2024

SEA Maine Roadmap

for the Marine Living Resource Economy

SEA Maine Roadmap *for the* Marine Living Seafood Economy

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Introduction

In October 2017, a "bomb cyclone" storm hit Maine, causing the largest weather-related power outage in Maine's history, with over 400,000 power outages lasting a week or longer. Most of Maine ground to a halt. All working waterfront activities, including harvesting, processing, and distribution, shut down, causing significant market disruption that lasted well beyond the power outage.

With climate change an increasing concern, the storm raised questions about Maine's ability to withstand these types of market disruptions, regardless of their cause. Could Maine build more capacity to endure such disruptions and ensure greater resiliency in our working waterfront communities? This led to the creation of SEA Maine (Seafood Economic Accelerator), an industry-led effort funded by the U.S. Economic Development Administration (EDA) with support from Maine Technology Institute (MTI) and FocusMaine.

Since its inception in 2019, SEA Maine's mandate has been to develop a strategic economic development Roadmap for Maine's marine living resource economy. This Roadmap outlines fundable and "shovel ready" sector goals, objectives, and projects that will:

- Expand Maine's marine living resource's production capacity and output through efficiencies and innovation;
- Spur product development and marketing efforts; and
- Foster economic growth for Maine through job creation and new business opportunities.

These goals are based on findings from multiple reports and projects commissioned by SEA Maine; the review and analysis of strategic planning documents (namely, Maine's Economic Development Strategic Plan 2020 – 2029, the Maine Won't Wait climate action plan, and the Maine Aquaculture Roadmap 2022 – 2032), as well as working waterfront assessment activities, Maine's offshore wind energy development report, and the deep industry knowledge of SEA Maine stakeholders. This roadmap is a high-level analysis of opportunities and challenges and a preview of a path forward for Maine's marine living resource economy.

A conscious decision was made at the outset of this project not to focus on the topics of wind energy, the evolving debate around the protection of right whales, global trade challenges, and the legal challenges regarding access to the intertidal zone. These are critical issues both for Maine's MLR economy and for environmental sustainability, but our intent was to create economic development goals that could: a) have an immediate impact, and b) didn't depend on first resolving the complicated political, policy, and legal questions connected with those issues. This project does, however, highlight that a collaborative effort will be needed to manage these impediments to growth and maximize economic development in the sector.



Definitions

What is the Marine Living Resource (MLR) Economy?

The MLR economy includes fishing, lobstering, aquaculture, life sciences, and value-added processing as well as critical supply chain elements, like shipping and logistics, that support this economy.

What is Maine's working waterfront?

Maine's working waterfront refers to land, legally filled lands, piers, wharves and other improvements to lands all adjacent to the navigable coastal waters of Maine.

It encompasses the land necessary for accessing the waterfront for commercial fishing and aquaculture activities such as walking paths to the intertidal zone and parking, as well as land for other vital infrastructure such as bait, ice, fuel, and gear necessary for harvesting seafood and marine products. This infrastructure and land can be located on the coast, but increasingly it is found further inland.

Executive Summary

Executive Summary

Maine's history of fishing, aquaculture, and seafood production; newer products and innovations such as beauty items, nutraceuticals, and natural fertilizers; and a healthy and diverse (though changing) marine ecosystem provide a strong foundation for future growth and economic vitality.

Goals

- 1. Grow the overall value of Maine's marine living resource economy by 10% by 2030.
- 2. Grow employment within the sector and related value chain by 1,000 employees by 2030.
- Increase sector-wide financial investments to support infrastructure, available capital, market development, and research and development.
- 4. Maintain and expand Maine's working waterfront access and the capacity of working waterfront communities to support infrastructure and businesses.
- 5. Enhance the ability of the sector to respond to challenges and opportunities resulting from climate change and demographic shifts.

Maine's Marine Living Economy: Where We Are Today

The People

Maine's *Economic Development Strategic Plan* for 2020 – 2029 emphasizes the need to attract 75,000 people to the talent pool (both by increasing participation among Maine's existing population and attracting new people from out of state) and to expand workforce training. Maine's marine living resource economy is one of several critical sectors contributing to the overall economic health of the state.

Maine boasts a skilled and knowledgeable sector workforce thanks to our history with fishing, aquaculture, and other maritime trades: fishermen who harvest a wide range of species using various methods and aquaculturists who farm a variety of marine organisms including shellfish, finfish, and seaweeds. That said, the steady decline of many commercial capture fisheries over recent decades has created a knowledge gap—younger generations increasingly do not have the institutional knowledge of previous generations, a loss which affects the entire sector.

NUMBER OF JOBS IN CENTRAL AND PERIPHERAL MARINE LIVING RESOURCE INDUSTRIES



Source: Workforce Needs Assessment, Phase II, SEA Maine

All told, including both payroll employees and self-employed individuals, estimates place the entire marine living resource economy's employment at approximately 34,125, with 12,052 in central industries (solely dependent on seafood and seafood products for continued employment) and 22,073 in peripheral Industries (partially dependent on seafood and seafood products for continued employment).

Today, Maine's population is estimated to be 1,355,924, with a little more than half of the population living in the eight coastal counties.¹ Many residents in Maine's 145 coastal and near-coastal cities and towns participate in the marine living resource economy, either in "central" vocations, as fishermen, aquaculturists, wholesale dealers, distributors, and processors, or in "peripheral" vocations, through retail and restaurant sales of seafood to residents and visitors. In 2019, there were between 33,300² and 34,125³ people working in the sector, with 12,052 in "central" industries (e.g. fisheries, processors) and 22,073 in "peripheral" industries (e.g. freight, food service). The number of jobs is expected to grow by 9% in central industries and 10.5% in peripheral industries, adding 1,091 and 2,313 positions respectively by the year 2033.⁴ Harvesting, including lobster, non-lobster species, and aquaculture, is the largest employing part of the seafood sector, supporting over 12,700 jobs, followed by retail seafood outlets, including restaurants (8,550).⁵

A wide range of jobs and careers are available in the marine living resource economy, from entry-level jobs working on aquaculture farms and processing lines to careers requiring more education and training such as marine scientists and operations managers. However, the marine living resource workforce in Maine faces various challenges, including seasonality, changing regulations, market demand, and environmental factors. Additionally, there are labor shortages year-round (but particularly during peak season), a challenge all of Maine currently faces. Access to affordable housing also poses a significant challenge for the entire state, but particularly those living in coastal communities. Maine's Economic Development Strategic Plan 2020 – 2029 also calls out these challenges (Strategy E, Provide Supporting Infrastructure).

Maine's rural coastal communities share many of the same challenges as inland rural communities. These challenges include a lack of access to high-speed internet, lack of affordable housing, substance abuse sometimes related to occupational injury or isolation, and lack of access to behavioral and medical healthcare. Maine's lengthy coastline further amplifies these difficulties — providing services to such a large geographic region is challenging with healthcare also suffering from workforce shortages. On the flip side, the geographic isolation of these small coastal inlets also contribute to a proud culture of self-reliance, problem-solving, community, and tenacity that are hallmarks of Maine's working waterfront communities.

