



Capture and Culture Fisheries of Maine: Training the Next Generation



**A Summary Report by
Maine Sea Grant
Maine Center for Coastal Fisheries
Maine Coast Fishermen's Association**

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Maine Sea Grant's work across Maine, from the Piscataqua River to Passamaquoddy Bay, is carried out on the lands and waters of the Penobscot, Passamaquoddy, Maliseet, and Mi'kmaq, collectively known as the Wabanaki people. We thank the Wabanaki, people of the Dawn Land, for their stewardship and continued strength and resilience in protecting it. We support all efforts for healing and protecting the land and water we share.

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A note from project partners about the timing of this report in light of emerging and uncertain changes in Maine's lobster fishery

The Young Fishermen's Development Act was envisioned to create a flexible program to provide training and education specifically tailored to address the diverse needs of fishing communities throughout the United States. While there are consistent foundational components of science, management, and business that every fisherman would benefit from knowing, the differences in the support available region to region varies as dramatically as the seafood options coming across our docks.

To help Sea Grant make an informed decision on the specific needs of Maine's fishermen and fishing communities, Maine Sea Grant, Maine Center for Coastal Fisheries, and Maine Coast Fishermen's Association undertook a project to create a snapshot of the current state of fisheries training programs in Maine. This venture consisted of a review and catalog of all the current programs available to fishermen and fishing businesses, as well as a series of interviews with fishermen and educators to develop a grassroots, community-based needs assessment of trainings for the next generation of fishermen and fishing businesses in Maine. Significant energy was spent



interviewing fishermen of various ages, fishing backgrounds, and communities with a focus on what can be invested in today, in terms of training and education, that will help set up young and next generation fishermen for success tomorrow.

The interviews conducted by Maine Coast Fishermen's Association, Maine Center for Coastal Fisheries, and Maine Sea Grant were the bedrock for much of our analysis of need. We are incredibly thankful to the fishermen who spent their time with us on this project, but we would be remiss if we did not acknowledge that the future of Maine's fishing

industry feels significantly different to those on the water today than it did when those interviews were conducted in early 2022. This report and its recommendations should be read using the new reality of our fishing industry as a lens to reassess and weigh the training needs and opportunities for the future fishing businesses in Maine.

In 2021, the National Marine Fisheries Services (NMFS) released a ten-year plan to reduce risk to the North Atlantic right whale. That plan requires fixed-gear fisheries in New England to reduce risk to right whales by 98%. Most of that risk is attributed to trap lines within the lobster fishery and, as of September 2022, NMFS is fast-tracking a plan that will require Maine's lobster and gillnet fisheries to implement a 90% risk reduction as soon as 2023. If reductions are not achieved, those fisheries could be shut down by a federal judge.

At the time of these interviews, participants expressed some concerns about the long-term viability of Maine fisheries. Many identified whale rules, offshore wind development, climate change, and access to permits and working waterfront as potential barriers to future business success. But, when these interviews were conducted in spring of 2022, the threats were less imminent and severe. Today, the peril to both the lobster fishery and the gillnet fishery is the focus of every conversation on the dock. There will likely be massive disruption along the coast of Maine if the current trajectory of regulation continues. Accordingly, the training needs for current and next generation fishermen identified in this report need to be recalibrated with a greater emphasis on business planning, flexibility, transferable skill cultivation, and safety at sea.

There are many important findings within this report, but for many in the fishing community, the fear of what the future holds for all fishermen in Maine is too much of a burden to even consider the promotion of “the next generation” as a priority. While we want to acknowledge those fears, those anxieties, and recognize the place that those feelings are coming from, we believe that there will be a future of fishing in Maine and that we must make investments now to ensure that fishermen and fishing businesses are prepared to face the challenges ahead. It is our hope that the needs and recommendations identified in this report provide guidance in the development of trainings and the provision of necessary resources that will help new and established fishermen adapt to an uncertain future.

Sincerely,

Maine Coast Fishermen’s Association

Maine Center for Coastal Fisheries

Maine Sea Grant



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Executive Summary

Maine has deep cultural and economic roots in its fisheries and maritime industries. Finfish, shellfish, sea vegetable fisheries, and bustling working waterfronts are, to this day, iconic and support our coastal and inland communities. Marine aquaculture and wild harvest fisheries play a foundational role in our diverse marine economy. As they face climate change, lack of access to working waterfronts/permits/leases, maritime heritage decline, economic hardships for generational fishermen, supporting infrastructure decline, global trade impacts, and other challenges, fishing industry leaders report feeling their voices are not being heard. Despite the many challenges, commercial fishing and aquaculture still offer opportunities for people to enter the workforce and make a good living in coastal communities. Anecdotal evidence, however, suggests fewer people are seeking employment in these industries, which is contributing to a phenomenon commonly referred to as the “graying” of the fleet. Understanding the landscape of Maine’s marine workforce can help address the challenges of recruiting and empowering the next generation of sea harvesters and producers.

In response to the Young Fishermen’s Development Act of 2020, Maine Sea Grant, in partnership with the Maine Center for Coastal Fisheries and the Maine Coast Fishermen’s Association, conducted a needs assessment focused on training for the next generation of fisheries and aquaculture harvesters and producers. This process included a series of interviews, surveys, and focus groups; an in-depth inventory of workforce development programs; and continual reflection by project partners. Our work focused on documenting existing skills and knowledge, as well as identifying training needs, including formats and incentives that would better support fishermen and harvesters.

Our most important findings included the need for A) hands-on, experiential learning and mentorship

provided by trusted members of the industry; B) teaching important skills such as business practices and entrepreneurship, gear technology, fisheries and ecosystem science, leadership, engagement, and policy, and developing work ethic and experience; C) scheduling short-duration trainings in the winter months (December through March) with incentives and motivators that make training programs worth industry members’ time investment; D) education and career aspiration opportunities targeted at younger audiences (K–8, high school, and vocational programs); E) mental and physical health support; F) diversity, equity, and inclusion in Maine’s fisheries and aquaculture industries. Acknowledgement of an uncertain future and the barriers to entry in the fishing industry are also important, as the industry continues to experience change.

Based on a synthesis of our findings (see Discussion section), we make several key recommendations for future training programs and potential requests for proposals (RFPs). Programs should address identified gaps in training and connect people to existing training opportunities, some of which struggle with low enrollment. Training should teach both skills relevant to industry and skills that are transferable across industries. Schedules should balance the need for hands-on experience with availability, or lack thereof, during the busy season. Trainings should provide growers and harvesters new opportunities for off-season employment, allowing them to work year-round. Programs should also concentrate on recruiting and retaining new and diverse talent to the workforce. Research and development that help overcome barriers to entry and industry development are also needed. Finally, identifying new, forward-looking opportunities will help the next generation of industry participants and leaders succeed.

Recommendations

Maine's fishing and aquaculture industries are changing, and new opportunities are emerging. By addressing gaps in existing training or knowledge, we can build a workforce that is stronger, more diverse, engaged, and equipped with a wealth of skills and talents that prepare workers for the future. Our needs assessment revealed skills the next generation wants to learn, skills established industry members consider crucial, and the existing training programs that meet those needs. While skills development is clearly at the heart of this needs assessment, our work incorporates insights from educators and other workforce development leaders.

A. New or Enhanced Training

Our findings illustrate the need for teaching skills that are transferable across sectors and that are delivered in a way that fosters connections, aligns with industry seasonality, and offers clear and tangible benefits to participation. These recommendations are valuable for both inspiring new training programs and enhancing existing programs to meet the needs of the sectors.

Focus on training needs and skills identified by the industry

- ▶ Create hands-on learning opportunities focused on skills valuable to the industry, such as the use and repair of gear and technology, vessel operations and maintenance, basic seamanship, and fisheries and ecosystem science, especially for community college and vocational programs.
- ▶ Develop opportunities for the next generation to strengthen their leadership and public speaking skills, including how to navigate political processes and how best to advocate for their future.
- ▶ Offer experiential and mentorship opportunities to develop soft skills, such as arriving on time,

We compared their knowledge and perspectives to our inventory of existing programs (and those in development) in order to identify the gaps and priorities related to:

- A** New or enhanced training
- B** Support for existing programs
- C** A diverse and ready workforce
- D** Research and development
- E** Additional considerations for state- and nation-wide Requests for Proposals (RFP)



reliability, initiative, adaptability, and having a positive attitude.

- ▶ Focus on skills/activities/actions that increase product value both onshore and offshore.



Teach transferable skills that support employment year-round and in related sectors

- ▶ Offer training that is relevant and foundational to both capture and culture industries.
- ▶ Focus on skills applicable across sectors and industries to support year-round employment and build a strong, versatile foundation. This includes skills that support fishing but are not fishing: welding, engine repair, plumbing, carpentry, marketing, etc.

Design effective formats and structures and communicate benefits clearly

- ▶ Foster relationships and information-sharing across generations through mentorships, apprenticeships, industry field tours, and other experiences.
- ▶ Offer trainings in settings where fishermen are already comfortable and accustomed to interacting across generations (e.g. on the docks, on boats, through fishing and aquaculture co-ops).
- ▶ Create paid opportunities for seasoned fishermen and aquaculturists to teach others.
- ▶ Offer training programs that align with industry off-season schedules.
- ▶ Design programs that are short (i.e. half day to three days) rather than requiring commitments spanning multiple weeks.
- ▶ Provide opportunities that yield relevant and useful take-home products (e.g. business plan).
- ▶ Demonstrate clearly the benefits of each training and provide incentives for participation (e.g. professional development, networking, financial compensation, access to permits, insurance rebates).

B. Support for Existing Programs

Our findings revealed the need to spread awareness of and support enrollment in existing training programs.

- ▶ Connect new and young talent to training and career opportunities (e.g. school counselors, social media campaigns, job fairs); utilize communication platforms that reach the next generation (e.g. YouTube, TikTok).
- ▶ Transform the workforce development inventory¹ into a searchable, online format with a “map” of existing resources and training programs.
- ▶ Connect programs with each other to facilitate learning and collaboration among educators.
- ▶ Enhance technical assistance programs that build the capacity of industry to acquire capital (e.g. grant-writing, applying for loans) and build their businesses, including providing professional development and training opportunities for employees.
- ▶ Increase the visibility of funding mechanisms for workforce development programs.

1. Appendix A

C. A Diverse and Ready Workforce

It is essential to make the industry accessible to and supportive of all. Based on our needs assessment and perspectives from industry leaders, the future of the industry hinges on attracting new, young, and diverse talent to the sector and providing support for established industry members to succeed.

- ▶ Create new programs and other resources to support the mental and physical well-being of fishermen, aquaculturists, and their families; increase awareness of existing programs.
- ▶ Increase the next generation's exposure to the range of career opportunities in fishing and aquaculture.
- ▶ Match youth and other potential trainees with opportunities that best correlate with their career aspirations, training interests, and needs.
- ▶ Support the workforce pipeline early by creating educational and career aspiration programs for youth (K–12).
- ▶ Support workforce retention by integrating into communities and addressing items regarding quality of life (e.g. access to reliable childcare).
- ▶ Develop recruitment, training, and funding opportunities that support diversity, equity, and



A demonstration of aquaculture techniques, such as scallops growing in a lantern net, can pique the interest of school children and make them aware early on of employment possibilities in their futures.

D. Identify New Opportunities for the Future of the Industry

Our conversations with industry and educators highlighted the need to invest in research and technologies, and to foster forward-looking opportunities for the next generation.

