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Cultivating Equity: Women's Experiences and Needs in Maine's Aquaculture Industry

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CULTIVATING EQUITY: WOMEN'S EXPERIENCES AND NEEDS IN MAINE'S AQUACULTURE INDUSTRY

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An Abstract of the Thesis Presented
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Women have historically played major roles in seafood production globally, both directly as harvesters and indirectly as support systems for harvesters. Recent studies have revealed that women are the minority gender in Maine's aquaculture industry, and they experience barriers related to their gender. Until recently, aquaculture training courses in Maine have not sufficiently acknowledged the different needs of different genders. This master's thesis aims to better understand the experiences and perceptions of women in the aquaculture industry, as well as the needs of women in aquaculture training programs. Researchers conducted semi-structured interviews with women who previously took the Aquaculture in Shared Waters (AQSW) training program and used thematic analysis to analyze the generated data.

Chapter 2 examines the experiences and perceptions of women enrolled in the AQSW training program. Participants described their motivations for pursuing a career in aquaculture in addition to barriers they perceived. This study found that women's backgrounds and experiences, including their connection to commercial fishing or parental status, were significant factors in their abilities to pursue aquaculture. While many participants enjoyed the AQSW program, some expressed frustration that the course did not accommodate the different needs of men and women.

Chapter 3 focuses on assessing the needs of women in aquaculture training programs based on participants' recommendations for a women-only programming. Some participants described not wanting a women-focused aquaculture training program, either because they felt it did not meet their personal needs or because they feared separating men and women would lead to further inequality. However, participants who did want a women's focused program described wanting a gender-responsive program that takes into consideration the unique needs of women. The content participants most wanted to see included lessons on safety skills, hands-on technical skills, and women-specific business skills. Participants also discussed wanting avenues for connecting and forming social networks with other women in aquaculture, and they recommended structural features they would want to see in a potential women-specific program. Results from this research were used to inform the design of the 2024 Aquaculture in Shared Waters: Women in Aquaculture Series.

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CHAPTER 1. INTRODUCTION

Women have historically played major roles in seafood production globally, both directly as harvesters and indirectly as support systems for harvesters (e.g., in the role of bookkeeping or marketing).[1] The FAO (2022) estimates that women make up half of the overall workforce in fisheries and aquaculture industries globally, and women are heavily represented in the seafood processing sector. Since characterizations of fisheries typically center around the act of fishing, with nets and boats, women have been excluded from being viewed as active participants in fisheries. Globally, women indirectly contribute to fisheries by taking on support roles for their fishing husbands and family members. By raising children, marketing fish, and bookkeeping, wives support their husbands' ability to fish. These contributions, while important to the functioning of marine fisheries, are in large part overlooked and unpaid labor (Harper et al., 2013), and women who are directly employed in seafood production industries disproportionately work in the lowest value sectors (FAO, 2022). Even though fisheries have been traditionally viewed as male-dominated industries, Weeratunge et al. (2010) argues that there may be more women than men employed in fisheries given the disproportionate number of women in post-processing and marketing roles globally.

[1] Gender is a complex social construct that is difficult to define. Gender is often considered in a binary system, with two options: male and female. The binary system not only ignores the biological diversity of human gender, including intersex people, but also ignores the social diversity of individuals who self-identify outside of the binary (Lindqvist et al., 2021). Especially in medical contexts, sex is usually used to describe physical and anatomical characteristics, while gender is used to describe the complex interlinking constructs of gender identity and expression: how an individual views themselves and how an individual signals their gender to others. The dominant ideology of the gender binary is heavily influenced by Western and Eurocentric ideals of gender, with many other cultures having long histories of identity categories outside the binary. A transgender individual is one whose gender identity is different from what sex they were assigned at birth, while a cisgender individual identifies with the sex they were assigned at birth (Bates et al., 2022). For the purposes of this study, the term 'woman' or 'female' refers to those who self-identify as such and could include both transgender and cisgender women.

While research on the role of gender in seafood production industries has been extensive in other regions, research on the role of women in the U.S. and Canada is extremely limited (Harper et al., 2013). Much of the research that does exist on women's participation in seafood production in the U.S. and Canada focuses on historical participation of women in wild-capture fisheries, such as drying and salting cod (Keough, 2012) and work as packers and fish processors (Bavington et al., 2004). In some communities in the northeastern U.S., fishers' wives were the bookkeepers of the family business, tracking expenses such as gas, crew, and food while monitoring profits. In Gloucester, Massachusetts, wives took on an advocacy role with the creation of the Gloucester Fishermen's Wives Association in 1969, which is credited with helping pass the Magnuson-Stevens Fishery Conservation and Management Act in 1976 as well as introducing healthcare initiatives for Gloucester fishermen. Fishers' wives also often attended fishery council meetings and advocated for the fishery, arguing that regulations were too stringent (Hall-Arber, 1996).

While many women have played supportive roles in fishing communities, there have been women that defied gender norms and participated directly in fishing and maritime industries. Kaplan (1988) interviewed 18 female commercial fishers in the Northeast U.S. to understand their reasoning behind joining such a male-dominated field. The women interviewed felt that once they had paid their dues and proven themselves to be hard workers, most male fishermen accepted them. Participants did note that some male fishermen, particularly older men, believed that women did not belong on the water and should not fish, and no amount of hard work could convince them otherwise (Kaplan, 1988).

The United Nations (UN) has set ambitious sustainable development goals (SDGs) determined to address global development challenges including poverty, climate change, global

conflict, and inequalities, all of which will not be achieved without the advancements of gender equality and increased women's rights worldwide (UN Women, 2018). The Food and Agriculture Organization of the United Nations (FAO) has set four objectives for gender equality in fisheries and aquaculture, which include: 1) all genders have equal voice and decision making power, 2) all genders have equal rights and access to natural resources, 3) all genders have equal rights and access to services, markets, and decent work, and 4) women's disproportionate work burden is addressed and equal distribution of labor, including household labor, is promoted (FAO, 2022). However, the FAO (2022) acknowledges that one of the biggest challenges to achieving these goals is the lack of data on women's participation in seafood production sectors. As government agencies globally are not collecting demographic data from fisheries and aquaculture participants, there is no way to accurately quantify the number of women working in seafood production sectors worldwide (FAO, 2022). Other data gaps exist too, most notably place-based understandings of women's roles in seafood production. For example, women's experiences in Africa will likely have very little in common with women's experiences in Maine due to different social and cultural contexts (Harper et al., 2013). Given the place-based, social, and cultural complexities of aquaculture, researchers have called for aquaculture policies that put human and social dimensions at the forefront, instead of just being included as an afterthought (Brugere et al., 2023). Though the lack of quantitative data is a serious issue, regulators need to be equipped to utilize qualitative data, which are often not incorporated into policy (Harper et al., 2013). Acknowledging the intersecting identities of aquaculture actors and creating policies and programs that are responsive to the needs of diverse populations is crucial for advancing diversity, equity, inclusion, justice, and accessibility (DEIJA) in the aquaculture industry (Brugere et al., 2023).

The substantive equality framework, developed by Fredman (2016), is characterized by four dimensions, all of equal importance: 1) redressing disadvantage, 2) redressing stigma, stereotyping, and humiliation, 3) enhancing participation, social inclusion, and expression, and 4) accommodating difference through structural change. The substantive equality framework does not claim that human differences should not exist, but rather that those differences should not result in differential treatment (Fredman, 2016). Fredman (2016) states: "the aim should not be to eliminate difference, but to prohibit the detriment attached to such difference, preferably adjusting existing norms to accommodate difference" (720).

The first dimension of substantive equality, redressing disadvantage, involves removing barriers to genuine choice for disadvantaged peoples. Redressing stigma, stereotyping, and humiliation is the "dimension of equality that speaks to our basic humanity…. Individuals should not be humiliated or degraded through racism, sexism, violence, or other status-based prejudice" (Fredman, 2016, 730). Enhancing participation, social inclusion, and expression is the dimension that allows for equal participation of all people in communities and political processes. The fourth dimension, accommodating difference and structural change, aims to dismantle structures that ignore markers of identity, and instead create systems that accommodate the different needs of different people (Fredman, 2016). Fredman (2016) argues that one dimension can't take priority over another, and that they should be considered as a whole. When discussing the framework's potentially transformative capabilities, Fredman (2016) writes:

> The status quo, without legal intervention, requires the out-group to bear the full cost: women bear the cost of child-bearing and childcare; disabled people bear the cost of disability; and ethnic minorities bear the cost of their own cultural or religious commitments…. At the same time, little notice is taken of the fact that society does bear

> the cost of the specific characteristics of dominant groups, be they male, ablebodied, or in the ethnic majority. Working time, the built environment, or religious or cultural holidays and dress already cater for the dominant groups. Substantive equality aims to redistribute these costs in ways which are fairer to all. (734)

While the substantive equality framework was originally described to be used in the context of human rights law (Fredman, 2016), Brugere et al. (2023) argue that the substantive equality framework can be used to facilitate "a renewed human relationship with aquaculture" (505). Brugere et al. (2023) state that the substantive equality framework could not only be used as a transformative ideal in the aquaculture industry to promote justice and equity, but also can be used as a practical tool for those wishing to implement ethical and responsible practices in the industry.

