SEA Maine

SEAFOOD ECONOMIC ACCELERATOR

seamaine.org

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The Seafood Economic Accelerator for Maine (SEA Maine) is an Economic Development Administration (EDA)-funded initiative that brings together industry leaders and committed partners dedicated to developing a roadmap for economic growth, workforce development, and greater resiliency in Maine's seafood economy. The sector includes wild caught fisheries, lobstering, aquaculture, and value-added processing, along with other elements of the supply chain, such as transportation, logistics, and shipping.

SEA Maine's Workforce & Talent Committee commissioned this study, the "*Current State of Knowledge of Maine's Wild Catch Fisheries and Seafood Workforce*", in 2021. It represents a fundamental building block in developing an understanding of the workforce and talent needs of Maine's living marine resource economy. The findings of this study go to the heart of a substantial challenge facing this sector: a mismatch between the vast future potential of the sector and the perceptions, preparation, and realities of today's workforce. It is our intention to break this mismatch and align today's aspirations and capabilities with the opportunities ahead.
The study, completed by the Maine Center for Business and Economic Research at the University of Southern Maine, is a first step in understanding the nuances and complexities of an industry critical to the Maine economy. This report is meant to be read alongside the 2020 Maine Aquaculture Workforce Development Study completed by the Gulf of Maine Research Institute. Because of differences in methodology, however, the data in the studies cannot be compared. There are several additional caveats that should be kept in mind while reading this report. Because the report is limited in scope, it does not fully reflect the large, dynamic marine living resources sector we work in every day. Existing data are, in particular, notoriously challenging. They do not always capture the seasonality, multiple jobs, self-employment, and informal employment that define the character of Maine's working waterfront. Some of the numbers, as a result, can look startling low. In addition, in this study, aquaculture may, at times, be included in the data so a careful review of the tables and analysis is important.

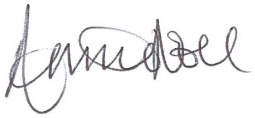
Even with these caveats, the findings in this study are undeniably sobering. They point to an aging workforce, competition for talent from other sectors, and fragmentation and redundancies across the sector related to workforce development. The assessment only amplifies the need for the work of SEA Maine and for a comprehensive approach to workforce development, attraction, and industry engagement if Maine is to remain globally competitive. Over the next few months

SEA Maine will not only expand on the assessment of workforce needs but will also support innovative projects to address our workforce challenges.
To complement this report, the Committee has also undertaken an inventory of Maine-based workforce programs and initiatives for the marine living resources sector. The initial version of this inventory can be found here. This resource will continue to evolve and will eventually be accessible via the SEA Maine website.

We thank the team at the Maine Center for Business and Economic Research for their partnership and the members of the Workforce & Talent committee for their helpful input. We hope the study sheds light on the challenges facing the sector and the range of solutions necessary to create promising careers for the people of Maine, and those we hope to attract here. By helping to meet industry needs with exceptional talent, we are ensuring that an industry so critical to Maine's heritage will also define and propel its future.

Sincerely,

Kimberly Hamilton, PhD
President, FocusMaine
Co-Chair, Workforce & Talent Committee



Anne Langston Noll, PhD
Project Director, Maine Aquaculture Innovation Center
General Operations Manager, Pemetic Sea Farms
Co-Chair, Workforce & Talent Committee

Current State of Knowledge of Maine's Wild Catch Fisheries and Seafood Workforce: Phase 1 Assessment

December 2021 Draft

Prepared by
The Maine Center for Business and Economic Research |
University of Southern Maine

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I. Executive Summary

Overview

Maine's seafood sector and working waterfronts are a core identity and economic driver of the state's coastal communities and economies. The sea has provided livelihoods and opportunities for generations while contributing billions of dollars to the state's economy and supporting others industries, such as the state's tourism and food economies. The sector continues to undergo significant transitions in recent years stemming from environmental pressures, changes in consumer markets, and value chain shifts brought about by the global coronavirus pandemic in 2020. Meanwhile, new opportunities for value-added production and niche products are emerging offering diversification and future growth in the sector and coastal communities. A critical enabler of growth and resiliency of the sector is the availability of a workforce with the necessary skills and knowledge to accommodate labor and skill demands of existing and emerging opportunities. An integral part of this effort is to provide a foundational understanding of workforce related challenges and opportunities facing the sector, its stakeholders, and the broader state of Maine.

The Seafood Economic Accelerator for Maine (SeaMaine) initiative commissioned the Center for Business and Economic Research (CBER) to provide a basic understanding of the workforce conditions in the sector by collecting and synthesizing existing information and available data on the sector's workforce with limited primary data collection through surveys, interviews, or other means. A complementary report prepared by the Gulf of Maine Research Institute (GMRI) titled *Aquaculture Workforce Development Strategy* provides a strong foundational understanding of the skill demands and workforce training supply in Maine for aquaculture operations, but does not directly account for other sector components, such as finfishing and to a lesser extent seafood processing and distribution. The analysis, findings, and recommendations that follow are primarily focused on wild-caught fisheries and processing and are intended to provide SEAMaine with a more rounded picture of the workforce challenges and opportunities across the entire sector. Although we do not incorporate all aspects of the GMRI study into this report, we do refer to connectivity between the two studies. Collectively, these works should provide SEAMaine with a foundational understanding of the workforce issues facing the entire sector as a launching point for strategy development and implementation. This summary provides the core findings and priority recommendations for SEAMaine to move forward with Phase II.

Core Findings

Aging workforce demographics and shrinking labor pools

The state of Maine completed a comprehensive 10-year economic development strategy in 2019 which highlighted a critical workforce challenge with implications for all economic sectors in the state. The state's population is among the oldest in the nation and workers are beginning to age out of the workforce with an imbalance of younger workers in-state to replace retirees. The report indicates that the state will need to find upwards of 83,000 workers over the next 10 years to accommodate replacement workers and modest economic growth. Most regions of the state, especially more rural counties, are projected to have declining youth populations over the next 10 to 15 years limiting the potential local supply of workers. Conditions have been further exacerbated by the COVID-19 pandemic and continue to cause bottlenecks in the workforce and limit businesses' ability to scale and grow.

The implications of a smaller labor pool to recruit from have important implications for regional industrial competitiveness. First, a smaller pool of workers means firms, in general, will have a lower

probability of finding appropriately skilled workers in the region or state, adding to training costs and inhibiting overall productivity. Labor shortages also have the impact of limiting business growth. If firms cannot find and retain workers, firm output cannot increase. Second, the increased competition for in-state labor means wage costs will increase as firms compete for workers by offering better compensation packages as workers churn from operation to operation. This is particularly challenging for smaller, and earlier stage operations, which add to operational costs and decrease margins.

Since there is already a shortage of both skilled and general laborers within the shoreside supply chain, including the working waterfront and seafood processing industries, competition for these types of workers could intensify as aquaculture companies grow and new/larger businesses open with onsite seafood processing capabilities. This could have sector-wide value chain impacts, much like what has occurred in the forest product sector between mills and harvesters/loggers. The lack of local processing capacity can leave both wild-catch fisheries and aquaculture (small) businesses in a position where they're unable to grow beyond supplying the raw product.

Limited workforce demographic diversification

The sector is largely dominated by males and there is limited representation of minority populations. The racial composition reflects the broader demographics in the state, although they are changing, particularly in Southern Maine where there is opportunity to attract new immigrant populations into the sector.

Industry cross-cutting skills demands

Aside from wild-caught seafood and related workers, most occupations are not considered unique to the sector itself. Although a significant share of the workforce is in the harvesting of marine species, a large portion of the workforce is employed in general roles such as clerical and administrative work, packaging, and delivery vehicle and truck driving or as technicians and trade workers. Many of the types of skills needed are applicable across many industry sectors and can be gained through variety of indirect course offerings at various education levels. One advantage of this demand is a larger labor pool to recruit from as well as economic scale in implementing training and workforce education programs.

Industry specific skill demands differ across the sector, some commonalities in core competencies

General skill demands in the aquaculture and finfishing pertain to operating in a marine environment, core competencies and work ethic, while general skills in the processing sector more closely align with food and general manufacturing more broadly, such as machine operation, quality control, and FDA regulatory compliance. All jobs in harvesting and production on the floor rely on some degree of awareness and safety, although there is more limited data or information on the full-spectrum of skill requirements in the wild-caught fisheries space, in part due to the small-scale nature of many operations. However, there are some reports that boat captains are seeking skills that can leverage new technologies, which many operations now have access to but have limited knowledge and experience in how to best utilize them.

Jobs in transportation, which are not unique to the sector, typically require a CDL or analogous license, of which are in high demand across all economic sectors in the state. Most of the core skills identified in the GMRI study, including life skills/problem solving, work ethic, trade skills (electrical, plumbing, and mechanical), and maritime skills as well as food processing and HAACP and management/HR skills, overlap with those required in the wild catch fisheries and seafood processing industry. However, it's important to note that the core skills are framed as those the sector places the highest of value on. So, while we can say the core skills overlap between aquaculture and wild catch fisheries and seafood processing sectors, we cannot say with certainty that they are the core skills valued here.

Many of the jobs typically require little to no education credentials (90%) or prior work experience (91%). Sixty-five percent of jobs required moderate to long-term training. Most of the industry-specific technical skills training occurs on-the-job outside of the traditional workforce delivery system, except for management and a few transportations and distribution-related occupations which require a bachelor's or post-secondary degree. Apart from core business operations (including sales, marking, and management) and technical and scientific jobs, the majority of jobs in the sector have minimal specialized skill requirements, although this differs across finfishing, aquaculture, and processing to a degree. In general, operations are typically looking for a set of core competencies and knowledge from which workers can be trained in-house or on-the-job.

Recruitment and hiring

Large firms, such as established seafood processors or large aquaculture operations, have greater capacity to recruit and attract workers compared to smaller operations. These firms are able to recruit through multiple mediums, including online job postings, career fairs, or other means. Smaller scale operations, which the majority in the sector identify, typically have greater success recruiting through local networks and word-of-mouth. This poses challenges for out-of-state recruitment in which smaller firms lack the resources of a human resource department or dedicated staff to focus solely on recruitment and screening applicants. Another challenge is the seasonal nature of many jobs in the harvesting industries, making the work less appealing or feasible to local workers.

Public perceptions of the industry pose a challenge

As with other legacy production oriented industries in the state, public perception of career opportunities in the sector are typically low or non-existent. Although the industry has evolved significantly, perceptions are often shaped by negative news stories, opposition to certain projects, or based on an inaccurate understanding of the types of work, technology, and activities that are present in today's jobs. The GMRI aquaculture study found similar findings as well and is an important issue for the Sector to address if it is to enable support for growth in the future.