- ▶ Identify further barriers to entering training programs and the sector as a whole (e.g. implicit bias, discrimination, access to permits and leases) and define the steps needed to reduce those barriers at the state and national level.
- ▶ Enable new, value-added products, reduce waste products, and create new revenue streams.
- ▶ Identify new technologies and other strategies that create efficiencies and build resilience to “economic shocks” throughout the seafood value chain.
- ▶ Identify models for “whole business” support systems that streamline access to resources (e.g. bring services directly to the dock).

E. Additional Considerations for State- and Nation-wide Requests for Proposals (RFP)

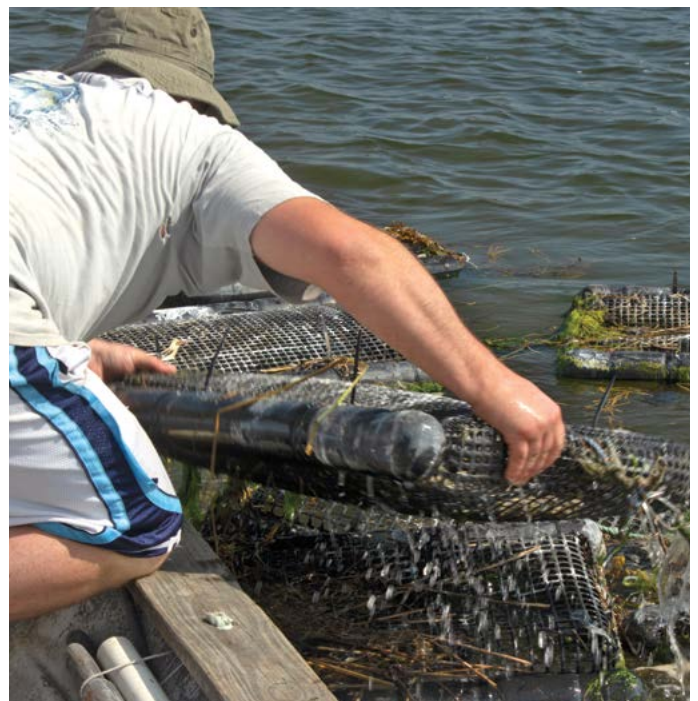
This report was compiled with funding from the National Sea Grant program following the passing of the Young Fishermen's Development Act and National Sea Grant's subsequent request for state or regional planning frameworks that outline priorities for training programs. Maine's team has been in close contact with ten other programs across the country that are conducting similar needs assessments and recognizes that there are striking similarities and equally striking differences regarding training needs throughout the nation. Though funding for the YFDA had yet to be appropriated by the U.S. Congress at the time this report was produced, the National Sea Grant Office has since announced funding for Young Fishermen's Career Development Projects. We envision that potential applicants will include businesses, agencies, organizations, institutions, education practitioners, and others grounded in the knowledge and experience necessary to successfully implement the above recommendations.

Requests for Proposals (RFP) that take the following actions will help address the needs identified by this needs assessment:

- 1 Focus on a national RFP program that fosters a strong national fisheries and aquaculture training program network, including the sharing of best practices and success stories.
- 2 Enable an RFP that supports the diversity of local needs within that national network.
- 3 Require RFP applicants to articulate how their proposed projects will either enhance existing training programs in their location or will develop new training programs that address needs unmet by current programs.
- 4 Evaluate proposals based on how RFP applicants will
 - ▶ Support the expansion and participant recruitment of existing training programs
 - ▶ Address priority training needs identified by potential participants

- ▶ Consider how proposed training programs will prepare the workforce for the future of a sustainable seafood sector
- ▶ Provide innovative methods of training that integrate hands-on training in real world settings with trusted mentors
- ▶ Include mentorship and/or peer-to-peer elements
- ▶ Include measurable benefits for training participants
- ▶ Bring unlikely partners together across public and private businesses and organizations to address the identified needs
- ▶ Foster training programs that provide transferable skills that are useful in a wide diversity of marine-based industries

Maine's fishing and aquaculture industries face many internal and external challenges. By addressing the needs of people working on the docks, on the water, on farms, and on boats, Maine and the greater United States can continue to enjoy a robust, thriving industry that supports and empowers the next generation of industry leaders, fishermen and aquaculturists.



III Background and Context

A. The Young Fishermen’s Development Act

In December 2021, Congress passed the Young Fishermen’s Development Act (YFDA) “to preserve United States fishing heritage through a national program dedicated to training and assisting the next generation of commercial fishermen.”² The Act directed the Secretary of Commerce, through the National Sea Grant Office, to establish and administer a program to prepare for the future. In response, the National Sea Grant College program awarded 11 planning grants to state Sea Grant

programs to support collaborations with local partners to identify state-wide and community-specific needs for training programs. Maine Sea Grant received one of these grants and worked with the Maine Center for Coastal Fisheries and the Maine Coast Fishermen’s Association to assess training needs for “fishermen, aquaculturists, and seafood sector professionals to enter career paths and make a living supplying seafood from our oceans, coasts, and Great Lakes.”³

B. Maine’s Capture and Culture Fisheries

Fisheries and aquaculture industries and the working waterfront are iconic and important to our economy and heritage. In recent years, capture and culture fisheries have harvested over 35 species of finfish, shellfish, and sea vegetables annually.⁴ In 2020, despite the widespread impacts of the pandemic on the industry, Maine wild fisheries and aquaculture harvesters landed more than 206 million live pounds of seafood valued at \$524,826,593,⁵ with nearly 10% from various aquaculture species and the remainder from lobster and other wild harvest species.⁶ Maine’s landings represent approximately 2.5% of the total live pounds and 11% of the total value of seafood landed in the United States that year.⁷

Commercial fishing and aquaculture are important industries in Maine’s coastal communities and offer opportunities for people to enter the workforce and make a good living.⁸ That being said, while most of these fisheries are robust, fishing industry leadership finds



many current events concerning. Similar to other industries in Maine, the seafood sector is experiencing the need to “[i]ncrease the participation in the labor force of the existing population, help existing workers to upskill, create more diverse, welcoming workplaces, and attract

2. U.S. Congress, House, *Young Fishermen’s Development Act*, 2; U.S. Congress, Senate, *Young Fishermen’s Development Act*, 1.

3. NOAA, Sea Grant “Food from the Sea” Careers Program.

4. Maine DMR commercial fisheries species information, maine.gov/dmr/fisheries/commercial/fisheries-by-species.

5. Maine DMR, *2017-2021* Commercial Maine Landings*.

6. Determined by comparing Maine’s total landings value in 2020 to total aquaculture value of the same year. Maine DMR, *2017-2021* Commercial Maine Landings*; Maine DMR, *Total Maine Aquaculture Harvest Value*.

7. NOAA Fisheries, *Fisheries of the United States*, 2020.

8. While there are myriad opportunities to enter the marine workforce, there is no comprehensive account of the type or number of opportunities available. Current assessments of direct employment in the industry are dated and do not consider ancillary businesses. Additionally, it is notoriously difficult to calculate definitively the number of licensed commercial fishermen in Maine, as the self-employed sector are often undercounted in labor statistics.

new talent to live and work in Maine.”⁹ Evaluating what prevents people from entering and excelling in Maine’s seafood sectors, as well as identifying the training

programs that currently exist and those programs that are needed, can help address the challenges of recruiting and empowering the next generation of sea harvesters.

C. Scope of Our Needs Assessment

Our assessment targets Maine’s next generation of industry members, leaders, and entrepreneurs. This assessment does not include the training needs of other closely linked elements of Maine’s Marine Living Resource (MLR) Economy,¹⁰ such as processing and transportation.

While our efforts included both wild harvest and aquaculture fisheries, our interviews and surveys placed emphasis on wild harvest fisheries. In early consultations, aquaculture industry leaders and training program coordinators urged our team to correlate our findings and inform our recommendations with

existing reports rather than duplicating work that has already been done.¹¹ Over the last decade, the aquaculture industry has experienced increased investments from private, academic, and federal organizations to prepare businesses and communities for the projected growth of the industry in Maine. Wild harvest fisheries have not experienced a similar growth in investments, though they accounted for about 90% of the state’s total landed value in 2020.¹² Capture and culture fisheries have also received differing levels of investment in workforce development initiatives.¹³

D. Project Goals

The primary goal of this project was to identify training and mentoring programs that provide the next generation of Maine fishermen and sea farmers with the skills and experience needed to work on the waterfront, boats, farms, and businesses that supply Maine’s growing MLR Economy. Our specific objectives were:

- 1 To **conduct a training and mentoring needs assessment** in Maine for individuals seeking to enter capture and culture fisheries.
- 2 To **compile a comprehensive inventory** of existing post-secondary training and education programs in Maine, determine if these programs are accessible to applicants, and identify what gaps in programming need to be addressed in our planning framework.

- 3 To **engage with Maine’s next generation of sea harvesters and industry members** to identify the skills needed to succeed in the seafood industry and ways to motivate participation in training programs.
- 4 To **produce a planning framework that addresses training needs identified by the next generation of sea harvesters**, assesses the accessibility of existing programs, and identifies new training and mentoring opportunities.
- 5 To collaborate with the seafood industry and Sea Grant programs around the region and nation to **provide shared access to regional curricula, best practices, and training opportunities** that support a skilled workforce.

9. Frank O’Hara, *Making Maine Work*, 9.

10. Defined by the Maine Center for Business and Research as seafood producers (capture and culture fisheries), processing and distribution, and transportation and logistics for edible and non-edible products; see Maine Center for Business and Economic Research, *Current State of Knowledge*.

11. For example, Gulf of Maine Research Institute documented skills employers find most valuable and relevant across Maine’s aquaculture industry in its report and Maine Aquaculture Association developed specific occupational standards for each subsector based on industry input. See GMRI, *Maine Aquaculture Workforce Development Strategy* and MAA, *Occupational Standards for Maine Aquaculture*.

12. Determined by comparing Maine’s total landings value in 2020 to the total aquaculture value of the same year: Maine DMR, *2017-2021* Commercial Maine Landings*; Maine DMR, *Total Maine Aquaculture Harvest Value*.

13. Table 2

IV Methodology

Our team collected data through individual and small group interviews with *next generation* and *established industry members*, an online survey of *educators*, a series of focus groups with *industry leaders* and other thought leaders, a comprehensive inventory of existing workforce development programs in Maine, and continued iterative reflection among project partners. Through this, we sought perspectives and insights in four major themes:

- ▶ Existing skills, knowledge, and aspirations
- ▶ Training needs (skills and knowledge)
- ▶ Preferred delivery methods/formats
- ▶ Motivators to participate in training programs

In total, we gathered information from 171 participants. Interview and survey participants included 36 *next generation*, 28 *established industry members*, and 35 *educators*.

For the purposes of this needs assessment, when the following terms are italicized, they specifically refer to people who participated in interviews, surveys and focus groups.