This thesis considers the substantive equality framework to examine gender inequity in Maine's shellfish and seaweed aquaculture industry. Maine's shellfish and seaweed aquaculture industry offers Maine residents an opportunity to work on the water (Johnson, 2020),[2] including commercial fishers (Cleaver et al., 2018). However, gender inequity in Maine's aquaculture industry has emerged in recent studies (Lord, 2022; McClenachan and Moulton, 2022).[3] In Maine and New Hampshire, female oyster farmers identified training opportunities as a barrier to

[2] Aquaculture refers to the cultivation of organisms in aquatic environments for scientific, educational, recreational, or commercial purposes, including finfish, crustaceans, molluscs, and algae that are utilized for human consumption, pharmaceuticals, cosmetics, animal feed, and other purposes (FAO, 2022)

[3] McClenachan and Moulton (2022) used publicly available lease and license data to determine the number of women involved in Maine's lobster fishery and non-fed aquaculture industry. They also interviewed 14 women in Maine's aquaculture industry and lobster fishery to identify women's perceptions on the working waterfront (McClenachan and Moulton, 2022). Lord (2022) surveyed thirty-nine male and female oyster farmers in Maine and New Hampshire to identify opportunities and barriers in aquaculture. Lord (2022) also used a photovoice methodology to gain deeper insight into the experiences of four women oyster farmers (Lord, 2022).

their success (Lord, 2022). Women reported feeling alienated in aquaculture training programs as they were often the only woman in the class, and they also reported feeling that the training programs focus on business growth and operations expansion misaligned with their goals and resulted in individuals feeling out of place (Lord, 2022). Based on this information, there is room for improvement in making aquaculture training programs more accessible. As a growing industry in Maine, aquaculture is uniquely positioned to engage a wide array of groups. Understanding barriers to women in the industry and improving training programs with that information could help to encourage women to pursue aquaculture, thereby increasing small businesses in Maine and supporting working waterfronts. Though improvements in the DEIJA of the industry are a top priority for relevant parties in Maine's aquaculture industry, the lack of information about the barriers women and other underrepresented groups experience and how training programs can improve to meet women's needs holds the industry back (Sadusky et al., 2022).

In 2022, the Maine Aquaculture Roadmap was developed through focus groups of diverse relevant parties in Maine, including representatives working in aquaculture, wild capture commercial fishing, regulation, academia, and non-profit organizations (Sadusky et al., 2022). To make Maine a leader in triple bottom line sustainable aquaculture, which includes social, economic, and environmental sustainability, the roadmap identifies an action item under this goal to "Build on workforce training, including diversity, equity, and inclusion" (Sadusky et al., 2022, 25).

While there are numerous aquaculture workforce development training programs in Maine, the longest running program in the state is Aquaculture in Shared Waters (AQSW). This free training course has been offered in Maine through a collaboration between Maine Sea Grant,

Maine Aquaculture Association, Coastal Enterprises Inc., the Maine Aquaculture Innovation Center, and the University of Maine since 2013 (Johnson and Veo, 2023). The original goal of the program was to provide aquaculture training to commercial fishermen so they could diversify their businesses (Cleaver et al., 2018; Pianka, 2016). Now, the program serves a broad group of coastal Maine residents, including those without fishing experience. The course typically runs for 8-12 weeks and covers topics such as permitting, regulations, site selection, equipment, operations best practices, biosecurity, public health, marketing, and business planning. The program covers growing information for commercially valuable, non-fed aquaculture species, including oysters, mussels, scallops, and kelp. The course has a core group of instructors from its collaborating organizations, as well as guest speakers from organizations such as the Maine Department of Marine Resources and the University of Maine. Additionally, established farmers speak to the course about their experiences from beginning their aquaculture business to marketing products.

To reach a broad audience, AQSW has been offered in different towns on the coast of Maine each year, including Corea, Harpswell, Brunswick, Thomaston, Ellsworth, Bath, Machias, and Belfast. Due to the COVID-19 pandemic, the 2021 course was entirely virtual, while the 2023 course was offered in a hybrid format with both an in-person option in Belfast and a virtual option through Zoom. In 2022, AQSW 2.0 was offered for the first time as a series of workshops aimed to provide advanced training for existing farmers and those who have already taken the original AQSW course and focuses on providing information for existing aquaculture businesses to expand their operations.

Though the AQSW program has served hundreds of Maine residents interested in pursuing or learning more about aquaculture, the program has mostly served men (Figure 1). In

every course offered, women have been the minority gender, excluding the 2020 Belfast course, in which ten men and ten women attended. In other years, female attendance ranged from 0% to as high as 39% (Johnson and Veo, 2023).

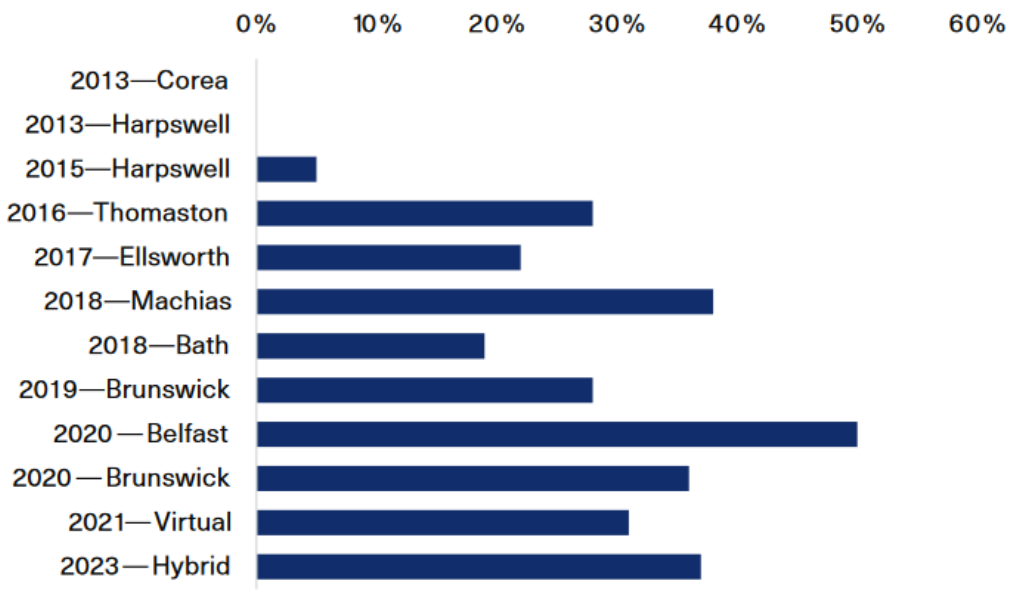

Figure 1. Proportion of women attending the Aquaculture in Shared Waters program from 2013 to 2023. Figure from Johnson and Veo (2023).

1.2. Research Questions

To address the gaps in our understanding of women's experiences in Maine's aquaculture industry, this project explores the following question: "What is it like to be a woman in Maine's aquaculture industry, and how can training programs adjust to meet their needs?" To address this broad research question, the project explored the following research questions (RQ):

RQ1 (Chapter 2): What are the experiences and perceptions of women in the working waterfront and in aquaculture training programs according to former AQSW students?

RQ2 (Chapter 3): How can aquaculture training programs be improved to address women's needs?

1.3. Methodology

1.3.1. Study Site

Once reliant on a diverse fishing fleet, Maine's fishing economy is now dependent on the American lobster fishery (Johnson, 2020). In 2023, lobster accounted for 76% of Maine's commercial fish landings by value, representing approximately $464 million (Maine DMR, 2024d). Threats to the fishery include climate change (Johnson, 2020), graying of the fleet (Johnson and Mazur, 2018), gentrification (Thompson et al., 2016), and youth outmigration (Beals, 2020), which all put the fishery's social and ecological resilience at risk. Considering these numerous threats and uncertainties to Maine's most lucrative fishery, shellfish and seaweed aquaculture represents an opportunity for Maine residents to work on the water in an emerging and environmentally sustainable industry (Johnson, 2020).

Organisms cultivated in Maine's aquaculture industry include finfish (e.g., salmon), shellfish (e.g., oysters and mussels), and sea vegetables (e.g., kelp) (Bricknell et al., 2021). In 2023, farmed mussels, oysters, scallops, and seaweed landings totaled approximately $16.5 million USD in the state of Maine (Maine DMR, 2024c). Though Atlantic salmon production has not been publicly reported since 2010, in 2010 the harvest value was at approximately $73.5 million USD (Maine DMR, 2024a).

Aquaculture in Maine takes different forms: fed versus non-fed and ocean-based versus land-based. Fed or discharge aquaculture refers to aquaculture with any feed inputs, which in Maine includes cultivation of Atlantic salmon, brook trout, and American eel. Non-fed or non-

discharge aquaculture refers to any aquaculture not requiring inputs, including shellfish and algae farming. Non-fed aquaculture in the state is ocean-based, meaning that the organisms are grown in coastal waters, while fed aquaculture in Maine utilizes both ocean-based net pens as well as land-based recirculating aquaculture systems (RAS). Finfish aquaculture is the least common type of aquaculture operation in the state, as it requires high capital investment in the millions of dollars and has had significant public pushback (Neufeld, 2023). Most aquaculture opposition in Maine is directed towards finfish aquaculture operations, with opponents citing concerns about environmental pollution and conflicts with Maine fishing industry, although there is opposition to non-fed aquaculture development as well (Hanes, 2018). Participants in this study only engaged with non-fed aquaculture.

1.3.3. Paradigm

This study employs a qualitative research approach through a constructivist paradigm. Some of these tenets include capturing the individual participant's perspective and experiences as well as securing rich descriptions that defy generalizations (Denzin and Lincoln, 2017). Qualitative research aims to produce rich, in-depth data of individual's perceptions (Hennink et al., 2019) The constructivist paradigm ontology, which can be considered the nature of reality, is relativist, meaning constructivists believe there are multiple realities (Denzin and Lincoln, 2017). I understand this as the realities people experience are different due to our culture, upbringing, life experiences, and other such factors. The individual participant's wealth, education level, age, career choice, and other factors determine their experience and understanding of gender-based discrimination.

Epistemology is the nature of knowledge, and can examine the relationship between scientist and participant (Lee, 2012). Constructivist epistemology is considered subjectivist,

meaning both the scientist and participant are working together to generate data and produce knowledge. This very directly opposes other paradigm epistemologies that emphasize objectivity (Denzin and Lincoln, 2017). For my current research project that explores the experiences of women in a male-dominated industry, it would be nearly impossible for me to remain completely objective. I am a woman that has worked in male-dominated fields and has experienced differential treatment due to my gender. I do not share my personal experiences and perceptions with participants and allow them to share their perspectives as they see them, whether I agree with them or not. However, I believe that our conversations and our personal interactions lead us to co-create the data together – which requires a willingness of interaction and communication from both sides.

Constructivist axiology, the study of values, according to Guba and Lincoln (2005), is propositional and transactional. They further describe knowledge as a means to enact social emancipation, which is intrinsically valuable (Guba and Lincoln, 2005). The values guiding my study include improving equity for women in the aquaculture industry and creating safe, welcoming spaces within aquaculture training programs. Additionally, I hope my research will be a starting point for more work on how to improve access to aquaculture and other maritime industries for other marginalized groups.

