

Collaborative Solutions to Meet Workforce Development Needs in U.S. Aquaculture: A Synthesis of Industry and DEI Stakeholder Perceptions

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About This Report

Meridian Institute prepared this report in January 2024 based on insights from 23 interviews. This paper is a direct follow-on to Meridian's December 2022 publication on [DEI Challenges and Opportunities in U.S. Aquaculture Workforce Development](#), and outlines opportunities for the U.S. aquaculture industry and aquaculture diversity, equity, and inclusion (DEI) stakeholders to collaborate and meet shared workforce development needs. As shown in this report, these shared needs came to light by exploring data gaps that aquaculture DEI stakeholders believe inhibit workforce development efforts.

This report is not intended to be a comprehensive compilation of all issues related to aquaculture workforce development or DEI, nor should it be considered an authoritative, prescriptive, or consensus document. Rather, this report aims to provide a deeper understanding and discussion of U.S. aquaculture workforce development needs, as a diverse range of stakeholders assess and address both needs and actions for growing and sustaining a domestic aquaculture sector.

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We are most grateful to those individuals who shared with us their honest insights on aquaculture workforce development and DEI, making this report possible. We hope the findings presented here allow for greater understanding of the collaborative solution-building opportunities to address broad workforce challenges in U.S. aquaculture.

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Executive Summary

INTRODUCTION

Over the past two years, Meridian has engaged various U.S. aquaculture educators and practitioners committed to building a diverse, equitable, and inclusive (DEI) workforce. These stakeholders have noted the presence of two data gaps that often challenge DEI-focused workforce development efforts:

- The seeming lack of comprehensive demographic data that accurately reflects the makeup of the U.S. aquaculture sector (a *quantitative* data gap); and
- A holistic lack of understanding of how the U.S. aquaculture industry views DEI, particularly the perceived need or practicable application of DEI in hiring and operations (a *qualitative* data gap).

We examined these two data gaps through desktop research and interviews with 23 U.S. aquaculture industry representatives. In the end, we found that **the U.S. aquaculture industry and aquaculture DEI stakeholders share workforce development needs and can collaborate to meet those shared needs.**

THE QUANTITATIVE DATA GAP: DEMOGRAPHIC DATA ON THE U.S. AQUACULTURE SECTOR

Many in the U.S. aquaculture space have noted to Meridian that little to no demographic data exists on the domestic workforce. To verify this, we carried out a high-level inventory of existing demographic data sources and data collection efforts on the U.S. sector. Key takeaways from our findings include:

- **The U.S. aquaculture sector is indeed data-poor when it comes to demographic data.** The data that does exist is neither centralized nor representative of the entire industry. Data sources also vary in the type of data they collect. This makes the workforce landscape challenging to assess.
- **Demographic data tends to focus on farm owners and leaseholders rather than the workforce at large.** Not only is there a lack of data about operation laborers and support staff, but there is also little to no demographic data on those who work in the broader supply chain.
- **Industry groups, non-profits, and extension offices collect demographic data, but they are limited in their ability to fully address data shortages.** These entities can often only collect data with grant funding or within existing resources at a limited scale (e.g., at aquaculture events).

THE QUALITATIVE DATA GAP: INDUSTRY VIEWS ON DEI AND WORKFORCE DEVELOPMENT

We interviewed 23 people from the U.S. aquaculture industry (representing various operation types, roles, and locations) to gauge perspectives on DEI. Interviewees touched on several overarching issues (e.g., business viability, overall workforce challenges) that provided greater clarity as to why they hold the views they do on DEI – including, in some cases, why DEI is not a top-of-mind issue. Key takeaways:

- **Many industry stakeholders see workforce development as secondary to more pressing issues around business and operational viability.** According to our interviewees, the most critical concerns for aquaculture farms are keeping operations afloat financially and working through a complex regulatory environment (the latter seen as a major inhibitor to industry growth).

- **DEI is just one of several criteria (is often seen as a less critical consideration) when hiring.** Many interviewees noted that their top priority is recruiting people who understand the hard labor and physical risk inherent to aquaculture work and have the right mix of technical and business skills.
- **Many industry stakeholders believe that funders, NGOs, and academics drive the conversation on DEI in U.S. aquaculture.** Some interviewees hesitate to diversify the industry “for diversity’s sake” and wonder whether DEI accounts for: (a) equity between smallholders and large operations, and (b) helping struggling fishing communities equitably transition to aquaculture.
- **Interviewees perceive that many DEI challenges are beyond the control of individual operations.** For instance, short of building housing for employees, the expensive coastal locations of some aquaculture farms “price out” potential employees who cannot live near where they work.
- While small operations often do not view demographic data collection as a priority, **larger operations, industry groups, and industry-supportive organizations (e.g., extension offices) see the merit of having demographic data on hand**, particularly to address recruitment challenges.

BRIDGING INDUSTRY AND DEI WORKFORCE DEVELOPMENT NEEDS

Synthesizing findings from this work with insights gained from our 2022 [DEI Challenges and Opportunities in U.S. Aquaculture Workforce Development](#) report, there are three high-potential opportunities for industry and DEI stakeholders to collaborate on meeting shared workforce needs:

(1) Creating Connection Points Across the Workforce Pathway

- Industry stakeholders acknowledge that U.S. aquaculture is losing talent to other STEM industries and that potential industry contributors should be exposed to the industry early on. DEI stakeholders desire more sustained connections between diverse students and industry.
- **Collaborative Opportunity to Meet Shared Goals: Formalize collaborations between industry and educational institutions** that: (a) **connect and maintain industry-student linkages**, and (b) **engage diverse communities** to expand the talent pool that contributes to the industry.

(2) Building Relevant Skillsets Throughout the Workforce Pathway

- Industry stakeholders understand the core competencies needed to fill roles that grow the industry. DEI stakeholders believe in building multiple pathways into the industry by exposing diverse students to the breadth of the aquaculture industry, from early education to college.
- **Collaborative Opportunity to Meet Shared Goals: Co-design workforce development pathways** that: (a) **broaden student and community engagement**, including via educational curricula, and (b) **focus on practical skill-building** to meet the range of industry needs.

(3) Gathering and Maintaining Aquaculture-Specific Demographic Data

- Industry stakeholders acknowledge that demographic data is important to understand and successfully compete in recruitment efforts. DEI stakeholders hold an interest in demographic data to track and grow industry representation. Both stakeholder groups acknowledge that demographic data largely does not exist and is hard to collect.
- **Collaborative Opportunity to Meet Shared Goals: Advocate for, invest in, and collaborate on comprehensive demographic data gathering for the U.S. aquaculture sector.** This includes both workforce and trainee data to assess conversion from training to industry participation. Collaboration can alleviate capacity constraints for data collection and provide stakeholders with metrics needed to grow the workforce and increase industry representation.

Introduction

Aquaculture has gained increasing attention in the U.S. as an opportunity to meet growing demand for seafood, responsibly manage aquatic and ocean resources, and plan for domestic food security. However, considerable challenges remain to build out a U.S. aquaculture industry, including the need to grow and maintain a reliable aquaculture workforce. **In this report, we explore how the U.S. aquaculture industry and aquaculture diversity, equity, and inclusion (DEI) stakeholders can work together to support such workforce development.**

Meridian Institute is uniquely positioned to address this topic. Over the past four years, with support from [Builders Initiative](#),¹ we have engaged stakeholders across the U.S. to bring to light the broad spectrum of needs, interests, and concerns related to the future of domestic aquaculture. Part of our work has included a dedicated focus on workforce development, including interview-based research to better understand how DEI dynamics affect recruitment and participation at different stages of the U.S. aquaculture workforce development pathway. We published initial findings on this topic in 2022 (see our [DEI Challenges and Opportunities in U.S. Aquaculture Workforce Development](#) report).²

We have continued conversations on workforce development by convening a [DEI-Aquaculture Community of Practice](#) (CoP),³ made up of aquaculture educators and practitioners who wish to build a robust U.S. aquaculture workforce that is representative of the U.S. population at large. Through these CoP conversations, we've learned that aquaculture DEI stakeholders are persistently challenged in their workforce development efforts by two specific "knowledge gaps" (or data gaps):

- The seeming lack of comprehensive demographic data that accurately reflects the makeup of the U.S. aquaculture sector (a *quantitative* data gap); and
- A holistic lack of understanding of how the U.S. aquaculture industry views DEI, particularly the perceived need or practicable application of DEI in hiring and operations (a *qualitative* data gap).

In 2023, we set out to examine these data gaps as a way to build further understanding on U.S. aquaculture workforce development issues. This included identifying known demographic sources and data gathering initiatives relevant to the U.S. aquaculture industry and collecting viewpoints from U.S. aquaculture industry stakeholders on DEI.

In the process of exploring these quantitative and qualitative data gaps, we discovered that **U.S. aquaculture industry and aquaculture DEI stakeholders share several values, needs, and interests**

¹ Builders Initiative, "Impact Area: Oceans," accessed 22 November 2023, <https://www.buildersinitiative.org/what-we-do/impact-areas/oceans>.

² Ian Yue et al., "DEI Challenges and Opportunities in U.S. Aquaculture Workforce Development" (Meridian Institute, 2022), https://merid.org/wp-content/uploads/2023/01/DEI-Challenges-and-Opportunities-in-U.S.-Aquaculture-Workforce-Development_2022.12.06.pdf.

³ Meridian Institute, "Aquaculture DEI: Utilizing Collaboration to Bolster Workforce Pathway Development," accessed 22 November 2023, <https://merid.org/case-study/aquaculture-dei-utilizing-collaboration-to-bolster-workforce-pathway-development/>.

when it comes to building out a workforce. What's more, we identified several opportunities for these stakeholders to work together to meet those shared needs.