There are regional differences in the scale of the marine living resource workforce. The Downeast region (Hancock and Washington Counties) accounted for 45% of all direct jobs and supported \$390 million in labor income in 2019 and accounted for 65% of all harvesting jobs in the sector statewide. The seafood

¹NOAA Office for Coastal Management (2023, August). *Maine*. https://coast.noaa.gov/states/maine.html.

² Colgan, Charlie and Ryan Wallace. 2023. The Economic Impacts of the Maine Seafood Sector. SEA Maine, February 21.

https://www.seamaine.org/wp-content/uploads/2023/03/FINAL-SEAMaine-Economic-Impact-Analysis-Report-2.pdf. ³ Thomas P. Miller & Associates. 2023. *Workforce Needs Assessment*. SEA Maine, September 11.

https://www.seamaine.org/wp-content/uploads/2023/09/FINAL-Workforce-Needs-Assessment-9.11.23.pdf.

⁴ Thomas P. Miller & Associates, Workforce Needs Assessment.

⁵ Colgan, Charlie and Ryan Wallace. The Economic Impacts of the Maine Seafood Sector.

sector supported over 10,000 jobs and over \$260 million in labor income in the Midcoast region in 2019 and over 7,600 jobs and \$370 million in labor income in southern Maine. The sector's total economic impact is a much larger share of the Downeast region, accounting for almost 20% of employment, than the Midcoast or southern sectors.⁶

In addition to understanding who is involved in the production of seafood in Maine, it's important to understand who is consuming our seafood. Average domestic seafood consumption in the U.S. is about 19 pounds annually per capita, while Asian cultures consume a much higher per capita amount of seafood, with Japan having one of the highest rates at 101 lbs./year, followed by Cambodian consumption of 93 lbs./year and Vietnamese consumption of 83 lbs./year.⁷

The Place

The Gulf of Maine, surrounded by three U.S. states and two Canadian provinces, is the receiving water for several large river systems draining an overall watershed totaling 69,115 square miles (in the U.S. and Canada collectively).

The coastline of Maine only measures 228 miles, but the tidal coastline (which includes all the islands, inlets, and bays in Maine) measures 5,408 miles.⁸ Maine's territorial waters extend three nautical miles from the shoreline, covering a total area of approximately 3.5 million acres (5500 square miles).

Nourished by cold ocean waters and characterized by a complex geomorphology made up of deep basins and shallow banks, this semi-enclosed sea is one of the most biologically productive marine ecosystems on earth⁹. This allows for a rich diversity of harvested products.

Logistics

Maine's long jagged coastline, dotted with numerous islands and peninsulas, makes transportation difficult. The marine living resource sector operates in remote and dispersed locations, and many rural coastal areas in Maine lack transportation infrastructure, including adequate road networks, ports, and cold storage and freezing facilities. It is a logistical challenge to transport products quickly and efficiently from landing ports to processing plants and markets.

⁶ Colgan, Charlie and Ryan Wallace. The Economic Impacts of the Maine Seafood Sector.

⁷ Chong, Tae. 2022. Multicultural Market Analysis: Cambodian, Vietnamese Seafood. SEA Maine, November.

https://www.seamaine.org/wp-content/uploads/2023/03/Multicultural-Marketing-Analysis-Cambodian-and-Vietnamese-Seafood-2.pdf.

⁸ Maine Department of Marine Resources, Maine Coastal Program. https://www.maine.gov/dmr/programs/maine-coastal-program.

⁹ Sherman, K., and Skjoldal, H. R. 2002. Large Marine Ecosystems of the North Atlantic: Changing States and Sustainability. Elsevier, Amsterdam.

Geography and climate

Like other parts of the globe, the Gulf of Maine's ecology and all its flora and fauna is subject to stressors caused by global climate change. Recent studies suggest that the ocean temperature is rising faster in the Gulf of Maine than in most of the rest of the oceans on the planet.¹⁰ Severe storm events are predicted to increase in intensity and frequency,¹¹ causing significant disruptions in marine living resource economy operations all along the value chain and adding an element of uncertainty that creates ongoing challenges for those working in the industry. Sea level rise impacts intertidal coastal habitat as well as coastal infrastructure in the ports and harbors that are critical to fishing and aquaculture operations. Shifts in temperature, nutrient profiles, and changes in circulation throughout the North Atlantic are causing changes in the food web, most notably the phytoplankton that lies at the very base of the food chain. Ocean acidification also poses a problem, particularly for species with shells or skeletons.¹² In 2022, approximately 75% of Maine's fisheries (by landings value) were shell-producing species, including lobster, clams, scallops, urchins, oysters, mussels and others (Maine DMR commercial landings).

These changes will continue to affect the marine living resource economy as various species respond to climate change, resulting in decreases in populations of some species and increases in other species as well as new species that will migrate into the Gulf as temperatures rise. These ecological changes also affect the aquaculture industry's operations, husbandry strategies, and options for which species of fish, shellfish, and seaweeds to cultivate. Fortunately, Maine boasts strong cooperative research assets in the state through a variety of institutions, anchored by the University of Maine system along with other notable institutions such as Maine Sea Grant, Gulf of Maine Research Institute (GMRI), Darling Marine Center, Downeast Institute, Bigelow Labs, the Department of Marine Resources, the Island Institute, and others. These institutions have, and will continue to champion, the need for research and data to support ongoing initiatives in the sector.

Use

Coastal communities and working waterfronts are a critical resource for sustaining and growing the marine living resource economy. These towns depend on fishing and aquaculture for jobs and economic activity that in turn support community services and infrastructure. The marine living resource industry cannot exist without access to the waterfront. Along Maine's coast, demographic shifts mean that some community

¹⁰ Andrew J. Pershing et al. Slow adaptation in the face of rapid warming leads to collapse of the Gulf of Maine cod fishery. *Science* **350**, 809-812 (2015).

¹¹ IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

¹² NOAA Fisheries. Understanding Ocean Acidification. https://www.fisheries.noaa.gov/insight/understanding-ocean-acidification.

members have less familiarity with the daily activities of working waterfronts. These tensions can be seen up and down the coast:

- The state of Maine has implemented regulations to limit the use of airboats, which are occasionally used by clam diggers, due to their sound while under operation.¹³
- Towns are debating whether to welcome aquaculture businesses in their communities. For example, the town of Jonesport, after a period of intense public debate in 2022, rejected a moratorium on aquaculture that would have blocked a proposed land-based recirculating aquaculture system facility from being built there.
- In Harpswell, a collaborative effort aimed at educating current community members and newcomers about living and working near the ocean called Scuttlebutt: How to Live and Work in a Waterfront Community. is an excellent example of how to ease tensions and create unity.

Maine's marine living resource economy occurs in a vibrant, dynamic, and increasingly busy context. In addition to commercial fishing boats and aquaculture vessels, the coast of Maine continues to be a popular place for recreational boating and other maritime traffic. The potential for conflict between user groups is real. Maine has applied for a federal research lease to construct an offshore wind energy research array in federal waters to explore the efficacy of floating wind turbines in the Gulf of Maine. The planning for wind energy development has included stakeholders from the fishing and aquaculture industry, who have expressed concern about maintaining access to the ocean and minimizing the potential loss of fishing grounds and habitat impact. Proponents of these offshore energy installations have expressed their commitment to minimize adverse impact to the fisheries.¹⁴

The Gulf of Maine represents a dynamic geographic region, both culturally and ecologically. Maine's future depends on developing a unifying narrative and collaborative approach to marine resources. Such a narrative will involve political compromises, understanding, and above all strong communication among all interested entities.