- ▶ *Next generation industry members*: teenagers, young adults, or individuals who had been working in fisheries and/or aquaculture for less than ten years

A. Interviews

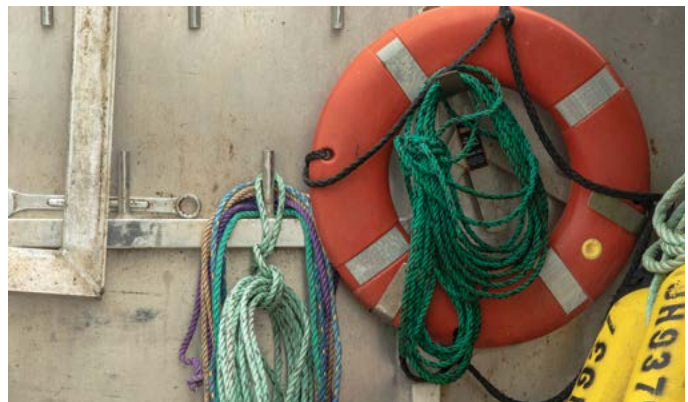
A team of 10 interviewers from the three partner organizations¹⁴ conducted individual and small group interviews during the fall of 2021 and winter of 2022. Prior to each interview, interviewees were briefed on the project's goals. Interviewers followed a script¹⁵ and recorded participants' answers. Though interviewers collected participants' basic demographic information,¹⁶ they removed identifying information

- ▶ *Established industry members*: individuals who had been working in fisheries and/or aquaculture for more than ten years

- ▶ *Educators*: teachers, practitioners, and program leads

Seventy-two industry leaders and other thought leaders provided information and insights through focus groups and follow-up conversations.

Given time and capacity constraints, our team acknowledged early in the project that this needs assessment could not represent all subsectors and demographics involved in capture and culture fisheries. Instead, our needs assessments targeted general representation and our findings emphasized areas where a range of participants shared the same or similar insights, signaling relevance across the seafood industry.



before aggregating responses. After an initial round of interviews, we conducted a gap analysis to determine the range of demographics and sea harvest sectors represented. To address identified gaps, the interview team conducted several additional interviews. A total of 70 people provided data via interviews.

We pulled eight skills from the YFDA language and amended them to align with needs in Maine.

14. Maine Sea Grant, Maine Center for Coastal Fisheries, and Maine Coast Fishermen's Association

15. Appendix B

16. Demographic data were provided voluntarily. While many chose to disclose their information, some participants did not.

Interviewees ranked those eight skills as high, moderate, or low priority for training the next generation of sea harvesters. This approach was intended to help us identify and focus in on the skills industry considered credentials of value.¹⁷ The eight skills ranked are as follows:

- ▶ Capture and culture techniques
- ▶ Business practices and entrepreneurship
- ▶ Vessel operation and maintenance
- ▶ Navigation and safety
- ▶ Gear technology and electronics
- ▶ Fisheries and ecosystem science
- ▶ Leadership, engagement, and policy
- ▶ Wellness (mental and physical well-being)

Participants answered a set of open-ended questions specific to their own category (*next generation, established industry member, or educator*). Before concluding, interviewers asked participants to share additional thoughts.



17. High value credentials are those that lead to future employment or further education.

18. Appendix C

19. 1) Existing skills, knowledge, and aspirations; 2) training needs (skills and knowledge); 3) preferred delivery methods/formats; and 4) motivators to participate in training programs. Appendix D

20. Appendix A

B. Survey

Educators connected to wild harvest and aquaculture fisheries received an online survey that consisted of 12 open-ended questions.¹⁸ The survey collected data on available training opportunities, current student engagement, and successful training formats. Survey respondents were also asked to rank the eight skills. A total of 29 educators responded.

We reviewed the data and coded interview and survey responses into the four major themes.¹⁹

C. Focus Groups

Fishermen and seafood industry leaders responded to and provided feedback on our preliminary findings. We conducted three focus groups ranging in size from nine to 17 individuals. At the start of each focus group meeting, attendees were provided information on preliminary findings and were invited to respond with questions, comments, and concerns. We also shared preliminary findings at educator- and industry-attended gatherings. A total of 72 people provided input on preliminary findings.

D. Workforce Development Inventory

Project partners conducted a comprehensive inventory of existing and planned workforce development opportunities in Maine, including micro-credential programs and other initiatives relevant for the next generation of industry members. All post-secondary (tenth grade and beyond) programs relevant to the eight skills categories were compiled. A gap analysis of our inventory helped us identify needs. Despite the abundance of available training opportunities, we could not find an existing repository or comparative analysis of these programs prior to this inventory.²⁰

V Findings

“Fishermen are a rare breed who, despite the hardships, want to do it day after day.”

—Focus Group attendee

It is important we reiterate that the findings below are based on the reflections of the individuals interviewed and surveyed. Attempts were made to ensure

A. Interview and Survey Responses

The interview and survey results below reflect the perspectives and needs of this project’s three target groups: *next generation*, *established industry members*, and *educators*.

► *Next generation industry members*: teenagers, young adults, or individuals who had been working in fish-

1. Demographics

All interviewees who provided demographic information were white, and more than three-quarters were male.²¹ Participants’ ages ranged from 10 to 79 years, with the majority of interviewees between 30 and 39 years old. Nearly three quarters of *next generation* and *established industry* interviewees participated in multiple fisheries, with over 21 species represented.

2. Aspirations for future work in the industry

The *next generation* shared a wide variety of aspirations for their future work in the fishing and aquaculture industry. They wanted financial independence and a comfortable living, opportunities to own shoreside infrastructure and boats, and access to permits and licenses, among other things.²²

Further, the *next generation*, *established industry members*, and *educators* all cited the need to incorporate education about fishing and aquaculture into elementary school curricula in order to raise awareness, foster interest that could lead to a career, and, ultimately, build a workforce pipeline.

a representative sample of Maine’s seafood producers, but this was never intended to be an exhaustive study; these findings are an attempt at understanding the larger industry needs based on a sample group which was then verified via focus groups and other conversations with industry leaders and other thought leaders.

eries and/or aquaculture for less than ten years

► *Established industry members*: individuals who had been working in fisheries and/or aquaculture for more than ten years

► *Educators*: teachers, practitioners, and program leads

“Most of the classes I’ve taken are unintentionally or intentionally tailored towards a limited demographic — white, male—and don’t always successfully attract or meet the needs of people that don’t fit within that.”—interviewee

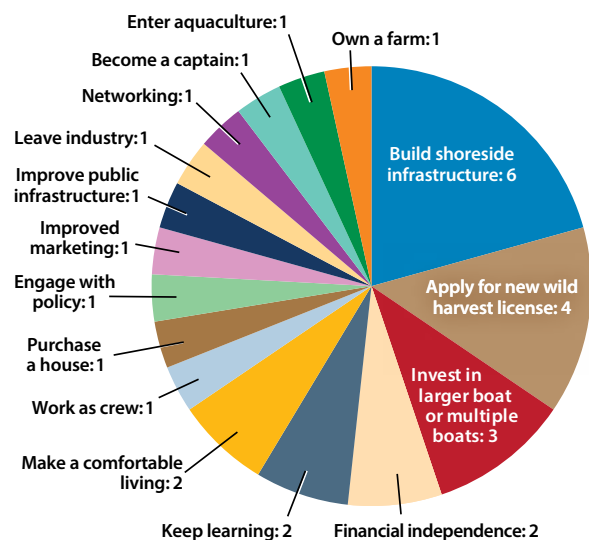


Figure 1 Next generation aspirations for future work in the industry, based on responses to open-ended questions.

21. Appendix E
22. Figure 1

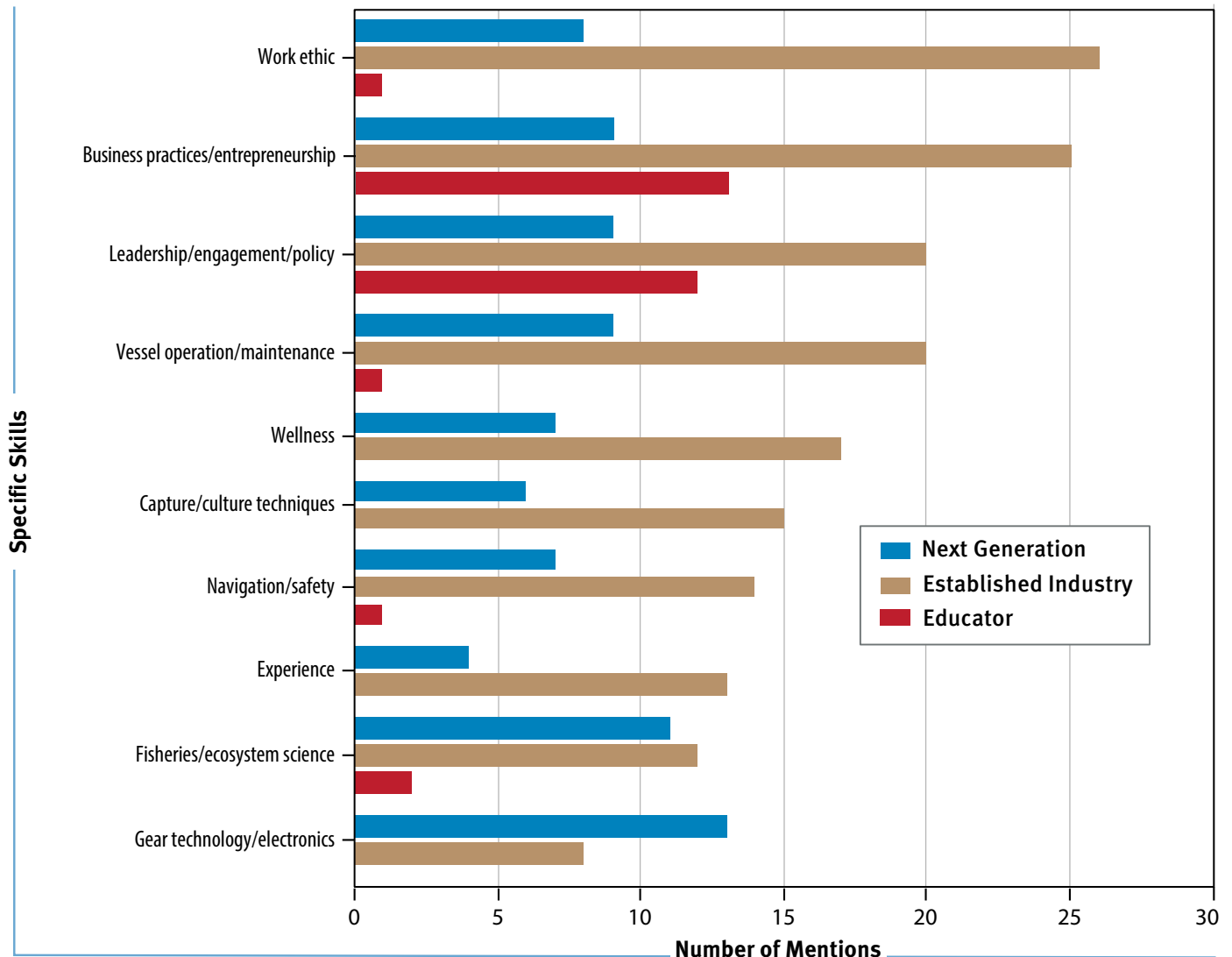
3. Important skills

After we analyzed interview and survey data, two new characteristics emerged as important: work ethic and experience.²³ Both *next generation* and *established industry members* stated that qualities within those new categories, such as adaptability, initiative, reliability, and a positive attitude are more important than some of the original eight important skills.

Participants in different categories expressed different priorities.²⁴ Established industry members

overwhelmingly considered work ethic; business practices and entrepreneurship; leadership, engagement, and policy; and vessel operation and maintenance to be the most important skills for individuals entering wild harvest and aquaculture fisheries. *Next generation* fishermen ranked gear technology and fisheries and ecosystems science as the most important, while *educators* prioritized business practices and entrepreneurship, leadership, engagement, and policy.