Constructivist methodology is hermeneutical or dialectical and focuses on the individual (Guba and Lincoln, 2005). My research, which involves interviewing women about their individual experiences, certainly focuses on the individual. My methodology could also be viewed as hermeneutical, as I am focusing on one part (the experience of women in aquaculture) to understand the whole (equity of the aquaculture industry). Other aspects of constructivism that

relate to my research include the role of the researcher as a passionate facilitator as well as control being shared between scientist and participants (Guba and Lincoln, 2005).

1.3.4. Researcher as Instrument

In qualitative research, the researcher is viewed as the instrument through which data is generated. Qualitative researchers do not presume that they are unbiased and objective, rather acknowledging their identity as central to the meaning-making process (Xu and Storr, 2012). As such, I wanted to introduce myself and my background.

I am a cisgender white woman who grew up near coastal Massachusetts and have always felt a deep connection to the northeast United States and the Gulf of Maine. I have worked in marine science research fields starting during my undergraduate degree, and I was fortunate enough to work alongside many incredibly talented and kind women throughout my college career, including peers, graduate students, and professors. Much of my research experience has been in the field of marine mammalogy, a field in which women are very well represented, save for many high-level leadership positions. As such, my early career was spent working around some of the most resourceful, brilliant, hard-working women I had ever met. I never felt for a second that my gender was a limiting factor in my success, and frankly never even thought much about my gender save for the occasional reflection on how I enjoyed working with so many women.

As I moved through my career, I ended up in jobs and spaces that noticeably had fewer women. I experienced sexual harassment from a male superior at a job, which weighed on me and impacted my job performance at times. At another job, I worked as the only woman on a team of men doing field research, and though I never witnessed inappropriate language or behavior, the men I worked with consistently made assumptions about my strength, capabilities,

and my limitations. As I aged and moved through different spaces in the world and in the workplace, I for the first time felt my gender. At times I felt different than those around me while working with primarily men.

Conducting this research has been extraordinarily meaningful to me. It was the highest honor to be trusted by my participants, for them to share their experiences and stories with me. Many times, I felt that I understood their perspectives because I had lived through similar experiences. However, it was important to me that I not share my perspectives with my participants, as I wanted their responses to be true to their own experiences. I did not prescribe my beliefs onto my participants and their stories. Women are not a monolith and are informed by a diverse array of cultural backgrounds, life experiences, and factors, as evidenced by the data generated through this research project.

1.4. Thesis Aim and Organization

The aim of this thesis is to better understand the experiences and perceptions of women in the working waterfront and to learn how aquaculture training programs can be improved to meet the needs of women. Chapter 2 will broadly cover the experiences and perceptions of women in the aquaculture industry. Chapter 3 will discuss women's needs and desires for women-focused aquaculture training programs. Finally, Chapter 4 will provide a conclusion and recommendations using the substantive equality framework.

CHAPTER 2. EXPERIENCES AND PERCEPTIONS OF WOMEN ON MAINE'S WORKING WATERFRONT

2.1. Introduction

Over the last fifty years, Maine's aquaculture industry has emerged as an ecologically sustainable seafood production system that provides Maine residents with an opportunity to work on the water (Johnson, 2020). However, recent studies have highlighted that women in the aquaculture industry face burdens that men do not, revealing inequity in the industry (Lord, 2022; McClenachan and Moulton, 2022). Better understanding the human dimensions of aquaculture is imperative to advance the industry's economic, environmental, and social sustainability (Brugere et al., 2023), however there is little research being produced on the role of gender in fisheries and aquaculture in the U.S. (Harper et al., 2013). As sustainability goals cannot be achieved without achieving gender equality (UN Women, 2018), it is crucial to better understand the experiences of women in the aquaculture industry. This could provide industry members, regulators, and aquaculture training providers with necessary information needed to identify and reduce gender bias and gender-based violence in the industry. This chapter will explore the research question: What are the experiences and perceptions of women in the working waterfront and in aquaculture training programs according to former Aquaculture in Shared Waters (AQSW) students?

2.1.1. Literature Review

Commercial fishing industries have long been dominated by men, and women interested in pursuing careers in seafood production have struggled to carve out spaces for themselves, especially in production roles. In fishing cultures that are patrilineal, sons are typically given the

opportunity to inherit boats, gear, and fishing licenses over daughters (McClenahan and Moulton, 2022; Szymkowiak, 2020). In the Maine lobster fishery, some women reported feeling unwelcome, viewing men as hostile to women trying to work in wild capture fisheries. Their families did not believe that lobstering was an appropriate job for women. When young, women were allowed to participate in the fishery with their families, but adult women were discouraged from pursuing fishing full time (McClenachan and Moulton, 2022).

Aquaculture, on the other hand, may be more accessible to women than commercial fishing for a variety of reasons. Aquaculture's scheduling flexibility and relative proximity to shore is an enticing element to mothers of young children (Lord, 2022; McClenachan and Moulton, 2022). Women are often the primary caretakers of children and the managers of their households. Because of this obligation, women are more limited than men in terms of the labor they can do outside of their home (Weeratunge et al., 2010). Regardless of career type or relationship status, women in the United States disproportionately conduct more unpaid household labor than their male counterparts, often considered invisible labor (Hess et al., 2020). Though some fisheries operate relatively close to shore, others involve multi-day trips away from home. This often prevents mothers from being able to pursue fishing (Szymkowiak, 2020). Female commercial fishers have described electing not to have children to pursue fishing (McClenachan and Moulton, 2022), while female aquaculture farmers have shared that the flexibility of sea farming allowed them to balance their childcare responsibilities with their jobs (Lord, 2022).

McClenachan and Moulton (2022) found some of their participants, who were all women, viewed their gender was an aspect of their success, citing in part their communication skills, social skills, and marketing skills. In other regions and industries, studies have found that women

are more likely to communicate and resolve conflict than their male counterparts, potentially making them more suited for work that requires collective action (Agarwal, 2000). Some participants in Lord's (2022) study described their gender as a resource, describing that marketing and selling products was easier because the public wanted to buy from diverse, women-owned businesses. Studies have shown that across industries, a diverse workforce is associated with positive outcomes, including better return on investments in financial industries and better patient outcomes in healthcare industries (Gomez and Bernet, 2019). Maine's aquaculture industry could economically benefit by encouraging diverse groups to pursue aquaculture, thereby increasing the social resilience of the industry.

Despite these potential advantages for women in Maine's aquaculture industry, gender inequity exists. According to Maine aquaculture lease and license holder data, only 23.1% of non-fed aquaculture farms in Maine are owned by women.[4] Women's participation is highest in Maine's seaweed aquaculture industry, which is the lowest value sector of all of Maine's aquaculture sectors (McClenachan and Moulton, 2022). Barriers are prevalent for women pursuing aquaculture in Maine. Women oyster farmers have described needing to purchase custom gear that is adapted for their shorter stature and struggle to find sea-worthy maritime clothing that fits them because it is primarily designed for men. Women have also described feeling unwelcome and alienated in aquaculture training programs, in which at times they were the only women in the class (Lord, 2022). Additionally, women in both McClenachan and

[4] Little is currently known about the demographics of the Maine aquaculture industry as Maine DMR does not collect demographic data (Lord, 2022). Publicly available names of lease and license holders can be sourced from DMR, but it is not ideal to attempt to ascertain gender from names alone, as gender identity is complicated and nuanced and can't be determined by assumptions based on stereotyped gender identities associated with names (Bates et al., 2022; Lindqvist et al., 2021). Even if this number is accurate, there is need to determine the role of those women in the farms. For example, some farmers will apply for additional LPA licenses under the name of a woman in their family, when she will not actually be participating in farming.

Moulton's (2022) and Lord's (2022) studies described experiencing harassment while working on the water due to their gender. Bondestam and Lundqvist (2020) define sexual harassment as "part of a continuum of different forms of actual and potential forms of gender-based violence… ranging from bullying and sexist jargon to sexual abuse and rape" (398). Sexual harassment is associated with long term negative outcomes on victim's careers, as well as on their psychological and physical health (Chan et al., 2008; Hershcovis and Barling, 2010; Rospenda et al., 2023).

More research is needed on gender in fisheries and aquaculture in the United States (Harper et al., 2013). Researchers are calling for more attention to the human dimensions of aquaculture development (Brugere et al., 2023), and while the recent studies are helpful, there is still much to learn about women's experiences in the working waterfront and within aquaculture training programs in Maine. This study aims to better understand these experiences and perceptions and hopefully equip future researchers, regulators, those who hold aquaculture training programs, and other relevant parties with information necessary to advance equity in Maine's aquaculture industry. Specifically, this study explores the question: What are the experiences and perceptions of women on the working waterfront and in aquaculture training programs according to former AQSW students?

2.2. Methods

2.2.1. Study Site

Maine is a mostly rural coastal state in the Northeastern U.S. Maine has historically had an economy based in resource extraction, with substantial logging and fishing industries. In recent years, tourism has emerged as the primary means of economic growth in the state. Lobster remains a lucrative fishery in the state, however entry to the fishery is extremely limited and

obtaining licenses can be difficult for young people (Johnson and Mazur, 2018). While aquaculture represents a potentially ecologically and economically sustainable way of working on the water and producing seafood for young Maine residents (Johnson, 2020), recent research has revealed significant barriers that women face when trying to pursue aquaculture in Maine (Lord, 2022; McClenachan and Moulton, 2022). Aquaculture training programs can be an ideal venue to study women's experiences as students have various levels of experience in aquaculture, from complete novice to experts.

Aquaculture in Shared Waters (AQSW) is the longest running aquaculture training program in Maine, beginning in 2013. For the first two years of the program, the intentions were to provide aquaculture training to commercial fishers, promoting aquaculture as a fisheries diversification strategy (Cleaver et al., 2018). As such, likely due to the extremely low number of female commercial fishers in the state, the first year of the program had no women attending. While the proportion of women students has increased over the years, in most years female students have been in the minority. Because of these fluctuations over the years as well as AQSW's longevity, AQSW is an ideal training program to study to understand women's experiences in Maine's aquaculture industry. Further, because students in the course have varying levels of exposure to aquaculture, researchers can capture the experiences of women from an array of backgrounds (Johnson and Veo, 2023). As female oyster farmers in Maine and New Hampshire have recently identified training programs as a barrier to their success (Lord, 2022) this research is timely and necessary.