The Products

Fish, shellfish, and seaweed species are harvested in the Gulf of Maine, primarily as food products. Non-food products are also created with living marine resources, including agricultural products like biostimulants, natural fertilizers, health and beauty products, and nutritional and medicinal products.

¹³ An Act Regarding Airboat Noise, H.P. 142 - L.D. 221 (2023).

https://legislature.maine.gov/legis/bills/getPDF.asp?paper=HP0142&item=3&snum=131 ¹⁴ REF: Maine Governor's Office of Energy

The most popular seafood species consumed in the U.S. include shrimp (no longer fished in Maine due to a climate-change induced closure in 2013), salmon, tuna, and clams; in Maine, this list also includes lobster. SEA Maine's Seafood Benchmark Assessment focused on the 11 individual species and two species groups with the largest harvest volumes and value in Maine.¹⁵ Maine's total seafood landings for 2022 were 197,093,698 lbs. with a total landed value of \$574,049,682.¹⁶

In Maine, many of these species are sold live at the retail level, including lobster, crabs, clams, and oysters, while other species are processed into frozen picked products ready for cooking. Several companies add value to these raw materials by creating specialty products such as lobster tails, salmon burgers, kelp cubes, picked crab meat, and smoked unagi (eel). While the most popular species of seafood enjoy strong local and domestic markets, other species of fish present in the Gulf of Maine, such as monkfish, redfish, and whiting, don't currently have large markets. This is also true for species that are migrating into the Gulf of Maine to take advantage of changing conditions, including black sea bass and squid.

A study commissioned by SEA Maine and carried out by the Maine Center for Entrepreneurs analyzed the retail and food service activity in the United States related to key species produced in Maine,¹⁷ finding that seafood sales increased significantly during the pandemic as consumers cooked at home more frequently and showed more curiosity about seafood's nutritional and culinary value as a protein source. According to the report, seafood products remain very popular in the South Atlantic states, Middle Atlantic states, and the East North Central region (Great Lakes). These regions are easily accessible through traditional transportation routes, suggesting an opportunity to develop and expand the market for Maine seafood, particularly for frozen and ready-to-eat products.

Taken as a whole, Maine's marine living resource economy — its people, place, and products — offers a strong foundation for success. Notwithstanding the many challenges we may face, Maine's tenacity, sense of community, and self-reliance will play significant roles in building a more resilient and prosperous future for the sector.

https://www.maine.gov/dmr/fisheries/commercial/landings-program/landings-data. ¹⁷Maine Center for Entrepreneurs. 2023. *Maine Seafood Market Report*. SEA Maine, November.

¹⁵ MacAskill, Gregor, Noah Oppenheim, and Joshua Stoll. 2022. *Maine's Seafood Baseline*. SEA Maine, June. https://www.datadashboard.seamaine.org/wp-content/uploads/2022/10/Foundational-Data-Report.pdf. ¹⁶ Most Recent Maine Commercial Landings. Department of Marine Resources, 2022,

https://www.seamaine.org/wp-content/uploads/2023/11/SeaMaine-Seafood-Market-Report.pdf.

MAINE SEAFOOD SECTOR ECONOMIC IMPACT SUMARY

INDUSTRY	EMPLOYMENT	LABOR INCOME (\$M)	VALUE ADDED (\$M)	GROSS INPUT (\$M)
Aquaculture	\$540	\$28.9	\$190.1	\$198.4
Harvesting (Non-Lobster)	\$7,7663	\$154.7	\$174.8	\$1962
Harvesting (Lobster)	\$5,037	\$393.0	\$446.9	\$511.6
Processing	\$735	\$36.5	\$48.6	\$343.1
Retail	\$8558	\$285.3	\$425.9	\$692>4
Wholesale & Logistics	\$1,313	\$68.6	\$91.0	\$212.6
Total Direct	\$23,846	\$966.9	\$1,377.3	\$2,154.3
Indirect (all other)	\$3,154	\$106.4	\$169.7	\$353.8
Induced	\$6,319	\$229.9	\$419.4	\$732.6
Total	\$33,319	\$1,303.22	\$1,966.35	\$3,240.72

Source: The Economic Impacts of the Maine Seafood Sector, SEA Maine

The seafood sector contributed over \$3.2 billion dollars in total economic output to the Maine economy in 2019, two-thirds (\$2.15 billion) resulting from direct sales in sector industries and roughly \$1.97 billion accounted for as value added. Employment supported \$1.3 billion in total labor income.

Where We're Going

Photo Credit: MCFA

Maine's Marine Living Resource Economy: Where We're Going

Vision

Maine produces some of the best seafood in the world. By expanding and training our workforce, supporting working waterfront communities and the fishermen who fish there, addressing infrastructure needs, promoting Maine seafood, and developing other types of products such as nutraceuticals, biostimulants, and health and beauty products, our industry will expand and become more resilient to the effects of climate change and economic disruption. Our coastal ecosystem, featuring cold clear water, is ideal for the production of seafood and other marine-based non-food products. Our proximity to markets will foster consumer enthusiasm and robust sales now and into the future.

Goals

- 1. Grow the overall value of Maine's marine living resource economy by 10% by 2030.
- 2. Grow employment within the marine living resource economy and related value chain by 1,000 employees by 2030.
- 3. Increase sector-wide financial investments to support infrastructure, available capital, market development, and research and development.
- 4. Maintain and expand Maine's working waterfront access and the community capacity to support infrastructure and businesses.
- 5. Enhance the ability of the sector to respond to challenges and opportunities resulting from climate change and demographic shifts.

How We'll Get There

Photo Credit: Island Institute

How We'll Get There: Goals and Actions for Maine's Marine Living Resource Economy

Presented here are a series of economic development opportunities for the marine living resource economy that will benefit all parts of the sector and can be implemented by industry members, community leaders, government, and non-government organizations, and most especially by all these entities working collaboratively.

These goals are broken into three categories—People, Place, and Product—but there are many overlaps among the three.

The People

Goals

- 1. Diversify jobs and opportunities for business owners as the sector evolves and grows and production increases.
- 2. Improve employer access to appropriately trained workers.
- 3. Create access to requisite training for potential employees of all backgrounds.
- 4. Develop sector-specific skill-building and credentialed educational programs through existing entities (universities, technical colleges, etc.).
- 5. Develop sector-specific recruitment campaigns to highlight the diverse career opportunities and increase understanding of the sector both in and out of state.
- 6. Access, recruit, and retain diverse talent from within and outside the state.

Actions

Data Collection

- 1. Improve data collection on the workforce sector to better understand needs and trends.
 - a. Work with DMR to gather workforce data through regular surveys linked to harvester and aquaculture licenses.
 - b. Conduct regular economic impact studies to improve understanding of labor inputs and inform recruitment and training needs.