A fragmented approach

The comprehensive review of efforts throughout Maine shows that compared to similar industry efforts in other states or countries, there is a lack of cohesion between wild-catch fisheries, aquaculture, and processing sectors which results in fragmented or redundant approaches to address common workforce needs (e.g. education and training, marketing and recruitment, and advertising career opportunities). Other regions, whether domestic (Georgia or Alaska) or international (Scotland or Australia), address workforce challenges from an industry-wide approach and there appears to be a more joint or complementary narrative for attraction and marketing efforts as it relates to workforce needs. Although this is not uncommon in Maine - similar to the state's forest products sector - it is a challenge as interests of various value chain firms and workforce stakeholders may not align, while free-rider problems and limited scale economies suppress appropriate and necessary investment and coordination of activities.

Recommendation Priorities

Branding and marketing campaign

Public perceptions of the industry are a challenge to the recruitment of workers. A large-scale professional marketing and branding strategic campaign to promote the sector products, as well as career opportunities is a critical component in helping to overcome these barriers. A well-coordinated and designed professionally produced and executed campaign will target potential worker pipelines both in-

state and out-of-state workers. While large individual operations have the capacity to craft a firm specific message, the outcomes of a larger centralized effort, such as that prepared by SeaMaine, will have positive benefits for all producers and enable smaller scale operations, workforce training programs, and educational institutions, to capitalize on a Maine brand that celebrates the state's heritage while emphasizing progress, innovation, and entrepreneurial opportunities in a thriving sector. Focusing on key characteristics of the sector that appeal to younger or non-traditional workers, such as sustainability, lifestyles, innovation, technology, or environmental stewardship, can be a powerful, emotional message.

Outreach and engagement in secondary, post-secondary, and community college local networks

In conjunction with a coordinated branding campaign, the Sector needs to document and present the wild-catch, aquaculture, and seafood processing industries in a way that helps inform and control the narrative of the types of opportunities available stimulating excitement that a career in the sector can potentially offer. Intentional, recurring, and professional engagement with youth influencers (parents, guidance counselors, coaches, etc.), immigrant communities, and other pipeline workforce pools need to be undertaken to tell the story of opportunity.

Targeted out-of-state recruitment

Growing the size and skill of Maine's workforce through in-migration is identified as one of the top goals critical to advance Maine's future economy. Maine's 10-year Economic Development Strategy, published in 2019, acknowledges/address many of the states underlying structural issues and provides a roadmap/foundation of opportunity to connect a (Seafood Industry) workforce development strategy to Maine's 10-Year Economic Development Strategy which identifies seafood production, fishing and aquaculture industries as priorities to invest to tackle unaddressed needs and solve long standing challenges. The Sector should think seriously and intentionally about bolstering a pipeline of out-of-state workers through piggybacking on statewide efforts or jointly with other heritage industries to target and attract youth (e.g. southern New England CTE programs), displaced workers (regions where jobs or marine resource stocks are in decline), or populations that have expressed interest in relocating or returning to Maine.

II. Project Overview and Methodology

Project Overview

In support of the Seafood Economic Accelerator for Maine (SeaMaine) initiative, this analysis aims to help identify the gaps, challenges, and opportunities related to the wild-catch fisheries and seafood sector workforce in Maine. For the purposes of this analysis, Maine's seafood industry is defined as inclusive of wild-catch fisheries (e.g., lobster, finfish, and shellfish), aquaculture, seafood processing, and critical maritime and working waterfront industries. This definition includes activities throughout the value chain from harvesting to processing to transportation, storage, and logistics. A recent report prepared by the Gulf of Maine Research Institute (GMRI) titled *Maine Aquaculture Workforce Development Strategy (AWDS)* provides a comprehensive analysis of the state's aquaculture workforce. Therefore, this report provides a compilation of existing resources, reports, and data focused on the remaining components of the sector and does not attempt to duplicate the GMRI study but rather complement the GMRI study.

This work is the first phase of a two-phase process. The second phase will develop a comprehensive workforce action plan and strategy focused on the needs of wild-catch fisheries and important shoreside supply chain components, including critical waterfront industries and seafood processing. The present analysis is intended to provide the SeaMaine Workforce and Talent Development sub-committee the foundation to prioritize workforce development activities in Phase 2.

Assessment Methodology

This assessment is based on a broad review of existing resources, data, and other pertinent information related to Maine's seafood industry, workforce, and economy, as well as workforce development efforts and strategies that have taken place in other regions. This assessment also includes an inventory of relevant and known training and certification programs provided in Maine and an assembly of current and historical secondary industry and occupation employment data.

This analysis will address several broad questions presented in the following order: What is the current state of the sector's workforce? What are the current industry workforce needs? What types of career pathways/opportunities are available now and in the future? What is Maine's current capacity to meet the sector's workforce training and educational needs, and where is the pipeline of workers to meet industry demand? The core findings and priority recommendations are outlined and described in the Executive Summary.

III. Sector Employment Overview

Maine's wild-catch fisheries and seafood processing industries have a long and proud heritage. Like other longstanding natural resource or heritage industries, the wild-catch fisheries and seafood processing sector face several challenges. The decline within wild-catch fisheries has pushed many individuals and businesses to diversify and seek new opportunities by embracing new technologies that are changing the types of knowledge and skills required of the workforce. Companies are not simply engaged in the commercial catching or taking of lobster, groundfish, shellfish, or other species. They are adapting their business model by vertically integrating parts of the supply chain to save costs, improve efficiency, expand into different forms of aquaculture, or provide tourism-related activities during the off-season. People often talk about the graying of the fleet and the need to build the future pipeline of the fishing workforce, and the same applies to shoreside supply chain components, including critical waterfront industries and

seafood processors who also need recruits and talent to maintain competitiveness and growth. The demographic challenges of an aging workforce are not unique to the sector but are characteristic of many, especially heritage industries, across the state.

As of 2020, Maine's wild-catch fisheries and seafood sector workforce comprised over 7,000 workers across several industries, as illustrated in Table 1. A majority of jobs are within the wild catch fisheries sector (4,456), followed by wholesale and retail (1,712), seafood processing (693), and critical working waterfront (162).[1] Jobs within the wholesale/retail and critical waterfront sectors have increased from 2010 employment levels while wild-catch fisheries and seafood processing employment levels have declined.

Table 1: Maine's wild-catch fisheries and seafood processing sector employment, 2020

NAICS Codes	Industry Group/Sector	2020 Jobs	% Job Change ('10 - '20)
	Wild catch fisheries (Fish, Lobster & Shellfish)	**4,456**	**-2%**
114112	*Shellfish Fishing (includes lobstermen)*	3,493	-1%
114111	*Finfish Fishing + Other Marine*	963	-5%
	Wholesale/retail	**1,712**	**4%**
424460	*Fish & Seafood Merchant Wholesalers (fresh & frzn.)*	1,331	4%
445220	*Fish and Seafood Markets*	381	3%
311710	**Seafood Product Preparation and Packaging**	**693**	**-12%**
	Critical Working Waterfront	**162**	**15%**
488320	*Marine Cargo Handling*	72	28%
488330	*Navigational Services to Shipping*	78	-1%
488310	*Port and Harbor Operations*	12	-

*Data source: EMSI 2021.3 data series, employment data include QCEW and Non-QCEW Employees, and Self-Employed workers. *Excludes aquaculture workforce, which supported an estimated 622 jobs in 2020 according to Maine's Aquaculture Workforce Development Strategy.*

The wild catch fisheries and seafood industry workforce is primarily employed in commercial fishing (55%), transportation and material moving (15%), production (9%), sales (6%), and management (5%) related occupations (Table 2), which illustrates the portion of industry sector employment by broad occupation groups. Appendix 2 highlights critical detailed occupations employed in each major occupation group.

[1]Employment in this industry sector is hard to quantify, many people do not want to be counted, and many are self-employed. While Table 1 includes self-employed workers, the figures appear to undercount the actual number of workers. According to an article published in the Portland Press Herald, there were 18,000 licensed fishermen, seafood dealers, processors, aquaculture operators, and charter fishing operators that make up Maine's seafood industry in 2020; meanwhile, data from the 2019 5-year American Community Survey (ACS) report a total 7,825 jobs in the commercial fishing industry alone of which 76% were self-employed workers. Although not all licenses indicate employment, the disparity between official department of labor employment counts shows the challenge in quantifying the true size and characteristics of the workforce.

Table 2: Broad occupational employment concentration by industry sector, 2020

Major Occupational Groups	Seafood Industry Total	Sectors				
		Finfish Fishing	Shellfish Fishing	Seafood processing	Wholesale/ retail	Critical Working Waterfront
Commercial Fishing	54.8%	80.9%	87.1%	2.3%	0.7%	0.0%
Transportation & Material Moving	15.1%	4.2%	3.1%	14.7%	40.1%	79.0%
Production	9.1%	2.6%	1.3%	63.4%	8.0%	0.7%
Sales and Related	5.7%	0.5%	0.3%	1.7%	21.5%	0.6%
Management	4.7%	5.5%	4.4%	2.7%	5.3%	7.0%
Office & Administrative Support	4.1%	1.7%	0.8%	4.7%	11.7%	8.0%
Food Preparation and Serving Related	1.2%	0.1%	0.0%	0.6%	4.7%	0.0%
Installation, Maintenance, and Repair	1.1%	0.7%	0.3%	3.6%	1.6%	5.0%
Personal Care and Service	1.0%	1.7%	1.5%	0.0%	0.0%	0.0%
Business and Financial Operations	0.9%	0.3%	0.2%	1.3%	2.6%	0.5%
Life, Physical, and Social Science	0.4%	1.1%	0.4%	0.8%	0.1%	0.0%
Arts, Design, Entertain., Sports/Media	0.4%	0.0%	0.0%	0.0%	1.6%	0.0%
Protective Service	0.3%	0.7%	0.3%	0.3%	0.1%	0.0%
All Other	0.3%	0.0%	0.0%	1.7%	0.4%	0.1%

*Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers. *Excludes aquaculture workforce.*

Wild Catch Fisheries

Maine's wild-catch fisheries sector includes businesses primarily engaged in the commercial catching or harvesting of lobster, finfish, shellfish, or other living species from their natural habitat. The sector employed nearly 4,500 workers, accounting for 64% of total seafood sector jobs in 2020. Employment levels have decreased by 2% since 2010 (Table 1). The wild-catch fisheries sector comprises various industries (subsectors) that can be defined by species or groups of species, methods or gear to be used, and geographic area. In this analysis, Maine's wild-catch fisheries sector is defined by species and groups of species (e.g., lobster, shellfish, and finfish), which broadly align with their differing production methods and the availability of industry employment data.

Based on data from the Maine Department of Marine Resources (DMR), commercial fishers and harvesters landed a total of over $500 million in 2020. Maine's lobster, softshell clams, and scallops were the state's top-valued species in terms of landing value. Lobster and shellfish landings for 2020 were valued at just over $441 million, accounting for 85% of the total commercial landing value. Of the 85%, lobster (and crab) makes up 79%, and shellfish make up 21%.[2] The remaining marine landed species, such as bloodworms, menhaden, elver, Atlantic herring, tuna, groundfish, sandworms, and seaweed, accounted for the remaining 15% of total commercial landing value in 2020.