This report provides insight into how we came to identify these opportunities for collaboration. We first present findings from our quantitative and qualitative data gaps research. We then synthesize our findings from this research with insights gained from the [DEI Challenges and Opportunities in U.S. Aquaculture Workforce Development](#) report⁴ to outline the potential for U.S. aquaculture industry and DEI stakeholders to collectively meet *both DEI and overall workforce development needs*.

Like our previous report, this document is not intended to be a comprehensive compilation of all issues related to aquaculture workforce development or DEI, nor should it be considered an authoritative, prescriptive, or consensus document. Rather, this report aims to provide a deeper understanding and discussion of U.S. aquaculture workforce development needs, as a diverse range of stakeholders assess and address both needs and actions for growing and sustaining a domestic aquaculture sector.

METHODOLOGY

To explore both the quantitative and qualitative data gaps noted above, we carried out desktop research and stakeholder interviews. This section details how we gathered and synthesized information.

DEFINITION AND SCOPE OF DEI FOCUS

We maintain the same definition of DEI that we used in 2022 report, adapted from terminology used by the Ford Foundation.⁵ Notably, we use the term DEI (i.e., the collective use of the terms diversity, equity, and inclusion) to mean:

- representation of varied individual and collective identities and differences;
- fair treatment, equality of opportunity, and fairness in access to information and resources; and
- an environment that actively invites the contribution and participation of all people.

We also maintain our DEI focus on racial, ethnic, and gender DEI. We acknowledge that this does not fully encompass the considerations of all DEI elements within the domestic aquaculture space. We are aware, for instance, of existing and important DEI-aquaculture considerations surrounding tribal nations and indigenous peoples, the LGBTQIA+ community, and military veterans, among other communities. It bears noting, however, that there are other organizations and initiatives already making meaningful progress in these areas (including, but certainly not limited to, the [Indigenous Aquaculture Collaborative](#)⁶ and the [VFW Post 8950's Veterans Aquaculture Training Center](#)).⁷

⁴ Yue et al., *DEI Challenges and Opportunities*.

⁵ Ford Foundation, "Diversity, equity, and inclusion," accessed 22 November 2023, <https://www.fordfoundation.org/about/people/diversity-equity-and-inclusion>.

⁶ Indigenous Aquaculture Collaborative, "About Us," Washington Sea Grant, accessed 22 November 2023, <https://indigenusaquaculture.org/about-us>.

⁷ Veterans of Foreign Wars Post 8950, "Veterans Aquaculture Training Center," accessed 22 November 2023, <https://www.vfwpost8950.com/veterans-aquaculture-training-center>.

BACKGROUND RESEARCH & INTERVIEWS

To collect information on demographic data, we relied primarily on desktop research, supplemented by insights gathered from stakeholder interviews (see below). Overall, our desktop research focused on identifying and analyzing two types of information: (1) Data sources with quantitative demographic information on the U.S. aquaculture sector, and (2) Data gathering initiatives (either completed or in progress), representing unpublished or non-public data on the U.S. aquaculture sector. The latter was more informed by information gathered through interviews.

Our other research approach involved individual interviews with people who are either part of (or have active touchpoints with) the U.S. aquaculture industry. The primary intent of our interviews was to gather information on how the U.S. aquaculture industry views DEI, particularly the perceived need or practicable application of DEI practices in hiring, operations, and overall workforce development and sustainment. However, we also used these interviews, as relevant, to gather information on existing demographic data sources and data gathering initiatives.

We looked to interview a range of stakeholders across the U.S. aquaculture sector, with a focus on aquaculture farm owners or operators. Our goal was to interview owners or operators across a range of environments (marine, freshwater, RAS); geographies (Pacific Coast, Atlantic Coast, Gulf Coast, inland); operation sizes (large, medium, and small); and product types (finfish, shellfish, seaweed). We also aimed to speak with individuals who hold leadership or decision-making positions in either their organization or the industry more broadly. While there are limitations to solely focusing on this audience, we felt it was important to speak with those who hold notable, existing influence on organizational or industry direction.

We recruited interviewees using Meridian's existing aquaculture stakeholder network, our CoP members' industry connections, and via suggestions from the interviewees themselves. Throughout our interview timeframe, we faced challenges recruiting as diverse an array of interviewees as initially envisioned (particularly from larger operations focused on finfish). To supplement interviews with aquaculture owners and operators, we ultimately also sought interviews with extension and other support organizations that work directly with operators, as well as interviews with representatives in the upstream supply chain (e.g., feed, technology, biopharmaceuticals). In all, our interviewees largely fell into three categories of stakeholders:

- Owners and managers of marine or coastal aquaculture operations across a range of operations sizes (e.g., small/family-owned, medium-sized, large/industrial operation) and product types (finfish, shellfish, seaweed);
- Industry leaders that organize, promote, and/or represent aquaculture operations (e.g., trade organizations); and
- Organizations that support the U.S. aquaculture industry through workforce connections and technical assistance (e.g., Sea Grant/land grant extension, workforce development organizations).

In total, we interviewed 23 stakeholders over the course of five months in 2023.

The Quantitative Data Gap: Demographic Data on the U.S. Aquaculture Sector

In conversations with U.S. aquaculture stakeholders over the past four years, we have heard repeatedly that little to no demographic data exists on those who participate in the sector (workforce, trainees, etc.). Stakeholders noted that this data gap is a considerable detriment to workforce development efforts, as not understanding the current state of U.S. aquaculture participation inhibits the ability to both strategically plan for workforce growth and identify shortcomings in sector recruitment.

Aquaculture DEI stakeholders have particularly lamented the lack of demographic data. Aquaculture DEI stakeholders see demographic data as critical to establishing a baseline metric from which the industry can track and measure changes in workforce representation over time. These stakeholders also see demographic data as a tool to justify the need for, and assess the impact of, interventional DEI workforce initiatives. Additionally, if such data is granular enough (e.g., demographic data is collected for both aquaculture training programs and the aquaculture industry at large), stakeholders noted that it will be easier to identify differences in representation at different points along the workforce pathway and within the industry itself (e.g., demographic differences between the entire U.S. aquaculture workforce and those in industry leadership positions).

We wanted to verify this perceived lack of U.S. aquaculture demographic data by exploring what data currently exists and what information is being collected to fill data gaps. We approached this task by carrying out a high-level inventory of both existing demographic data sources and demographic data collection efforts. As noted previously, we researched this information through desktop research and supplemented such findings with insights gathered from our stakeholder interviews.

Detailed findings are noted in [Appendix A: Demographic Data Sources and Data Gathering Initiatives on the U.S. Aquaculture Industry](#), including specific data sources (and data gathering initiatives) we identified and the types of demographic data that is currently being collected and disclosed. Based on our findings, we came to the following conclusions:

- **The U.S. aquaculture sector is indeed data-poor when it comes to demographic data.** Existing datasets on the U.S. sector primarily focus on production data, whether gathered by private sector entities (e.g., IBISWorld) or government agencies (e.g., U.S. Department of Agriculture). While demographic data does exist, it is neither centralized nor representative of the entire industry. Additionally, data sources vary in terms of the types and extent of information they collect, oftentimes focused on a particular company or subset of the industry. There is also no standard set of demographic data metrics that are collected.
- **Demographic data tends to focus on farm owners and leaseholders rather than the workforce at large.** Where demographic data is collected, it most often focuses on those who own, operate, or lease farms — which aquaculture stakeholders we've spoken with claim is not representative of the broader sector. Not only is there a lack of data about operation laborers and support staff, but there is also little to no demographic data on those who work in the broader supply chain (feed, equipment, technology, biopharmaceuticals, seafood processing, shipping and distribution, etc.).

- **Industry groups, non-profits, and extension offices collect demographic data, but they are limited in their ability to fully address data shortages.** All the data collection efforts we identified are carried out by organizations that recognize the shortcomings in existing demographic data and the importance of such data for tracking workforce trends and growing a future workforce. These organizations include regional and national industry groups, non-profits focused on aquaculture, and extension offices. These entities, however, are limited to collecting data when and where they can, within their spheres of influence. Given the labor and resources required for data collection, such work is often pursued with dedicated grant funding or within existing means at a very limited scale (e.g., collecting demographic data from attendees at aquaculture conferences and events).
- **Absent coordinated efforts, demographic data sources and data gathering efforts remain piecemeal and incomplete, making it difficult to fully comprehend the U.S. aquaculture workforce.** There are no existing initiatives or investments to gather or maintain demographic data at a sector-wide scale. As a result, existing datasets remain incomplete and data gathering efforts are carried out at an organizational or regional-level scale as resources allow. A lack of cross-coordination, sustained funding, and mandate to collect such data means that the U.S. aquaculture workforce landscape is challenging to understand and assess.

As discussed later in this report, a core collaborative opportunity between U.S. aquaculture industry and aquaculture DEI stakeholders is to coordinate the collection and maintenance of sector-specific demographic data. Doing so can both alleviate capacity constraints for data collection and provide all stakeholders with metrics needed to target workforce development efforts that grow the workforce and increase industry representation.

The Qualitative Data Gap: Industry Views on DEI and Workforce Development

This section outlines insights from interviews with 23 individuals who are either active in or have direct connections to the U.S. aquaculture industry. We approached these interviews with the goal of gauging industry views on the perceived need or practicable application of DEI practices in hiring and operations. However, as we entered into dialogue with these individuals, we discovered that our interviewees found it difficult to separate DEI considerations from overarching issues that can often feel more pressing, such as business viability and recruitment challenges. These broader conversations provided greater clarity and nuance to the views interviewees hold on workforce DEI — including, in several instances, why DEI is not prioritized as an issue that is thought or talked about regularly. To match this approach, we present interviewee insights on these overarching issues first, followed by their specific views on aquaculture DEI.

Our interview findings are presented in non-attributational format.