Recruitment & Attraction

- 2. Access, recruit, and retain a diverse and skilled workforce.
 - Encourage training facilities and educational institutions to provide education in ecosystem science and monitoring technologies, food science and food safety, and resource economics and planning.
 - b. Access the pool of potential talent in the state and attract diverse talent from out of state by developing meaningful, sustainable relationships with diverse and ethnic communities and populations historically underrepresented and underserved within the marine living resource economy. This includes but is not limited to people who are Black and African Americans, Latina/Latino and Hispanics, Asian Americans, Pacific Islanders, Native Americans, LGBTQ+, women, immigrants, differently abled, veterans, and formerly incarcerated individuals.

• Expand training and education programming to diverse populations and regions of Maine.

• Develop a better understanding of barriers that inhibit diversity and inclusion in the marine living resource sector and the training and education needs of underrepresented communities.

c. Change the social constructs surrounding employment in the marine living resource economy to foster recruitment and retention of talent (for example, providing year-round rather than seasonal employment and countering the rhetoric that "blue-collar" jobs are less valuable or worthwhile than other careers).

- 3. Continue to develop workforce pipelines that attract both youth and adults.
 - a. Expand sector-specific educational programming in K-12.
 - Expand and develop partnerships between the marine living resource sector and K-12 teachers, school counselors, adult education, community colleges, and career and technical colleges.
- 4. Alleviate existing barriers (tuition costs, transportation, affordable housing, childcare costs) to training and education programs for potential employees and existing employees, particularly among underrepresented populations.

Training

- 5. Align training and education programs with industry-recognized credentials; increase internship and accredited pre-apprenticeship and apprenticeship programs.
- 6. Expand training of basic skills in the marine living resource sector (such as the Aquaculture in Shared Waters program) as well as specialty training in new technologies and innovations related to post-harvest processing (freezing, high-pressure processing, inventory management systems, cooperative organization governance structures, and animal husbandry and hatchery technologies).

Community support

- 7. Ensure DMR and municipal staffing levels can support the logistical, regulatory, and scientific needs of the sector in the face of climate change, offshore wind energy development, and federal policy development. At the municipal level this includes hiring sustainability coordinators. Maine's *Economic Development Strategic Plan 2020 2029* also highlights this need for a stable business environment.
- Provide support for the behavioral and physical health needs of our working waterfront communities. Explore partnerships between industry, public health, and health care organizations to address gaps.

The Place

Goals

- Create community capacity to plan for and secure funding for investment at the municipal level that will support a vibrant and growing marine living resource economy, including attracting and managing grants and conducting planning activities in an integrated way.
- 2. Develop coherent and collaborative systems, policies, and support for both existing and new businesses at all scales in the marine living resource economy and related value chains.
- 3. Attract business investment that fosters growth of production, processing, distribution, and market development.
- 4. Maintain and expand working waterfront access for the marine living resource sector.
- 5. Develop more robust, consistent, and comprehensive monitoring and observation data, particularly with regards to environmental quality and changing habitat.

Actions

Data and Innovation

 Gather real-time marine and ecosystem data to monitor the coastal marine ecosystem and minimize the risk of negative environmental impact. Leverage improved technologies (computer modeling, AI, data analysis tools) to collect and manage water quality data and track parameters that are important to healthy and safe ecosystems and inform conservation strategies for wild harvesting and aquaculture operational strategies. 2. Attract investment in blue economy initiatives. Blue Economy refers to an economic system or sector that seeks to conserve marine and freshwater environments while using them in a sustainable way to develop economic growth and produce resources such as energy and food. It often implies the involvement of emerging industries and practices such as renewable energy, marine biotechnology, and carbon sequestration. There is a great deal of interest (and investment) across the United States in managing our marine ecosystems while sustainably accessing the valuable resources contained in those ecosystems to combat climate change, create new sources of healthy food, or develop innovative medicines.

Community Awareness & Support

- 3. Improve coastal communities' capacity to understand and support their local marine living resource economy.
 - Invest in initiatives such as the National Trust for Historic Preservation's Main Street America program (managed in Maine by the Maine Downtown Center) to help develop community-scale plans that will support the local marine living resource economy.
 - b. Support regional financial programs such as Small Business Development Centers, Department of Economic and Community Development, the Maine Manufacturers Extension Partnership, Eastern Maine Development Corporation's Financing Manual, and CEI's Woman and Minority Business Development program, among others.
 - c. Improve the environmental sustainability of the marine living resource economy through collaborative planning and investment in services and infrastructure. Encourage municipalities to coordinate their planning and marine living resource activities to share capacity and assets, including an ecosystem approach to planning, as many coastal towns share watersheds, embayment, and other natural features related to the marine living resource economy. (The Midcoast Managers Association for Knox, Lincoln, and Waldo counties is a good model, as are regional planning organizations.)
 - d. Develop regional distribution centers that provide hubs for producers of all sizes to share capacity for receiving, storage, inventory management, and transportation. Communities and industry can collaborate, and these hubs could be co-located with larger businesses and provide a partnership basis for cost efficiency.
 - e. Support sector-wide clean energy initiatives undertaken by the Island Institute and GMRI, among others, to implement solar energy, e-boats, and greenhouse gas measurement. Such efforts are directly aligned with *Maine Won't Wait*.

f. Develop a public relations campaign that shares positive stories about the marine living resource economy, its people, and its products to improve public understanding and perspective; create awareness of the environmental sustainability of the sector's practices and products; and create more public support for working waterfronts.

Working Waterfront Access

- 4. Support and invest in municipal and regional planning efforts to expand working waterfront access, including comprehensive plans and tools such as the Maine Coast Fishermen's Association's <u>Working Waterfront Inventory Report and Template</u>, <u>Land for Maine's Future</u>, and the <u>working waterfront preservation efforts</u>.
- 5. Support initiatives such as LD574: An Act to Amend the Laws Governing Working Waterfront Covenants, giving local land trusts the ability to hold an interest in property "for the permanent protection of working waterfront or the enlargement of working waterfront opportunities for commercial fisheries businesses."
- 6. Support and develop municipal fish pier models and other private-public partnerships that create working waterfront access and ensure that communities can direct infrastructure needs, prevent loss of commercial access, and allow for and encourage appropriate waterfront uses, including all sizes and types of operations.

Business Support

- 7. Invest in the development and expansion of marine living resource-related businesses, including training, start-up, logistics, and technology transfer. Towns should encourage and create incentives for a diversity of business owners to start or expand businesses in Maine and tap into existing business support programs.
- 8. Support Wabanaki initiatives to develop aquaculture operations.