Key highlights by select species are highlighted in the following sections.

Lobster and Shellfish

Together the lobster and shellfish subsector employed nearly 3,500 workers; a modest 1% decrease since 2010. Tables 1 and 3 include self-employed workers, but the figures appear to undercount the actual number of workers. One reason is that employment in this industry sector is hard to quantify in government

[2] Note: shellfish species included lobster, soft clam, scallop, oysters, blue mussel, hard clam, crab, and mahogany quahog.

statistics because of the nature of the industry and many are self-employed. Further complicating employment counts in the lobster and shellfish industry is that employment numbers for these industries are grouped together.[3] Based on data from the US Census 2019 5-year American Community Survey (ACS), there were a total of 7,825 jobs in the commercial fishing industry, 76% of which were self-employed workers.

A similar challenge exists in the occupational employment data for the sector in which specific fishing related occupations are collectively grouped together. Detailed occupations employing 10 or more workers comprised 96% of the subsector workforce, listed in Table 3, which includes tour and travel guides that are made up of smaller companies involved in the visitor sightseeing or guiding industries.

Table 3: Key occupations employed in the lobster and shellfish subsector, 2020

SOC Code	Detailed Occupation	Employed in Subsector (#)	Percent of Occupation in Subsector
45-3031	Fishing and related workers	3,010	86%
11-9198	Personal Service Managers, All Other	90	3%
53-5021	Captains, Mates, and Pilots of Water Vessels	60	2%
11-9013	Farmers/Other Agricultural Managers	57	2%
39-7018	Tour and Travel Guides	52	1%
53-7062	Laborers, by hand	22	1%
45-1011	Supervisors (fishing)	15	0.4%
51-3021	Butchers and Meat Cutters	14	0.4%
51-9198	Helpers--Production Workers	12	0.3%

Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers.

Table 4: Key occupations employed in the finfish fishing subsector, 2020

Detailed Occupation	Employed in Subsector (#)	Percent of Occupation in Subsector
Fishing and related workers	763	79%
Personal Service Managers, All Other	24	2%
Farmers/Other Agricultural Managers	21	2%
Tour and Travel Guides	15	2%
Captains, Mates, and Pilots of Water Vessels	14	1%
Laborers, by hand	10	1%

Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers.

[3] This is an issue that could in part be addressed with DMR licensing data, but the dataset must first be processed to avoid duplicate counts.

Finfish

The finfish (and other marine species) subsector employed over 950 in 2020, suggesting a 5% decrease since 2010, and includes the remaining wild catch marine species industries as noted above. Similar to the lobster and shellfish industry, the majority of the workforce is employed in commercial fishing (81%), management (6%), and transportation (4%) related occupations (Table 2). Detailed occupations employing 10 or more workers comprise 88% of the subsector workforce, as listed in Table 4.

Seafood Wholesale/Retail

This sector includes businesses that wholesale and retail fresh, frozen, or processed fish and other seafood products, which includes imported products. [4] These businesses purchase fish and seafood from wild catch fisheries, aquaculture, and seafood processors. Such products might be repackaged or sold as is to fish and seafood markets (also included in this sector, primarily engaged in retailing fresh, frozen, or cured fish and seafood products) like supermarkets, restaurants, caters, or hotels. Together the sector employed a little over 1,700 workers in 2020, marking a 4% increase since 2010.

The majority of the workforce in this sector is employed in transportation and logistics, sales and related, and office and administrative support occupations (Table 2). The detailed occupations listed in Table 5 employ 70% of the sector.

Table 5: Key occupations employed in the seafood wholesale and retail sector, 2020

SOC Code	Detailed Occupation	Employed in Subsector (#)	Percent of Occupation in Subsector
41-4012	Sales Reps. (non-technical products)	190	11%
53-7065	Stockers and Order Fillers	183	11%
53-3032	Heavy and Tractor-Trailer Truck Drivers	167	10%
41-2011	Cashiers	75	4%
53-7062	Laborers, by hand	75	4%
53-3031	Driver/Sales Workers	75	4%
53-3033	Light Truck Drivers	74	4%
35-2021	Food Preparation Workers	48	3%
11-1021	General & Operations Managers	41	2%
53-7051	Industrial Truck & Tractor Operators	40	2%
43-9061	Office Clerks, General	38	2%
53-1047	Supervisors (transport)	38	2%
41-1012	Supervisors (Non-Retail)	35	2%
41-2031	Retail Salespersons	32	2%
43-4051	Customer Service Reps.	30	2%
51-3023	Supervisors (Retail)	30	2%
41-1011	Bookkeeping, Accounting, and Auditing Clerks	30	2%
43-3031	Packers and Packagers, Hand	25	1%

Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers.

[4] A list of Maine businesses can be found here: https://www.mainebids.us/maine-contractors/naics-424460-Fish-Seafood-Merchan.htm

Seafood Processing

Business establishments in this industry are involved in various processing techniques/activities, including canning, smoking, salting, drying, freezing, and packing fish, lobster, and shellfish. Industry operators also eviscerate fish (remove parts from fish), shuck shellfish (remove their shells), and process fish and shellfish fats and oils (IBISWorld Industry Report, 2021). This industry also includes fish processing vessels that are engaged in offshore seafood processing (aka "floating factory ships"). The majority of seafood processing takes place in shore-based plants located in southern Maine or smaller operations near the place landing, and therefore the shoreside seafood supply chain skill and knowledge are critical here, although there is a marked shift in the core landing ports Downeast in recent years, suggesting processing may follow. The seafood processing subsector employed nearly 700 jobs in 2020, a 12% decrease since 2010.

The industry workforce is employed in production (64%), transportation and material moving (15%), office and administrative support (5%), and installation, maintenance, and repair (4%) occupations (Table 2). Jobs in processing facilities include production line workers, trade workers (refrigeration, electrical, production, or equipment repair), plant managers or plant section managers, sales/marketing, product development/innovation, quality control technicians, and food safety and regulation experts. The detailed occupations that employ 10 or more employees in seafood processing make up 66% of the sector's workforce (Table 6).

Table 6: Key occupations employed in the seafood processing sector, 2020

SOC Code	Detailed Occupation	Employed in Subsector (#)	Percent of Occupation in Subsector
51-3022	Fish Cutters and Trimmers	280	40%
51-9111	Packaging & Filling Machine Operators	45	7%
53-7064	Packers and Packagers, Hand	38	6%
51-1011	Supervisors (Production & Operation)	24	3%
51-3092	Food Batchmakers	15	2%
53-7062	Laborers, by hand	14	2%
51-3099	Food Processing Workers, All Other	13	2%
53-7051	Industrial Truck and Tractor Operators	11	2%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	10	1%
49-9041	Industrial Machinery Mechanics	10	1%

Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers.

Critical Working Waterfront

This industry includes businesses primarily engaged in operating ports, harbors (including docking and pier facilities) or canals, navigational services, as well as those engaged in providing loading or offloading services to or from a ship. Together the critical working waterfront subsector employed 162 workers in 2020; a 15% increase since 2010.

The majority of the workforce is employed in transportation and material moving (79%), office and administrative support (8%), management (7%), and installation, maintenance, and repair (5%) occupations

(Table 2). The detailed occupations listed in Table 7 comprise 48% of the sector's workforce, while the rest is employed in a variety of occupations that employ 9 or fewer workers and cannot be shown due to data restrictions.

Table 7: Key occupations employed in the critical working waterfront sector, 2020

SOC Code	Detailed Occupation	Employed in Subsector (#)	Percent of Occupation in Subsector
53-3032	Heavy and Tractor-Trailer Truck Drivers	23	14%
53-5021	Captains, Mates, and Pilots of Water Vessels	21	13%
53-7062	Laborers, by hand	21	13%
53-5011	Sailors and Marine Oilers	12	8%

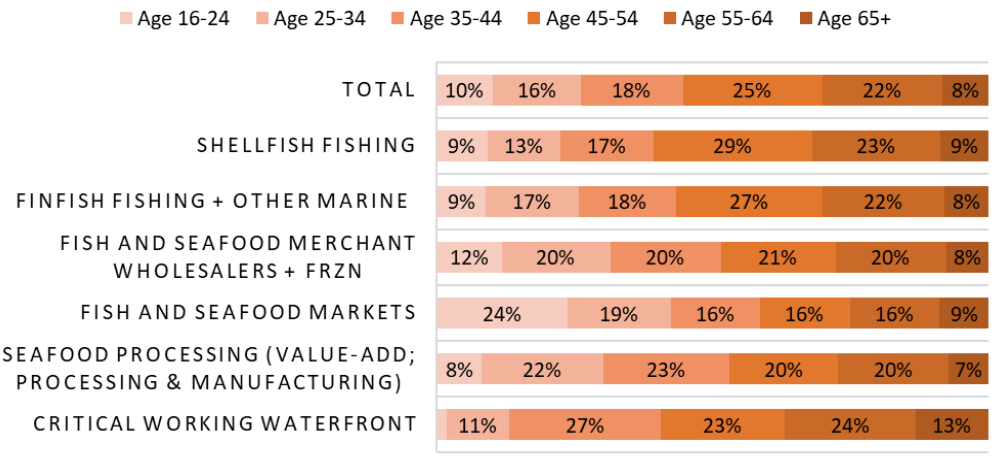
Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers.

Workforce Characteristics

Thirty percent of workers will be of retirement age in the next 10 years; however, the industry is known to work long past retirement age. The most vulnerable sector is the critical working waterfront in which 37% will be of retirement age in the next 10 years (Figure 1).

Overall, 80% of the total workforce is male, although this varies by sector. Wild-catch fisheries, including finfish, shellfish, and lobstermen, and the critical working waterfront are around 90% male. Seafood processing and fish and seafood markets are more gender diverse, where 44% and 60% are male, respectively.

Figure 1. Age Composition, based on 2020 industry data



*Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers. *Excludes aquaculture workforce. Industry specific data not available due to sampling size.*

IV. Wild Catch Fisheries & Seafood Workforce Occupations

To characterize the workforce and define job and career opportunities within Maine's wild-catch fisheries and seafood industry we use Industry Staffing Patterns data to identify the major and detailed occupations found within the wild catch fisheries and seafood industry. This information is intended to align with the occupation clusters and career pathways discussed in *Maine's Aquaculture Workforce Development Strategy*. The following section provides a snapshot of the current workforce by looking at occupational employment trends and typical job preparation requirements for broad occupational groups.[5,6] A table with detailed occupation information can be found in Appendix 1 and Appendix 2.