Figure 2 Next generation, established industry, and educator rankings of the most important skills for sea harvesters.



23. While these are not skills per se, they were repeatedly mentioned in questions about skills. As such, we decided to report out on them in the skills section. See page 12 for a list of the original eight skills

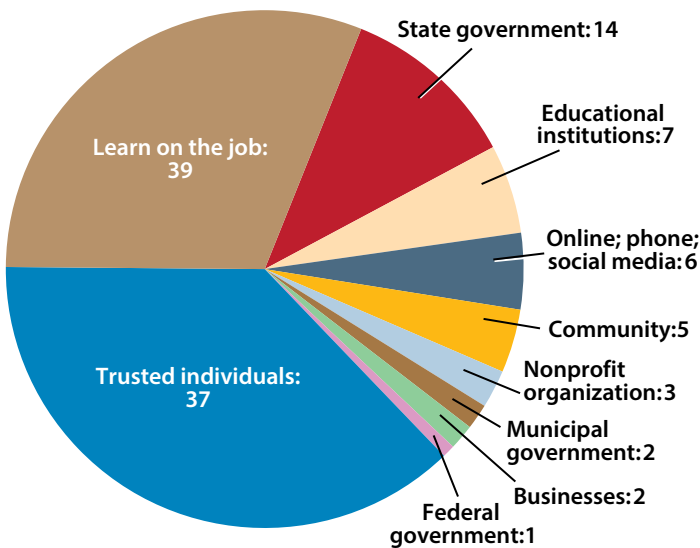
24. Figure 2

All groups suggested “cross-pollination” in training and skills from other disciplines, such as geography, boat maintenance, and other fisheries. Transferable skills were deemed to be crucial, especially given rapid industry changes and uncertainty about the future.

4. Training structures and mentorship

When asked where they get information, the majority of *next generation* and *established industry* interviewees cited learning on the job from trusted individuals, such as family members, fellow fishermen, and captains.²⁶

Figure 3 Sources of information for next generation and established industry interviewees combined.



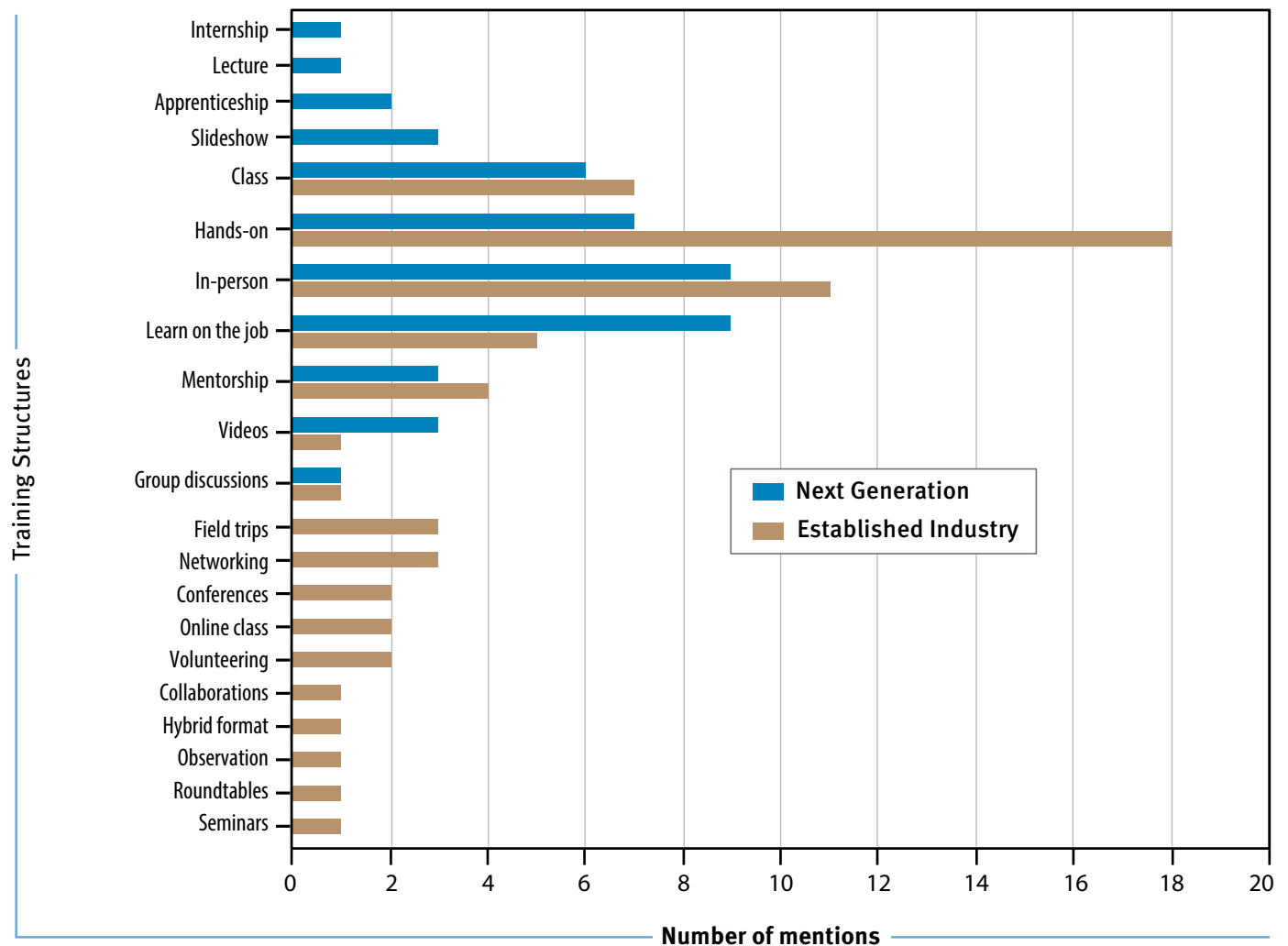
Next generation interviewees prefer learning on the job, in-person, and hands-on formats, followed by classes, mentorship, and then videos and slide-shows.²⁷ *Established industry members* highlighted hands-on and in-person formats, followed by classes and learning on the job, then field trips and networking. Hands-on and in-person training were preferred across the three participant groups, sending a clear message for effective training program design.

Finally, in open-ended questions about skills needed for a successful future, interviewees and survey respondents used a rich array of words that offer an additional level of detail. We chose to display participants’ language in word clouds²⁵ to illustrate their priorities within each of the ten skills categories.



25. Appendix F
 26. Figure 3
 27. Figure 4

Figure 4 Training structures identified by *next generation* and *established industry members* as effective for gaining and strengthening skills relevant to wild harvest and aquaculture.



Likewise, *educators'* responses about most effective training formats reinforced the *next generation* and *established industry members'* interest in hands-on, on-site learning experiences. Educators also offered a host of ideas for improving training programs and making them successful.²⁸ Finally, *next generation* and

established industry members expressed that training formats and content could be made more meaningful with clearly outlined goals, an array of options, space for formal and informal conversations, and direct connections to and inputs from industry.

28. Appendix G

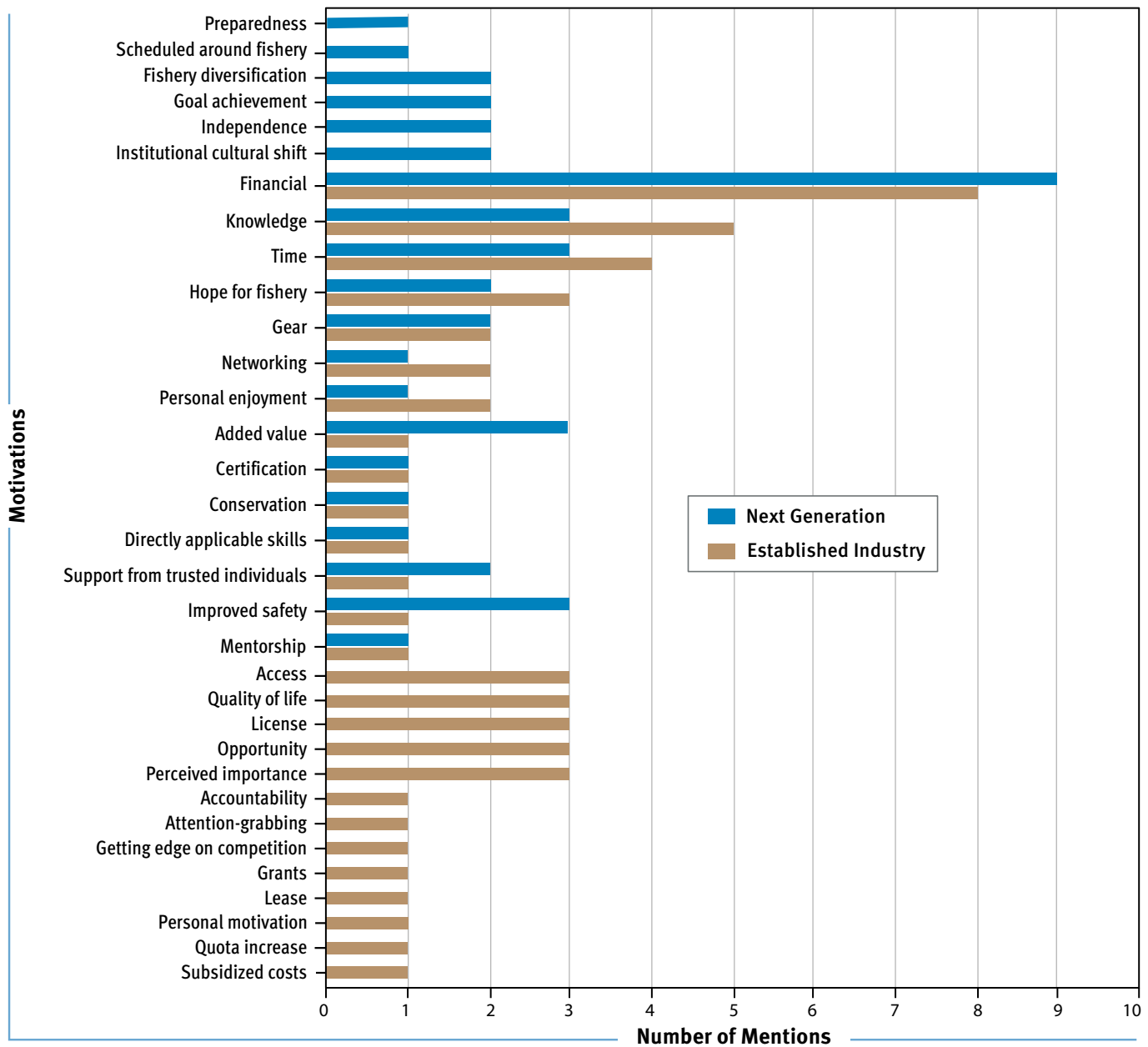
5. Scheduling training and motivations to participate

Overwhelmingly, *next generation* and *established industry members* highlighted the winter months (December through March) as ideal for training.²⁹ Interviewees preferred half-day or full-day programs to long-term programs lasting a week or longer.

Next generation and *established industry members* participating in wild harvest fisheries indicated that

they are often motivated to participate in training if they believe the training will financially benefit them long-term and if they are reimbursed for their time.³⁰ Financial benefits could include paying participants or providing certifications that give them advantages on bank loans or fisheries permits, for example.