2.2.2. Data generation

This study analyzes semi-structured interviews conducted with thirty-two women who have previously taken the AQSW course between 2015 and 2023.[5] The sampling frame consisted of 135 women who had previously the course. We divided this sampling frame based on the year the participant signed up for the course, as well as their attendance level. Two different semi-structured interview guides were used, based on the participant's attendance in the Aquaculture in Shared Waters training program. High attendance individuals were defined as individuals who attended at least half of the classes over the 8-12 week period, while low attendance individuals were defined as individuals who attended less than half of the classes.

While the literature that does exist was useful in determining some questions to ask our participants, we employed an inductive study design to determine the important phenomena within our project (Miles et al., 2020). High attendance individuals were asked the most questions about their experience with the course and its content, while low attendance individuals were asked fewer (see Appendix A for interview guide). While we intended to use a purposive sampling strategy, our strategy more closely aligned with convenience sampling (Gill, 2020). Initially, we sought a purposive sample of students representing different attendance levels to reflect different experiences in the program. We received much greater interest in students who had high attendance (n=29) than low attendance (n=3). Further, we received much greater interest from students who took the course in 2023 (n=17) than those who took the course prior to 2023 (n=15). Thus, our sample ended up aligning with the convenience sampling strategy. The thirty-two participants in the study provided quality data on their experiences and perceptions of Maine's aquaculture industry, and thus concluded our sampling (Gill, 2020).

[5] Though the course began in 2013, 2015 was the first year a woman attended the course.

Interviews following standard human subjects research protocols to protect confidentiality of research participants.

Miles et al. (2020) argues that "trustworthiness ride[s] largely on the skills of the researcher" (p. 34). This project had three interviewers that assisted in the data generation process. The process of developing the interview questions and interview strategy was an iterative process. To assure reliability, the three interviewers reviewed the interview guide, completed an interview together, and discussed strategies and best practices for interviewing participants. Finally, a checklist was created with step-by-step instructions for all interviewers to assure that the interviews were systematic.

The interview guide began with introductory questions, and then participants were asked a variety of questions regarding their perceptions of experiences and barriers in aquaculture and in the AQSW course. Some of these questions included: *Why did you take the AQSW course? What did you like most about the course? What did you like least about the course? How useful did you find the course? Did you ever feel uncomfortable while attending the AQSW course, for any reason? Are you currently doing or planning to do aquaculture? As a woman, have you ever felt uncomfortable working in the aquaculture industry? What do you see as the most critical barriers for those interested in pursuing aquaculture?* The full list of interview questions is available in Appendix A.

Interviews were recorded by at least two different methods to ensure a viable recording: by Zoom, an external SONY recorder, or using a phone recording. Zoom recordings automatically created a transcript, however it contained a multitude of errors. Otter AI, an artificial intelligence transcription tool, was used to create a cleaner transcript, in which the audio recording was uploaded to the Otter AI website and was automatically transcribed. The Otter AI

transcripts were then manually corrected according to the audio to ensure that the transcripts were accurate. While some of the paralinguistic phenomena that occurred were recorded when relevant, the transcripts focus on the words being said rather than the more fine-scale linguistic details (Flick, 2014).

2.2.4. Data analysis

The researcher employed thematic analysis (TA) to analyze the data. TA is a method of analyzing and interpreting themes and patterns within qualitative data. Unlike other methods, TA is not bound to a theoretical framework and can be utilized in an array of research paradigms. The researcher utilized TA within a qualitative approach, in which they acknowledge their active role as a researcher in producing meaning from the data (Clarke and Braun, 2017). In TA, a "theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set" (Braun and Clarke, 2006, 82).

Braun and Clarke (2006) describe six steps for effective TA: 1) familiarize yourself with the data, 2) generate initial codes, 3) search for themes, 4) review themes, 5) define and name themes, and 6) produce the report. To familiarize themself with the data, the researcher spent considerable time accurately transcribing the interview audio files into transcripts. Transcription is a crucial element of the data analysis process (Flick, 2014). Of those audio files that were processed through Otter AI software to produce a preliminary transcript, the researcher listened to the audio file and reviewed the transcripts to ensure accuracy and to better understand the data. The researcher created a transcript that documented verbatim what participants said in interviews, paying attention to punctuation and sentence structure to maintain the participant's

original meaning. The researcher also spent time rereading the transcripts once produced, and jotting notes, to better familiarize themself with the data.

The researcher utilized NVivo 12 Plus to code the data. First, the researcher coded the data by each question that was asked to participants. This also aided in familiarizing the researcher with the data, and served as large-scale holistic coding (Miles et al., 2020). Though this is not recommended as your only coding strategy (Braun and Clarke, 2006) it was useful to understand the breadth of the participants' responses to the full array of questions asked. After assessing the initial codes the researcher generated, they went back through the transcripts and then began coding again for a second cycle for more refined detailed coding (Miles et al., 2020), this time not being constrained to the questions asked to participants. The researcher used an inductive approach to early coding, allowing themes to arise without the use of theory or prior research to guide analysis. This allows the data to speak for itself and is useful for research on populations and phenomena that have been poorly studied (Braun and Clarke, 2006). Then, the researcher assessed the codes that had been produced and organized them into themes. Upon assessment, some codes were not relevant and had to be deleted, while others were so similar they could be grouped together. The researcher began creating nested hierarchies, which allowed them to group and organize codes into themes and subthemes. Then, the researcher reviewed the themes and organized them further, creating a concept map to describe the story of the data. Finally, the researcher worked on defining and naming themes, and producing the report (Braun and Clarke, 2017). To better understand the data and the coding structure, concept tables and concept maps were used. Concept tables were used to display an array of perspectives in response to one theme, while concept maps were utilized to organize major themes and

subthemes (Miles et al., 2020). See Appendix B for an example of concept maps created to organize themes in the data.

2.3. Results

Thirty-two interviews were conducted with women who had previously taken the AQSW course. Fifteen participants had taken the course prior to 2023, while seventeen had taken the 2023 Hybrid course.[6] Participants had an array of involvement in the aquaculture industry. Of those in the aquaculture industry (23/32), fourteen are farm owners, three are farm workers, and eight are other aquaculture industry workers. 'Other aquaculture industry workers' are those whose jobs fall under the category that includes administrative and non-production roles in aquaculture businesses. Some participants had multiple concurrent roles, for example one participant was both a farm owner and a non-production worker in the aquaculture industry (Figure 2).

[6] Due to the low number of female participants in early years of the course, participants that took the course prior to 2023 were grouped together to protect their confidentiality.

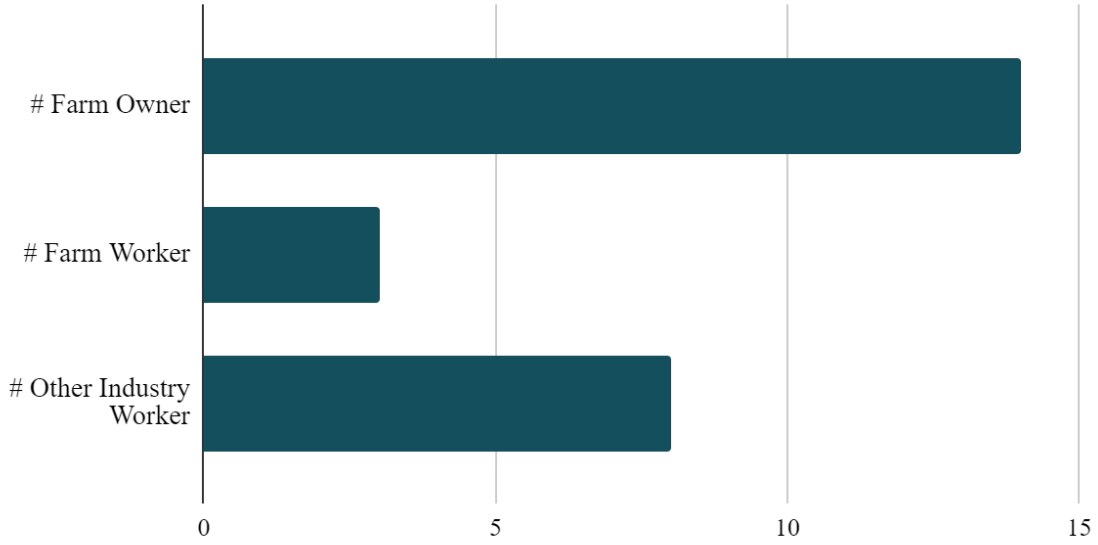

Figure 2. Roles of research participants in the aquaculture industry, with some representing multiple roles (n=23). Farm owners refer to those who are lease or license holders, farm workers refer to those who work on an aquaculture farm (e.g. as a farm hand) but are not themselves lease or license holders, and other industry workers are those employed in the aquaculture industry but in non-production roles (e.g. marketing, administration, etc.) Some participants held more than one role concurrently (e.g. farm owner and other aquaculture industry worker).

Participant ages varied, with most participants in the 30-39 age range. Every participant identified their race or ethnicity as white (32/32). While one participant had completed some college, twenty participants had a bachelor's degree and eleven had a postgraduate degree as their highest level of education. Of participants who farm (including farm owners and farm hands), participants grew oysters, kelp, and scallops. Four participants had at least one child under the age of eighteen.

While all but one of the research participants were current Maine residents, only thirteen were born in Maine. Only eight participants had a connection to commercial fishing (including a fishing spouse or fishing family member), while seven participants currently or previously commercially fished themselves.

2.3.1. Motivations

Participants were asked their reasons and motivations for pursuing aquaculture. Some participants mentioned the ability to work on the water as a motivating factor and saw aquaculture as a way to maintain Maine's cultural maritime heritage. Some viewed aquaculture as an opportunity to retain youth in the state, to create meaningful jobs and discourage youth outmigration. Others described that they perceived aquaculture to be environmentally sustainable, discussing how oyster's filter feeding improves water quality. Some perceived aquaculture as more sustainable than wild capture fisheries, and saw aquaculture as an opportunity in light of future threats to global food security. Some participants also shared feeling a sense of pride in and a desire to be a part of Maine's seafood industry. One participant, when sharing her reasons for pursuing aquaculture, stated:

> I just loved that synergy between environmental health and human health and how both can change the world. That's kind of why I fell so in love with the oyster farming stuff because it has that same kind of story, you know, they're filter feeders. They clean our oceans, and they're also sustainable protein and very healthy for people. So, it's just kind of that win-win concept.