Employment and wages

The largest occupational groupings employed in the seafood industry include commercial fishing (55%), transportation and material moving (15%), and production (9%), followed by sales and related (6%), management (5%), and office and administrative support (5%) jobs (Table 8). Employment change from 2010 to 2020 is illustrated in Table 8. Overall employment levels decreased by 1% varying by occupation group.[7]

The median hourly wage for all wage and salary workers in Maine was $19.30 compared to the national hourly wage of $20.10. Table 8 shows the median wage for broad occupation groups, which range from as low as $12.89 for food service and preparation worker occupations to as high as $39.81 for management-related occupations. As of 2021, Maine's minimum wage is $12.15 and will be increased to $12.75 in 2022. Broadly speaking, all of the occupations in Table 8 pay a wage greater than the state's minimum wage.

Education and training requirements

Figure 2 illustrates the typical education, work experience, and training levels for the wild catch and seafood industry workforce. Many of the jobs within the current industry sectors typically require little to no formal education credentials (90%) or prior work experience (91%). Sixty-five percent of jobs required moderate to long-term on-the-job training, while many of the necessary industry-specific technical skills training occurs on the job and is provided by businesses. Skills and knowledge are generally transmitted from the owner, manager, or another employee to the new employee. On-the-job training typically occurs when getting industry-specific qualifications before starting a new job is limited among young people or potential new entrants – but also when a job is seasonal and has lower barriers to entry as many do within the wild catch fisheries and seafood industry sectors.

[5] Much of the industry sector heavily depends on word of mouth and postings on sites such as Craigslist for recruitment - which is not captured in the jobs analytics data and limits insight about businesses real-time in-demand skills and knowledge needs. Fishing and fishing-related jobs are significantly underrepresented in job posting data. Still, these data provide limited insight into demand across the entire economy. Refer to Appendix 3 for a description of the top in-demand skill sets for the largest occupational groups.

[6] The Bureau of Labor Statistics (BLS) groups jobs by occupation using the Standard Occupational Classification (SOC). Individual occupations have a unique SOC code that can be linked to a wealth of career information.

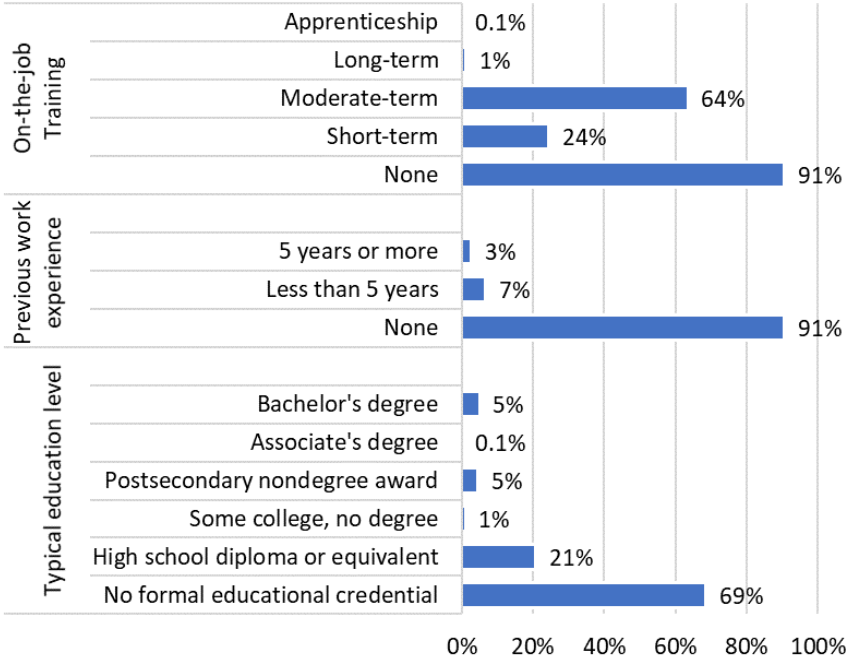
[7] It is important to note that employment change is more pronounced in occupational groups with less than 40 employees; smaller employment figures magnify growth trends and should be kept in mind.

Table 8: Broad Occupational Employment in Maine's wild-catch fisheries and seafood industry, 2020

Major Occupational Groups	Jobs, 2020	% of job in industry total	Job change from 2010 (%)	Median Hourly Wage
Commercial Fishing	3,846	55%	-4%	$16.47
Transportation & Material Moving	1,062	15%	14%	$16.43
Production	650	9%	5%	$19.22
Sales and Related	399	6%	-13%	$14.93
Management	327	5%	3%	$39.81
Office and Administrative Support	290	4%	-5%	$18.08
Food Preparation and Serving Related	86	1%	38%	$12.89
Installation, Maintenance, and Repair	79	1%	2%	$21.96
Personal Care and Service	70	1%	-30%	$13.78
Business and Financial Operations	63	1%	15%	$31.13
Building Maintenance	39	1%	33%	$14.61
Living Resources Science	32	0.4%	44%	$30.13
Arts, Design, Entertainment/Media	27	0.4%	-31%	$19.37
Protective Service	19	0.3%	-30%	$20.82
Other*	35	0.5%	-30%	-

*Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers. Note: Excludes aquaculture workforce. *Includes Architecture and Engineering, Construction, and IT*

Figure 2: Portion of workforce grouped by typical education, work experience, and training levels, 2020



Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers.

Some occupations, including those within sales and marking, such as retail and non-retail sales supervisors and travel and tour guides, have experienced a fairly significant drop in employment since 2010. This is in part driven by the COVID-19 pandemic but is also part of longer-term trends. Aside from fishing and fishing-related workers, occupations are not considered unique to the wild catch fisheries and seafood industry itself. A large portion of the workforce is employed in general roles such as clerical and administrative work, packaging, and delivery vehicle and truck driving. Other occupations include technicians and trade workers as well as processing managers. As previously mentioned, most of the technical skills and specific knowledge required in the industry sector occurs on the job and outside of the traditional workforce delivery system, except for management and a few transportations and distribution-related occupations which require a bachelor's degree or post-secondary degree.

Detailed occupations that employ 25 or more workers makeup 89% of the wild catch fisheries and seafood industries workforce, occupational employment trends and typical entry level requirements and are documented in Appendix 1 and detailed in Appendix 2.

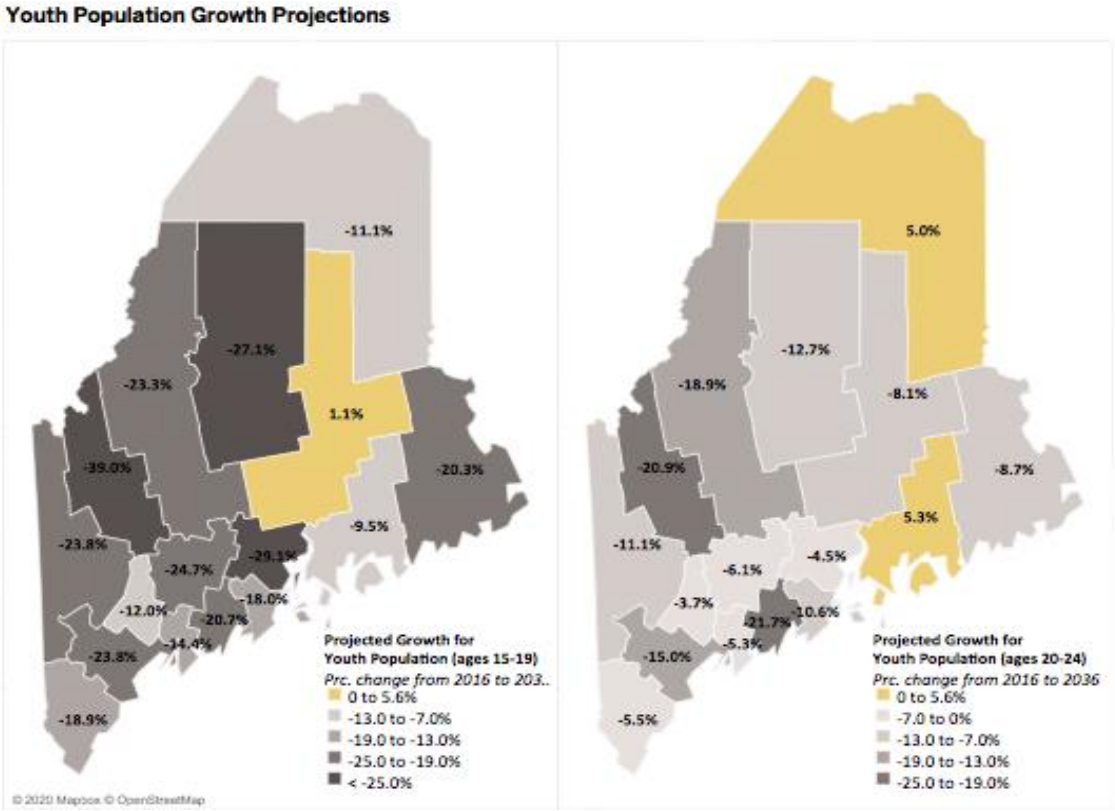
V. Workforce Pipeline

One of the fundamental challenges facing the sector, as well as the vast majority of sectors in the state, is finding and attracting a sufficient and sustainable pipeline of workers to enter careers in the sector. The demographic trends in Maine suggest that upwards of 80,000 workers will be required over the next 5-10 years to support the replacement of retiring workers as well as to support economic growth. As the oldest state in the nation by median age, Maine's challenges are not unique but pose significant challenges to growth and economic competitiveness.

Secondary and youth in-state populations

The in-state youth workforce pipeline will continue to decline in most regions across the state forecasted through at least 2036, under current trends (Figure 3). In particular many rural and coastal areas of the state, where sector is generally concentrated, are expected to see continued decline in younger aged populations lowering the potential workforce pipeline. Industries and firms will have to compete more aggressively for labor under this scenario.

Figure 3: Maine Youth Population Projections by County, 2016-36



Source: The Forest Opportunity Roadmap for Maine Workforce Development Strategy (2021). Data from US Census Population Estimates Program and Maine State Economist's Office.

Traditionally underrepresented populations

Another potential local pipeline to access high-skilled adult workers with the talent and high-tech knowledge and skills needed to advance the seafood processing, aquaculture, and wild-catch fisheries sectors is IntWork – a Maine-based business that provides recruiting and diversity hiring and retention consulting. IntWork has built a pipeline of both local and out-of-state BIPOC (Black, Indigenous, and People of Color) and immigrants who want to live and work in Maine – with a focus on engineering and construction trades. They currently offer three specializations: engineering, finance, and information technology. While not directly related to the wild catch fisheries and seafood industry, this is an example of a business addressing the labor shortage and skills gap through diversity hiring and retention and leveraging skilled immigrant labor. With a broad focus on engineering – including engineering and construction trades – finance, and IT, this could be a pool of high-skilled workers with the talents and high-tech knowledge and skills needed to advance the seafood processing, aquaculture, and wild-catch fisheries sectors.