Figure 5 Motivations for the *next generation* and *established industry members* to participate in training programs.



29. Appendix H
30. Figure 5

B. Focus Groups Insights

When preliminary findings were presented, focus group attendees reinforced findings from the interviews and survey. The most significant confirmation was that hands-on learning is the best way for fishermen to acquire new skills. Attendees also highlighted the importance of financial support, due to the high costs of permitting, insurance, and boat maintenance. They also confirmed the importance of sharing knowledge across the generations. When individuals outside of fishing families enter the industry, they are not privy to a kind of knowledge passed down in fishing families. Finding a mentor may also be more difficult for them. Industry leaders also identified the need for public speaking skills and civic engagement to enable the younger generation to advocate for their future.



Focus group attendees confirmed trainings should provide skills that can apply to multiple marine work environments. However, some attendees also noted that handling, processing, and even fishery heritage may be different, whether the same species is wild harvested or farm raised (e.g. seaweed). *Industry leaders* expressed the need for teaching best practices, onshore and offshore, to increase product value (e.g. product handling).

A key finding brought up at multiple stages of this needs assessment, including during focus groups, was the lack of resources for mental and physical well-being for fishermen. The lack of wellness support for fishermen was documented by the inventory, and the resources to address that gap either do not exist or are not easily known or accessible by fishermen and their families.

“This job is not for everyone. I’ve had several who, even though they were making the most money they had ever made, couldn’t sustain the work physically or mentally.”

—interviewee comment shared with and confirmed by focus group participants.

Lack of affordable housing for fishermen, fishing families, and the next generation entering the seafood industry was a concern. Rising coastal housing costs coupled with an affordable housing shortage has pushed fishing families away from the coast and created barriers to accessing the waterfront, making it more difficult to enter the fishing industry.

Focus group attendees articulated that interviewees were not demographically fully representative of the total Maine fishing community. The majority of interviewees were, by design, more representative of the wild-caught fisheries than aquaculture. Attempts were made to include a diverse and representative sample of Maine’s seafood producers, and the focus groups were intended to provide additional context.

C. Workforce Inventory Review

Our workforce inventory identifies and assesses available programs, and includes information on targeted education level, training type, and skills focus.³¹ This review does not evaluate the effectiveness of each

program, nor its enrollment history. The number of programs alone, which is what is reported in this section, cannot provide a complete picture of the training landscape.

Table 1 Total number of existing workforce development programs for wild harvest and aquaculture fisheries by education level.

High School	Non-College Post-Secondary	Community College	4 Yr. College	Post-Grad	Total
22	57	9	17	4	109

In total, our review found the total of these number is 109 programs that align with the eight skills categories detailed in the methodology,³² with the majority geared towards non-college, post-secondary students.³³ Most programs were not specifically aimed at aquaculture or wild fisheries.³⁴ Rather, they were aimed at more general skills that can be put to use in a variety of

maritime careers. However, for those that were specified, there were more programs for aquaculture (39) than wild caught fisheries (6).

We found only one program with content that addressed mental and physical wellness. Most programs addressed capture/culture techniques or business practices and entrepreneurship.

Table 2 Number of programs organized by format including program type and audience (wild caught, aquaculture, or general skills)

Type of Program	Training/licensing	Short course	Internship	Degree/certificate program	Class/workshop	Apprenticeship/Mentorship	Experiential Learning/specialized curriculum	Support/resources	Totals
Wild Caught	1	0	1	1	0	0	1	2	6
Aquaculture	9	1	6	7	0	2	3	11	39
General	14	1	0	10	2	0	6	19	52

31. While we focused on compiling training programs in the workforce inventory, some programs listed could better be defined as resources. Additionally, we included four of the more formalized K-8 programs. While less formal K-8 programs do exist, we did not include them as they are outside the scope of this project. This need assessment focused on training and programs for those who have the potential to enter the workforce in the near-term, namely grades 10 and beyond. It is important to note, however, that multiple participants emphasized K-8 is a key time to spark interest in the industry and build foundational skills and career aspirations.

32. The breakdown of programs can be found in Tables 2-4, and the full inventory can be found in Appendix A.

33. Table 1

34. Table 2

Table 3 Number of programs for each category of important skills organized by education level.³⁵

Skill	High School	Non-College Post-Secondary	Community College	4 Yr. College	Post-Grad	Totals
Wellness	0	1	0	0	0	1
Capture/Culture Techniques	11	18	6	6	4	45
Business Practices/ Entrepreneurship	8	33	5	1	2	49
Vessel Operation/ Maintenance	5	6	2	3	0	16
Navigation/Safety	5	8	2	1	0	16
Gear Technology/ Electronics	5	3	5	3	0	16
Fisheries/Ecosystem Science	10	9	1	14	4	38
Leadership/ Engagement/Policy	7	7	1	5	4	24



Students at the Cranberry Islands Fishermen’s Co-op take notes as they listen to a commercial lobsterman explain the function of the co-op.

35. This does not account for overlap in important skills categories (i.e. a single program could teach skills in multiple categories). For the total number of individual programs listed in the inventory as of October 2022. See Table 1.

VI Discussion

“Collaboration and compromise need to be seen as a way to ensure a future for the fishery, not a means of destruction to the independence allowed in the industry... Lots of fishermen would benefit from understanding the strength in unity.”—fisherman

The needs assessment findings highlight seven needs specific to the industry for training and other important considerations that affect enrollment and retention in training, and the industry as a whole.

Priority needs, as identified by the needs assessment, include:

- A** Hands-on, experiential learning and mentorship provided by trusted members of the industry
- B** Skills training focused on business practices and entrepreneurship, gear technology, fisheries and ecosystem science, leadership and engagement and policy, work ethic and experience
- C** Scheduling short-duration trainings in the winter months (December through March)
- D** Incentives and motivators that make training programs worth industry members’ time and investment
- E** Education and career aspiration programs targeted at younger audiences (K-8, high school, and vocational programs)
- F** Mental and physical health support
- G** Diversity, equity, and inclusion in Maine’s fisheries and aquaculture industries

A. Hands-on experiences and mentorship by trusted individuals

Perhaps the single most important need identified by interviewees, survey respondents, focus group participants, and other industry leaders is the need for hands-on training programs which offer active learning experiences for interested next generation fishermen.

“You have to go out on a boat for the day first before it’s worth doing training—you could do three months of learning and then find out you don’t like it. [I started fishing when I] was 5—came from a fishing family. If you don’t, you don’t know until you’ve actually experienced it.”—fisherman

Introductory experiences are essential both to spark interest and to provide opportunities to explore fishing as a viable career option. Experiences must demonstrate the value of transferable skills and ensure that they introduce a variety of career options within the fishing and aquaculture industry to lay the groundwork

for further career development. This is true for fishing and aquaculture, but also for other marine careers. Many foundational skills, such as navigation, safety, financial literacy, and leadership, will be useful to the next generation in the future, whether they eventually choose lobstering, oyster farming, boat building, or become a charter boat captain or a kayak guide. A central message from *industry leaders* and *educators* is to give the next generation experiences that help them imagine many options for their future.

Next generation interviewees expressed interest in learning from trusted peers and experienced fishermen, as well as a desire for mentorship and apprenticeships. Taking on new crew and losing crew when work expectations do not align with realities is costly; as such, seasoned fishermen see the value of training the next generation. Industry partners suggested creating jobs or income-generating opportunities for mentors to encourage participation. Fishermen need to be paid for their time and experience. Many fishermen shared

that mentorship usually comes from fishing families supporting their own and that social circles need to expand to provide support to new fishermen.

Finally, the next generation needs opportunities to connect as a community, both within fishing villages and within a network of peers. Fishing is a relatively

B. Skills training

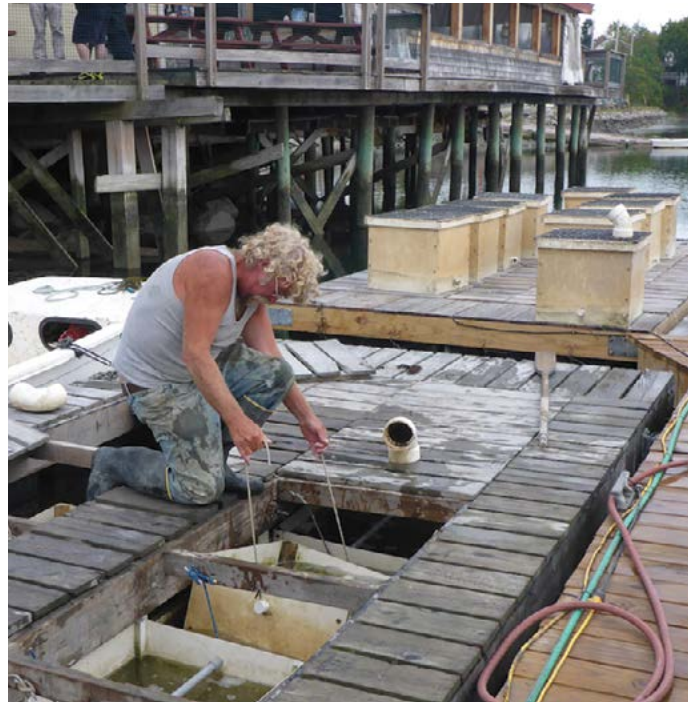
Comparing the opportunities listed in our workforce inventory with those highlighted in our needs assessment revealed priority trainings.

Participants, especially *established industry members*, considered understanding sound business practices and entrepreneurship one of the most important skills needed for industry members, and our inventory assessment found the greatest number of existing programs in this category (49). This raises many questions, given *educators* indicate under-enrollment in some programs. Is this because the *next generation* do not view the trainings as important, or the trainings are not designed to account for diverse needs, schedules, or interests? Could there be too many trainings about this subject competing for the same participants? Or are people not aware of the trainings? Further investigation is needed.

We catalogued 16 programs associated with gear technology, mainly at the vocational high school and community college level. Increasing the reach of these programs is necessary, as aquaculture businesses have considered trades skills like gear technology and electronics essential.³⁶ Creating programs that are geographically dispersed and more frequently offered will allow a greater number of people to participate, as will raising awareness of existing opportunities to waterfront workers beyond the high school and community college level.

Thirty-eight programs focus on fisheries/ecosystem science. Many fall within the 4-year college track. Given the expense and time commitment of a four-year degree, those programs may not be accessible to everyone. Furthermore, the four-year college track is less common

solitary career, and many fishermen are well-suited for the lifestyle. Nevertheless, the ability to share information and mobilize to collective action is important, especially as many interviewees shared that they feel the future is uncertain and their voices are not always heard.



Experienced industry members, like this oyster farmer in the Damariscotta River, have much to offer the next generation who seek hands-on learning from trusted individuals.

for wild harvest fishermen, who have historically relied more heavily on family members or trusted individuals to provide direct training, than for aquaculture farmers, who are more likely to enter the farming business after college. Providing fisheries/ecosystem sciences training through vocational, community college, and micro-credential programs could make them accessible to wild harvest fishermen and broader audiences.

There appears to be a variety of programs teaching leadership, engagement, and policy, especially at the community college level. *Industry leaders* indicate a need for support to empower and train fishermen to effectively engage in the civic process.