The Products

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Photo Credit: Merritt Carey

The Products

Goals

- Develop post-harvest processing (facilities, specialty equipment, training and support for product development and testing) that will add value to and improve the quality of marine living resource products.
- Improve storage capacity, transportation systems, access to power and other utilities, and logistics to support the diverse geography and scales of primary marine living resource production and improve the energy efficiency of these systems.
- 3. Create systems to handle byproducts and waste that are currently discarded or underutilized and explore opportunities to convert them to valuable products.
- Expand marketing efforts to include a wider range of products to support fishermen in diversifying their catches and aquaculturists in growing new species.
- Expand market development approaches and export logistics in places where seafood is a popular protein choice for consumers, including the South Atlantic, Middle Atlantic, and East North Central (Great Lakes) regions.
- 6. Develop a broader and more inclusive local and regional consumer base that includes communities with a variety of ethnic and racial identities.
- Pursue promising new species or products derived from species that will thrive in changing ecosystems.
- 8. Develop reliable climate-focused solutions to support marine living resource businesses and improve resiliency in the face of weather events and changing climate change.
- Support research and development efforts that will inform wild-caught fisheries management, aquaculture, and coastal ecosystems and maximize the sustainable landing and production of seafood products.

RELATIVE SIZE OF SEAFOOD SECTOR IN MAINE REGIONS



Source: The Economic Impacts of the Maine Seafood Sector, SEA Maine

Almost 20% of employment in the Downeast region is directly or indirectly related to seafood. This compares to about 9% in the Midcoast and 2% in the Southern Region. Seafood accounts for almost 12% of labor income in Downeast and 7% of value added. This concentration of the seafood industry in the rural economies of Hancock and Washington counties is one of the key findings of the economic impact analysis.

Actions

Structural Supports:

Logistics and Value Chain

- 1. Promote the SEA Maine Seafood Transportation Dashboard and connect industry members as they explore collaborative improvements to transportation and logistics such as allowing the sharing of cargo space between producers.
- 2. Identify and inventory the capacity for freezing, cold storage, and ice making across Maine's food systems and explore partnerships, protocols, and policy changes to develop capacity where it is most needed (such as eastern Maine). Explore opportunities to collaborate with agricultural products if food safety protocols can be managed (such as blueberries). Potential partners may include O'Hara, Rockland; Barber Foods, Portland; Good Shepherd, Bangor and Lewiston.
- 3. Support utilities improvements that are critical for marine living resource businesses, particularly in Downeast Maine and on the islands.
 - a. Identify opportunities and partnerships to upgrade power service in rural communities to a reliable level (such as 3-phase). There may be local power generation capacity that can be shared, such as the Robbins Lumber Company's biomass power plant in Searsmont, Maine.
 - b. Support existing Internet connectivity initiatives working to fill gaps in Internet service, particularly in rural and island communities. Expanding connectivity is a primary goal in Maine's Economic Development Strategic Plan 2020 – 2029.
 - c. Support improvements in reliable, high-quality fresh water sources (public or private) that are critical to operating processing facilities.
 - d. Incorporate marine living resources businesses in community clean energy projects (e.g. community solar) to ensure they have access to clean reliable energy

ESTIMATED RESIDUAL VOLUMES (000s LBS): BY SPECIES IN MAINE 2021

SPECIES	PRODUCT	VOLUME	RESIDUAL %	RESIDUAL VOLUME
Lobster	Live Processed	54,451 54,451	4% 38%	2,042 20,419
Seaweed/Algae		15,724	2%	338
Mussels		8,540	1%	85
Clam, Monkfish, Elver/Eel		8,544	49%	4,219
Oysters		6,304	6%	378
Crab		2,570	55%	1,413
Quahog		1,442	na	na
Groundfish	Haddock Hake Cod Hallibut Pollock	192 248 47 32 323	50% 50% 35% 60% 50%	96 124 16 19 162
Tuna		411	3%	10
Sea Scallops		64	0%	-
Salmon	Hatcheries Grow-out	1,884 16,960	1% 3%	19 509
Other		54,099	50%	27,050
Total		226,288	25%	56,900

Source: Marine Resource Residuals in Maine, SEA Maine

Extracting maximum value from marine resources includes full utilization of residuals, and it is critical to know where, how much and what type of residuals are being produced. An estimated 57 million pounds of residuals were generated in 2021, representing about 25% of the total volume of seafood generated within Maine.

Structural Supports:

Waste Stream and Residuals

- 4. Investigate the potential of biodigestion for the extraction of added-value processing of compounds such as chitosan from the waste stream at processing facilities.
- 5. Explore the potential to work with residuals from seaweed harvested within the state and with marine sea plant material coming into the state.
- 6. Explore opportunities to use non-biological residuals. For example, companies in parts of the U.S. repurpose discarded fishing nets, and a few large Maine operations have indicated strong interest in supporting a process to handle waste netting/waste ropes to build marine products from recycled materials in their sector (circular economy goal).

Structural Supports:

Business Support

- 7. Develop collaborative approaches to marketing, logistics, and other supports that will benefit all marine living resource businesses, including individual owner-operators.
- 8. Assist industry members who wish to diversify their income sources.
- 9. Track the wide range of related businesses critical to the success of the marine living resource economy—everything from boat building, maintenance, shipping, and trucking to facility maintenance and business supports such as commercial printing and financial management services—to better understand the overall impact of the sector on Maine's economy.
- 10. Expand the cooperative model such as ESOP (employee stock ownership plan) and employee-owned cooperatives to support marine living resource businesses. The lobster industry has successfully used local/regional cooperatives as a means of spreading the cost of inputs like fuel, ice, and bait and creating shared equity in capital-intensive assets like waterfront property and collective marketing power. There are currently four small co-ops in Maine's aquaculture sector and effective leadership is critical to the success of this approach. Similarly, the Portland Fish Exchange has provided this approach for other capture fisheries. Although the Portland Fish Exchange has struggled with limited products and volume in recent years, there are elements worthy of replicating including receiving, cold storage/freezing capacity, the auction, distribution, and transportation. The <u>Cooperative Development Institute</u> can be a resource for forming these types of businesses.

- 11. Support decarbonization as fuel costs continue to rise. Early innovations in electric boat engines are in process and will continue to scale up towards possibly meeting the needs of workboats in the marine living resource economy. The transition of the fleet will be incremental depending on the size of boats, the power demands, and the availability of alternatives. The availability of charging stations will also be a limiting factor in this transition away from fossil fuels. The Island Institute is currently measuring greenhouse gas emissions for several sectors, data that will be important to Maine's clean energy sector.¹⁸
- 12. Support continued research into alternative fishing gear. Materials science can develop alternative approaches to fishing gear that could reduce dependence on plastics and provide more flexibility in responding to regulatory requirements. On-demand fishing gear is a potential solution to reducing the risk of entanglement for whales, but fishermen have legitimate concerns about these emerging technologies, including feasibility of the technology, the ability to find and retrieve the gear, and the cost. Research and development will benefit from the involvement of fishermen doing trials on the fishing grounds.

Products:

Marketing

- 13. Protect and promote the Maine brand for all seafood, highlighting Maine's strong reputation for clean water and quality products. Develop stronger relationships with the Department of Economic and Community Development's Maine Office of Tourism, the Department of Agriculture, and the Maine Jobs & Recovery Program's Domestic Trade Pilot Program to ensure coordinated approaches to marketing seafood products.
 - a. The report "A Seafood Promotional Council for Maine" showed broad support for the development of a Maine Seafood Promotional Council to promote the state's varied seafood industry products and expand and develop markets. However, ongoing funding for such a council remains the primary challenge.