Out of state recruitment and attraction

The bulk of Maine's workforce pipeline will likely be cultivated through in-state populations, but as the demographics suggest, this will become increasingly more challenging over time. It is imperative that the sector, and most industries in the state, focus on attracting and cultivating a workforce pipeline from outside of the state as well. This of course is by no means a silver bullet and is not without challenges. However, there are untapped opportunities in youth markets in proximate states, as well as labor pools in

similar industry clusters in regions elsewhere in the US, such as southern New England. There is also untapped potential in transient populations, such as military members seeking career opportunities upon discharge from service. Regardless of the source, it will be imperative for the sector to be able to attract workers from outside of the state to career opportunities in the marine living resources sector.

VI. Workforce Training & Education

To meet workforce education and training needs, the *Maine Aquaculture Workforce Development Strategy* (AWDS) outlines a detailed approach that includes leveraging existing vocational-oriented partnership models between community colleges, Career and Technical Education (CTE), and the Maine Department of Labor Apprenticeship (Apprenticeship) to develop a vocational education and training (VET) system. This inventory and approach is applicable to the broader sector. Workforce training and education needs, where applicable, are similar across sub-sector industries.

To address some of the most immediate workforce needs and prepare for future skill demands, this section adds to the existing information by bringing together and highlighting some of the current education and training opportunities related to the needed skills identified through prior industry-specific research. This approach helps identify training gaps (and opportunities) and will serve as a resource that the SeaMaine Workforce Committee and businesses can utilize for targeting and recruiting to address immediate workforce needs. The following highlights the workforce development capacity and pipelines available in Maine.

Workforce Development Capacity

Several businesses, organizations, and institution types in Maine provide training opportunities that can be leveraged to upskill or advance current employees and prepare young people and potential new entrants for jobs or careers in the seafood industry. It should also be recognized that most businesses provide internal training often to meet regulatory safety guidelines, specialized equipment operations, and general job activities training.

The inventory of relevant training and education programs in Maine that support the wild-catch fisheries and seafood industry sector workforce needs is provided in Appendix 5.

Career and Technical Education (CTE)

The CTE system, including education partners and providers, has been underutilized and is well-positioned to meet industry-specific workforce needs with adequate funding and support. The CTE courses at the high school level align with CTE programs provided at the post-secondary level and fall within one of the state's 10 Career Clusters, which provide a solid framework to help explore and understand workforce pathways. The framework offers an established organizational system that can be leveraged and adapted to make career information accessible to anyone exploring jobs and occupations, including potential new workers, counselors, program planners, and others. Individual occupations – like those listed above and A1-Table 1 and 2 – can be linked to the Career Clusters, pathways, and other job-related information, to identify the courses and programs offered in Maine that provide complementary qualifications, skill sets, and competencies among the aquaculture, wild-catch fisheries, and seafood processing workforce; as well as identify the courses and programs that match the skills and knowledge needed to prepare the wild catch fisheries and seafood industry workforce.

Secondary education

All of the CTE high schools in Maine offer courses and programs that either directly or indirectly relate to the needed skills for various sector occupations and include:[8]

● Agricultural Mechanics and Equipment/Machine Technology ● Aquaculture ● Business Admin. and Management ● Office Automation/Tech./Data Entry ● Computer Information Systems/Information Assurance ● Computer Installation and Repair Technology/Technician ● Culinary Arts/Chef Training ● Diesel Mechanics Technology/Technician ● Electrical/Electronics Equipment Installation and Repair, General ● Engineering Technology, General ● Food Preparation/Professional Cooking/Kitchen Assistant	● Heating, A.C., Ventilation & Refrigeration Maintenance Technology/Technician ● Machine Tool Technology/Machinist ● Manufacturing Technology/Technician ● Marine Maintenance/Fitter and Ship Repair Technology/Technician ● Marketing/Marketing Management ● Mechanical Engineering/Mechanical Technology/Technician ● Natural Resources/Conservation ● Retailing and Retail Operations ● Small Engine Mechanics and Repair Technology/Technician ● Truck and Bus Driver/Commercial Vehicle Operation ● Welding Technology/Welder

[8] Programs explicitly geared towards living resources, aquaculture, processing, etc. are denoted as bold text

A core program implemented in nine high schools along the Maine coast, the Eastern Maine Skippers Program (EMSP), is a collaborative community-based effort that provides students with the core skills and knowledge needed to participate in today's wild-catch fisheries. According to statistics on their website, the EMSP supports between 60-100 students in grades 9-12 in downeast Maine annually.

Post-Secondary Education & Training

Several public and private post-secondary institutions offer degrees in marine science and resources. It was not until recently that the first classes focused on commercial fisheries [and aquaculture] were offered. Several short courses and workshops have begun, including the *Business of Maine Lobster* and *Aquaculture in Shared Waterways*.[9] As of fall 2021, the Washington County Community College (WCCC) started offering the Coastal Fisheries and Marine Technology program, which provides a post-secondary certification and degree focused on commercial fishing and aquaculture or marine maintenance and operations. This is the first program of its kind in the state, though it is unclear how much focus, if any, will be given to day-to-day operations such as distribution, logistics, storage, and transportation or seafood processing. However, this is an opportunity for the sector to influence and shape curriculum that responds to workforce needs, while providing on-the-job training and intern or apprenticeship experience. With respect to food processing, there are various manufacturing-oriented training programs that serve the food sector and there is a fair amount of overlap with skill demands for seafood processing compared to the broader food manufacturing industry. Some basic culinary training is also provided at post-secondary levels [and secondary] in Maine. For example, Southern Maine Community College (SMCC) offers training to learn about basic food processing and health and safety skills – including Hazard Analysis of Critical Control Points (HACCP) – which apply to some entry-level seafood processing jobs.

Refer to the call-out tables below that provide a snapshot of Maine's two relevant education and training programs; the detailed inventory is provided in Appendix 5. Career path and workforce development resources can be found in Appendix 4.

Title (training, program, cert.): The Business of Maine Lobster
Institution or provider: Washington County Community College (WCCC) and Machias Valley Center for Entrepreneurship (MVEC)
Web link: https://www.wccc.me.edu/academics/programs/programs-study/coastal-fisheries-and-marine-technology/

- Free 10-week virtual class; 3 credit course
- Provides and overview of the lobster supply chain, identifies career pathways to employment in the industry, and explores career opportunities in the lobster industry. "Class covers from the basic biology of a lobster to storage and inventory management, quality assurance, grading, distribution of live lobster, transportation and marketing."

Tags: Seafood distribution, logistics, storage, transportation, etc.

Source: *Learning About Careers in The Maine Lobster Industry* | 4-Jun-21 | Maine Lobstermen's Community Alliance. Retrieved from: https://www.wccc.me.edu/press_release/learning-about-careers-in-the-maine-lobster-industry/

[9] However, it appears that the last time the Aquaculture in Shared Waterways program was offered was in 2018?

Title (training, program, cert.): Coastal Fisheries and Marine Technology Certificate and Associate Degree Program with a focus on either Marine Operations and Maintenance or a Fisheries and Aquaculture Track.
Institution or provider: WCCC
Web link: https://www.wccc.me.edu/academics/programs/programs-study/coastal-fisheries-and-marine-technology/

- Training program offering industry certification and community college certification. Offered online, e-learning, or distance learning.
- Commercial Fishing (CIP 490303). Per the Maine JobLink website, "This program design is in line with the recommendations from the recently published Maine's Aquaculture Workforce Development Strategy Report which states, "This program should be designed broadly, to include proximate sectors with similar skills needs such as commercial fishing." Industry credentials will include ABYC, US Coast Guard Operator of Uninspected Personal Vessel Captain's Licensure, and SCUBA.
- Graduates of the program will be qualified for positions such as Commercial Fisherman, Aquaculture Technician, Marine Technician, and Marine Engine Specialist.

- Source: Maine JobLink website, 2021

Adult Education

Education and workforce training opportunities that prepare adult learners for post-secondary education or employment can provide a chance to upskill or advance current employees and train new entrants for seafood industry jobs – ultimately creating a pipeline of adult workers at varying skill levels.

The Maine Adult Education system (i.e., a public education and career pathways system) is one example; it focuses on providing education and training to adult learners, preparing them for post-secondary education or employment opportunities. With over 70 education programs such as business and skills training and basic literacy, including English language acquisition, instruction is aligned to support the College and Career Readiness Standards (CCRS) for Adult Education (CCRS), developed for the Office of Career, Technical, and Adult Education (OCTAE). The OCTAE administers and coordinates adult education and literacy programs, career and technical education, and community colleges.[10]

Below are several relevant certificate programs associated with the in-demand skills and knowledge needed to improve the workforce – immediately and in the future – for some of the top occupations in the seafood industry:

- Digital Marketing Certificate, MSAD#1 Adult & Community Education
- Bookkeeping Certificate, MSAD#1 Adult & Community Education
- Certificate in Emerging Technology for Managers, York Adult Education
    - blockchain, artificial intelligence, and robotics
- Adult Basic Education (ABE), RSU16 Adult Education
- English Language Acquisition, Mt. Desert Island Adult & Community Education
- ESL/ELL (English as a Second Language), Washington County Adult & Community Education

[10]Classes and programming could be linked to the Career Clusters and pathways framework used by many schools and state agencies throughout Maine.

On-the-job training

A lot of training takes place outside of the traditional workforce delivery system, especially for low-skilled jobs and those with a high turnover (including a high degree of seasonality) but some training and educational opportunities are available in Maine. For example, most businesses typically provide some sort of training, whether formal or informal, for the majority of jobs in the industry, especially for entry-level jobs.

Education and Training Gaps

Several gaps have been identified in existing resources regarding training programs currently offered in Maine. These are summarized below.

Business and technology education gap, for youth in particular

Reportedly, training is offered for certain pieces of technology, but for many fishermen the time and location of these training are inconvenient and prohibitive. According to MCFA's Beyond the Bow: A Fisheries Needs Assessment of Harpswell, "When focusing on the needs of younger members of the fishing community, 65% felt a gap lay within business and technology education as opposed to access to fishing techniques and on-boat experience. Many had mastered the labor side of fishing, but they explained that the innate knowledge and techniques older fishermen had about the business and the Gulf of Maine were things they lacked. All felt that a program or class was needed to give younger fishermen the opportunity to listen and learn from the experienced captains and crew members."[11]

Fisheries programs lack fish processing and handling skills

As noted in the Workforce development in Aquaculture and Fisheries: Landscape analysis of ocean-related Career Pathways for Leadership and Development (2020), "very few fisheries programs in the United States have strengths in wild-capture fish processing and handling or wild-fish vessel and harvesting operations (including Maine) — even though these are useful, practical skills for entrants to the workforce. The gaps in program strengths highlight the need for more programs that address such topics and prepare participants to enter the workforce." The Coastal Fisheries and Marine Technology program at Washington County Community College is one of the first commercial fisheries and aquaculture post-secondary education programs but does not appear to offer such fish processing and handling in its curriculum.