2.3.2. Perceived barriers

Participants were asked to share what they perceived to be the most critical barriers to those wishing to pursue aquaculture. Participants discussed financial risk, regulatory struggles, social license issues, and environmental concerns. They also described struggles with their physical capabilities, lack of technical skills, and difficulty balancing childcare and aquaculture.

The financial risk that some participants discussed included the high initial investment associated with aquaculture, the long return on investment, and the high risk of failure due to crop mortality. Some participants described that aquaculture did not seem like a feasible full-time job and shared that they were worried about having to supplement their income while pursuing aquaculture. One participant, a farm owner, shared that when she started her farm, she expected that it would cost around $10,000. However, at the time of the interview, she had invested close to $160,000, and was reconsidering whether she wanted to continue farming, concerned that she would lose more money. When considering the high risk of financial loss, one participant shared: “It’s the great experiment. And it could be the great money dump.” Other participants described frustrations over the long profit timeline, discussing that AQSW instructors had told them that it can take as long as seven years to see a profit. Another participant discussed her perception that aquaculture cannot serve as your primary source of income for many years, while discussing the high risk of failure:

> I think for people to dabble in it, to see if it's viable, it needs to be this tertiary thing they're doing. It can't be what they rely on for income, because there isn't any for a while. And then you have to have the capacity to essentially lose everything you’ve invested into a cycle in one fell swoop. And that's true of many ventures. It seems more true of this.

Some participants also described concerns about financing their operations, including how to find funding. They shared feelings of confusion trying to navigate the funding process, stating that though they thought there might be women-specific grants and funding opportunities,

they did not know how to access them. Some participants expressed their concern that women are often less eligible for some business loans than men, and how statistically fewer women are awarded funding than men.

An oft-cited barrier for participants was the lengthy lease and license application backlog at the Maine Department of Marine Resources (DMR). This backlog is causing years-long wait periods for lease and license application approval, which participants noted as a factor in their financial uncertainty and their difficulties in growing their businesses. Some participants expressed sympathy for DMR employees and acknowledged that employees were overworked and spread thin, but shared concerns about the limited number of people working on aquaculture regulation in the state: “There's just not enough people to regulate this fishery. I don't think three people on the coast of Maine is going to be satisfactory to regulate all these farms.” Many participants expressed frustration over the lengthy lease approval process. However, one participant compared aquaculture leases to guns, sharing her exasperation that it was quicker and easier to get a gun than to be approved for aquaculture. She stated:

> I guess it's like a three year process now to get approved [for a standard lease].... it would be so much easier for me to get a handgun, then get an aquaculture lease. Like if I were to apply for a gun, and everybody within 1000 feet of me had to be given a letter and 30 days to comment on my sanity?... And aquaculture is doing good for the environment…. There's so many positives. If you take the two, one shouldn't take three years and one 48 hours.

Some participants also worried increasing public interest in pursuing aquaculture would increase regulatory wait periods and result in aquaculture oversaturation. Some even described their concern that the number of AQSW students would result in too many new entrants. When one participant learned that the 2023 AQSW course had over one hundred students, she shared her concern over the new entrants increasing the already long regulatory wait periods: “What happens when all those people start putting in for leases?... Then it’s just slowing all of us down to like this sort of morass of waiting and waiting and waiting.”

Some participants also expressed concerns over social license to operate, worrying that further clashes between landowners and aquaculture farmers would threaten further development. Some cited fears of riparian landowners attempting to block farms from being approved in the regulatory process. They also were concerned that groups focused on preventing salmon farming would also block non-fed aquaculture development. One participant discussed her feelings that town-wide aquaculture moratoriums were a case of bad public relations for non-fed aquaculture farms. One participant shared her perception that because of the public backlash against the proposed Nordic Aquafarms salmon farm in Belfast, public opinion had shifted against aquaculture, and members of the public didn’t understand the difference between finfish and non-fed aquaculture. Other participants described difficulties with gaining the trust of current members of the working waterfront, and shared that those without connections to Maine or connections to commercial fishing would struggle more gaining social license than those with those connections:

> I know that if I were to try and go into the working waterfront… I would not have a really hard time carving out a place within that culture…. I'm incredibly privileged

> because I grew up in a fishing family…. I grew up in Maine. And I think somebody who doesn't have those kinds of check marks in their favor would have a much harder time.

Some participants shared concerns about operating and growing their businesses. In particular, some were worried about being able to scale their operations, with smaller farms operating off of Limited Purpose Aquaculture Licenses (LPAs) acknowledging that larger operations have advantages over smaller ones.[7] Others discussed the difficulty of needing more help on the farm but being unable to adequately pay for staff. Other business-related barriers included the difficulties in safely delivering and finding markets for their crop. One participant discussed the struggle of being a small-scale farmer operating off LPAs, and shared that there appeared to be many benefits to being a larger-scale farmer:

> I think that right now, because there's so many LPA holders, that might [appear to] be a viable business model or the appropriate scale, where I feel very differently…. You know, people look down upon [larger aquaculture operations] when in fact those are the people who are able to provide things that I will never be able to provide. Insurance and PTO and year-round employment and like, you know, appropriate structure to keep

[7] In Maine, individuals can farm operating off a Limited Purpose Aquaculture License (LPA), an experimental lease, or a standard lease. An LPA covers a 400 square foot area in which one can grow shellfish, green urchins, or algae. One individual can have up to four LPA's under their name and are the least expensive option in the state. Experimental leases cover up to a four acre area, and can grow any species already present in the state. Experimental leases are allotted a three year period, and can only be renewed for scientific research. Standard leases are the largest and longest lasting option of the three, covering up to 100 acres and lasting up to twenty years. Standard leases require site visits, scoping sessions, and public hearings, which can extend time to a lease application decision (Maine DMR, 2024b).

> people safe on the water. Like I think that they're doing a much better job of that and that they're also meeting demand and producing a quality product.

Environmental concerns were noted as potential barriers to aquaculture development, including climate change and farm closures due to Vibrio toxins. Despite some participants seeing aquaculture as an opportunity in light of climate change, others were concerned about climate change's impact on aquaculture. Participants noted severe storms and changing water temperatures as potential threats to their aquaculture operations. Other participants noted concerns with the high amount of single-use plastic used in aquaculture farming, the changing water quality in southern Maine, and potential conflicts with conservation efforts such as eelgrass bed conservation. One participant shared: "I also have like an existential worry about water quality changing in Casco Bay. It's just like, there's so many people there. So many more people live there than ever before." One participant shared her concerns with the industry focusing too much on the economic opportunities surrounding aquaculture, stating that more care should be taken to consider aquaculture's environmental impact before pushing further development:

> I think that, you know, while we should 100% be thinking about how people can make a living and how we diversify, I get a little frustrated with the fact that that's always the basis for most conversations around aquaculture. There's less around… what it means for the ecology of the systems.

Some participants discussed their own perceived physical limitations as a barrier for pursuing aquaculture, describing that they do not believe they are as strong as men and struggle to farm in the same methods that men do. Some participants described their shorter stature as well as their overall strength as a barrier for being able to farm, sharing that they perceived that male farmers were stronger and did not struggle with farm-related manual labor as much as they did. Some discussed alternative methods of farming that are easier on their bodies than the methods male farmers often use. Others shared their concerns with their longevity in the industry, sharing they were worried about the health of their bodies long term while doing the physical work associated with aquaculture, with one participant stating: "Oystering is definitely physical…. I should just hire somebody or ask for help. And so I think I'm soaring right now, because I'm, you know, I'm young enough where physical stuff, like I can just bull through. But eventually there will be some limitations."

Some participants described not having the technical skills needed to pursue aquaculture, specifically maritime and maintenance skills including knot tying, boat driving, and engine repair. Some participants shared that they felt they were not able to gain these skills because they did not have a personal or familial connection to commercial fishing. One participant, when discussing how she did not grow up in Maine nor in a fishing family, shared: "And unless you're a true Maine gal, you may not have grown up running around in boats." However, those participants who did have commercial fishing experience or connections still felt that they did not have the same level of exposure to maritime or technical skills as men do. Some expressed their perception that more men have access to the water and therefore have more of the technical skills needed to operate on the water. Others shared that access to gear and equipment, including boats, might be a limiting barrier for women trying to participate in the aquaculture industry.

One participant stated: “But I imagine there are a lot more dudes out there that have their own boats than women.”

Women’s roles as parents and primary caregivers were discussed by participants as well. At the time of the interviews, only four participants had children under the age of 18, though others shared that while they were parents, their children were currently adults. One participant, a prospective farmer, discussed wanting to pursue aquaculture but feeling uncertain as to how to go about it while navigating her childcare responsibilities:

> I feel like just as much of a problem are the economic barriers and how hard it is to enter anything marine based because of the cost…. I'm a single woman and a single mom. And you know, that's, that's daunting. And a lot of men that are fishers out there, that might not be as much of an issue.

Some participants described deciding to pursue aquaculture because their children were now adults and they had fewer childcare responsibilities, expressing that they did not think they could feasibly have pursued aquaculture while their children were still young. Others, who themselves were not parents, acknowledged the labor burden placed upon mothers, and discussed the challenges women face in many different career paths. This participant shared:

> Women continue to have more challenges when it comes to careers than men do, period. Because we're women, and we are the child bearers. We are the mothers, we are all those things, I myself am not. But you know, many women are. And I think that that really

changes what feels accessible and or available to them, and probably doable as well, because it is overwhelming.

2.3.2. Perceptions of gender on the working waterfront

Though participants were not explicitly asked about their perceptions of gender dynamics on the working waterfront, many participants brought these topics up on their own. Some participants appeared to have conflicting views, with some viewing the aquaculture industry as male dominated, some viewing aquaculture as more accessible than commercial fishing, and some perceiving that Maine's aquaculture industry was not male dominated at all (Table 1).