Business Viability and Industry Growth

For many interviewees, ensuring the viability of their aquaculture operations is the most front-of-mind issue, even more so than developing a robust workforce for the future. Many interviewees stated that keeping their aquaculture operations financially afloat is a prominent, perpetual concern. Existing state and federal regulatory structures are a major contributor to this financial stress, starting from the point of putting together a permit application.

Interviewees did not shy away from expressing the capital and time intensive nature of navigating a multitude of permitting processes. Given how costly and burdensome this process can be, several interviewees lamented that large or wealthy aquaculture operations often have the advantage in securing permits, simply due to the resources available to them.

The full cost of the permitting process, according to interviewees, includes both the challenge of acquiring land or leases as well as the burden of managing social opposition that may arise during permit review. Interviewees noted that land and leases may not always be available, and when they are, prospective aquaculture operators may face costly competition (e.g., if jurisdictions extend open leases to the highest bidder) or non-ideal options (e.g., shellfish subaqueous land leases in less productive waters). One interviewee noted that Tribal Nations have, in some cases, gained access to both permits and land through sovereignty rights. As such, aquaculture companies have found it advantageous to partner with Tribal Nations to move forward on operations. From a social perspective, interviewees noted that public opposition to aquaculture operations can sometimes sink a permit application. Interviewees stated personal knowledge of aquaculture operations that failed to secure a permit due to social pushback from adjacent landowners. Interviewees thus emphasized that the time and money invested in the permitting process could very well end up as a sunk cost that never materializes in an actual operation.

Overall, most interviewees believe that until the permitting process and regulatory environment for aquaculture is streamlined, aquaculture operations of all sizes will continue to face challenges in setting up and becoming profitable in the U.S. Even if permits are secured, interviewees stressed that most U.S. aquaculture operations are small farms with slim profit margins. Securing a permit is seen as just the first step in overcoming market entry barriers. In some cases, these farms also find themselves competing against foreign imports and products from large aquaculture companies. According to one interviewee, to keep operations afloat, farm operators often don't pay themselves what they believe they are worth. With such financial concerns front of mind, interviewees noted that workforce development is often a deprioritized consideration.

Several interviewees also noted that stable industry growth is required before considering how to expand and diversify the workforce. These interviewees expressed that it is unwise for the industry to place an emphasis on growing a diverse workforce if there is no guarantee of future jobs in which to place trainees. For example, a California-based interviewee stated that the "choke point" to industry growth is not the lack of a workforce but rather burdensome regulatory processes that stifle growth and expansion of operations in the first place. To this interviewee, when more operations are active there will be more demand for jobs at aquaculture operations.

Still, perspectives on balancing industry growth and workforce development seemed to be location dependent. Interviewees in Maine, for instance, also spoke about permitting challenges in growing the industry, but they viewed workforce development as an equally important industry growth challenge. This is because, interviewees noted, Maine has a workforce that is aging more rapidly than other states and the state has historically lost its young workforce to other locations. As such, interviewees noted that the state is investing in workforce development efforts, including in aquaculture specifically (see sections below for more details: ["Industry Perceptions Around DEI and Its Applicability to Building an Aquaculture Workforce"](#) and ["Bridging Industry Workforce Needs with DEI Priorities"](#)).

Overall Industry Workforce Development Challenges

Interviewees noted several general workforce development challenges they encounter, particularly around recruiting reliable labor to support operations. Interviewees indicated several dynamics at play when it comes to finding people to fill aquaculture operation positions, primarily related to the nature of aquaculture jobs and expectations around wages. DEI is often seen as a consideration above and beyond these overarching challenges.

A summary of concerns related to industry workforce development challenges is detailed below.

NATURE OF THE JOB

Interviewees repeatedly mentioned that running an aquaculture operation is hard work that demands long hours, a broad set of manual labor skills, and the ability to "wear multiple hats." Interviewees detailed a range of knowledge areas that could be required by aquaculture operations, including (but not limited to) engineering, inventory control, payroll, regulatory and compliance issues, commercial insurance, grant writing, biology and biosecurity, basic survival skills (e.g., swimming), boat operations, and a variety of trades skills (e.g., welding, plumbing, electrical). One interviewee noted that the need for such expansive competency across skillsets disadvantages small operations the most, as they cannot

afford to hire or contract individual specialists to support their operations. As such, small- and medium-sized farms rely on people who are willing to work in a highly demanding and dynamic environment. Given this reality, interviewees stressed that attracting labor to work on a farm is immensely challenging as is, without even considering issues of DEI. In fact, finding the ideal candidate for aquaculture operations can be so difficult, interviewees said, many operations end up resorting to hiring “whoever can do the job” — that is, anyone who has a sufficient enough skillset and an expressed willingness to put in the hard work to keep baseline operations running. This can sometimes mean operators investing in longer than desired on-the-job training periods for new hires and facing worker retention challenges over the long term, given the demands of the job.

When it comes to hiring for on-water aquaculture operation jobs, interviewees indicated that safety is a top priority. Operation owners want to ensure that they do not bring anyone on board they believe could be at a high risk of injury or death due to not having the skills needed to be out on the water. This is because, interviewees said, operations need hires who can go out on the water their first day on the job. One interviewee reflected on differences they’ve noticed in terms of swimming abilities and comfort on the water between different ethnic groups, noting that such differences could preclude underrepresented individuals from taking on-water aquaculture operation jobs. Safety is also relevant when it comes to trades skills (e.g., welding, plumbing, electrical). Interviewees noted that aquaculture operation owners may turn down job applicants if they do not have sufficient trades skills to keep them safe on the job. Decisions like these have affected hiring and recruitment. One interviewee opined that the dangerous nature of aquaculture jobs, along with a general decline in the number of people trained in the trades in the U.S., has made aquaculture recruitment increasingly difficult.

Despite the nature of aquaculture farm jobs, interviewees emphasized that young people tend to have an idealized view of the aquaculture industry, lacking a true understanding of the work and physical risk involved in running an operation. Interviewees also noted that many young people (especially those with higher education degrees) enter the field expecting to manage operations at the get-go, rather than working as a general laborer to support multiple needs across the operation. Formal education, such as an undergraduate or master’s degree, is often not needed to work on a farm. As such, interviewees noted that in some cases, operation owners will intentionally not hire candidates with master’s degrees to avoid a possible employer-employee mismatch in expectations around work responsibilities. Some interviewees also noted that they wished workforce development programs would give trainees a realistic understanding of the job and skillsets required to be successful on a farm.

For some, misalignment of job expectations has not only made hiring challenging but long-term planning as well. One interviewee noted that, given their age, they know they will soon have to retire from the industry. However, they revealed that they do not have a succession plan in place for their business because they have struggled to find an experienced and committed young person to whom they can entrust their business — someone who understands demands of the aquaculture lifestyle and won’t just sell the business after a short period of time. For this interviewee, bringing someone onboard isn’t solely about bringing on an assistant but rather finding someone who can carry on their legacy.

When asked about pathways to expose students to the realities of the industry, one interviewee shared that they are skeptical of internships. In their view, internships can be a double-edged sword. Notably, while internships can show students what the industry is like, internships have more often than not (in this interviewee’s experience) turned people away from the industry by exposing them to the demands of the work. This has made it difficult to justify continued investment in internships from industry

sponsors. They also noted how it can be risky to trust interns with production activities, given how even one error can cause the loss of product, which can be detrimental to the business. At the same time, this interviewee acknowledged that not giving interns direct production-related tasks can limit the interns' exposure to what working in aquaculture is really like.

WAGE EXPECTATIONS

Pay in aquaculture operations is relatively low compared to other STEM career fields. This is especially true for students coming out of undergraduate or graduate programs where expectations around compensation are not aligned with most jobs currently available in the aquaculture sector (e.g., deckhand positions, ad-hoc labor support during key points in production). Many interviewees noted that it is not uncommon for some workers on aquaculture farms to work multiple jobs, either during "off season" or throughout the year, to make ends meet. This can make aquaculture jobs unattractive to those who don't have the interest or ability to work multiple jobs.

Some interviewees noted that the average pay for aquaculture jobs, in combination with the demanding work environment, also makes employee retainment challenging, which impacts the overall ability to grow the workforce. Interviewees stressed that they wish people entering the field better understood that working in aquaculture is more an intentional lifestyle choice than a lucrative career path.

Industry Perceptions Around DEI and Its Applicability to Building an Aquaculture Workforce

For most industry interviewees, DEI is not a core consideration, particularly in relation to the business viability and overall industry workforce development challenges noted above.⁸ When DEI was brought up, interviewees largely reflected on how DEI is thought and talked about in the U.S. aquaculture industry. Some interviewees further reflected on specific DEI-related issues, such as industry barriers to entry for diverse and underserved communities and data collection around demographic information.

HOW DEI IS THOUGHT AND TALKED ABOUT IN THE U.S. AQUACULTURE INDUSTRY

Nearly all interviewees acknowledged that the sector is not diverse and that considerations for diversifying the workforce should be part of the aquaculture workforce development equation. Some interviewees specifically pointed out that representation in the highest positions in the U.S. aquaculture industry, such as leadership or management roles, were particularly non diverse. Despite this acknowledgement, most interviewees expressed that it did not make sense for the industry to diversify the workforce simply "for diversity's sake." Many interviewees also wondered whether DEI-focused workforce development programs have a full view of what diversity looks like in industry hiring and employment, inclusive of migrant labor and employees that come from other countries.

⁸ The exception were interviewees who represented extension offices (e.g., Sea Grant) and workforce development programs. These interviewees openly acknowledged the importance of DEI to growing the U.S. aquaculture workforce but also admitted that most industry stakeholders they interact with on a regular basis do not hold the same views (mostly due to the business viability and overall industry workforce development challenges noted previously).