Work ethic and experience emerged during interviews as being very important, especially for

36. Gulf of Maine Research Institute, *Maine Aquaculture Workforce Development Strategy*.

established industry members. Grit, a strong work ethic, and experience were important to interviewees. This underscores the importance of teaching soft skills, such as arriving on time, reliability, initiative, adaptability, and having a positive attitude. These directly relate to captains' expectations for crew

behavior. Understanding and being able to meet those expectations could ultimately determine whether a person looking to enter a fishery can get their foot in the door. Practical experience, work ethic, and life skills/problem-solving were also high priorities for aquaculture businesses.³⁷

C. Scheduling of trainings and motivators to participate

Our needs assessment revealed that many existing programs have struggled with under-enrollment. Priorities must include reversing that trend by changing the timing and providing incentives to participate. For fishermen and harvesters, time spent away from the water means money lost. Programs that align well with the fishing/aquaculture annual calendar,³⁸ for example, will likely be more successful. Feedback from the *next generation* and *established industry members* indicates they would be more likely to participate in training held during the winter months (December through March).

By contrast, hands-on training is most effective during the fishing/farming season—exactly when most said they were too busy to either participate in training or serve as mentors. Program developers will need to strike a balance between what kinds of training (hands-on, classroom, etc.) happen at what time of year (fishing vs. non-fishing season). Programs should last either half a day, a full day, or 1–3 days. Based on our findings, longer programs may see low attendance.

Many *next generation* fishermen said they would be motivated by incentives that make their businesses more successful and by financial support for attendance. The unseen costs of participating in a training program can be a deterrent—fishermen who take a day off the water lose income, and some trainings require participants to pay for travel, meals, and lodging out of pocket. Receiving compensation for the loss of a day's catch would be helpful, and the benefits of the training must be seen as a worthwhile investment in long-term returns. As such, programs should offer

financial incentives (i.e. cash for participation) and/or cover meal, lodging, and travel expenses.

Financial motivators are not strictly limited to cash. Interviewees were open to different interpretations of return on their investment of time and energy to participate. Some mentioned added-value, marketing opportunities, and subsidized gear costs. Others mentioned certifications that give participants advantages when applying for bank loans, insurance, licenses or permits.

Program developers will need to work side by side with fishing and aquaculture industry members, bankers, insurers, fisheries managers, and others to create new opportunities. Engaging the *next generation* is only half of the journey — encouraging *established industry members* to lead trainings or become mentors is the other half.

Further investigation is needed. One example from focus group discussions was how the New England Young Fishermen's Alliance recently secured USDA funding to provide stipends to trainees and mentors with stipulations attached, requiring things like business planning and commitment to engage in the industry for a set amount of time. This supported fishermen, they reported, while increasing accountability.

Finally, practical training with clear outcomes that will benefit youth and industry may not all require tangible incentives, but it is important to clearly communicate the value proposition for successful recruitment and retention purposes.

37. Gulf of Maine Research Institute, Maine Aquaculture Workforce Development Strategy.

38. Appendix H

D. Education and career aspiration programs for youth (K–12)

Post-secondary *educators* have identified low interest and lack of enrollment as two of the most pressing challenges they face. Scores of education and career aspirations programs for younger audiences exist. *Educators* and *industry leaders* found it imperative to plant the seed of interest early and often, and to expose children to career opportunities throughout the seafood

value chain. There is also a need to counter our cultural narrative that blue-collar jobs are unimportant or undesirable. This includes highlighting transferable skills that provide robust career opportunities. Maine’s seafood industry needs transportation and logistics, marketing, human resources, welders, plumbers, and technicians of all kinds to keep the “ecosystem” functioning.

F. Mental and physical health support systems

We found only one program aimed at providing mental and physical health support to fishermen. Yet focus groups, partner insights, and some interviewees pointed to the need for wellness support and flagged the lack of resources that currently exist as problematic. Injury and illness can have serious impacts on physical and mental health and impose limitations on a fisherman’s, or aquaculturist’s work. These can also open the pathway to opioid addiction, an issue cited by several interviewees. There is a stigma in fishing communities

about “opening up” on mental health challenges.

Training and resources should emphasize the importance of caring for mental and physical health, and offer specific ways to do so (e.g. Maine AgrAbility’s “yoga poses for fishermen”).³⁹ Mentors can help normalize health and wellness practices by modeling healthy behavior and showing how it contributes to a successful fishing career. Further, they could explain why new practices (i.e. mental/physical wellness routines) are necessary.

G. Diversity, equity and inclusion in Maine’s fisheries

While diversity, equity and inclusion (DEI) was not a specific focus of this project, implications surfaced as interviews and other data were collected. Maine is the whitest state in the U.S., by percentage of the population, and has the oldest average population.⁴⁰ The lack of young people (age 20–40) entering the industry is considered a major threat to the future of the industry (see ‘Findings’ above). Children need to be able to see themselves as adults who work on the water, or they will have trouble imagining themselves in the work, and will not see the careers as viable opportunities.

Further, feedback from participants indicated that training enrollment historically has been predominantly white males. There may be need for more targeted outreach and engagement with women, minorities, and other underserved populations. They indicated training programs may not be welcoming to them, don’t fit their needs, or are not relevant to their interests or

experiences. Programs that meet the specific needs of underserved populations are necessary. Understanding the barriers to entry for the next generation and underserved populations is key to attracting new and diverse talent to the sector. Our interview sample was limited, and more research is necessary. There is tremendous value and much to be gained by diversifying participants in Maine’s seafood economy. Diversity is a beneficial strategy that drives innovation⁴¹ and immigrants offer a wealth of expertise.⁴²



39. University of Maine Cooperative Extension, *Who’s Got Your Back? Part I*.

40. United States Census Bureau. *Maine: 2020 Census*.

41. Garcia Martinez, Zouaghi, and Garcia Marco, *Diversity is Strategy*.

42. Peter McGuire, *Employment Barriers for Highly Skilled Immigrants*.

An Uncertain Future and Other Considerations

There are influences and challenges to the industry that affect access to training, participation in the industry, and aspirations for the future. While not necessarily addressed by training programs, these issues impact the industry and underscore *industry leaders'* concern about young people's ability to envision a future in the industry, affecting recruitment and retention. Warming oceans change fishing patterns, new regulations (such as those aimed at protecting endangered North Atlantic right whales) restrict certain gear uses, and the aging fishing population all impact how many newcomers enter the industry.

"I don't know if I'd recommend young people get into the industry—it's so hard."—fisherman

"Fishermen have to fight everyday, and they are powerless within a system that has the ability to manipulate their business without any regard for their safety, well-being, or job. We can adapt to warming waters, we can adapt to changing species, we can even adapt to gear changes. We can't adapt to perpetual moral injury."—fisherman

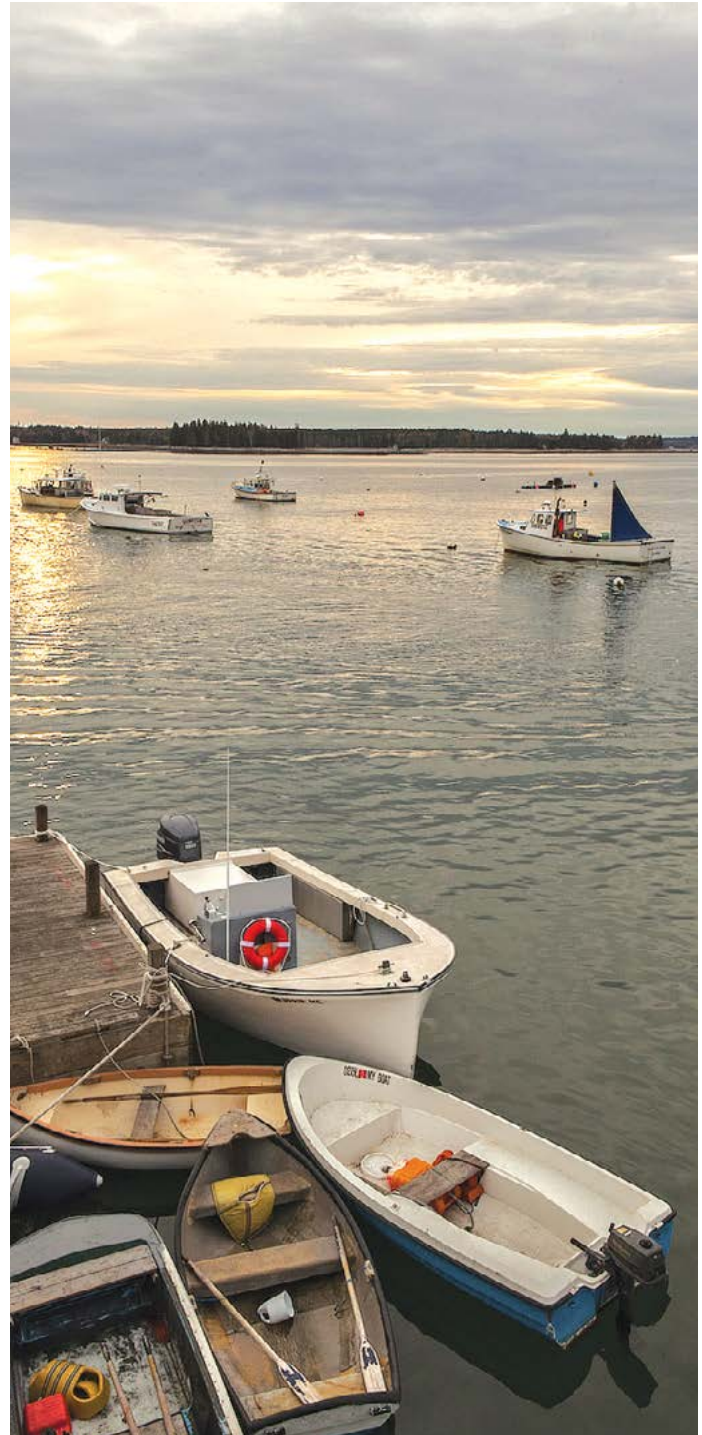
There were some important challenges that were raised through this process that include, but are not limited to, the following:

Offshore wind development and whale regulations

Several interviewees expressed dismay (even anger) that we could possibly ask about training needs when the future of the industry felt so uncertain. Fishermen are especially worried about the potential impacts of wind development on Gulf of Maine fisheries. Likewise, lobstermen are faced with uncertainty surrounding their future because of pending litigation and regulations regarding fixed gear use and the endangered North Atlantic right whale. We heard incredulity from some interviewees about the timing of our efforts to improve training programs in light of this uncertain future.

Declining access to the working waterfront

Access to public and private piers, wharves, launch ramps, and the associated waterfront infrastructure needed for success as a fisherman or aquaculture farmer is declining. There is much documentation in Maine



reflecting the impact of this decline on the marine industry's viability, not least of which is increased competition for space at limited public access points.⁴³ Without access, there will be no next generation on the water.

Need for affordable housing

Access to affordable housing impacts who can enter the industry. Changing demographics and housing trends near the coast have made it difficult for people working on the water to live close to work. When coastal homes transition to out-of-state or wealthier ownership, the next generation are forced to live further from the sea. Not only are they unable to travel to fishing and aquaculture jobs or trainings, but they cannot easily envision themselves in the work. Affordable housing is currently a nationwide issue, but it particularly impacts working fishing families as coastal property values rise. Funding is needed in order to provide affordable housing to next generation fishermen.