	AQ is male dominated	AQ is better for women than fisheries	AQ is not male dominated
Perceptions of a gendered working waterfront	"And most of the farmers are men. All the farmers in my co-op are men.... Whatever area you're going to be in most of those farms are owned by guys."	"I never got the impression that aquaculture on the coast of Maine was an old boys club.... I think that [lobstering] still feels like a harder industry to enter as a female than aquaculture."	"Well, certainly there's, there's certainly no barriers to entry, as far as I can see, woman or man."
	"I think in general the aquaculture community is pretty open and supportive.... It's still a male dominated field."	"Maybe aquaculture has an advantage over the fisheries, because it is a newer industry, so less of that historical gender roles. But I think if you walk down a fishing dock, the majority of the people you see are going to be men."	" I think it's, you know, [aquaculture is] not a male dominated industry as you know."

Table 1. Some participant's perceptions of a gendered working waterfront, with quotes from participants illustrating the themes. Some participants viewed the aquaculture industry as male dominated, others thought the aquaculture industry was better for women than commercial fisheries, and some viewed the aquaculture industry as not male dominated at all.

Numerous participants that reflected on these perceptions shared in some way that they viewed the aquaculture industry as male dominated. One participant shared: "And most of the farmers are men. All the farmers in my co-op are men.... as soon as you start it's like all of the

harbor masters are guys, right? Like all, most of the farmers in the area, whatever area you're going to be in, most of those farms are owned by guys."

Some participants felt that aquaculture was more welcoming and accessible to women than commercial fisheries. Because aquaculture was a newer industry, some participants perceived it as having fewer historical gender roles than commercial fishing. Therefore, they felt that women were able to carve out a space for themselves in aquaculture more easily than they could in commercial fishing, an industry with a deeply patriarchal history. Others just described that aquaculture in Maine had a generally more welcoming air than commercial fishing:

> I never got the impression that aquaculture on the coast of Maine was an old boys club, or that was something of a hurdle that I was going to face.... Whereas I get that impression about lobstering.... I think that still feels like a harder industry to enter as a female than aquaculture.

Some participants referenced the number of women in aquaculture as reasons for aquaculture being more welcoming to women. One participant shared her perception of there being a lot of women in seaweed aquaculture:

> I know that there are certain barriers that people are facing, like breaking into the working waterfront, but just seeing the number of women in these spaces is so cool…. I went to the seaweed symposium in Portland and it's ladies everywhere, it's great.

Other participants, however, did not perceive aquaculture as male-dominated at all, sharing that they feel that there are equal opportunities for both women and men in the industry. Some overtly stated that aquaculture was not male-dominated, while others shared that they couldn't perceive any barriers to entry for either gender. One participant shared: "Well, certainly there's, there's certainly no barriers to entry, as far as I can see, woman or man.... if I were younger now and wanted to work on an aquaculture farm, I don't see me being discriminated against as a woman."

2.3.3. Experiences of women on the working waterfront.

Throughout the interviews, participants who had worked on the working waterfront (including aquaculture and commercial fisheries) shared experiences they had had in those spaces. These were in part in response to questions asked to them in the interviews, including: *Have you ever felt uncomfortable working as an aquaculture farmer or on the working waterfront?* However, as the interviews were semi-structured, participants also brought up their own experiences unprompted, or in response to other interview questions. Some described experiencing self-confidence issues, awareness of being the minority gender, and gender-based violence. Some participants also described being treated differently than their male counterparts, being underestimated and second guessed, having to prove oneself, negative attitudes towards women, and unwelcoming environments. One participant shared that though she had experienced differential treatment while working on the water, she had also experienced that in her everyday life:

> I mean, it's funny, because like, I feel like when people ask me that question about this, it's like, just kind of think about how you're treated on a day-to-day basis, but now it's on

> a boat. Like, I feel like we all experience this kind of discrimination all the time. And then it doesn't really change on the water.

Other participants recalled experiences where they felt they had to prove themselves or work harder than the men around them to be taken seriously. One participant said that she was able to gain respect from most men when she consistently showed that she was committed to aquaculture, but reflected that even then not every man in the industry was welcoming to her. Another participant shared her perception of labor differentials between men and women:

> I think there are a lot of times where in order to be successful at my objective for what I'm supposed to be doing, I do have to… show up with 150%. Showing up with 50% will never get me to the point that I need. And a lot of times, it's because I'm not the same gender.

Being underestimated and second-guessed by those around them was a common experience among participants. One participant described an instance where her coworkers assumed she was an intern when she was actually a higher-level worker, despite the fact that she had been introduced to her coworkers with her job title. Others, particularly farm owners, described situations where strangers assumed they were farm workers and were surprised when they revealed that they were instead the owners. One participant described these situations and the questions she often receives: “Like, and the immediate question will be: ‘Who do you work for?’ I’m not even kidding…. ‘Who do you work with?’ Like, no, I own the farm.” Others shared experiences in which their knowledge and skills were underestimated. This was especially

prevalent when trailering their boat in and out of the water, as others often assumed they did not know what they were doing or that they would need help. One participant reflected: “You know, launching and loading boats is always a fun time when you’re a woman at a dock and everyone assumes you don’t know what you are doing or you’re going to take a really long time.”

Some participants also described being impacted by self-confidence issues and their own insecurities. Some described experiencing imposter syndrome while working in the aquaculture industry, sharing they didn’t feel like they belonged or that they deserved their success. One participant discussed her lack of technical skills and the way that impacted her confidence: “I feel like I've not really been that uncomfortable. Like, if anything, I've just been insecure or uncertain. And that comes back to not having a background on the water. Like, I used to cry because I couldn't tie knots.” Others described feeling immense pressure to succeed as a women-owned business. One participant believed that women are harder on themselves than men when they make mistakes, and that women felt they needed to succeed to not let other women down. When discussing making mistakes on the water, she shared: “I think more women I've seen feel like somehow they're letting folks down, or they should ask somebody else to be doing this job.” Another participant discussed the pressure that women often feel when pursuing male-dominated careers: “I think a lot of people are expecting you to fail or not be as good as your male counterparts.” She also described confidence as a major barrier for those wishing to pursue working waterfront jobs, namely because others around them assume they are not capable of working on the water or, for example, running a boat.

Some participants shared that being the only women in working waterfront spaces, or being one of very few, they often felt alienated and different from their male colleagues or fellow farmers. One participant described being the only woman in her farming cooperative. Some

participants described being the first and only women to work out of their town's commercial fishing docks. One participant, who had prior experience in commercial fishing in other states, shared that working in Maine's aquaculture industry was extremely different from her prior commercial fishing experience. Whereas in the past she has worked in crews made up entirely of women, in Maine she was always the only woman working on her team. Another participant described wanting representation after only ever working with male farmers: "I just like, I needed representation out there. You know, [the male farmers I worked with], they're great and they've always been proper gentlemen to me. But there was no one that looked like me."

Some participants described experiencing, or fearing the threat of, gender-based violence while working on the water. Participants shared experiences where they felt unsafe on the water, witnessed inappropriate language and behavior, and had been harassed. While witnessing inappropriate language while working on the water was referenced, specific language or behaviors were not disclosed, and no participants reported experiencing physical assault while working on the water. Some participants reflected that at the time of the incident, they didn't feel comfortable speaking up about inappropriate behavior they experienced while working in the aquaculture industry. Others shared occasions in which they had been harassed while working on the water, including incidents in which one individual would target them, say inappropriate things, and attempt to make them feel unwelcome. One participant shared about a particularly challenging experience in which she was harassed on the working waterfront by a former romantic partner.

Because of the harassment and the differential treatment some participants had experienced while working on the water, some expressed the feeling that the working waterfront was not a safe space for them or other women. After experiencing ongoing altercations with a

fellow farmer who was male, one participant expressed reservations about having female friends on the farm with her when male fishers or farmers approach them:

> I've brought my sisters out on the farm before, and I've had guys out there on the farm, other fishermen, that I just am like, don't even come over here right now…. I have felt uncomfortable having friends out there with some of these guys out there…. There have been some situations where I was with [women] that were in bathing suits hanging out on the oyster farm, and there were [men] that came that I was immediately like, everybody get dressed…. I feel gross being out there in that situation.

In addition to her interactions with some male fishers feeling unsafe and uncomfortable, the same participant shared that she wouldn't encourage her sister to pursue aquaculture for fear of her being treated poorly, while alluding to the threat of gender-based violence on the water:

> I just think of, you know, if my little sister told me she was going to start a farm and go out there by herself, I would be anxious about how she would be treated…. But just the industry as a whole, women coming into a male dominated field, especially this one, where you are out in the elements like, you're not in an office, like that has a whole other culture…. You're in a body of water on floating things, and it can be kind of scary. It's dangerous by itself, regardless of having other people out there. And then you kind of put some of these other dynamics in there that, yeah, it can be.

Participants' experiences being harassed and treated poorly on the water varied, with many participants having had few negative experiences. Some participants shared their feelings of hope for the future of the aquaculture industry. Even of those who had been treated negatively, many felt that the experience was not as bad as it could have been, with many participants acknowledging their privilege (connection to fishing, being from Maine, etc.) as reasons why they may not have had extreme experiences on the water. However, those who did have more extreme experiences believed they were intentionally targeted by others because of their gender or age. The threat of future gender-based violence weighed on some participants.

Many participants expressed that either they had not had a negative experience in the working waterfront, or that they hadn't had a very bad experience in the working waterfront, but then shared their perceived reasons for why they had not had an overtly negative experience. The reasons participants provided included having a background in the working waterfront, working in a hobby or educational aquaculture operation rather than commercial, prior experience working in male-dominated industries, or because of innate personal characteristics such as toughness and confidence. One participant shared that she hadn't ever been uncomfortable working in the aquaculture industry because of her personal characteristics, describing herself as a "tough Maine woman." Another participant shared that she was very confident and assertive, but acknowledged that a woman that was less so would likely struggle working in the industry. Others shared their prior experiences working in other male-dominated industries as reasons for why they had not had negative experiences in aquaculture, with one participant sharing: "I've always worked in a man's world. So that really doesn't bother me too much."

	Positive	Negative
Positive and negative perceptions and experiences on Maine's working waterfront	"I think there is a bigger reward for being an independent female farmer that fires me up. I love that that is my brand."	"It's humiliating over time to have to explain over and over why those [comments] are offensive…. It's like death by 1000 cuts."
	"I think the future is very bright for women in aquaculture. There are really good things ahead. I think there are lots of good role models."	"I've had comments like, asking if I have a boyfriend, comments like, 'You can't rush a lady'. People just generally cutting me off at docks."
	"I think its really badass that there's so many women doing it now."	"I have been bullied on the water. And they tried to intimidate me. And I don't know if they would have done that if I were a man."