¹⁸ Luke's Lobster Greenhouse Gas Emissions from Lobster and Crab Products, Island Institute, 2022, https://www.islandinstitute.org/priorities/climate-solutions/lukes-lobster-greenhouse-gas-emissions-report/.

- 14. Continue to focus on market expansion and diversification. The SEA Maine benchmarking study provides insights into alternative markets for Maine species, including both international and domestic opportunities, as does the Global Opportunities Assessment. This goal aligns with Action C4 in Maine's *Economic Development Strategic Plan 2020 2029*, which calls for promoting exports both domestically and internationally, particularly to support startups and small businesses.
 - Target market development and expansion in places where seafood remains a popular protein choice for consumers, including the South Atlantic, Middle Atlantic, and East North Central (Great Lakes) regions.
 - b. Target international markets for species (like lobster) that have sufficient volume.
 Companies navigating the complicated international and export spaces can leverage support from organizations such as the Maine International Trade Center (MITC).
 - c. Expand current and emerging local/regional domestic markets and initiatives to promote the wider variety of products being harvested and farmed.

Products: New and Value-Added Products

- 15. Evaluate new species that are migrating into the area as the ecosystem changes in the Gulf of Maine, on their potential for commercial-scale harvest. In some cases, this may require changes to management policies.
- 16. Evaluate opportunities for small-scale fishing operations that can target "live" fish markets and hook-based fishing that is environmentally sustainable and adds value to the catch, minimizing the likelihood of overfishing vulnerable species.
- 17. Green crabs have gained particular attention as a potential economic resource due to their culinary value and use in other cultures. Developing alternative uses can provide economic incentives for the fishery while assisting in controlling green crab populations.
- 18. Explore budget-friendly alternative bait options for trap-based fisheries as the traditional reliance on herring and other pelagic fishes becomes unsustainable. For example:
 - a. Explore the commercial potential of menhaden. Menhaden have a strong odor and high oil content, making them highly effective bait fish for lobster and crab fisheries as other common bait species decline.

- b. Explore the feasibility of artificial attractants in place of fish.
- 19. Develop and process small volume/high value products. For example:
 - a. Eel farming operations in Maine are exploring and developing techniques to raise American eels in captivity, aiming to provide a consistent supply of eel products for both domestic and international markets. American eel is primarily consumed in high-end restaurants, sushi bars, and seafood-focused establishments that cater to customers looking for novel and exotic seafood options.
 - b. Process Bluefin tuna for domestic consumption, rather than simply shipping them to primarily Asian markets. This requires sophisticated and highly coordinated value-chain management since sushi must reach high-end food service (not retail) buyers immediately after catch.
 - c. Growing and processing yellowtail (used in sushi) and salmon in land-based RAS (recirculating aquaculture systems) facilities in Maine offers an opportunity to replace imports of these popular species with homegrown products.¹⁹

¹⁹ MacAskill, Gregor. 2023. *Global Opportunities Assessment*. SEA Maine, December.

https://www.seamaine.org/wp-content/uploads/2023/12/SeaMaineGlobalOpportunities_FinalReport2023Dec.pdf.

IMPORTANT FACTORS WHEN SHOPPING FOR SEAFOOD HAVE EVOLVED

Product quality remains the most important purchasing factor. Pricing played a more significant role as a factor when shopping for seafood in 2022.



Source: Maine Seafood Market Report, SEA Maine

Brief Histories

Brief Histories

Groundfish

For hundreds of years, the groundfish fishery formed a core part of New England's marine living resource industry. Groundfish are a collection of species, including cod, haddock, redfish, and flounders, that live near the ocean floor. While landings of some groundfish species have declined steadily due to overfishing (and the resulting tighter regulations) and the effects of climate change, there remain opportunities to harvest other species. In 2022, just in the groundfish fishery, over 42 million pounds of pollock, redfish, and flounder were left uncaught in the Gulf of Maine due to the challenges of multispecies quota management.²⁰ Other species, such as monkfish, whiting, and halibut, were also far below their catch limits because the market for them is poor, gear restrictions make it difficult for small boats to target them, or the density of fixed gear prevents mobile gear access in the inshore fishing grounds of the Gulf of Maine.

In the past, many commercial fishermen fished for several different species throughout the year, transitioning their gear and harvesting to meet market demand. The fleet has less of this diversity now, so some fishermen are looking to other vocations to support their families while others participate in aquaculture.

Access remains a critical factor for the offshore groundfish fishery—namely, the vessel's homeport in relation to the targeted fishing grounds and the permits (and associated quotas) held by that vessel. A fishing vessel's historical landings as well as the amount of each species available to be caught determines the vessel's permits and quotas. As of 2023, more large boats fishing in the Gulf of Maine had ports-of-call in southern New England than in Maine. There are organizations working to secure more of these assets for Maine-based boats with an eye to fishing and landing a wider range of species at Maine ports, thereby supporting more robust and sustainable processing and handling facilities like the Portland Fish Exchange.

²⁰ NOAA. 2022. Commercial Summary Table (Sector and Common Pool) Catch Monitoring.

https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/Sectors/Commercial_Summary_2022.html

The Lobster Fishery

Lobster is one of the most valuable species of seafood harvested in the United States, and Maine is the largest producer. In 2022, the Maine lobster fishery was composed of around 4,700 commercially licensed lobstermen, a little bit more than 3,000 of whom are active, as well as a little more than 950 student license holders.²¹ By law, every Maine lobsterman must own and operate their own boat; therefore, each harvester is a small, self-employed business owner who spends earnings locally, benefiting Maine's economy directly. Steady increases in landings since the 1990s were likely due to several factors including harvest effort, conservation measures, and reduction of predators. Harvest levels have fluctuated in recent years, but the value of the fishery has steadily increased. Landings have exceeded 100 million pounds 10 times since 2011 and ex-vessel value has exceeded \$500 million three times since 2015.²² Recently, Maine has successfully expanded in-state processing, developed new products, and expanded marketing with the creation of the Maine Lobster Marketing Collaborative in 2013, which has helped stabilize the value of the lobster fishery. Lobster abundance has shifted northeastward from southern Maine in the 1970s to the eastern Penobscot Bay/Stonington region. Population shifts are nothing new and the fishery will need to continue to adapt.

In addition to climate change, the lobster fishery faces regulatory changes intended to maintain a sustainable fishery, additional conservation measures to protect the endangered North Atlantic right whale, and the steady progression of user conflicts on the water, most notably potential offshore wind energy development.

²¹ Maine Department of Marine Resources.

²² Maine Department of Marine Resources

Aquaculture

Since the first lease for mussels in the Damariscotta River was granted in the 1970s,²³ aquaculture has modestly but steadily expanded statewide. Several species of shellfish are now being cultured across the state, including oysters, mussels, scallops, and clams. Salmon aquaculture using net pens is well established in parts of eastern Maine. In the past 10 years, cultivation of kelp and other sea vegetable species has emerged as well.