Additionally, while issues of “diversity” were discussed, very few interviewees mentioned motivations driven by considerations of equity, inclusion, or justice. Those interviewees who brought up equity spoke from the perspective of ensuring:

- **Equity between smallholders (e.g., one-person or small family operations) and large aquaculture companies.** One interviewee mentioned that the dynamics between small and large operations can feel like “class warfare,” with large operations outcompeting and outpricing small operations which pushes them out of the market.
- **Equitable transitions for fishing communities to enter the aquaculture space, as aquaculture continues to expand in seafood market share and influence in the U.S.** One interviewee noted that many U.S. fisheries were destroyed in the 1990s and that the aquaculture industry has and can continue to provide those in the fisheries sector a way to transition their skills to a developing industry.

Several interviewees inferred that conversations around DEI in the U.S. aquaculture sector do not often stem from within the industry but rather from outside forces, such as funders, academia, and NGOs. Interviewees who receive grant funding note that they primarily address DEI issues when funders require them to do so. One interviewee also noted that DEI components are now included in the scoring system for many grant applications.

Interviewees that manage aquaculture farms noted that they are often unsure about how to specifically apply DEI practices to their operations. Some interviewees raised that the industry most readily considers DEI in relation to Tribal Nation interactions, including partnership on operations. Still others have tried to implement policies that cultivate and maintain a “culture of care” among their employees in lieu of official DEI plans. A few interviewees raised examples of ways they intentionally invest in their employees, including:

- **Providing employees with accommodations that acknowledge life circumstances.** One interviewee runs an aquaculture operation where migrant labor makes up a notable portion of operations support staff. They offer accommodation through flexible work schedules so that employees can take time off to care for family members. Employees see this as a critical benefit, the interviewee said, given the close-knit family ties in migrant labor communities. Such flexibility also includes providing employees with assurances that their job will still be intact when they return.
- **Prioritizing effective communication with employees across language barriers.** In operations where employees may speak multiple languages, an interviewee noted that creating a culture of care includes hiring supervisors that can speak more than one language or hiring translators to help communicate effectively with all employees.
- **Providing employees with fair wages, health insurance, retirement plans, transportation support, and other benefits.** Interviewees from larger operations noted that if possible, they provide employees with benefits to ensure job stability. For some operations, this involves providing housing near the worksite. For others, this involves providing employees with all the gear they need to carry out the job, access to company vehicles, and guaranteed access to a 40-hour workweek, even if the growing season isn’t as strong as expected.
- **Committing to professional development.** One interviewee, who runs a medium-sized operation, noted that while they often struggle to compete for employees on a compensation basis, they

commit to providing all their employees with “opportunities for advancement” and ownership in the business. This has included opening management opportunities in specific parts of their operation (e.g., systems design, regulatory affairs, shop maintenance) and providing on-the-job training in entrepreneurship (e.g., business plan development, fundraising).

For operations that can provide these benefits, they see these offerings as a way to extend the spirit of DEI, even if such policies are not labeled as DEI-specific or -motivated. However, the interviewees that provide such benefits represent a small minority of those with whom we spoke.

DEI BARRIERS TO INDUSTRY PARTICIPATION AND ENTRY

Interviewees that run aquaculture operations in coastal regions noted that it can be challenging for employees to live near where they work. Many such operations are based in places that have a high cost of living — places that may not be affordable to those living on farm labor wages. One interviewee, who runs a coastal aquaculture operation, noted this reality has meant that they have not been successful in hiring people who don’t already have some form of financial or social “safety net” (e.g., other means of financial support, family in the area with whom they can lodge).

Transportation to job sites is another barrier that interviewees raised. One interviewee noted that public transit often does not provide connections to farms located on the coast, making jobs on such farms infeasible if a potential recruit does not have their own form of transportation (e.g., access to a personal vehicle).

As mentioned previously, some operations located in remote areas build housing for their farm workers, both to attract and retain employees. Interviewees who spoke of such operations noted that finding accessible and affordable housing for employees can be just as difficult as finding viable transportation options. Given how common this situation is for coastal farms, two interviewees raised that greater workforce growth opportunities may exist in the inland, freshwater aquaculture space, where the cost of living is considerably lower.

Interviewees noted that barriers also exist for those looking to start their own farms. Interviewees mentioned that extensive knowledge and resources are needed to establish a farm, including upfront financial investment, business training and acumen, the knowledge of how to navigate complex permit processes, and gaining access to markets and supply chains. On top of this, interviewees pointed to the thin profit margins that many operations, even after getting established, regularly struggle through (see the [“Business Viability and Industry Growth”](#) section for more details).

Some interviewees acknowledged that such barriers are especially challenging for individuals from communities that have historically faced limited access to such knowledge, funding, and markets. One interviewee mentioned that such disparities point to why there are few racial minorities starting their own farms in the U.S. Another interviewee shared that starting an aquaculture business is risky for anyone in the U.S.; however, for someone coming from a historically disadvantaged community, securing capital may be especially challenging.

Historical access to the industry, especially in the aquaculture sector, may be especially impactful to one’s ability to establish and grow in the field. One interviewee noted that that without a family background in farming, government regulations can make it difficult for any new entrants to the industry. Other interviewees mentioned that since in the U.S. aquaculture is predominantly made up of

family farms, there is limited career growth in the sector, particularly paths that eventually lead to farm ownership.

Case Study: Learning from Past Workforce Development Experience in Cedar Key, Florida

Two of our interviewees pointed to Cedar Key, Florida, as a workforce development model that bears examination. Cedar Key, a small community situated along the Florida Gulf Coast, is home to 90% of the state's clam aquaculture operations, producing 120 million clams annually. Historically a fishing community, Cedar Key suffered a setback in the 1990s due to the U.S. Department of Agriculture (USDA) closing oyster harvesting grounds, along with the state of Florida issuing a gill net ban around the same time. To provide recovery assistance, the state of Florida initiated a job retraining program, with financial support from the USDA and technical assistance from several universities. The program was designed to help fishermen translate their skills into alternative work opportunities in oyster and clam farming. Federal funds were deployed to provide comprehensive hands-on training, including classroom learning, business development, and the provision of gear and equipment. Additionally, administrators of the retraining program established the first round of aquaculture leases on the west coast of Florida, placing 130 training program graduates into shellfish leases.

The program has fostered a thriving shellfish aquaculture industry in the Big Bend region, with over 150 shellfish farms operating year-round. The shellfish operations in the region are family-run and community-supported, resulting in demand for local support services, such as seed supply and labor for hatchery and nursery culture. The program also impacted education in the region, with aquaculture now taught in primary and secondary schools and an aquaculture community college training program established to meet the demand for skilled labor.

Cedar Key serves as an example of how holistic investment in workforce development can support individuals and communities entering the aquaculture industry. The success of the program is not only seen in the still-thriving industry but also in the integration of aquaculture as part of community identity and education. Its application to other workforce development issues, such as DEI, however, requires additional consideration.

For instance, **while the Cedar Key investment has helped create many operations, the program's primary beneficiaries are those that took part in the training in the 1990s.** In recent years, issuance of new leases in Florida's Big Bend region has either paused or slowed. One interviewee noted that most of the viable shellfishing areas along the Florida Gulf Coast are already taken. Additionally, **existing leases are largely passed down within family units, and no comparable workforce training program is currently available today** as it was in the 1990s. In other words, those just entering the shellfish aquaculture industry now may find establishing *(cont. on the following page)*

(Case Study continued)

operations challenging, having to coordinate funding, education, equipment, and leases on their own.

Cedar Key provides an interesting case study for how intentional investment in workforce development can establish access to the aquaculture sector. However, when considering how such an example could apply to other regions and populations, such as displaced fishermen and communities that are currently underrepresented in the U.S. aquaculture industry, additional thought is merited to consider how long-term, equitable access can be applied to the broader U.S. aquaculture industry.

DEMOGRAPHIC DATA COLLECTION

Interviewees noted that only limited amounts of data are collected from (and about) the U.S. aquaculture industry, most of which are related to production (e.g., production volumes and methods). Interviewees shared that given the time and effort that goes into running aquaculture operations — and the fact that there is no clear financial incentive to collect data — most farm owners do not see value in gathering or reporting data beyond what is required by government regulators.

This has meant that most aquaculture operations (particularly smaller ones) do not collect demographic data about their workforce. Interviewees that are part of small operations noted that they do not see a compelling reason to collect specific demographic information about their company's workforce, since the number of employees is so small.

Interviewees also noted that aquaculture operations are reluctant to collect and share data because they do not trust how the information will be used. One interviewee stated that farmers worry about whether and how information they share might be used against them in a competitive business environment where profit margins are slim and staying afloat is a constant challenge.

Because of these dynamics, gathering any sort of data — particularly demographic data — from the U.S. aquaculture industry can be very difficult. One interviewee, who leads an industry group that represents farmers, indicated that they have historically had only a 2-5% response rate when emailing surveys out to their membership. Another interviewee noted that state regulatory agencies collect some data on the industry but admitted that such datasets are often limited to the bare minimum information required to secure a lease (e.g., the name on the lease) and are most often absent of differentiating metrics like race, age, or gender.

Despite these challenges and barriers, interviewees raised two instances in which demographic data on the U.S. aquaculture sector can be particularly useful:

- **Understanding the student-to-workforce transition** – A few interviewees, particularly those who provide extension technical assistance or lead workforce development programs, indicated that demographic data is critical to understanding the success of their workforce support efforts. One interviewee is leading an initiative to develop post-secondary career paths for students that graduate from the three high schools in their state that offer an aquaculture training program. Part of this work involves better understanding the state industry that could hire these students; building this understanding, the interviewee noted, will require gathering demographic data about the current makeup of the industry. Similarly, interviewees in another state noted a trend in young people leaving their state for employment. One interviewee leads an aquaculture workforce development program that gathers and uses demographic data to understand whether the students who go through the program plan to remain in the state to live and work and whether they believe promising work opportunities exist for students like them in the local aquaculture industry. This interviewee also noted that collecting demographic data metrics (e.g., race, gender identity, education level/status) has helped them make the case to funders why their programs are valuable and deserve continued funding.
- **Understanding the recruitment market** – Interviewees readily admit that recruitment in the U.S. aquaculture sector is challenging. Some interviewees also acknowledge that demographic data could help them better understand and compete in the job recruitment market. One interviewee, for instance, noted that they are trying to integrate DEI into hiring practices but feel like they are “stumbling” through it. They indicated that it would be helpful to have information that provides insight on what has and hasn’t worked in terms of recruiting a more diverse pool of applicants to the U.S. aquaculture sector. This interviewee also noted that demographic data could help shed light on what draws STEM-trained students to choose other STEM fields over careers in marine science, fisheries, or aquaculture.