Lack of a professional pathway or pipeline for essential seafood processing jobs

Currently, there are no career pathways or programs to prepare or to encourage workers to enter food manufacturing and processing, let alone seafood processing in particular. This is not new information, and the demand for workers with the knowledge and experience related to seafood processing and supply chain operations, including storage and inventory management, quality assurance, grading, distribution of live lobster, finfish, or shellfish, and marketing, have been well documented by many. This issue was touched on in the AWDS report but less emphasized since the aquaculture sector definition excluded secondary processors and downstream businesses dependent on production though it acknowledges their critical importance.

[11] MCFA (2017) Beyond the Bow: Harpswell Needs Assessment https://www.mainecoastfishermen.org/beyondthebow

VII. Appendices

Appendix 1: Detailed Occupational Employment and Typical Entry-level Requirements Table

*A1-Table 1: Occupational Employment Trends and Typical Entry-Level Requirements for Wild Catch Fisheries and Seafood Industry, 2000**

Major occupation group	SOC Code	Occupation Title	Jobs in Seafood Industry (2020)	Job Change Since 2010 (%)	Median Hourly Wage	Typical entry level education|previous work experience|on-the-job training
Commercial Fishing	45-3031	Fishers and related fishing workers	3,780	-2%	$ 18.5	No formal edu. credential|None|Moderate
	45-1011	First-Line Supervisors	27	-47%	$ 21.8	HS diploma|<5 yrs.|None
Production	51-3022	Fish Cutters & Trimmers	311	7%	$ 13.3	No formal edu. credential|None|Short
	51-3021	Butchers and Meat Cutters	41	48%	$ 17.3	No formal edu. credential|None|Long
	51-3023	Slaughterers and Meat Packers	32	1889%	$ 14.1	No formal edu. credential|None|Short
	51-9111	Packaging and Filling Machine Operators	59	6%	$ 19.8	HS diploma|None|Moderate
	51-1011	Supervisors	34	11%	$ 32.2	HS diploma|<5 yrs.|None
Sales & Marketing	41-2011	Cashiers	76	-28%	$ 12.6	No formal edu. credential|None|Short
	41-2031	Retail Salespersons	37	80%	$ 13.5	No formal edu. credential|None|Short
	41-4012	Sales Representatives	199	6%	$ 28.7	HS diploma|None|Moderate
	41-1012	Supervisors (Non-Retail)	35	-33%	$ 29.4	HS diploma|<5 yrs.|None
	41-1011	Supervisors (Retail)	32	-37%	$ 19.2	HS diploma|<5 yrs.|None
Transportation & Material Moving	53-7065	Stockers and Order Fillers	188	66%	$ 14.2	HS diploma|None|Short
	53-7062	General labor & manual workers	142	22%	$ 14.5	No formal edu. credential|None|Short
	53-7064	Packers and Packagers, Hand	74	-1%	$ 13.1	No formal edu. credential|None|Short
	53-7051	Industrial Truck and Tractor Operators	58	-5%	$ 17.9	No formal edu. credential|None|Short
	53-3032	Heavy and Tractor-Trailer Truck Drivers	202	25%	$ 20.2	Postsecondary nondegree award|None|Short
	53-3033	Light Truck Drivers	88	18%	$ 15.4	HS diploma|None|Short
	53-3031	Driver/Sales Workers	75	-29%	$ 14.4	HS diploma|None|Short
	53-1047	Supervisors (transport & general)	48	41%	$ 23.1	HS diploma|<5 yrs.|None
	53-5021	Captains, Mates, and Pilots of Water Vessels	97	55%	$ 36.7	Postsecondary nondegree award|<5 yrs.|None

*Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers. *Excludes aquaculture workforce. The table only shows occupations with 25 or more workers as of 2020.*

A1-Table 2: Occupational Employment Trends and Typical Entry-Level Requirements for Wild Catch Fisheries and Seafood Industry, 2000*

Major occupation group	SOC Code	Occupation Title	Jobs in Seafood Industry (2020)	Job Change Since 2010 (%)	Median Hourly Wage	Typical entry level education|previous work experience|on-the-job training
Manage-ment	11-1021	General and Operations Managers	59	14%	$ 42.9	Bachelor's degree|5+ yrs.|None
	11-9198	Personal Service Managers, All Other	123	3%	$ 32.0	Bachelor's degree|<5 yrs.|None
	11-9013	Farmers and Other Ag. Managers	78	16%	$ 16.8	HS diploma|5+ yrs.|None
Office & Admin Support	43-3031	Bookkeeping, Accounting, and Auditing Clerks	50	2%	$ 18.6	Some college, no degree|None|Moderate
	43-4051	Customer Service Representatives	32	10%	$ 16.9	HS diploma|None|Short
	43-5071	Shipping, Receiving, and Inventory Clerks	30	14%	$ 17.6	HS diploma|None|Short
	43-9061	Office Clerks, General	59	44%	$ 17.1	HS diploma|None|Short
	43-6014	Secretaries and Administrative Assistants	27	0%	$ 18.4	HS diploma|None|Short
Other	35-2021	Food Preparation Workers	50	71%	$ 13.6	No formal edu. credential|None|Short
	49-9071	Maintenance and Repair Workers, General	29	22%	$ 19.4	HS diploma|None|Moderate
	39-7018	Tour and Travel Guides	68	-25%	$ 13.5	HS diploma|None|Moderate

*Data source: EMSI 2021.3 data series, employment data include QCEW Employees, Non-QCEW Employees, and Self-Employed workers. *Excludes aquaculture workforce. The table only shows occupations with 25 or more workers as of 2020.*

Note: Information presented in A1-Table 1 and 2 is organized by major occupation categories and are based on similar work activities and experiences. Detailed occupations within these groups share similar job duties, and in some cases skills, education, and/or training.

Appendix 2: Detailed Occupational Employment Composition

The following section includes information about detailed occupations and their composition within Maine's wild-catch fisheries and seafood industry sectors.

Commercial Fishing

Virtually all positions are employed within the subsectors of lobster/shellfishing (70%) and finfishing (20%). Key occupations, as well as their concentration in this broad occupation group, include:

- Fishers and related fishing workers (98%)
    - Note that detail beyond this level is not available in secondary datasets.
- General workers, laborers, inspectors, graders & sorters (1%)
- Supervisors (1%)

Transportation and Material Moving

Jobs in this subsector are found throughout all subsectors, although primarily employed in the wholesale/retail (65%) followed by working waterfront (12%), lobster/shellfish fishing (10%), and seafood processing (10%), and finfishing (4%). Key occupations, as well as their concentration in this broad occupation group, include:

- *Laborers and material movers (47%)* – work throughout all industry sectors, although primarily in Wholesale/retail (66%) and processing (15%); the average hourly wage is $16.8/hr. with a low of $14.5 to a high of $28.5. The median wage is $16.55/hr.
- *Motor Vehicle Operators (35%)* – Primarily within wholesale/retail (85%) and critical working waterfront (9%). Median hourly wage low of $12 to high of $20 per hour; the average hourly wage is between $15 and $21/hr.
- *Water Transportation Workers (captain, mate, sailor & ship engineer) (13%)* – Somewhat specialized within the wild-catch and seafood industry relative to other occupations, approx. 25% of workforce occupation is concentrated in the industry. The majority is found within the wild catch fisheries (67%) followed by the critical working waterfront (28%), and processing (5%). The average hourly wage is $27/hr. with a low of $18.2 to a high of $38.8/hr. The median wage is approx. $24/hr.
- *Supervisors (5%)* – Primarily within wholesale/retail (79%), followed by the critical working waterfront (13%) and seafood processing (8%). The median hourly wage is $23 per hour, the average hourly wage is $25/hr.

Production

These types of production-based occupations are primarily land-based jobs employed in the seafood processing sector (69%) and are also found in wholesale/retail (20%), wild-catch fisheries (11%), and less than 1% are employed in the critical working waterfront sector. Key occupations, as well as their concentration in this broad occupation group, include:

- *Food Processing Workers (71%)* – Most workers are employed as Fish Cutters and Trimmers (311 in 2020) and primarily work within the seafood processing subsector; this is one of the more specialized occupations. About 43% of workers are employed in the wild catch and seafood industry. Median hourly wage $13.3 per hour; avg $14.2. All food processing jobs typically require no previous work experience and range from short to long-term on-the-job training. These types of positions generally provide entry-level opportunities that offer a good starting point within the seafood industry.

- *Other Production Occupations (including systems operators) (22%)* – Found throughout processing (59%), wild catch (23%), and wholesale/retail (18%). Hourly median wage around $19.8; average hourly wage around $20 from a low of $16 to a high of $24.8. Helpers and production workers are more concentrated in the lobster/shellfish industry than finfish; the median wage is $16.2/hr.
- *Supervisors (5%)* – Processing (70%) and wholesale/retail (30%) sectors; $32/hr. avg wage, $32/hr. median.

Sales and Related

Virtually all positions are employed within wholesale/retail (91%). Key occupations, as well as their concentration in this broad occupation group, include:

- Sales Representatives, Wholesale and Manufacturing (50%)
- Retail Sales Workers (28%)
- Supervisors (Retail Sales) (9%)
- Supervisors (Non-Retail Sales) (8%)
- Other Sales and Related Workers (4%)

Management

Positions employed within all industry sectors, primarily concentrated within wild-catch fisheries (64%) and wholesale/retail (28%), followed by seafood processing (6%) and critical working waterfront (3%). Key occupations, as well as their concentration in this broad occupation group, include:

- *Other Management Occupations (61%)* – Almost exclusively employed in wild-catch fisheries, concentrated in the lobster and shellfish subsector. There are two detailed occupations worth mentioning since their levels of job preparation vary: 1) Personal service managers have a median hourly wage of $32/hr. and typically require medium prep (i.e., bachelor's degree and less than 5 years of previous experience); and 2) Farmers, ranchers, and other agricultural managers have a median hourly wage of $16.8/hr. and typically require some prep (i.e., HS diploma or equivalent and 5 years or more previous experience).
- *General & operations managers (and other top executives) (23%)* – Most in wholesale/retail (to a less extent in fisheries and processing)
- *Operations Specialties Managers (9%)* – Mostly in wholesale/retail and processing
- *Sales & Marketing Managers (6%)* – Marketing managers are exclusively in wholesale/retail, and the majority of sales managers are in wholesale (90%); the rest are employed in wild-catch fisheries.