As of 2023 there were 162 standard and experimental aquaculture leases listing mussels, oysters, clams, Atlantic salmon, kelp and other marine algae, and scallops as primary species, as well as 700 Limited Purpose Aquaculture (LPA) permits. A total of 1,650 acres are occupied by aquaculture leases statewide. Maine's coastal territorial waters make up about 3.5 million acres, so the current footprint of aquaculture represents only 0.04% of state waters.²⁴ The sector has been steadily growing in recent years, and its total economic impact nearly tripled—from \$50 million to \$137 million—between 2007 and 2014.²⁵

Aquaculture operations require leasing public space, or submerged lands, to individuals and businesses. This process is managed by the state through the Department of Marine Resources (DMR) using regulations that allow for riparian owners and other interested parties to participate in the decision-making process. The lease decision-making criteria require the applicant to address a wide range of issues to minimize impact on the environment and other practices that ensure the operation will be compatible with other nearby users. Applicants must ensure that they understand the site and potential conflicts to be successful in the leasing process.

Sustainable aquaculture has tremendous potential to bolster Maine's coastal economy, providing good jobs, local food security, and diversification opportunities for working waterfront families. According to the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages, 39 aquaculture operations reported wages in Maine in 2020, employing 361 people and providing \$15,943,568 in wages.²⁶ Limited purpose aquaculture operations and other aquaculture leases operated by small businesses also brought significant income to the state, although they do not report wage data to the Department of Labor.²⁷

²³National Shellfisheries Association. Edward A. Myers, 1917 - 2002.

https://shellfish.memberclicks.net/assets/docs/edwardmyersQNL%20in%20memoriam.pdf.

²⁴ Maine Department of Marine Resources

²⁵ Cole, Avery, Anne Langston, and Chris Davis. 2017. *Maine Aquaculture Economic Impact Report*. University of Maine Aquaculture Research Institute, January. https://umaine.edu/aquaculture/wp-content/uploads/sites/572/2017/01/Aquaculture-Econ-Report.pdf.

²⁶ Quarterly Census of Employment and Wages, U.S. Bureau of Labor Statistics. https://www.bls.gov/cew/.

²⁷ MacAskill, Gregor, Noah Oppenheim, and Joshua Stoll. Maine's Seafood Baseline.

Most recently, several land-based operations using recirculating aquaculture systems (RAS) to grow eel, salmon, and yellow tail (seriola) have been launched or proposed. Some RAS operations rely solely on fresh water for cultivation, including American eel and hydroponics operations for co-cultivation of vegetables and fish. Coupled with the excellent R&D capacity in Maine, these operations have the potential to make Maine a global leader in RAS production, creating hundreds of jobs and attracting talent from across the U.S. and abroad. As a regulatory matter, the Department of Environmental Protection (DEP), not DMR, regulates land-based aquaculture; this has the potential to create administrative complexities in the future.

The potential for growth in the aquaculture sector (both land- and sea-based) can be assessed through several factors beyond the volume and value of landings. The number of lease applications continues to increase, indicating growing interest in aquaculture. Since it takes several years for these operations to grow their products to market size and become established businesses, a significant portion are "pre-revenue" and their full potential in terms of production and employment is still emerging.

Appendices

A. Completed SEA Maine Studies

- Maine's Seafood Baseline and Dashboard
- Marine Living Resources Transportation and Logistics Dashboard and Report
- The Economic Impacts of the Maine Seafood Sector
- Marine Resource Residuals in Maine Report and Map
- <u>A Seafood Promotional Council for Maine</u>
- Multicultural Marketing Analysis—Cambodian and Vietnamese Seafood
- <u>Cambodian Seafood Purchase Intent Survey</u>
- Seafood Market Report
- <u>Global Opportunities Assessment</u> and <u>summary table</u>
- Current State of Knowledge in Maine's Wild Catch Fisheries and Seafood Workforce (Phase 1)
- Workforce Needs Assessment (Phase 2)
- Workforce Toolboxes
- Workforce Education and Training Capacity Building Grants

B. Related Planning Documents

- <u>Maine Economic Development Strategy 2020-2029: A Focus on Talent and Innovation</u> (State of Maine)
- Maine Won't Wait: A Four-Year Plan for Climate Action (State of Maine)
- <u>Maine Aquaculture Roadmap</u> (Maine Aquaculture Association)
- Maine's Offshore Wind Roadmap (State of Maine)
- Aquaculture Strategic Plan (NOAA)
- <u>Maine Seafood Study</u> (CEI)
- <u>Seafood From Maine</u> (Maine DMR)

C. SEA Maine Discovery and Engagement Process

Funded by the US Economic Development Administration in 2020, SEA Maine is the Seafood Economic Accelerator for Maine, an effort to develop a roadmap for Maine's seafood economy. SEA Maine was organized into five thematic working groups that reported findings to the Steering Committee monthly. Several contracts were awarded through these committees to develop a series of technical reports available on the SEA Maine website (<u>www.seamaine.org</u>) and listed at the back of this report. The Maine Development Foundation served as project manager. The stakeholders listed under each committee participated as members of that committee at some point during the project.

Steering Committee

The Steering Committee oversees the roadmap initiative and members are responsible for monitoring the high-level strategy while driving the goals of this effort. The focus of the committee was to coordinate the team's efforts in the four work areas: Marine Resources & Data Benchmarking, Workforce & Talent Development, Market Development, and Opportunities & New Technology. The Steering Committee met quarterly. The Executive Committee, a subgroup of the Steering Committee composed of all subcommittee chairs/co-chairs, met monthly.

Curt Brown – Co-Chair <u>Ready Seafood</u> Sara Rademaker – Co-Chair (2022 – 2023) <u>American Unagi</u> Bill Mook – Former Co-Chair (2020 – 2022) <u>Mook Sea Farm</u> Kim Hamilton (2020 - 2022) and Andrea Maker (2023) – Co-applicant <u>FocusMaine</u>

Brian Whitney – Co-applicant Maine Technology Institute Merritt Carey Hugh Reynolds Greenhead Lobster George Seaver Ocean Organics Andrew Lively Cooke Seafood (2020 – 2023), Ocean Perfect (2023) Peter Handy Bristol Seafood Jennifer Cyr Bristol Seafood Liz Johndrow Atlantic Sea Farms Dianne Tilton Downeast Institute Bill Keleher Kennebec River Biosciences Jim Markos Maine Shellfish Keith Bisson Coastal Enterprises, Inc. Hugh Cowperthwaite Coastal Enterprises, Inc. Holly Parker Bowdoin College Jim McManus **Bigelow** Labs Sebastian Belle Maine Aquaculture Association Ben Martens Maine Coast Fishermen's Association Patrice McCarron Maine Lobstermen's Association Annie Tselikis Maine Lobster Dealers' Association Peter DelGreco Maine & Co.

Jonathan Labaree Gulf of Maine Research Institute Meredith Mendelson Maine Dept. of Marine Resources Charlotte Mace Maine Dept. Economic & Community Development Chris Davis Maine Aquaculture Innovation Center Jake Ward University of Maine Keri Kaczor Maine Sea Grant Paul Anderson Maine Center for Coastal Fisheries (now retired) James Beaupré University of Maine Christian Brayden Maine Aquaculture Association Leo Waterston FocusMaine Sam Belknap Island Institute

Marine Resources & Data Benchmarking Subcommittee

The subcommittee will identify and assess existing and anticipated resource reports and data sets, current gaps in resource analysis, and inform the data used in the roadmap. The subcommittee will also identify capacity and targets for growth and economic impact and help align SEA Maine with other complementary marine resource economy efforts. Accurate data will inform SEA Maine decision making and efforts to strengthen Maine's seafood economy, and to identify opportunities for innovation, investment, workforce, and market development.

