years of age are limited to intrastate trucking routes due to federal laws. As such, interviewees mentioned that young drivers will opt to take jobs in construction hauling or forestry rather than long haul freight companies that transport products across state lines. This is a long-recognized issue facing the national trucking industry.

As part of the IIJA bill, the safe driver apprenticeship pilot program allows drivers under 21 to participate in interstate transport. This began in September 2022⁵³. However, the program requires trucking companies to apply to the program, and the application will require some effort that may prove difficult for smaller companies and companies with a lack of experienced drivers to train the new drivers for the required time: a full 120 and 240 hours in two phases.

We recommend that there be a coordinated effort to encourage transport companies operating in Maine, in particular companies that offer refrigerated trucking services, to enroll in the pilot as well as recruit young drivers in partnership with workforce development programs and organizations across the state.

New Data Collection of Seafood Supply Chain

Due to data limitations, we recommend that SEAMaine work in collaboration with harvesters, dealers, processors, and the DMR to collect more complete data of the amount of seafood purchased by wholesale dealers and processors in Maine. Additionally, we suggest that SEAMaine conduct extension meetings with harvesters, dealers, and processors to introduce the dashboard tool and how it can assist them to analyze, strategize, and resolve transportation and logistics issues from their own informed perspective.

⁵³ https://www.fmcsa.dot.gov/safedriver

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Supplemental Materials

Stakeholder Interviews

We thank the following individuals for sharing their insights into Maine's Marine Living Resource Industry. The views expressed in the report do not reflect individual's participant's views.

First Name	Last Name	Role	Company
Ashley	Pringle	Vice President of Operation	Maine & Co
Bartlett	Chris	Marine Extension Associate for Eastern Maine	Maine SeaGrant
Chris	Jordan	Logistics Director	Luke's Lobster
Christian	Brayden	Project Manager	Maine Aquaculture Association
Dianne	Tilton	Executive Director	Downeast Institute
Emma	Wendt	Community Development Officer	Island Institute
George	Seaver	Vice President and General Manager	Ocean Organics Co
Gregor	MacAskill	Economist	Gardner-Pinfold Residual Management
Jeff	Payson	Owner	Northeast Transportation
Kanae	Tokunaga	Research Scientist	Gulf of Maine Research Institute
Nick	Branchina	Director, Fisheries and Aquaculture	CEI
Sadia	Crosby	Owner	OystHERS Seafarm
Sam	Belknap	Senior Community Development Officer	Island Institute

Susie	Arnold	Marine Scientist	Island Institute