In all, the U.S. aquaculture sector faces a distinct dilemma in that collecting data remains a challenge, even as industry stakeholders acknowledge the value of such data.

Bridging Industry and DEI Workforce Development Needs

In synthesizing insights gathered from U.S. aquaculture industry stakeholders, we were struck by the fact that many of the key workforce concerns raised by our interviewees correlated strongly with those mentioned by DEI-focused aquaculture educators and practitioners in our [DEI Challenges and Opportunities in U.S. Aquaculture Workforce Development](#) report.⁹ While exact views between the two groups differed, many of the underlying interests and priorities — at least as it relates to workforce development needs — showed considerable alignment.

In this section, we identify shared workforce development needs between U.S. aquaculture industry and aquaculture DEI stakeholders by synthesizing and comparing viewpoints between the two groups. We also outline opportunities that we believe hold the potential for these groups to work together to meet those shared needs. These “bridges,” if implemented, can be a solution to building a diverse and robust aquaculture workforce through collaborative approaches.

(1) CREATING CONNECTION POINTS ACROSS THE WORKFORCE PATHWAY

Establishing connection points across the workforce pathway is a strategic opportunity to both grow public awareness around U.S. aquaculture and strengthen channels that enable students to participate in the aquaculture industry long term. Creating connection points involves linking educators with industry practitioners to inform the needs of the workforce as it grows and evolves. It also involves broadening access to the industry as it expands, not only to enhance opportunities for industry contribution but also to diversify the pool of contributors. **Industry and DEI stakeholders can work together to establish and maintain connections between students and the U.S. aquaculture sector, allowing for broader industry engagement and more entry points into the aquaculture workforce.**

INDUSTRY PERSPECTIVES

As previously mentioned, many industry interviewees share the perspective that the U.S. aquaculture industry is losing talent to other STEM industries. Interviewees acknowledge that developing a robust aquaculture workforce will require exposing students and potential talent to the industry early on, as young as primary school.

Interviewees raised two types of workforce pathway connections that seem to be particularly worthwhile: Engagement with students and workforce development partnerships.

- **Engagement with Students** – Interviewees noted two reasons why pre-high school student engagement in aquaculture is important: (1) a college education is not essential for entry into the aquaculture workforce, so recruitment needs to start early on, and (2) student exposure to the

⁹ Yue et al., *DEI Challenges and Opportunities*.

industry over many years will help set realistic expectations for students on how the industry actually operates.

- One interviewee who owns a small aquaculture operation shared that the best workforce development opportunity, in their view, is apprenticeships. This interviewee personally benefitted from an apprenticeship program in their early career and envisions a model where aquaculture operation owners are paid to take on one or two apprentices, train them in the day-to-day skills of running an operation, and provide the apprentices with a farm lease or permit upon completion of the apprenticeship program. From this interviewee's perspective, apprenticeships benefit the student (by providing them a clear path to ownership in aquaculture) as well as the industry (by actively engaging industry members in the workforce development process).
- Despite broad agreement on this need to engage students, very few interviewees actively engage in student or educational outreach themselves. Still interviewees pointed to a few examples of student engagement on aquaculture done well:
 - One interviewee noted that they see education as an essential way to build social license for aquaculture which, they say, is necessary for developing both the industry and workforce pathways. They shared [Manna Fish Farms'](#)¹⁰ student engagement efforts as an example of how this is being done in the industry. Based out of Long Island, the company invests in local community and student education on aquaculture by hosting conversations with industry members at local restaurants and marine-based camps to increase understanding of how the aquaculture industry operates.
 - Another interviewee developed a series of online training modules that cover the various aspects (science, safety, best practices) of working on a shellfish farm. This interviewee felt that creating these modules was necessary to set realistic expectations about the realities of working in aquaculture. They also acknowledged the correlation between engaging students early in their academic careers and growing diversity in the industry, pointing to [Billion Oyster Project](#)¹¹ (New York) and [Save the Bay](#)¹² (Rhode Island) as particularly strong examples of organizations that engage students early on in their learning journey in a fun yet practical way.
 - We were also directed to [The Cultured Abalone Farm's](#)¹³ student engagement efforts in California. Cultured Abalone Farm provides education programming for high school students that includes [interactive presentations about abalone aquaculture and webinars that teach teens about aquaculture](#).¹⁴
- **Partnerships** – Some interviewees noted how creating partnerships with outside supporting organizations has been key to both recruitment and setting up stronger pathways for students to enter the aquaculture industry. Interviewees pointed to a few examples of aquaculture workforce development partnerships that have succeeded.

¹⁰ Manna Fish Farms, Inc., "About Us," accessed 22 November 2023, <https://mannafishfarms.com/about-us/>.

¹¹ Billion Oyster Project, "Our Story," accessed 22 November 2023, <https://www.billionoysterproject.org/our-story>.

¹² Save the Bay, "About Us," accessed 22 November 2023, <https://savebay.org/about-us/>.

¹³ The Cultured Abalone Farm, "Farm History and Facilities," accessed 22 November 2023, <https://culturedabalone.com/farm-history-and-facilities/>.

¹⁴ NOAA Education, "CELC aquaculture webinar: abalone aquaculture education pilot project," 8 August 2023, Coastal Ecosystem Learning Centers Aquaculture Literacy Webinar, <https://www.youtube.com/watch?v=IcL7S1j7afY>.

- An interviewee from a trade association highlighted their partnership with [Minorities in Aquaculture](#) (MIA),¹⁵ a non-profit that aids minority women in pursuing careers in aquaculture. This partnership is part of their workforce development program, which aims to support building DEI into the industry by placing a diverse pool of students into aquaculture internships across host farms that are members of the trade association. These internships have been successful in practice: According to MIA, over 50% of its 2023 interns were offered full-time positions at their placement farms, with one intern even starting their own farm.¹⁶ Beyond internships, this interviewee's workforce development program also provides students with opportunities to gain exposure to the industry by hosting farm tours, including bringing students out on the water.
- A few interviewees spoke of an effective partnership between several organizations in Maine (Educate Maine, FocusMaine, Maine Aquaculture Association, and the Maine Department of Labor) that launched and supports the [Aquaculture Pioneers Program](#).¹⁷ The program supports Maine's aquaculture industry by providing students with experiential learning opportunities at farms and hatcheries. Students who participate in the program can also receive internship credit through their high school or higher education institution and have the option to enroll in an official apprenticeship program after completing the Pioneers curriculum. Eligible students in the Pioneers Program are also able to receive stipends through the [Equity in Internships Program](#),¹⁸ aimed at supporting racial equity and experiential learning opportunities for students facing financial barriers to growing their career.
- One interviewee noted how the National Sea Grant Office is investing in aquaculture workforce development projects, having recently funded [\\$2.4 million in grants for such projects across seven states](#).¹⁹ Several of these projects have a DEI focus.

DEI PERSPECTIVES

As shared in our 2022 report, aquaculture DEI stakeholders note that engagement on workforce development issues often occurs within (rather than across) individual stages of the workforce pathway (see image below). This reality is a challenge to breaking down systemic DEI issues that span the entire pathway. Those who did have experience working across pathway stages shared that they saw clear benefits of creating those connection points, including providing support to diverse students to enter the aquaculture workforce.

¹⁵ Minorities in Aquaculture, "About Minorities in Aquaculture," accessed 22 November 2023, <https://www.mianpo.org/aboutmia>.

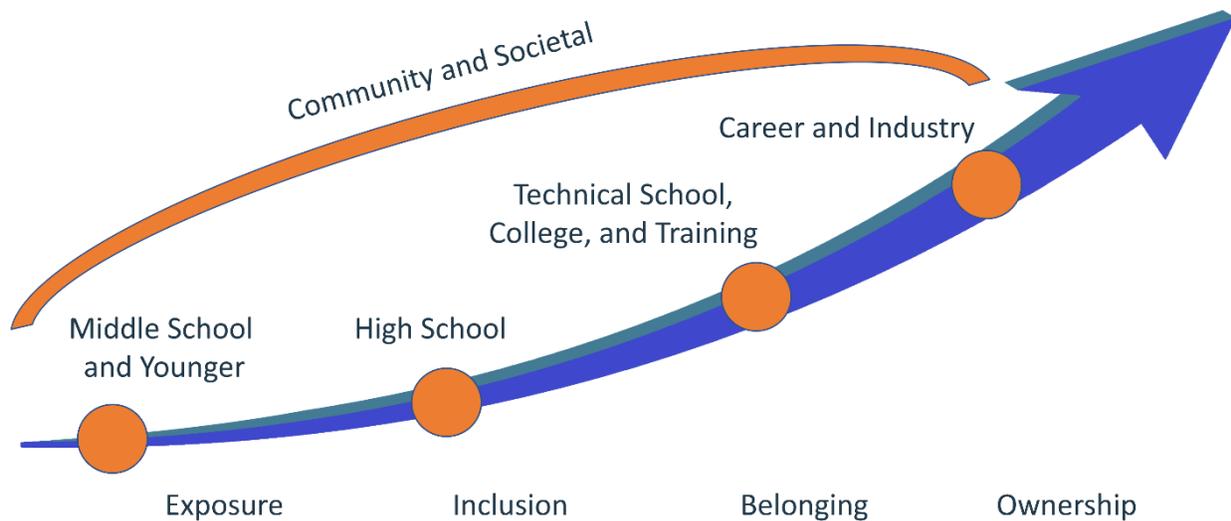
¹⁶ Minorities in Aquaculture, "Minorities in Aquaculture Champion Newsletter," 29 August 2023.