Debt and insurance

Knowledge of and access to financial literacy training for the next generation and a parallel need for training in business practices was identified by *established industry members* and focus group participants as crucial. Financial literacy includes how to prevent or manage debt carried either by an individual or by their family. One interviewee indicated he had made financial mistakes in his early 20s and was “still paying for them now,” in his early 40s. Debt can be debilitating, and impacts advancement in the industry by preventing fishermen or farmers from purchasing larger boats or upgrading gear and technology. Further, fishermen mentioned that insurance has become unaffordable to the point where some simply cannot pay for coverage. Without insurance, fishermen may face wellness challenges, which often have ripple effects that negatively impact their careers.

The cost of insurance is also a barrier for developing hands-on programming. The coverage required to welcome students onto their vessels for on-the-water, hands-on experiences is often beyond the means of most small businesses, or even schools and training programs.

Industry leaders report that Maine lacks research, development, training, and career opportunities to make the most of landed species.⁴⁴ For example, value-added product innovations that reduce waste and optimize value, such as pharmaceuticals and nutraceuticals,⁴⁵ offer additional opportunities for the marine industry. There are also opportunities to land underutilized species or create new fisheries in the Gulf of Maine due to warming waters and shifting ranges. Looking for innovative, value-added opportunities which support more value from less product will become increasingly beneficial as access and resources become scarcer. Likewise, training to support individuals as they experiment with such innovations will prove crucial.

Inconsistent product value

Seafood has long been a mainstay of the state's economy, particularly in rural and coastal areas, where many communities are now heavily reliant on the lobster fishery. Market disruptions and “economic shocks” from trade tariffs, cost inflation, COVID-19, lack of processing capacity, and inefficiencies throughout the value-chain reduce profit margins and create inconsistent product value. Inconsistency in projected versus actual revenue can be destabilizing. Coupled with the other challenges facing the industry, an uncertain future affects how the *next generation* perceives their opportunities in the industry, as well as the cost/benefits of investing in that future.

43. Merritt Carey, *Maine's Working Waterfronts and Access to the Shore*; Monique Coombs, *The State of Maine's Working Waterfronts*.

44. New England Ocean Cluster. *A Conversation About Bioprospecting and Biorefining in Maine*.

45. Pharmaceuticals are substances used for medicinal purposes (e.g. diagnosis, treatment, or prevention of disease) and nutraceuticals are products derived from food sources with additional health benefits beyond basic nutritional value.

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Appendices

Appendix A. Workforce Development Inventory

[Link to the full list of compiled workforce development programs.](#)

Appendix B. Interview Scripts

SCRIPT for 1-on-1 or small group interviews

Short summary (share with all people interviewed, can be verbal or in writing)

We are seeking to talk to next generation, fishermen, aquaculture farmers, new industry members, established industry leaders, educators, mentors, workforce experts, training program leaders, and anyone else who cares about the future of Maine's working waterfront to help identify the educational priorities and opportunities for the next generation's of Maine fishermen and aquaculture farmers. Our three organizations (Maine Sea Grant, Maine Coast Fishermen's Association, and Maine Center for Coastal Fisheries) are working together in advance of anticipated funding through the Young Fishermen's Development Act (YFDA), national legislation passed by Congress in December 2020. Congress still needs to appropriate the funds requested in the legislation for the four-year period between 2022 and 2026. If and when that funding becomes available, input from you will help us make sure that the most pressing training needs and opportunities for Maine's next generation of fishermen, aquaculture farmers and industry leaders are prioritized.

All interviewees information will be aggregated and your privacy will be kept.

DEMOGRAPHICS

Participant's name: _____ Age: _____
Mailing address: (need at least town) _____ Contact info: _____
Phone/cell (do you text for follow up survey?): _____ Gender (ok if they prefer not to say): _____
Ethnicity (immigrant populations, tribal members, and others who face unique barriers to entry, again ok if they prefer not to say): _____

Next Generation (<10-15 years)

- ▶ Student in high school?
- ▶ Participant in post-secondary program?
- ▶ Currently employed in seafood/working waterfront sector <10-15 years?
- ▶ None of the above? What are you up to these days?
- ▶ What fisheries or aquaculture species do you currently participate in? Please list all that apply, whether primary or secondary and some details about species, distance from shore...
- ▶ Do you have family in these industries?
- ▶ Other demographic info you would like to share?
- ▶ What time of year is easiest for you to participate in skills and training related meetings?

Established industry member (>10-15 years)

Fisherman or Aquaculture Farmer?

- ▶ All species targeted & % importance:
- ▶ Scale of business (from owner operator to corporate):
- ▶ Your role in it (sternman, captain, manager, site worker, other...)

Seafood business owner

- ▶ Scale (to what level of vertical integration?)
- ▶ How long established?
- ▶ Entrepreneur, start up?

What time of year is easiest for you to participate in skills and training related meetings?

Other demographic info you would like to share?

Educators/Practitioners

Teach at the high school level?

- ▶ Subjects
- ▶ Examples of classes

Teach at the post-secondary level?

- ▶ Tech school
 - ▶ Community college
 - ▶ College
 - ▶ Other training programs? What?
- Other connections to existing training programs? List...

Other demographic info you would like to share?

Please rank the following items as highest or lowest priority for you to gain additional skills and knowledge.

H = Highest Priority L = Lowest Priority (ok to give same ranking to several)

Skills ranking: Next generation (<10-15 years)

_____ Capture/culture techniques	_____ Navigation/safety	_____ Leadership/engagement/policy
_____ Business practices/entrepreneurship	_____ Gear technology/electronics	_____ Mental/physical health
_____ Vessel operation/maintenance	_____ Fisheries/ecosystem science	_____ Other

Skills ranking: Established industry member (>10-15 years)

_____ Capture/culture techniques	_____ Navigation/safety	_____ Leadership/engagement/policy
_____ Business practices/entrepreneurship	_____ Gear technology/electronics	_____ Mental/physical health
_____ Vessel operation/maintenance	_____ Fisheries/ecosystem science	_____ Other

Skills Ranking: Educators/Practitioners

_____ Capture/culture techniques	_____ Navigation/safety	_____ Leadership/engagement/policy
_____ Business practices/entrepreneurship	_____ Gear technology/electronics	_____ Mental/physical health
_____ Vessel operation/maintenance	_____ Fisheries/ecosystem science	_____ Other

Open ended questions

REMEMBER: you do not need to ask all sub-questions, please DO be sure to address each of the 4 core areas that we are seeking data about and use your judgment, based on time and interviewee, how much detail to go into.

Open ended questions: Next Generation (<10-15 years)

Existing skills, knowledge and aspirations

- What were some of the hardest things for you to learn as you have begun to fish or farm?
- Where have you gone to get answers when you have questions about fishing, farming, regulations or business?
- If you could have one new skill just handed to you, what would it be?
- Do you participate in fisheries management or science? Why or why not?
- Do you have a business plan to get you to where you aspire to be in 10 years?

Do you track your businesses profits and losses? How?

Does someone other than you do accounting?

- Do you have access to and do you use the Internet? Email? Texting? Social media?
- What are your aspirations for future work in the industry?

- Do you envision building any shore-side components to your fishing business?
- If you were to close your eyes, and envision yourself in five years, how do you think you will feel? What do you think you will be doing?
- What about in 10 Years? What do you hope that you will have achieved?

Training needs (skill and knowledge needs)

- What skills do you think you need to achieve your goals in this industry?
- Do you have the ability to access the skills you want to acquire? (Things like knowledge of where to go, connections, resources, family members who can help etc.).
- What would help you gain these skills?
- What types of training do you think would be most helpful to allow you to build a more successful business?
- What skills training would you have the most interest in participating in?

Formats for delivery

- Have you taken any classes or training to help you become a better fisherman, farmer or community leader?
- Have you worked as an apprentice, or with a mentor, or someone in the industry who helped show you the ropes?
- What was the format of the training?
- How effective was your training in getting you prepared for what you do now or what you hope to do in the future?
- How do you think you learn best?
- Incentives to participate in training programs
- What would inspire or motivate you to seek out learning opportunities?
- How would they be structured (e.g. apprenticeships, classes, certification programs, badges etc.)
- What is a reasonable time commitment for training?
- Would you consider paying for training or for opportunities to gain experiences?
- Would you expect to be paid while you learn? (such as a paid apprenticeship)

Open ended questions: Established industry member (>10-15 years)

Existing skills, knowledge and aspirations

- Where/how did you learn the skills most important to your success on the water and in business?
- What do you know now that you wish you had known when you first started in the industry?
- Do you have access to and do you use the Internet? Email? Texting? Social media?
- Are there tensions within your industry between older and younger generations that could be alleviated through education/mentoring?
- Training needs (skill and knowledge needs)
- What skills would you say are most important for new or young fishermen and farmers to master?
- What skills/training do people need to work for you?
- How do you envision the industry in the next five years? ten? And What skills will be needed to be successful in the face of such changes?

- What is new technology coming down the pike that you want to know about?

Formats for delivery

- Have you done any trainings or classes?
- Any that were particularly helpful in getting you prepared for success or helping you achieve your goals?
- Any that you would consider not as useful and why?
- What training formats have worked for you, as a participant? Why?
- Do you or does your business offer training? What? How?
- Do you or have you served as a mentor for people coming into the industry? What did you like/dislike about that experience?
- Would you consider serving as a mentor? How would that work best for you?

- Are there barriers to you offering training (e.g. need tech assistance applying for funds to develop training)?

Incentives to participate in training programs

- What would inspire or motivate people to seek out learning opportunities?
- How should these opportunities be structured (e.g. apprenticeships, classes, certification programs, badges etc.)
- What is a reasonable time commitment for training?
- Do you think people should pay for training or for opportunities to gain experiences? How much is reasonable?
- Would you be willing to pay incoming employees to learn on the job? (such as a paid apprenticeship)

Open Qs: Educators/Practitioners

Existing skills, knowledge and aspirations

- What are your students' aspirations for their future work in the industry?
- What skills are most important for them to master as they get started in their fishing or aquaculture careers?
- What training programs are you currently offering and what are you hoping to achieve with your program?

What needs assessment or other justification prompted the implementation of this particular program?

- What programs or institutions do you collaborate with?

- What evaluation system is in place and how are you getting feedback from participants?

Training needs (skill and knowledge needs)

- What are you hearing from your students / participants regarding additional training needs and interests that you are not currently able to offer
- What are existing barriers to entry into training programs?

Formats for delivery

- Is there a different pathway to learning for people growing up in fishing vs non-fishing families?
- If you had no limitations, what type of program would you build to build skills and create opportunities for the next generation of Maine fishermen?

- What are additional training needs and interests that you are not currently able to offer? What is missing?

Incentives to participate in training programs

- What incentives to participate have you incorporated into your program?
- What do you wish you could offer to enable increased participation?