Office & Admin. Support

Overall, jobs in this occupation group make up a small portion of the total seafood industry workforce and individual sectors but play an essential role in its' success, particularly in the wholesale/retail sector where 70% of positions are found. Key occupations, as well as their concentration in this broad occupation group, include:

- Other Office and Administrative Support Workers (20%)
- Information and Record Clerks (20%)
- Financial Clerks (19%)
- Material Recording, Scheduling, Dispatching & Distributing Workers (18%)
- Secretaries and Administrative Assistants (9%)
- Other (7%)

- Supervisors (6%)

Food Preparation and Serving Related

Nearly all positions are found within the fish and seafood markets (92%). Key occupations, as well as their concentration in this broad occupation group, include:

- *Food Preparation Workers (60%)* – Virtually all positions are found within retail seafood markets
- *Fast Food and Counter Workers (21%)* – All jobs are found within retail seafood markets
- *Other back of the house-related occupations (including cooks to chefs /support) (19%)* – Most positions employed within retail seafood markets and to some extent in wild-catch fisheries and seafood processing.

Business and Financial Operations

Jobs are distributed across all industry sectors but primarily concentrated within wholesale and retail (71%). Key occupations include:

- Business Operations Specialists
- Financial Specialists

Installation, Maintenance, and Repair

Jobs are distributed across all industry sectors. Key occupations include:

- Other Installation, Maintenance, and Repair Occupations
- Vehicle and Mobile Equipment Mechanics, Installers, and Repairers

Living Resources Sciences

Jobs primarily concentrated within wild-catch fisheries and seafood processing. Key occupations include:

- Biological Scientists and Biologists
- Technicians and Safety Specialists

Appendix 3: Skill Profiles

Much of the industry sector heavily depends on word of mouth and postings on sites such as Craigslist for recruitment - which is not captured in the jobs analytics data. For this reason, many fishing and fishing-related jobs are significantly underrepresented, however, this information is these data provide insight into demand across the entire economy, bearing implications for the sector.

Data on the skill composition for key occupations in the sector is limited, though some information on skill requirements for occupations that are not unique to the sector, that is they are sector cross-cutting, is more readily available from online job posting data. Skill and occupational data specific to commercial fishing and aquaculture is more limited and difficult to obtain. Top in-demand skills and related information is provided for the largest occupational groups, including transportation, production, sales, and management, as well as commercial fishing. Information is based on online job posting data collected by EMSI/Burning Glass from January 2019 through August 2021.

Transportation and Material Moving

The following information is based on job posting data from 59 unique postings from Jan. 2019 to August 2021. Job posting demand was driven by businesses in all the wild catch and seafood industry sectors.

Median Advertised Salary: $14.95/hr.

- This is $1.47/hr. below the government recorded median salary for transportation and material moving occupations in Maine.

Top posted job titles: CDL-B Truck Drivers, CDL-A Truck Drivers, dock workers, and dockhands.

Education & job experience: More than half did not list an education level, those that did list high school or GED as the minimum; a handful of job postings list an associate or bachelor's degree as the minimum education level. The majority of postings did not list any kind of work experience as needed; a handful of job postings listed a minimum of 1 year or less of previous work experience.

Hard skills: aquaculture, seafood, secondary education

Common skills: good driving records, sales, communications, management, punctuality, self-motivation

Qualifications: CDL Class B License, Commercial Driver's License (CDL), and Certified Forklift Operator

Production

The following information is based on job posting data from 73 unique postings from Jan. 2019 to August 2021. Job posting demand was driven by businesses in the merchant wholesalers and seafood processors industry sectors and, to some extent, retail markets.

Median Advertised Salary: $13.97/hr.

- This is $5.25/hr. below the government recorded median salary for production occupations in Maine.

Top posted job titles: fish processors, production workers, production team members, assembly workers, and packers.

Education & job experience: More than half did not list an education level, those that did list high school or GED as minimum education level; a handful of job postings list an associate or bachelor's degree as minimum education level. The majority of postings did not list any work experience as needed; a handful of job postings listed a minimum of 1 year or less of previous work experience.

Hard skills: packaging and labeling, palletizing, sanitation, finished goods, good safety, trimming, and seafood

Common skills: lifting ability, loading and unloading, management, detail-oriented, operations, teamwork, communication, and prioritization

Qualifications: None

Commercial Fishing

The following information is based on job posting data from 24 unique postings from Jan. 2019 to August 2021. Job posting demand was driven by merchant wholesalers and seafood processors industry sectors.

Median Advertised Salary: not enough data

Top posted job titles: Hatchery techs and managers

Education & job experience: More than half did not list an education level, those that did list high school or GED as the minimum; a handful of job posting listed an associate or bachelor's degree as the minimum education level. The majority of postings did not list any kind of experience as needed; those that did request 2-3 years of previous experience

Hard skills: None listed

Common skills: Willingness to learn

Qualifications: None listed

Sales and Related

The following information is based on job posting data from 20 unique postings from Jan. 2019 to August 2021. Job posting demand was driven by businesses in the wholesale and finfishing sectors.

Median Advertised Salary: not enough data

Top posted job titles: retail sales associates, cashiers

Education & job experience: More than half did not list an education level, those that did list high school or GED as the minimum. The majority of postings did not list any kind of experience as needed; a handful of job postings listed a minimum of 1 year or less to 2 to 3 years of previous work experience.

Hard skills: no industry-specific information

Common skills: no industry-specific information

Qualifications: none listed

Management

The following information is based on job posting data from 27 unique postings from Jan. 2019 to August 2021. Job posting demand was driven by businesses in the merchant wholesalers, retail markets, and seafood processors industry sectors.

Median Advertised Salary: not enough data

Top posted job titles: business development managers, quality assurance managers, human resources generalists, area managers, food safety, and quality assurance managers.

Education & job experience: Half listed a bachelor's degree as minimum education level; the rest did not list an education level. The majority of postings did not list any experience as needed; those who did requested a minimum of 2-3 or 4 - 6 years of previous work experience.

Hard skills: Accounting, accounting software, account payable, accrued liabilities, auditing, budgeting, financial statements, fixed assets, and forecasting.

Common skills: Time management, business administration, detail/goal-oriented, interpersonal communication, leadership, planning, lifting ability

Qualifications: SQF (Safe Quality Food) Practitioner, Lean Six Sigma Certification

Appendix 4: Review of Existing Resources, and Workforce Development and Career Path Resources

Includes resources collected in Phase 1 to review existing economic & workforce issues and workforce development strategy efforts in Maine and other regions. This section highlights some key takeaways based on the extensive review. This information is provided as a base resource and a reference for anyone working or interested in the broad industry and workforce sectors. Some of the reports reviewed from Maine included data directly collected from businesses, that information is incorporated into this document to capture their workforce related needs and issues.

The Bureau of Labor Statistics (BLS) groups jobs by occupation using the Standard Occupational Classification (SOC). Individual occupations have a unique SOC code that can be linked to a wealth of career information including the National Career Clusters and pathways which serves as the foundation to the Maine Career Clusters Framework, which is comprised of 10 Career Clusters and related Career Pathways (the National Career Cluster framework is divided into 16 clusters in total). This information is useful and important because it helps structure career information in a way that is more accessible to anyone exploring jobs and occupations including counselors, program planners, and others; to develop programs of study and curriculum.

Numerous frameworks are available to design and present career pathway information, some are highlighted in A4-Table 1, and they can be adapted to Maine's seafood industry. The BLS Occupational Information Network (O*NET) program – the U.S. primary source of occupational information – provides hundreds of standardized and occupation-specific job descriptions that help enable career exploration and facilitate the development and maintenance of a skilled workforce (O*NET, 2021).[12] This information couple with additional resources in this Appendix, can serve as a starting point – or framework – that can be adapted to a specific region or location based on local industry and occupational size and composition.

[12] About O*NET Online Resource Center: https://www.onetcenter.org/overview.html.

A4-Table 1: Economic and Workforce Issues, and Workforce Development Strategy Highlights and Resources

Resource Title	Overview & Note	Region	Sector	Relevant tags	Web link
Fishermen's Direct Marketing Manual, 5th Edition (20Xx) Alaska Sea Grant And Washington Sea Grant	An example to present and provide actionable recommendations	Alaska	Wild catch fisheries	Report Design; Example; Educational Resource.	
Employment and Training Services / Seafood Career Streams. Alaska Dept. Labor & workforce dev	Public facing website for Statewide Level efforts. Audience can explore Employment and Training Services for various careers and career paths. Opportunities in the seafood industry are broken down into four different career streams. Come back to this document for Phase II	Alaska	Wild catch fisheries, seafood processing	Career Paths, Workforce Development Strategies, Occupational Standards	https://jobs.alaska.gov/seafood/careerstreams.ht ml
Alaska Maritime Workforce Development Plan (2014) Major seafood processors, the University of Alaska, and Alaska Fish and Game, and Labor and Workforce Development departments	Developed by reps within fisheries, seafood, and marine industry sectors as well as state agency and local university. This document guides the work reported elsewhere in this list. The Plan identifies 23 specific occupations and occupational groups in need of focused tactics. Come back to this document for Phase II	Alaska	Wild catch fisheries, seafood processing	Workforce Development Strategies; Occupational Standards	https://www.alaska.edu/fsmi/
Alaska Safety Alliance	Website has a lot of info including career flyers for fisheries careers, seafood harvesters, seafood processor, repair and maintenance, and vessel operations.	Alaska	Wild catch fisheries, seafood processing	Resource, Career Paths, Occupational Standards, Marketing & Advertising	https://www.alaskasafetyalliance.org/explore-careers/maritime-careers/

Alaska's education and training gap analysis [Education and Training Gap Analysis for the FSM Workforce] (2012)	This analysis reports the findings from surveys and in-person interviews. Reports, the types of skills needed based on the primary data collection efforts and help inform the profile education and training needs by major subsectors.	Alaska	Wild catch fisheries, seafood processing	Workforce Development Plan; Career Paths; Needs Assessment; Example.	
Alaska's Seafood Future Action Agenda. Alaska Research Consortium	An example to present and provide actionable recommendations	Alaska	Wild catch fisheries, seafood processing	Report Design; Marketing & Advertising Example	https://www.alaskaresearchconsortium.org/ alaska-seafood-future.html/#action% 20steps
SFI Seafood Industry Training Package Version 2.0	Extensive career mapping/education programing guide by detailed occupation/outcome/skills/competencies etc.	Australia	Wild catch fisheries and aquaculture	Career Paths, Workforce Development Strategies, Educational Training Package. Curriculum Design. Occupational Standards	https://training.gov.au/Training/Details/SFI
Australian Aquaculture and Wild Catch Industry Sector: Annual update; IRC Skills Forecast (2020)	Annual report. Technology skills gap, is an issue that jumped out	Australia	Wild catch fisheries and aquaculture	Changes To Skill Requirements, Training Barriers	
WorkBC Jobs & Careers > Explore Careers	Explore career, career path info - Canada. Come back to this document for Phase II	Canada	Seafood industry + supply chain. Wild catch fisheries	Career Paths, Occupational Standards, Marketing & Advertising	https://www.workbc.ca/careers/9618