¹⁷ Maine Career Catalyst, "Aquaculture Pioneers," accessed 22 November 2023, <https://mainecareercatalyst.org/aquaculture-pioneers/>.

¹⁸ Maine Career Catalyst, "Equity in Internships Program," accessed 22 November 2023, <https://mainecareercatalyst.org/equity-in-internships/>.

¹⁹ NOAA Sea Grant, "Sea Grant Projects Provide \$3.3M in Support of Seafood Industry Workforce Development," 14 August 2023, accessed 22 November 2023, <https://seagrant.noaa.gov/sea-grant-projects-provide-33m-in-support-of-seafood-industry-workforce-development/>.

Aquaculture Workforce Pathway



Our 2022 report centralizes this figure to depict the different stages of the U.S. aquaculture workforce development pathway.

Aquaculture DEI stakeholders noted that co-ops and career and technical education programs are a particularly useful way to provide high school and college students with direct exposure to the aquaculture industry through apprenticeships and hands-on training — all integrated into their academic program. Such programs not only provide students with relevant skills and experiences that they may not have gained in the classroom, but they also benefit the industry by creating opportunities to strengthen the workforce that will eventually be contributing to the industry. DEI stakeholders also noted these programs provide both avenues for critical knowledge exchange between industry, colleges, and high schools, as well as a foundation on which further training program-industry partnerships can be built.

POTENTIAL BRIDGE TO MEET INDUSTRY AND DEI WORKFORCE DEVELOPMENT NEEDS

The perspectives noted above indicate alignment between industry and DEI stakeholders on the importance of making connections across the workforce pathway. There is thus the opportunity to build on that alignment by having these stakeholder groups connect and coordinate around increasing student engagement and rounding out partnerships that benefit both industry and DEI priorities.

A specific collaborative opportunity to meet shared goals would be to **formalize collaborations between industry and educational institutions** that: (a) **connect industry to students and schools** and maintain those connections over time, and (b) **engage a broad range of communities** to expand both student opportunities and the talent pool that contributes to the industry.

(2) BUILDING RELEVANT SKILLSETS THROUGHOUT THE WORKFORCE PATHWAY

Workforce development programs, as demonstrated in the Cedar Key case study (see box on pages 16-17), can be powerful tools to boost the growth of an industry. However, for such programs to work, they must provide students with the relevant skillsets that will set those students up for success upon joining the workforce. Additionally, workforce development programs can best contribute to industry by encouraging students to explore the breadth of opportunities available in the aquaculture sector beyond the aquaculture farm or production setting. **Industry and DEI stakeholders can collaborate to set up programs that cater to a wide range of skillsets and people, thereby meeting the broad labor needs of the aquaculture sector.**

INDUSTRY PERSPECTIVES

Many industry stakeholders we interviewed expressed that current aquaculture workforce development programs lack a broad view of all possible job opportunities that exist in the sector. According to interviewees, these programs are not training students with broad enough skillsets that would enable them to take any number of career paths in the U.S. aquaculture industry.

For instance, many interviewees described current workforce development programs as narrowly focused on building technical and scientific skills for specific jobs, such as hatchery work, rather than training comprehensively for skills needed to run a full aquaculture business, such as trade skills and business management skills. Furthermore, interviewees expressed concern that some aquaculture training programs are developing curricula for jobs that are not yet broadly available for students to transition into after graduation.

A few interviewees also noted that because most U.S. aquaculture operations are small-scale, family-owned farms, there is generally not much career mobility and growth for new hires, as management positions are often passed down to family members. Given this, interviewees noted, defining a pathway into management roles or operations ownership in the aquaculture industry may be limited — posing a large challenge for workforce development programs that tailor education to launch students into operations-specific work (save for students who can overcome market entry barriers to start and run their own farms).

Interviewees also expressed that aquaculture training programs need to support students in exploring the broad range of career options that the aquaculture industry has to offer. One interviewee spoke to a failed aquaculture training program that focused its curriculum specifically on managing aquaria. The interviewee noted that the program was not viable because it trained many students to work in a specialized subset of the field, but only a few of them were able to get placed in jobs post-graduation. To this interviewee, aquaculture training programs should instead be structured to maximize students' ability to land diverse opportunities in the sector. This includes, for instance, training students broadly enough that they can take on jobs in different locations (e.g., freshwater vs. marine operations).

Other interviewees noted that aquaculture training programs do not do enough to encourage students to consider jobs that *support* aquaculture operations. These interviewees noted that jobs that support the aquaculture sector but are adjacent to operations/farming are growing and can provide additional and potentially more attractive job opportunities for students that wish to contribute to the aquaculture industry without necessarily working in operations. Some examples of supporting sector jobs raised by interviewees include:

- **Regulatory Affairs** – For those who enjoy field-based work (e.g., being on the water), working in roles that provide regulatory oversight (e.g., public sector roles) can be more stable and financially secure, yet still involve regularly visiting operations and spending significant time on the water (e.g., carrying out water quality checks and safety inspections).
- **Seafood Supply Chain and Marketing** – Jobs in the seafood supply chain and seafood promotion are viable alternatives to those who do not wish to work on the water but are nonetheless energized by building resilient food systems and bolstering consumer interest in U.S. seafood.
- **Systems Design and Consulting** – More technically oriented trainees may find aquaculture farm systems design or working for a consulting firm that supports an aquaculture operation’s needs, such as genetics research, to be attractive career options.

For students that *are* interested in production work on a farm site, interviewees stated that aquaculture training programs should be realistic about what can and cannot be taught in the classroom. One interviewee, for instance, noted that even though they have worked in on-water operations for more than 25 years, they are still learning what best practices are by hands-on experience. As such, this interviewee noted that aquaculture training programs should invest in the aquaculture industry through apprenticeships.

DEI PERSPECTIVES

In our 2022 report, we learned that DEI stakeholders seek to expose diverse students to the breadth of the aquaculture industry early on in their academic careers, with the view that exposure will enhance underrepresented community representation across the industry broadly. DEI stakeholders note that there has been a historical lack of investment and engagement with diverse communities in U.S. aquaculture. These stakeholders say the lack of engagement with diverse communities is evidenced by the widely acknowledged (though still anecdotal) reality that both U.S. aquaculture industry leadership and the aquaculture workforce as a whole is less diverse than the U.S. population at large (see [Appendix A: Demographic Data Sources and Data Gathering Initiatives on the U.S. Aquaculture Industry](#) for a fuller discussion on demographic data).

Addressing these issues, DEI stakeholders note, requires not only intentional investment in diverse community engagement (i.e., greater *exposure* to the aquaculture field) but also broadened access and opportunities to develop skills and interests in aquaculture (i.e., greater *inclusion* in the aquaculture field) so that access to the industry is more equitable. Examples of broadening access to skill-building include enhancing aquaculture- and oceans-related content in school curricula, building aquaculture labs at high schools, and developing industry work opportunities for students.

POTENTIAL BRIDGE TO MEET INDUSTRY AND DEI WORKFORCE DEVELOPMENT NEEDS

Industry stakeholders and DEI stakeholders have distinct yet complementary perspectives on how to build relevant skillsets and broader access to the U.S. aquaculture industry. Industry stakeholders are keenly aware of the core competencies required to enter the workforce and the various roles that need to be filled across the industry. DEI stakeholders understand the different pathways to build a diverse workforce pool by providing exposure and skill-building opportunities related to the aquaculture industry throughout their academic careers.

These two perspectives connect well together, as industry stakeholders know what tools and knowledge need to be taught to the future workforce, and DEI stakeholders understand how to engage and include future workforce participants. Therefore, there is a clear opportunity to bring both stakeholder groups together to collaborate on efforts that develop diverse skillsets among a diverse pool of students.

that is inclusive of all communities interested in joining the aquaculture industry.

A specific collaborative opportunity to meet shared goals would be to **co-design workforce development pathways** that: (a) **broaden workforce development pathways** through strategic student, school, and community engagement with diverse audiences, including investment in educational curricula design, and (b) **focus on practical skills-building to meet the range of industry needs** (e.g., accounting for the broad range of jobs in the industry, technical and management skillsets, freshwater and marine locations).

(3) GATHERING AND MAINTAINING AQUACULTURE-SPECIFIC DEMOGRAPHIC DATA

Comprehensive demographic data can be a valuable tool in promoting the growth of the U.S. aquaculture industry. It can help industry representatives better assess the recruitment market, provide insights on trends in the student-to-workforce transition, and identify opportunities for expanding the workforce to include a diverse pool of industry contributors. However, in the U.S., the aquaculture sector faces challenges collecting comprehensive demographic data. **Industry and DEI stakeholders can collectively invest in demographic data collection to acquire critical information and increase industry participation.**

INDUSTRY PERSPECTIVES

As mentioned earlier in this report, there are no processes in place to collect industry-wide demographic data, and many in the industry are reluctant to do so. Operations owners are both capacity-constrained and focused on keeping operations afloat – making data collection a deprioritized activity unless tied to grant funding or government-mandated reporting. Based on conversations with our interviewees, we generally heard three industry perspectives related to collecting demographic data:

- **Small aquaculture operations are not focused on data collection**, as day-to-day management of their farms takes up a considerable amount of time, effort, and energy already. As such, collecting data is seen as an added burden. When it comes to demographic data, small operations see little benefit in gathering insights about the few people that make up their staff roster.
- **Large aquaculture operations have an interest in workforce demographic data, given their needs to fill many job positions in a challenging recruitment market**, but they may not always collect it. Large operations that collect data tend to be those that are publicly traded (and thus have annual reporting practices) and those that have DEI hiring and workforce targets they are trying to reach.
- **Industry groups and other industry support organizations hold the greatest interest in demographic data collection efforts, given that their work relies on leveraging data to develop strategies for industry growth** — and, in some cases, reporting data to secure funding to implement those strategies (e.g., workforce development programs). These organizations often hold a “bigger picture” view of the industry, as they focus more on supporting enabling conditions

for industry growth and success rather than being beholden to profits as a bottom-line consideration.