Table 2. Participants shared both positive and negative perceptions and experiences while working on Maine's working waterfront.

In addition to many negative experiences and perceptions of working on the water, participants also shared that in some ways, they felt their gender was an asset to their aquaculture business (Table 2). For example, one participant shared: "I really receive a lot of press and a lot of interest… because I'm a woman, because I'm a young female entrepreneur". Another participant shared that her gender identity was a part of her personal motivations for pursuing aquaculture. Some participants described that buyers were often more excited to support them and purchase from them upon hearing that their farm was women-owned. Others shared their perceptions of innate strengths that women have that serve them well in the aquaculture industry,

including networking, communication skills, marketing, independence, and resilience. One participant reflected on her perception of the skills of women:

> I have a different way of thinking about things than, I think in general women do, than men do. So in a lot of ways I would say I'm better at my job, because I'm not confrontational. I'm always trying to work things out. I'm more patient.

2.3.3.1. Connection to fishing

Overwhelmingly, many participants tied their experiences as women in the working waterfront in relation to their connection to commercial fishing. Participants who have a commercial fishing connection acknowledged that they had privileges that others did not, most notably access to social capital gained through a spouse or parent that commercially fishes. One participant, whose husband is a commercial fisher, shared:

> And yet I think [women are] also a little bit at a disadvantage in terms of culture, like waterfront culture. And I haven't experienced that, because I'm always there with my husband. So you know, his credentials create a pass through, for me. But I'm sure that would not be my experience otherwise.

Some participants who had a father who worked as a commercial fisher shared that even though their father was not always present with them on the water, their father's reputation afforded them protection from poor treatment on the water. Participants that did not come from a

fishing family or have experience fishing themselves felt they were at a disadvantage regarding access to skills and knowledge needed for aquaculture farming.

One participant, who is a commercial fisher, works in the aquaculture industry, and is from a fishing family, reflected on her connection to the working waterfront and how that has conferred advantages to her:

> I feel like I am kind of in a unique position, because I've just been a part of working on the water for so long that I think maybe the accessibility for me has been easier than it would be for most people, because my family's just so like, Oh, my uncles lobster, my dad lobsters, and my grandfather lobstered, so you know I think it was a more welcoming place for me as a woman, just because I already had so many connections to it.

Another participant, who did not grow up in Maine nor had any background or connection to commercial fishing, shared that she felt her lack of connection to fishing was more of a disadvantage than her gender: “I just don't feel like gender has affected my experience that much. The thing that has is not growing up knowing this stuff and having to learn it all new for the first time.”

2.3.3.2. Experiences in AQSW

In addition to experiences participants have had in the working waterfront, participants were also asked about their experience taking the AQSW training course. Participants were asked a variety of questions aimed at receiving feedback about the course and their experience within it, including but not limited to: *What did you like most about the course? What did you like least about the course? Were you ever uncomfortable, for any reason, while taking the*

course? Some participants brought up their experiences in the class without prompting, or at different time frames within the interview.

	Positive	Negative
Experiences in AQSW	"I thought it was great. Really welcoming to all different backgrounds and people."	"It was a little complicated with my kids and being in the class…. Sometimes I just had [the Zoom] on and I was getting dinner ready while I was watching and listening. It was not easy."
	"[I haven't had challenges in the course relating to my gender] because I've always worked in a man's world….I think these days women are much better at not feeling intimidated by men."	"I wasn't sure what to say in the moment [after hearing innapropriate comments during the class] because being young, and new in the community, and wanting people to like you, you don't want to say anything…. It isn't cool. It's sexist."
	"I was surprised by how many women there were in the class…. It was nice to see."	"I don't think there were any other women [in the class]. Maybe one other woman."

Table 3. Participants shared both positive and negative experiences they had while taking the AQSW training program.

Some participants described having very positive experiences within the course, saying that the course felt welcoming and like a safe environment for them to learn (Table 3). One participant shared that the course felt welcoming to people of all backgrounds, while another said that even though the other students were mostly male fishers, she felt very comfortable. One participant reflected that "there was nothing like kind of telling me, this is not a safe place." Many participants had positive perceptions of the course, mentioning the passion of instructors, the breadth and variety of course topics, and the free cost.

Some participants discussed being aware of the genders of other students and instructors within the course, sharing that upon entering the classroom and they would assess the number of male and female students that were present. For example, one participant, who took the course prior to 2023, reflected on being one of the only women in the entire class: “I don't think there were any other women. Maybe one other woman…. We were the minority. But that's not surprising for that time at all, I don’t think.” Another participant, when asked if she had ever felt uncomfortable during the course for any reason, shared this: “Like [the] general, vague sense of uncomfortable that comes with being like one of few women in a room full of men.” Of participants who took the class prior to 2023, some noticed that many instructors and guest speakers were male. For example, this participant who took the course prior to 2023 shared: “I’m trying to remember, from what I remember a lot of the presenters were men. That can be something you notice. People in leadership, not all of them, but you know.”

Some participants from the 2023 Hybrid course shared a different experience, stating that they noticed and appreciated the number of women on the instructor and guest speaker team. One participant stated: “And especially like a lot of the speakers that we had were women too, so that helped.” Another participant reflected on the number of women on the instructing team as well as the number of women students as a reason for being so comfortable in the course.

Some participants were frustrated with the curriculum that treated men’s experiences as the default, and wanted the course to acknowledge that women might have different experiences or struggles within aquaculture than men. One participant discussed how she would have liked the topic of social license to be more sensitive to different identities:

> Well just generally speaking, women have wildly different experiences working in spaces that we know are so very heavily male dominated already? And the fact that there's not even a mention of that [in the class], you know, or, clearly no thought had gone into that? That, you know, when we talk about social license, it's gonna be a lot easier if you're a dude, and it's gonna be a lot easier if you're a dude who's like already working on that waterfront to establish that social license than if you're a woman and you have no connection to the place.

Some participants also described frustrations that the course didn't acknowledge that women often have different physical capabilities than men do, and that there may need to be adaptations to gear or working methods for women to work safely and efficiently. One participant described that if a hands-on gear workshop was designed with men in mind, she would be frustrated that her different abilities weren't accounted for, describing that she believes she is not as strong as most men.

Some participants described their experience in the course being colored by their lack of experience within the fishing or working waterfront industries. One participant stated:

> The biggest divide I felt [in the class] was the experience divide and the access divide. And I feel like that threw off my whole program. It was like us and them. Just not growing up in a fishing family it was just like well, you know, you've got to know somebody. And it was hard.

Finally, three participants expressed that they had experienced inappropriate language or behavior during the course. Due to the sensitive nature of these reports, the details of the inappropriate language and behavior cannot be disclosed at risk of revealing the participant's identities, however none of the participants reported experiencing any unwanted physical contact or assault during the course. This participant described the inner turmoil she felt after her experience:

> But you know, the long term impact of that is number one: now feeling like I don't, you know, I don't know how to leverage a connection…. If I saw him out at aquaculture events, it would be awkward, I think, for me. Now, this is a burden that I have to bear. Any other interactions I'm having with another man in this industry, that I think is a professional connection. Now, I'm second guessing, if they're thinking that? Or if something, you know, they're thinking something else? Yeah, like it's messed up…. I felt like I had really great interactions with people leading up to this moment. And now, I'm truly wondering how to even go about carrying on on this journey as a woman in this industry, because I've now had this experience with one person.

The participant expressed that she did not think of gender at all during the course until this incident occurred. This participant goes on to say that the experience "[had] a big impact even though it…could be viewed as a small misunderstanding…. as a woman, that is now my burden to bear."

2.4. Discussion

This study aimed to better understand the experiences and perceptions of women in Maine's aquaculture industry. It found that while many women are excited about aquaculture and perceive Maine's aquaculture industry as more accessible to them than commercial fishing, there still exists significant barriers unique to women trying to enter and succeed in the industry. This study found that women's backgrounds were a factor in their ability to pursue aquaculture, including where they were born, their connection to commercial fishing, and if they had children or not. Though many participants expressed hope and optimism about women's futures in Maine's aquaculture industry, others described experiences where being a woman caused challenges for them in the industry. Some participants described experiencing inappropriate behavior from men while working on the water and even within an aquaculture training program.

The aquaculture industry is often advertised and perceived as a new sustainable hope for Maine's coastal communities. However, women face numerous hurdles ranging from gender bias to gender-based violence. A goal for Maine's aquaculture industry is triple-bottom line sustainability, which must incorporate environmental, economic, and social sustainability (Figure 3) (Sadusky et al., 2022). This research suggests that there are areas for improvement to strengthen the social sustainability pillar of Maine's aquaculture industry.

Figure 3. Triple bottom line (TBL) sustainability is a goal of Maine's aquaculture industry which must incorporate social, economic, and environmental sustainability (Sadusky et al., 2022).

Attaining gender equity in aquaculture is non-negotiable for achieving greater sustainability goals (FAO, 2022; UN Women, 2018). All people, regardless of gender, deserve to be treated fairly and be able to pursue work safely, regardless of the type of work and where the job is located. Further, students in training programs deserve to feel welcome, comfortable asking questions, and safe from inappropriate language and behavior. While training programs like AQSW attempt to equip new entrants with the skills they need to get started in aquaculture, the environment in which they are learning is not truly safe for all students.

This research implies that though aquaculture may be environmentally sustainable (Bricknell et al., 2021), Maine's aquaculture industry has areas to improve upon to strengthen the social sustainability of the sector. According to Leach et al. (2016), "Pursuing either sustainability or gender equality without attention to the other is doomed to fail on practical,

moral and political grounds" (2). For Maine's aquaculture industry to truly deserve the title of 'sustainable' it must redress the disadvantaged positions of women within the industry and acknowledge and accommodate the different needs of men and women (Fredman, 2016).

Much of the findings in this study confirm the findings of prior research (Lord, 2022; McClenachan and Moulton, 2022). Some participants in this study viewed Maine's aquaculture industry as being designed for men, which created frustrations and struggles as women attempted to enter and succeed within the industry. Some participants discussed how aquaculture training courses that treated men as the default failed to acknowledge the different struggles and experiences that women have, leading to an ineffective curriculum for women, which has been described in Maine's aquaculture industry (Lord, 2022).