Appendix C. Educator Survey

Sea Careers: training the next generation of Maine fishermen

We are seeking input from educators and practitioners to help us identify the educational priorities and opportunities for the next generation's of Maine Fishermen and aquaculture farmers. Maine Sea Grant, Maine Coast Fishermen's Association and Maine Center for Coastal Fisheries are working together in advance of anticipated funding through the Young Fishermen's Development Act. Your input will inform priorities including the most pressing training needs and opportunities for Maine's next generation of Fishermen, aquaculture farmers and industry leaders

1. Name _____

2. Institution/School/Organization/Other _____

3. Location (city/town) _____

At what level(s) do you teach or support learners? (check all that apply)

High school

Tech school

Community college

College

Other: _____

4. Please describe what subjects, courses, internships and other opportunities are currently offered or planned that support fishermen/aquaculturists? _____

5. When or how frequently are these opportunities offered? _____

6. What needs assessment or other justification prompted implementation? _____

7. What are your students' aspirations for their future work in the industry? _____

8. Please rank the following skills for students/future industry members to gain

Mark only one oval per row. (As "high priority" or "low priority")

Capture/culture techniques

Business practices/entrepreneurship

Vessel operation/maintenance

Navigation/safety

Gear technology/electronics

Fisheries/ecosystem science

Leadership/engagement/policy

Mental/physical health

Other: _____

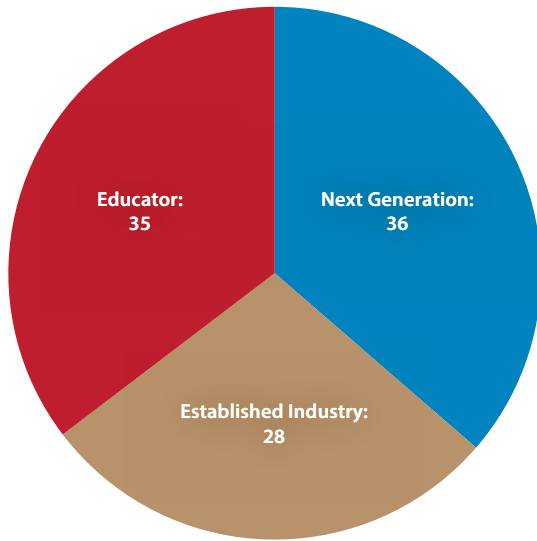
Appendix D. Interview and Survey Codes

This list shows how interview and survey responses were coded into the four major theme areas (existing skills, knowledge and aspirations; training needs; formats for delivery; and incentives to participate in training programs)

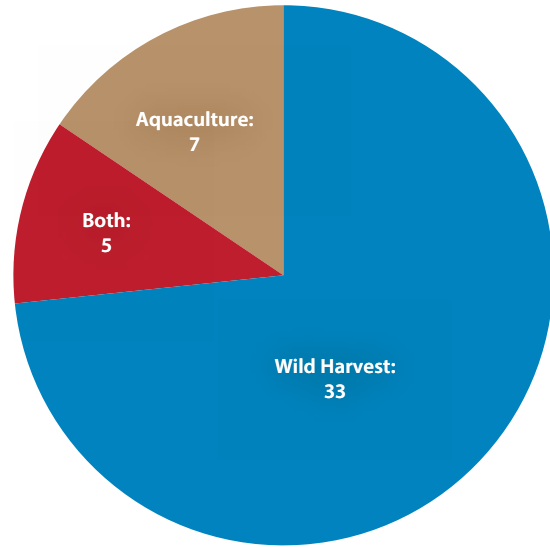
1. Demographics
2. Existing Resources & Current Programs
 - a. Access to Internet
 - b. Current Programs
 - c. Generational Tensions
 - d. Resources
3. Training Needs (Important Skills & Aspirations)
 - a. Important Skills and Specific Skills Ranking
 - i. Capture and culture techniques
 - ii. Business practices and entrepreneurship
 - iii. Vessel operation and maintenance
 - iv. Navigation and safety
 - v. Gear technology and electronics
 - vi. Fisheries and ecosystem science
 - vii. Leadership, engagement and policy
 - viii. Wellness (mental and physical well-being)
 - ix. Work ethic
 - x. Experience
 - b. Formats (Future)
 - c. Technology
 - d. Aspirations
4. Formats for Delivery & Ways of Learning
 - a. Formats (Past & Present)
 - b. Ways of Learning
 - c. Mentorship
 - d. Schedule & Time Commitment
5. Incentives to Participate in Training Programs
 - a. Incentives
 - b. Funding Sources
 - c. Barriers

Appendix E. Interviewee Demographics and Species Distribution

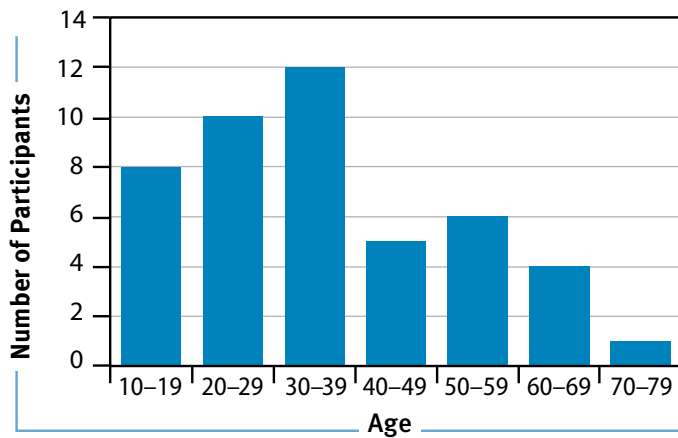
Number of participants from each category



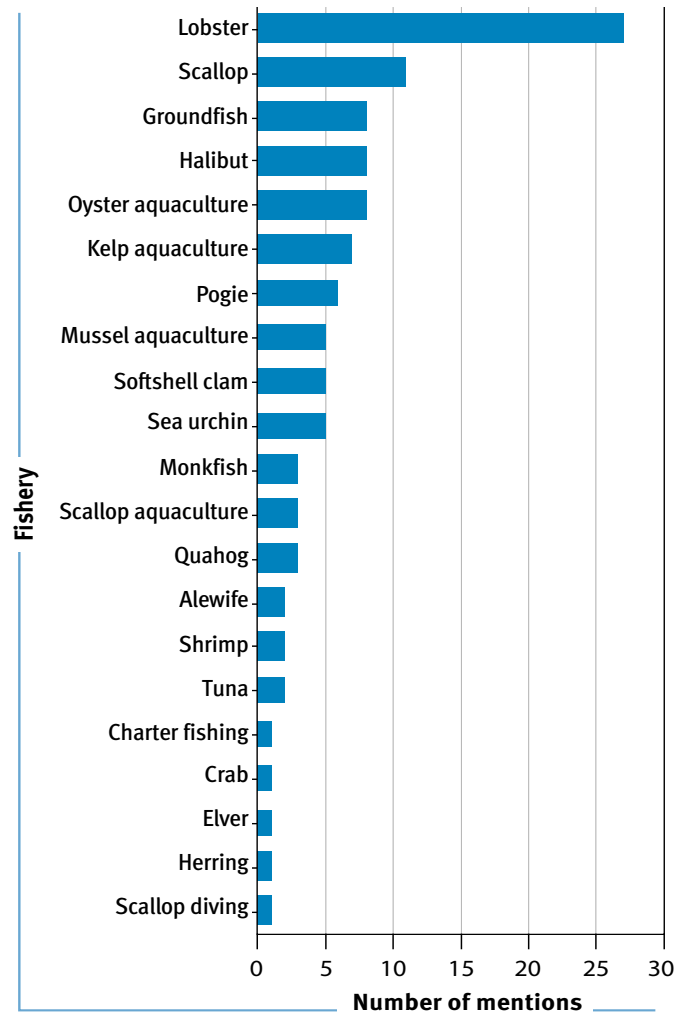
Number of participants from each sector



Age—next generation & established industry



Next generation and established industry members species distribution. Note that 73.3% participants target more than one species.



Appendix F. Important Skills Word Clouds

Using answers to open-ended questions, we coded participants' words to fall under one of the ten specific skills categories and then generated a word cloud for each skill category (except "experience") to reflect participants' insights and language. We did not generate a word cloud for experience as participants did not

define this category in more detail, the way they did with other nine categories.

The font size of each word correlates with the number of times it was mentioned across all of the interviews and survey responses.

1 Capture & culture techniques



2 Business practices / entrepreneurship



3 Vessel operation / maintenance



4 Navigation & safety



5 Gear technology



Important Skills Word Clouds *(continued)*

6 Fisheries / ecosystem sciences



7 Leadership / engagement / policy



8 Wellness

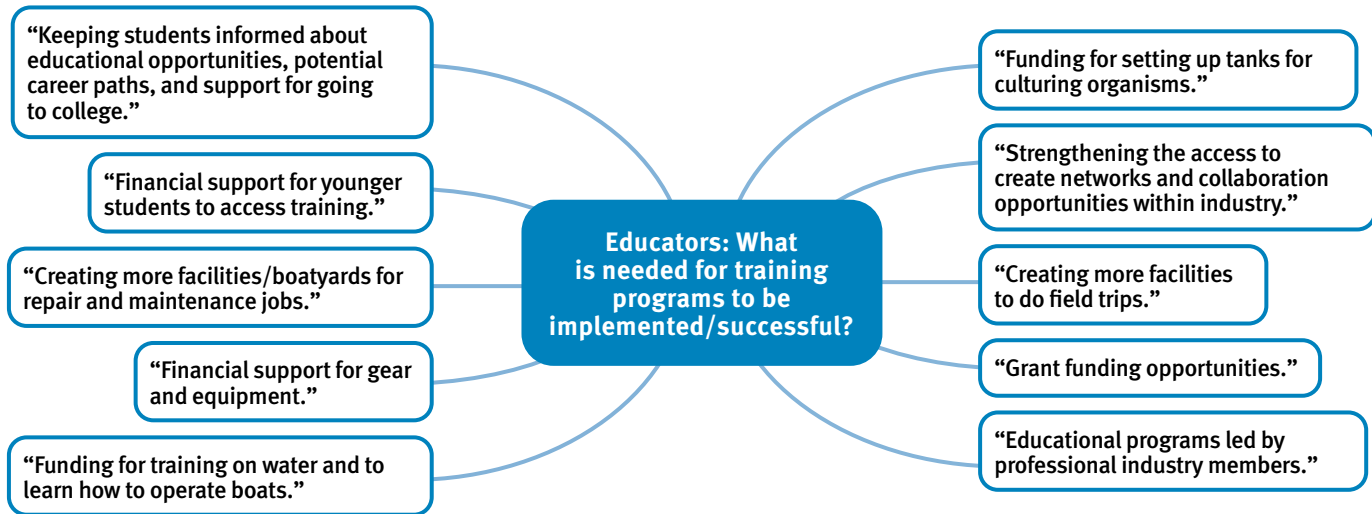


9 Work ethic



Appendix G. Training Structures

Educator suggestions (direct quotes) for training programs.



Next generation and established industry members preferred training formats and content approaches

Next Generation	Established Industry
Programs that have clearly outlined their goals.	Programs should be up front about setting agendas on what skills will be gained.
Short, direct, and clear representations of information.	Clear and succinct communication of information.
Experienced fishermen and industry members as teachers and leaders of the programs.	Programs that have direct applications to careers or fisheries of interest.
One-day field trips/programs led by experienced industry members to introduce potential diversification options for the next generation.	Training programs that are located on site e.g., at aquaculture farms.
Diversity of age and experience among participants.	Programs should have specific guidelines of what is already expected to know beforehand.
Having an array of options.	Training that helps brand products and add value.
Allowing space for casual and informal conversations to build connections.	Opportunities for financial aid support and scholarships for training programs for those in need.
Providing food and refreshments.	Offering training as paid internships.
Knowledge from different farms from Maine and around the world.	Offering apprenticeships that don't require sacrifices in fisheries diversity.
More industry-focused classes in high school without requirements for other courses that students are not interested in.	Certification set as a prerequisite to obtaining a license.
Having a dedicated notetaker.	

Appendix H. Monthly Availability for Training

Preferred month for training as indicated by *next generation* and *established industry members*.