Despite small operations holding less of an interest on demographic data, the views of large operations and industry support organizations indicate that there are indeed benefits realized when demographic data is collected.

DEI PERSPECTIVES

As noted in our 2022 report, DEI stakeholders believe that generating and curating accurate demographic data on the U.S. aquaculture workforce is essential to enhancing aquaculture DEI. Such data can provide a baseline understanding (and metric) from which the industry can track and measure changes in workforce representation over time. Demographic data can also help justify the need for and assess the impact of interventional DEI workforce initiatives. If such data is granular enough — for instance, demographic data collected for both aquaculture training programs and the aquaculture industry at large — DEI stakeholders noted that it may be possible to identify differences in representation at different stages along the workforce pathway and within the industry itself (e.g., demographic differences between the entire U.S. aquaculture workforce and those in industry leadership positions).

POTENTIAL BRIDGE TO MEET INDUSTRY AND DEI WORKFORCE DEVELOPMENT NEEDS

Industry stakeholders struggle to cohesively collect demographic data, yet there remains interest in having such data to recruit strategically and to implement strategies for workforce development. Similarly, DEI stakeholders also desire to have demographic data to pinpoint DEI challenges that exist in the industry (e.g., workforce diversity gaps) and to make the case that DEI can foster and grow industry representation. As both stakeholder groups share an interest in collecting demographic data, they can work together to gather data that meets both industry and DEI priorities.

A specific opportunity to meet shared goals would be to collectively **advocate for, invest in, and collaborate on comprehensive demographic data gathering for the U.S. aquaculture sector**. This includes **collecting data on both trainees and the existing workforce**, information that both industry and DEI stakeholders would find valuable to assess the conversion individuals from student trainees to industry participants. Collaboration has the potential to both **alleviate capacity constraints for data collection** and **provide all stakeholders with metrics needed to target workforce development efforts** that grow the workforce and increase industry representation.

Conclusion

The domestic aquaculture sector is actively working to expand and secure a vibrant industry for the future. Part of this process has involved tackling workforce development to ensure the sector has the support it needs in the long term. This has included considering the need for building a broad, diverse array of contributors to support industry growth and innovation.

To better understand these considerations, we examined two elements that aquaculture DEI stakeholders identified as relevant to U.S. aquaculture workforce development: (1) the perceived lack of available aquaculture sector demographic data, and (2) how the U.S. aquaculture industry views DEI. By exploring these areas, we discovered that not only do aquaculture industry and aquaculture DEI stakeholders share common workforce development needs, but also such commonality reveals opportunities for these stakeholder groups to work together to meet those shared needs.

In all, gathering and cross synthesizing stakeholder perspectives unveils both a deeper understanding of the U.S. industry's workforce development challenges as well as the potential for industry and DEI stakeholders to collectively maximize impact on the industry's workforce. A natural next step may be for the U.S. aquaculture sector and key partners to draw on the knowledge presented here and pursue initiatives that "bridge" industry and DEI workforce needs.

It bears re-emphasizing that this report is not intended to be a comprehensive compilation of all issues related to aquaculture workforce development or DEI, nor should it be considered an authoritative, prescriptive, or consensus document. However, the stakeholder insights presented in this report — along with those from our 2022 report — speak to the promise of collective approaches to address workforce development challenges head on.

Appendix A: Demographic Data Sources and Data Gathering Initiatives on the U.S. Aquaculture Industry

As noted earlier in this report, Meridian Institute carried out desktop research to identify both existing demographic data and demographic data collection efforts that provide details on the makeup of the U.S. aquaculture sector workforce. Our research findings are noted below. Table 1 and Table 2 provide an “at a glance” view of the information collected, with additional details provided below the tables. Where possible, and if permission was granted, we attributed these data sources and data gathering initiatives to the owners of such data.

Note: The information provided in this appendix is likely not comprehensive of all demographic data sources and data collection efforts on the U.S. aquaculture sector. However, given sentiments raised by U.S. aquaculture stakeholders with whom we’ve spoken over the years — that finding even limited domestic demographic data is challenging — we felt that publishing this data, even if incomplete, was still merited.

TABLE 1. AT A GLANCE: DEMOGRAPHIC DATA SOURCES ON THE U.S. AQUACULTURE SECTOR

Age = **A** Gender = **G** Race/Ethnicity = **R/E**

SOURCE	MAJOR INDICATORS	OTHER INDICATORS	NOTES
IBISWorld	Unknown	Unknown	IBISWorld tracks U.S. Fish & Seafood Aquaculture data, including statistics on employment and wages. A paid account is required to access both raw and analyzed data. Not having this access, Meridian was unable to determine the granularity of demographic information that IBISWorld collects.
Publicly Traded Companies	A, G, R/E (varies by company)	Varies by company	Information shared at the 2022 and 2023 Women in North American Aquaculture Summit (and during our interviews) indicate that some publicly traded companies collect demographic data about their own workforce as part of the annual reporting procedures.

SOURCE	MAJOR INDICATORS	OTHER INDICATORS	NOTES
Shellfish Aquaculture Industry Demographic Survey	A, G, R/E	N/A	A 2020 survey, targeting the shellfish aquaculture industry in coastal U.S. states, asked participants to provide information on specific demographics, among other questions related to production.
U.S. Department of Agriculture – Census of Agriculture	A, G, R/E	N/A	The latest Census of Agriculture (from 2017) contains information at the farm level, with limited details on the demographics of farm decision-makers. Some insights can be parsed from broader data.
U.S. Department of Labor – Bureau of Labor Statistics	N/A	N/A	The Bureau collects occupational employment and wage statistics for Farmworkers, Farm, Ranch, and Aquacultural Animals. However, the available data does not differentiate between agriculture and aquaculture farms. Additionally, no granular demographic data is collected about those employed on farms.

TABLE 2. AT A GLANCE: DEMOGRAPHIC DATA GATHERING INITIATIVES IN THE U.S. AQUACULTURE SECTOR

Age = A Gender = G Race/Ethnicity = R/E

SOURCE	MAJOR INDICATORS	OTHER INDICATORS	NOTES
Educate Maine	A, G, R/E	First-Generation College Student	Demographic data is collected from students and other participants engaged in Educate Maine-supported apprenticeship and internship programs on aquaculture.
Maine Aquaculture Association (MAA)	TBD	TBD	An upcoming MAA study looks to gather sociodemographic data that accounts for both leaseholders and farmhands working on aquaculture operations in Maine.
Minorities in Aquaculture (MIA) 2023 Census	A, G, R/E	Sexual Orientation	With support from The Pew Charitable Trusts, MIA is analyzing demographic data collected through a voluntary census. The census

SOURCE	MAJOR INDICATORS	OTHER INDICATORS	NOTES
			also gathered qualitative data focused on perceived barriers, challenges, and opportunities in the U.S. aquaculture sector.
2023 National Sea Grant Aquaculture Workforce Development Projects	A, G, R/E (varies by project)	Education, Languages Spoken, Disability (varies by project)	At least two of the seven funded projects look to collect demographic data to support their work. The Connecticut Sea Grant project, for instance, includes a statewide industry survey that looks to gather demographic information on the broader industry workforce (i.e., not just leaseholders).
United States Aquaculture Society (USAS)	A, G, R/E	N/A	USAS’s Diversity and Inclusion Committee is leading an effort to collect demographic data from participants who will be attending the Aquaculture America 2024 conference
Women of the Water	A, R/E	Geography, Student Status, Stakeholder Group Affiliation	Women of the Water collected demographic data from participants who attended their 2023 conference and plans to publish overall demographic data outputs, as well as cross-tabulation results.
Other	TBD	TBD	An environmental NGO active in the U.S. aquaculture space is working on a socioeconomic study that will include interviews with individuals who started their own aquaculture farms. The NGO is hoping to speak with farm owners about the makeup of their workforce and how they went about workforce recruitment.

Below is a non-exhaustive list and breakdown of demographic data sources and data gathering initiatives we identified around the U.S. aquaculture sector.

DEMOGRAPHIC DATA SOURCES ON THE U.S. AQUACULTURE SECTOR

Meridian identified five sources of demographic data on the U.S. aquaculture sector.

- **IBISWorld**

- IBISWorld is an industry research company that analyzes economic, demographic, and market data to create insights that support organizations across thousands of industries.
- IBISWorld has a [“Fish & Seafood Aquaculture in the US” dataset](#),²⁰ that encompasses data on industry performance, products and markets, geographic breakdown, companies and competitive forces, external environment, and financial benchmarks. The dataset also includes key statistics on employment and wages.
- A paid account is required to access both raw and analyzed data.
 - Not having this access, Meridian was unable to determine the granularity of demographic information that IBISWorld collects.
 - Meridian was, however, able to obtain a sample report from another industry. In this report, employment and wage information does not have cross-sectional demographic data, providing no information on age, gender, or race/ethnicity.