Paul Anderson (Co-Chair) <u>Maine Center for Coastal Fisheries</u> (now retired) Christian Brayden (Co-Chair) <u>Maine Aquaculture Association</u> Ben Martens <u>Maine Coast Fishermen's Association</u> Curt Brown
Ready Seafood
Meredith Mendelson
Department of Marine Resources
Sam Belknap
Island Institute
Patrice McCarron
Maine Lobstermen's Association
Gayle Zydlewski
Maine Sea Grant
Carl Wilson
Department of Marine Resources

Market Development Subcommittee

The subcommittee will work to advance and support the market development of Maine's marine economy including efforts to increase value-added opportunities and use of waste streams, develop new products, and grow high-value exports, all in an effort to increase jobs and wages across the state. The subcommittee will look for opportunities to collaborate with Maine food, agriculture, and life science sectors and support efforts to market Maine's seafood economy, attract investment, and connect the sector to new markets and resources.

Andrew Lively (Chair) Cooke Aquaculture (2020 – 2023), Ocean Perfect (2023) Sebastian Belle Maine Aquaculture Association Jesse Baines Atlantic Sea Farms Bill Needelman City of Portland Waterfront Boe Marsh Community Shellfish Jen Levin Gulf of Maine Sashimi Brain Langley Union River Lobster Pot Jeff Nichols Department of Marine Resources Ben Coniff

Lukes Lobster Shae McGehee Department of Economic and Community Development Peter DelGreco Maine & Co. Nick Branchina Coastal Enterprises, Inc. Kelsey Woodworth American Unagi Heather Sadusky Sustainable Fisheries Partnership Ben Martens Maine Coast Fishermen's Association Janine Bisaillon-Cary Maine Center for Entrepreneurs Kyle Foley Gulf of Maine Research Institute Courtney Cossgrove FocusMaine

New Opportunities & Emerging Technologies Subcommittee

The subcommittee will target emerging technologies, research, and innovation on the forefront of the marine economy that increase commercialization, improve efficiency, support business development, and help create quality jobs. This subcommittee will look at domestic and global trends in technology and new uses of all aspects of the seafood supply chain to inform the market development team by bringing forward technologies and innovation that match with market opportunities and develop strategies to attract investment in new technologies in the sector. The subcommittee will also examine Maine's vulnerabilities to economic or environmental "shocks" and will identify strategies to prepare and respond to short and long-term disruptions enabling greater resiliency in the marine economy.

Jake Ward – Co-Chair James Beaupré – Co-Chair <u>University of Maine</u> Ashley Pringle <u>Maine & Co.</u> Bill Keleher <u>Kennebec River Bioscience</u> Chris Davis Maine Aquaculture Innovation Center Debbie Bouchard Aquaculture Research Institute Dianne Tilton Downeast Institute David Reidmiller Gulf of Maine Research Institute Jared Wildwistle Gulf of Maine Research Institute George Seaver Ocean Organics Hugh Cowperthwaite Coastal Enterprises, Inc. Hugh Reynolds Greenhead Lobster Jim Markos Maine Shellfish Curt Brown Ready Seafood Sebastian Belle Maine Aquaculture Association Patrick Arnold New England Ocean Cluster Susie Arnold Island Institute Chris Cary New England Ocean Cluster Ben Sturtevant Department of Economic and Community Development

Workforce and Talent Development Subcommittee

This subcommittee will identify current and future workforce needs, build on existing workforce efforts in the sector, and develop an action plan to sustain and grow the workforce for the future of the marine resource economy. This will include identifying the skills required for existing and new opportunities, ensuring current workers have the skills they need, and the sector is well positioned to attract and prepare the necessary workforce for emerging technology, new products and opportunities. This group will identify the training and skills development opportunities, the credentials of value for the industries, and ways to attract and connect talent to opportunity.

Anne Langston Noll (Co-Chair) Maine Aquaculture Innovation Center Keri Kaczor (Co-Chair) Maine Sea Grant Leo Waterston Focus Maine Holly Parker Bowdoin College Meggan Dwyer Aquaculture Research Institute Carol White Southern Maine Community College Jason Judd Educate Maine Jake Ward University of Maine **Yvonne Thomas** Alex Zipparo Lia Morris Island Institute Carissa Maurin Gulf of Maine Research Institute Annie Tselikis Maine Lobster Dealers' Association Chris Davis Maine Aquaculture Innovation Center Nichole Sawyer Washington County Community College Dan Belyea <u>Maine Community College System</u> Christian Brayden <u>Maine Aquaculture Association</u> Armadeep Kahlon <u>Unity College</u> Scarlett Tudor <u>University of Maine</u> Carol White Southern Maine Community College Jake Daniele <u>Department of Economic and Community Development</u>

Communications Subcommittee

This subcommittee works across all committees and with a communications consulting firm, Northeast Media Associates, to ensure timely and relevant communications and outreach about SEA Maine projects, deliverables, and updates.

Leo Waterston (Chair) **FocusMaine** Monique Coombs Maine Coast Fishermen's Association Curt Brown Ready Seafood Brian Whitney Maine Technology Institute Amber-Jean Nickel Maine Lobstermen's Association Sebastian Belle Afton Hupper Maine Aquaculture Association Annie Tselikis Maine Lobster Dealers Association Jesse Baines Atlantic Sea Farms

D. Additional Participation

In addition to the committee members listed above, many others consulted and advised on the SEA Maine project. A special thank you to representatives of Maine's federal delegation, whose careful attention to this project helped ensure its success.

Robin Alden Neil Arnold Kathryn Ballingall Black Fly Media Damian Brady Christina Breen Yellow Breen Michael Burgess Tae Chong Jeanne Christie Denise Cilley Charles Colgan Philip Conkling Jesse Connolly Alexa Dayton Fiona de Koning Chris DeBow Robert Dumas Des Fitzgerald Halsey Frank Parker Gassett Barbara Hayslett Angie Helton Janet Horsager Jessica Joyce Adam Lachman Marianne Lacroix Gregor MacAskill Ken Magnus Marissa McMahan Amber-Jean Nickel Noah Oppenheim Kristan Porter Pulp + Wire Chris Rector

Jonathan Rubin Charles Rudelitch Zach Schmesser Vice Chief Mark Sockbeson Jason Spooner Josh Stoll Tony Sutton TP Miller & Associates Rosie Vanadestine Rob Veidenheimer Ryan Wallace Scott Wilkinson Carol Woodcock

E. Credits

Paul Anderson of C2C Consulting led the development and writing of this Roadmap with editorial support from Anne Schlitt, Merritt Carey, James Beaupré, Perri Williams, Leo Waterston, Meredith Mendelson, and input from the many stakeholders of SEA Maine.

SEA Maine Roadmaps designed by Le Anna Grosso

Thank You