Cape Cod's Seafood Supply Chain: Process, Challenges, and Opportunities (2019) Cape Cod Commercial Fishermen's Alliance Funded by NOAA	This report has information about permitting and regulations by species and describes how each works. It's focused on the seafood supply chain and has useful information about processing along the supply chain.	Cape Cod, MA	Seafood supply chain, by fishery product	Resource	
S. consumer attitudes and preferences about Farm-Raised Shellfish, Finfish, and Sea Vegetables in the Atlantic Coast States (2019) Atlantic Corp; University of Maine; Maine Aquaculture Innovation Center; Maine Statistical Analysis Center, University of Southern Maine	Consumer preferences for wild & farmed seafood products. Research highlights demand for both aquaculture and wild catch products. There's a report and online data assessment tool for industry trends, information on consumer preferences, and a summary of market demand projections for different species and categories by location.	Eastern US states	Wild catch fisheries and aquaculture	Consumer Attitudes; Regional Preferences; Market Opportunities; Resource; Consumer Survey.	
Fish Aqua Guide (Sustainable Fisheries and Responsible Aquaculture: A Guide For USAID Staff And Partners) (2013) U.S. Agency For International Development	Linkages between wild catch fisheries and aquaculture. Post-harvest procedures are similar as products often enter the same marketing and processing channels on way to the consumer. Products are seldom distinguished until packaged and @ final retail destination.	Global scale	Wild catch and aquaculture	Workforce Development Strategies	

Beyond the Bow: A Fisheries Needs Assessment of Harpswell (2017) Maine Coast Fishermen's Association (MCFA)	MCFA compiled an in-depth needs assessment of the Harpswell fishing community that is based on over 200 hours of interviews. Useful information related to workforce needs and training for the finfish industry.	Harpswell, Maine	Wild catch fisheries	Business Survey; Needs Assessment; First-Hand Knowledge.	https://www.mainecoastfishermen.org/beyondthebow
Maine Aquaculture Workforce Development Strategy & Summary (2020/2021). GMRI	Similarities between aquaculture and wild catch fisheries in terms of hard and soft skills and knowledge include core skills listed in bottom of triangle. Come back to this document for Phase II	Maine	Aquaculture	Workforce Development Plan	https://gmri.org/projects/maine-aquaculture-workforce-development-strategy/

Some examples of how other regions are helping train and upskill their seafood processing workforce include:

- The National Fisheries Institute Future Leaders Program provides hands-on training focused on seafood production, processing, farms and hatcheries, cold storage, and safety which is aimed to connect industry workers and develop leadership skills.
- The Kodiak's Seafood and Marine Science Center in Alaska provides an example of hands-on training and networking through an annual 8-day workshop. Each year Alaska businesses sponsor an employee who wants to advance his/her career in the seafood business, beginning with an eight-day crash course of workshops and training. The sponsored employees learn everything from theory and science to actually cooking and preparing the seafood. According to Alaska Sea Grant director Paula Cullenberg, "We've canned salmon, we've smoked it, hot smoke, cold smoke, we've freeze-dried it. We toured a fish plant and have gone everywhere from microbiology to the safety of working in the plant the week that we've been here. It's been a great introduction to a broad base of seafood overall." (Welch, 2013).[13]

[13] Welch, L. (2013) Training future AK seafood processing pros. http://www.alaskafishradio.com/training-future-ak-seafood-processing-pros/

Appendix 5: Workforce Training, Programs, Certifications Table

A5-Table 1: Direct and Relevant Workforce Training, Programs, Certifications

Title (training,program,cert.)	Institution or provider [Education/Training Institution]	Type	Credential(s) Offered	Overview	Sector/industry focus (or relevant tags)	Web link
The Business of Maine Lobster	WCCC and Machias Valley Center for Entrepreneurship (MVEC)	Community College	3 college credits	Free, 10 week, 3 credit course covering what happens to and the importance of Maine lobster, post-catch. Program reportedly offered within Coastal Fisheries and Marine Technology	Seafood distribution, logistics, storage, transportation, etc.	https://www.wccc.me.edu/academics/programs/programs-study/coastal-fisheries-and-marine-technology/
AAS degree Marine Industry Technology (MIT)	The Landing School	Private University	Post-secondary Certificate or Degree Program	Provides a broad foundation in the marine industry. Graduates of the Associate's degree program reportedly have wider range of professional opportunities and better understanding of industry business practices behind the marine industry. Degrees and certificates offered in 5 different fields.	Popular programs include: Transportation and Materials Moving, Mechanic and Repair Technologies/Technicians, and Precision Production. 49.0399 - Marine Transportation, Other	
Aquaculture Certificate and Associate Degree Program	Washington County Community College (WCCC)	Community College	Post-secondary Certificate or Degree Program	Aquaculture specific program build in partnership with MAIC and various industry partners	Aquaculture with specific concentrations re: shellfish, fin fish, plant, etc.	In development
BA, Coastal & Marine Environmental Science	Maine Maritime Academy	Private Academy	Post-secondary Certificate or Degree Program		Marine and Coastal Environment. Some relevant programs include: Marine Engineering Operations, Marine Engineering Technology, Marine Systems Engineering (5-year License Track), and Marine Transportation Operations	https://mainemaritime.edu/ocean-studies/coastal-marine-environmental-science/; https://mainemaritime.edu/student-life/regimental-program/
BS Marine Biology and Sustainable Aquaculture	Unity College	Private University	Post-secondary Certificate or Degree Program		Aquaculture	https://unity.edu/programs/bs-in-marine-biology-and-sustainable-aquaculture/
Coastal Fisheries and Marine Technology Certificate and Associate Degree Program	Washington County Community College (WCCC)	Community College	Post-secondary Certificate or Degree Program	Training program offering industry certification and community college certification. Offered online, e-learning, or distance learning. Applied Science (AAS) degree in Commercial Fisheries and Marine Technology with either a focus on Marine Operations and Maintenance or a Fisheries and Aquaculture Track. Name of Credential: Workforce Certificate in Coastal Fisheries and Marine Technology	Commercial fisheries, aquaculture, marine ops and maintenance	https://www.wccc.me.edu/academics/programs/programs-study/coastal-fisheries-and-marine-technology/

A5-Table 2: Direct and Relevant Workforce Training, Programs, Certifications

Title (training,program,cert.)	Institution or provider [Education/Training Institution]	Type	Credential(s) Offered	Overview	Sector/industry focus (or relevant tags)	Web link
Maine Maritime Academy Center, Center for Professional Mariner Development	Maine Maritime Academy	Continuing Education > Courses	Post-secondary Certificate or Degree Program		Engineering, Management, Science, And Transportation. Offers vessel and saftey related USCG-approved courses.	https://mainemaritime.edu/continuing-education/courses/
BS in Aquaculture; Professional Science Masters in Ocean Food Systems; Minor in Geographic Information Systems (GIS)	University of New England	Private University	Post-secondary Certificate or Degree Program; Advanced Degree Program	Marine programs. - School of Marine and Environmental Program	Aquaculture; Ocean Food Systems; Geographic Information Systems (GIS)	www.une.edu/cas/marine/undergraduate/aquaculture-and-aquarium-sciences; https://www.une.edu/cas/marine/psm-ocean-food-systems; https://www.une.edu/cas/environmental/undergraduate/minor-geographic-information-systems
Marine Systems Program	The Landing School	Private University	Post-secondary Certificate or Degree Program; Short-term classes or trainings	Offers short vocational courses in marine industry topics. Courses range from 2 days to several weeks. The two courses currently advertised are Captains Course and Maine Surveying, which the website says is not being offered due to COVID-19 restrictions but will return as soon as possible. And, a 12-week Captains course beginning in January 2021 was last offered at that time and cost $1,250 (worth 3 credits, 6 hours per week for a total of 72 hours)	Captains Course and Maine Surveying. 49.0399 - Marine Transportation, Other	https://www.landingschool.edu/
Aquaculture Early College Program	UMaine- Machias	State University	Secondary education > High School Students		Aquaculture	machias.edu/earlycollege/pathways/aquaculture/
Coastal Science Academy	Downeast Institute [UMaine- Machias]	K-12	Secondary education > K - High School Students	Coastal Science Academy helps educators incorporate authentic scientific inquiry and methods into their K-12 science curriculum and increase confidence in teaching STEM subjects		https://downeastinstitute.org/education/coastal-science-academy/
Aquaculture in Shared Waters	Maine Sea Grant and University of Maine Cooperative Extension	Other	Short-term classes or trainings	Free, 12 sessions (1 night per week for 12 weeks) program prepares fishermen to start an aquaculture venture (income diversity) curriculum on shellfish and seaweed production, covering such topics as site selection, equipment and husbandry methods, regulation and permitting, farm operations, marketing, business and financial management, biosecurity, community relations and public health.	Wild fisheries to Aquaculture	https://seagrant.umaine.edu/extension/aquaculture-in-shared-waters/
Aquaculture Top gun/generic Top Gun	Maine Center for Entrepreneurs	Other	Short-term classes or trainings	15-week program that combines hands-on mentoring with high-impact weekly gatherings	Aquaculture	https://www.mced.biz/top-gun

A5-Table 3: Direct and Relevant Workforce Training, Programs, Certifications

Title (training,program,cert.)	Institution or provider [Education/Training Institution]	Type	Credential(s) Offered	Overview	Sector/industry focus (or relevant tags)	Web link
Eastern Maine Skippers Program (EMSP)	Maine Center for Coastal Fisheries	Short-term classes or trainings	Short-term classes or trainings		Commercial fisheries, aquaculture, marine ops and maintenance	https://coastalfisheries.org/collaborative-education/eastern-maine-skippers/
Maritime training facility USCG approved training	Downeast Maritime Inc.	Private training facility	Short-term classes or trainings	Boat safty, technical training - private maritime training facility USCG approved training	Boat safty, technical maritime training	https://www.downeastmaritime.com/mariner-classes
USCG approved licenses	Atlantic Captain's Academy by Captain Greg Metcalf (Kennebunkport, Maine)	Licenses classes	USCG approved licenses	The types of licenses classes offered are more geared towards typically employment opportunites such as charter boats, sailboats and excursion boats, in short these sound like more tourism-related opportunities. Offers a variety of Coast Guard approved courses for Coast Guard captain's license candidates. Lic enses classes for boating tour operators	Noating tour operators, OUPV or Operator of Un-inspected Passenger, Sail/auxiliary sail endorsement, Assistance Towing Endorsement and License Renewal, 100 Gross Ton Masters Upgrade, and Launch Operator	http://www.atlanticcaptainsacademy.com/
Marine Resource Education Program (MREP)	Gulf of Maine Research Institute	Professional 2-part workshop	Workshop	2-part workshop series "By fishermen, for fishermen". Workshops guided by local industry members		https://mrep.gmri.org/

Note: Information up-to-date as of September/October 2021
Source: MCBER compiled information from program and course websites.