- **Publicly Traded Companies**

- Information shared at the [2022](#)²¹ and [2023 Women in North American Aquaculture Summit](#)²² (and insights shared through our interviews) indicate that some publicly traded companies collect demographic data about their own workforce as part of annual reporting procedures.
- Such data collection efforts are often linked to company-wide diversity and inclusion policies and targets (e.g., 30% female leadership by 2025, 50/50 male-to-female ratio in the overall workforce).
- Most aquaculture companies that collect and publicly disclose such information are larger organizations based in Canada (e.g., [MOWI](#)).²³

- **Shellfish Aquaculture Industry Demographic Survey**

- In the fall of 2020, Adriane Michaelis and Bill Walton (then with Auburn University, currently with the Virginia Institute of Marine Science, College of William & Mary) administered an online survey targeting the shellfish aquaculture industry in all coastal U.S. states.
- The anonymous survey was distributed through industry associations, local extension specialists, state resource managers, and directly to growers and asked participants to provide

²⁰ IBISWorld, “Fish & Seafood Aquaculture in the US - Market Size, Industry Analysis, Trends and Forecasts (2024-2029),” accessed 8 January 2024, <https://www.ibisworld.com/united-states/market-research-reports/fish-seafood-aquaculture-industry/#IndustryStatisticsAndTrends>.

²¹ Aquaculture North America, “Women in North American Aquaculture Summit 2022,” accessed 22 November 2023, <https://www.aquaculturenorthamerica.com/virtual-events/women-in-north-american-aquaculture>.

²² Aquaculture North America, “Women in North American Aquaculture Summit 2023,” accessed 22 November 2023, <https://www.aquaculturenorthamerica.com/virtual-events/women-in-north-american-aquaculture-summit-2023>.

²³ MOWI, “Reports,” accessed 22 November 2023, <https://mowi.com/investors/reports>.

information on general demographics (age, gender, race, and ethnicity), the state they work in, how they work with shellfish, and what types of shellfish they worked with.

- The survey received 388 completed responses, representing 22 states — possibly the largest known demographic dataset of shellfish growers in the U.S.
 - The majority of respondents were farm owners (rather than distributors, farm employees, gear/equipment manufacturers, or hatchery employees) who primarily worked with oysters. As such, the dataset is more representative of oyster farm owners rather than the industry broadly.
 - Seventy-four percent of respondents were male, with ages were distributed between 40 and 79 years of age.
 - Over 350 respondents selected white/Caucasian as their race (four denoted an additional race) and a similar number of respondents indicated that they were not Hispanic or Latino.
 - The data is currently unpublished, but the research team plans to prepare a more detailed summary of findings in the coming months.
- **United States Department of Agriculture (USDA)** – USDA has two federal-level datasets that provide information on domestic aquaculture: The Census of Agriculture and the Census of Aquaculture. USDA has historically carried out these censuses every five to eight years.
 - **Census of Agriculture**²⁴ – The USDA compiles this dataset to provide a “complete count of U.S. farms and ranches and the people that operate them.” The latest Census, compiled in 2017, contains information at the farm level, with limited details on the demographics of farm decision-makers. Some demographic trends can, however, be parsed out from broader data. For instance:
 - According to the 2017 USDA Census of Agriculture, 42% of aquaculture farms had female decision-makers. This calculated percentage comes from the 5,350 aquaculture farms that responded to the Census of Agriculture and a reported 2,256 farms that have female producers. However, it should be noted that the Census only collected demographic data for up to four producers maximum per farm, and there is no cross-section between race, age, or other demographic criteria.
 - While specific data on aquaculture farms are limited, for U.S. agriculture in general, women tend to be younger and more likely to be beginning farmers than men. Women are also more likely to have another job as their primary occupation.
 - Female-operated farms in the U.S. tend to have fewer sales and receive fewer government payments than farms operated by men. Farm decision-making overall falls to a larger percentage of men than women.
 - Overall, for both agriculture and aquaculture, female-operated farms (with one or more women in management positions) make up 56% of total farming operations in the U.S., compared to 91% of farms with one or more male operators.

²⁴ U.S. Department of Agriculture, National Agricultural Statistics Service, “Census of Agriculture,” accessed 22 November 2023, <https://www.nass.usda.gov/AgCensus>.

- [Census of Aquaculture](#)²⁵ – The USDA created this dataset to expand on information collected in the Census of Agriculture, providing a picture of the aquaculture sectors at both the state and national levels. The latest Census, compiled in 2018, focuses solely on production-related information (production volume and methods; surface water acres and sources; sales; and types of aquaculture product distributed for restoration, conservation, enhancement, or recreational purposes), with no workforce or demographic data provided. A 2023 census is underway, as of December 2023, though USDA does not appear to be collecting any demographic data.²⁶
- **United States Department of Labor, Bureau of Labor Statistics**
 - The Bureau of Labor Statistics is a federal-level agency that leads fact-finding in the field of labor economics and statistics, collecting, calculating, analyzing, and publishing data for the public, employers, researchers, and government organizations. Sector-specific data is updated approximately once per year.
 - The Bureau collects [Occupational Employment and Wage Statistics for the “Farmworkers, Farm, Ranch, and Aquacultural Animals” sector](#),²⁷ including employment and wage values, both nationally and by state. However, the available data does not differentiate between agriculture farms and aquaculture farms. Additionally, no granular demographic data is collected about those employed to work on farms.

DEMOGRAPHIC DATA GATHERING INITIATIVES IN THE U.S. AQUACULTURE SECTOR

Meridian identified seven demographic data gathering initiatives relevant to the U.S. aquaculture sector.

- **Educate Maine**
 - Educate Maine is a business-led, education advocacy organization that advances education policies and practices that prepare Maine students to be productive, engaged citizens. Among its many initiatives, the organization facilitates apprenticeship and internship programs that support students’ ability to equitably experience the aquaculture industry in Maine.
 - Educate Maine collects demographic data on students and other participants in their programs. Data collected includes race/ethnicity, gender identity, age, and whether the person is a first-generation college student. Educate Maine also collects supportive data, such as students’ plans following participation in the program (high school, 2-year degree, 4-year degree, workforce), whether they receive financial aid (if in college), and whether they are originally from (and/or plan to leave) Maine for school or work.

²⁵ U.S. Department of Agriculture, National Agricultural Statistics Service, “Surveys: Census of Aquaculture,” accessed 22 November 2023, https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Census_of_Aquaculture/index.php.

²⁶ U.S. Department of Agriculture, National Agricultural Statistics Service, “USDA to conduct the 2023 Census of Aquaculture,” accessed 4 December 2023, <https://www.nass.usda.gov/Newsroom/2023/12-04-2023.php>.

²⁷ U.S. Department of Labor, Bureau of Labor Statistics, “Occupational Employment and Wages, May 2022: 45-2093 Farmworkers, Farm, Ranch, and Aquacultural Animals,” accessed 22 November 2023, <https://www.bls.gov/oes/current/oes452093.htm>.

- **Maine Aquaculture Association (MAA)**
 - MAA is a non-profit trade association that represents Maine aquaculture (finfish, shellfish, sea vegetables) at the state, federal, and international levels.
 - Over the next few years, MAA will be developing an updated aquaculture economic impact report for the state, including information on both production data (landings and revenue) and sociodemographic data (specifically information that accounts for both leaseholders and farmhands working on operations in Maine).
- **Minorities in Aquaculture (MIA) 2023 Census**
 - MIA is a non-profit that seeks to educate and train minority women in aquaculture to promote a more diverse and inclusive aquaculture industry.
 - As of the publishing of this report, MIA (with funding support from The Pew Charitable Trusts) is gathering and analyzing demographic data collected through voluntary census. The census gathered over 140 submissions from women, women of color, and the LGBTQIA+ individuals working in U.S. aquaculture.²⁸
 - The census requested disclosure of certain demographic data (age, gender, race, ethnicity, and sexual orientation). The census also gathered qualitative data focused on the experiences of census respondents, including perceived barriers, challenges, and opportunities in the sector.
 - MIA plans to publish their census findings by early 2024.
- **National Sea Grant Aquaculture Workforce Development Projects**
 - In August 2023, the National Sea Grant Office announced \$3.3 million in funding for seafood industry workforce development initiatives across the country, including seven aquaculture-specific initiatives in California, Connecticut, Hawai'i, Massachusetts, New Jersey, South Carolina, and Washington state.
 - At least two of these initiatives look to collect demographic data to support their work. The Connecticut Sea Grant project, for instance, includes a workforce development needs assessment. This needs assessment involves surveying the aquaculture industry currently operating in the state. The survey will collect demographic data on the industry's workforce (not just leaseholders), including information about gender, ethnicity, age, education, languages spoken, disabilities.
- **United States Aquaculture Society (USAS)**
 - USAS is a professional organization that facilitates the exchange of information and networking among aquaculture researchers, students, and industry members interested in advancing the aquaculture industry in the U.S.

²⁸ Minorities in Aquaculture, "2023 Annual Report" (Minorities in Aquaculture, 2023), https://issuu.com/minoritiesinaquaculture/docs/2023annualreport_final.

- USAS's Diversity and Inclusion Committee is leading an effort to collect demographic data from participants who will be attending the Aquaculture America 2024 conference, including information about gender, ethnicity, race, and age.
- **Women of the Water**
 - Women of the Water is a collaborative network of women and gender minorities in U.S. aquaculture that hosts an annual conference to uplift diverse voices in the industry.
 - The conference organizers collected demographic data from participants who attended their 2023 conference, including age, race, geography, student status, and stakeholder group affiliation (academia and research; education, outreach, and extension; farmers, producers, and other industry members; management, regulation, policy, or government; and communications, marketing, and other media).
 - Women of the Water plans to publish overall demographic data outputs, as well as cross-tabulation results between different categories of data, in a future publication.
- **Other** – An environmental NGO active in the U.S. aquaculture space plans to conduct a socioeconomic study over the next 6 months, which will include interviews with individuals who started their own aquaculture farms. This NGO is hoping to speak with farm owners about the makeup of their workforce and how they went about workforce recruitment.