Motivations and barriers that participants described in this study aligned with the motivations and barriers previously described by mostly male commercial fishers looking to pursue aquaculture. Participants in Cleaver et al.'s (2018) study of commercial fishers in the AQSW training course were 98% male, and shared that they were pursuing aquaculture to work on the water and to increase food security, which is similar to some of the motivations shared by participants in this study. Participants in Pianka's (2016) study of male commercial fishers that took the AQSW program viewed the cost of aquaculture and regulatory struggles as barriers to their pursuing aquaculture. Similarly, participants in Cleaver et al.'s (2018) study shared concerns with the regulation of Maine's aquaculture industry, community opposition to aquaculture, and environmental concerns including concerns about Maine's water quality, similar to some barriers discussed by female participants in this study. Many of the motivations and some of the barriers described in this study align with the perceptions of men in Cleaver et al.'s (2018) and Pianka's (2016) studies. However, women's physical capabilities, balancing

childcare, and experiencing on-the-water harassment were some of the barriers that were only reported in this study. This doesn't necessarily mean that men don't experience these barriers. For example, safe working practices and ergonomics to preserve physical health is an issue for men in aquaculture as well (Dunleavy et al., 2022; Tortato Novaes et al., 2017). However, certain barriers may affect women more than men. Though there are likely many men pursuing aquaculture that are fathers, and some may be single fathers, women are statistically more likely to contribute more to household labor and childcare labor than men (Hess et al., 2020). While some issues clearly pertain to women, such as gender-based violence against women, others are more ambiguous as to whether they are barriers solely pertaining to women.

Consistent with other studies, participants in this study viewed connections to Maine and commercial fishing as beneficial to women attempting to pursue aquaculture. These connections allow participants to gain social license more easily, as other community members are more accepting of them than of those that are "from away" and not connected to commercial fishing. A connection to commercial fishing provided women with social capital, including access to maritime knowledge and gear. As many fishers are known members of coastal communities, being connected to them in some way lends credibility to women aquaculture farmers, who may struggle to be accepted otherwise. Participants without any familial connection to fishing described struggling pursuing aquaculture without access to these resources, and this study found that those struggles extended to training opportunities as well. However, even women in aquaculture with commercial fishing connections still struggled to gain access to resources and learn maritime and technical skills, potentially because many fishing families are patrilineal (McClenachan and Moulton, 2022).

Some participants in this study also reported experiencing, as well as fearing, gender-based violence against women while working on the water, which has been documented in other studies (e.g., Lord, 2022). Gender-based violence exists on a spectrum, including emotional and psychological violence, physical violence, and sexual violence (Figure 4). The gender-based violence described by participants in this study most closely aligns with emotional and psychological violence, which includes threats of physical violence, insults, humiliation, and intimidation at work or in public (Johnson, 2004). No participants in this study reported experiencing physical or sexual violence. Some participants feared personally experiencing gender-based violence or feared that women they knew would experience violence on the water from men they did not know. One participant described experiencing harassment from a former romantic partner, not a stranger. This study also documented instances of inappropriate behavior within an aquaculture training program, closely aligning with the definition of emotional and psychological gender-based violence, despite many other participants perceiving the program to be a safe and welcoming space for women. These findings suggest that more needs to be done to address the culture of gender-based violence in the aquaculture sector, including in training programs.

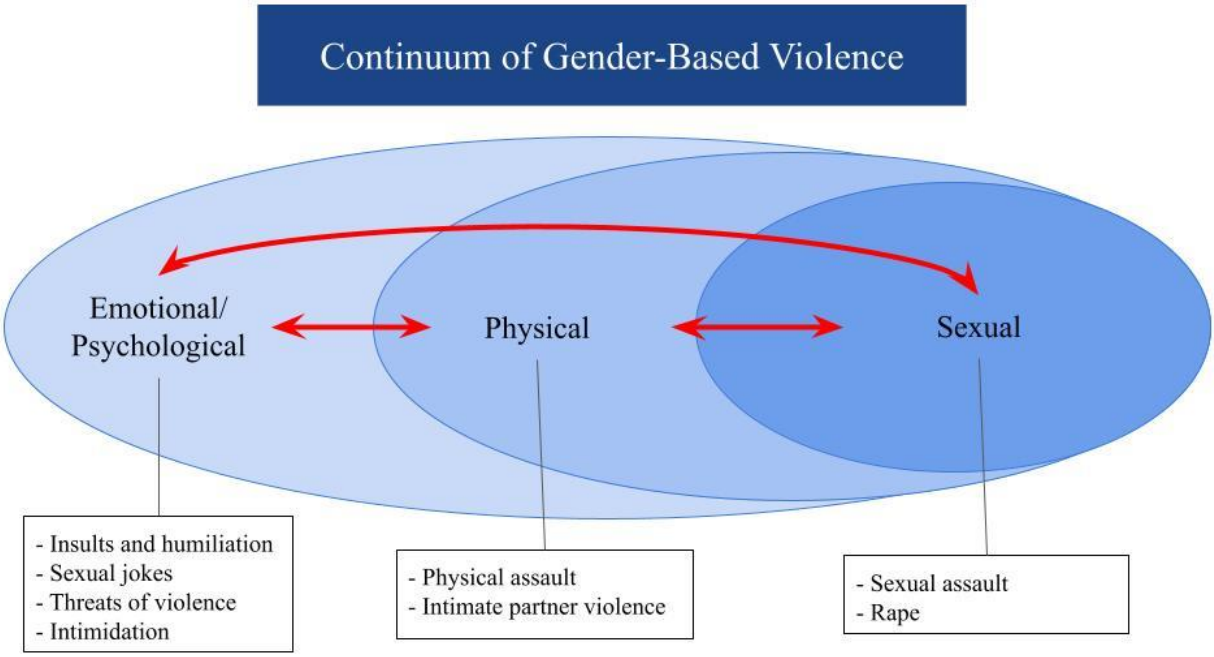

Figure 4. Continuum of gender-based violence (GBV). Definitions of different forms of GBV adapted from Johnson (2004). Red arrows acknowledge that all three forms of GBV can occur simultaneously and are not inherently isolated.

The role that one's background and life history (e.g. their connection to commercial fishing, whether they have children, etc.) factors into women's ability to succeed in the working waterfront has been documented specifically in Maine's aquaculture industry (Lord, 2022; McClenachan and Moulton, 2022). In this study, the role of women as primary caretakers for children was limiting for women wishing to pursue aquaculture, which was different from prior research. Lord (2022) and McClenachan and Moulton (2022) both found that aquaculture was a potentially flexible career opportunity for mothers. However, in this study, women with children struggled to balance the demands of child rearing with their roles as aquaculture farmers. Specifically, mothers of children under the age of eighteen struggled to pursue aquaculture, compared to mothers of children over the age of eighteen. Though aquaculture may be a more

feasible option for mothers than commercial fishing, the unequal division of household and childcare labor presented a barrier for women wishing to pursue aquaculture.

Though participants were not directly asked about this topic, many shared their perceptions of gender divides in aquaculture. Most described aquaculture as male-dominated, which is expected given that available data tells us that women are the minority in Maine's aquaculture industry (McClenachan and Moulton, 2022). Unexpectedly, however, a small number of participants in this study described Maine's aquaculture industry as not male-dominated, stating that there were no barriers to entry for women wishing to join the industry. Even participants who did view the industry as male-dominated perceived there to be numerous women in aquaculture. Some participants listed notable women farmers in Maine as evidence of aquaculture not being male-dominated. This skewed perception, that women make up a greater proportion of the working waterfront than they actually do, might be influencing why some individuals perceive the industry as already equal. However, even if the industry had equal representation of men and women, it wouldn't redress the structural inequalities and gender bias that are baked into the system. Larger, systemic changes would have to be made before Maine's aquaculture industry could be considered equitable. Banet-Weiser et al. (2020, 10) argue:

> The inclusion of women becomes the solution for all gender problems, not just those of exclusion or absence. It is, of course, important to have bodies at the table, but their mere presence doesn't necessarily challenge the structures that support, and builds, the table in the first place.

This study is limited in that it only interviewed former AQSW students, so it may not accurately capture the industry at large, rather those who are inclined to take aquaculture training programs. Further, not all participants were aquaculture farmers. Some participants were

aquaculture farm owners, some worked in the aquaculture industry in non-owner roles, and some were not in the aquaculture industry at all. In some ways, this is beneficial, as the diverse participant group allows for greater insights into the different experiences of a wide array of people with varying exposures to aquaculture. However, because of this diversity, some of the findings may not be as relevant to people already working in the aquaculture industry.

CHAPTER 3. WOMEN'S NEEDS IN AQUACULTURE TRAINING PROGRAMS

3.1. Introduction

Maine's aquaculture industry is rapidly growing and appears to provide Maine residents with an opportunity to work on the water and produce seafood, a crucial component of Maine's cultural heritage and economy (Johnson, 2020). This expanding workforce requires education and training, and organizations in the state are rising to meet the growing demand (Johnson, 2020). However, research has revealed that women often experience barriers in the industry that men do not (Lord, 2022; McClenachan and Moulton, 2022) and women in the industry have called for trainings that center the specific needs of women (Lord, 2022). Further, the Maine Aquaculture Roadmap prioritized diverse, equitable, and inclusive workforce training as a priority for the industry to achieve triple bottom line sustainability (Sadusky et al., 2022). This study aims to provide aquaculture training providers with specific suggestions for content for potential women-focused aquaculture training programs. It explores the research question: How can aquaculture training programs be improved to address women's needs?

3.1.1. Literature Review

While marine aquaculture humbly began in Maine in the 1970s, growth in the sector rapidly expanded in the 21st century. As interest in Maine's aquaculture industry has grown amongst Maine residents – as a hobby, as a career, or as an economic diversification strategy – the need for training and workforce development has grown as well. Multiple organizations have risen to meet this need over the years, including Aquaculture in Shared Waters (AQSW), which began in 2013. Other training programs have run in the state: the Island Institute's Aquaculture Business Development (ABD) program ran from 2016 to 2019, the Aquaculture Top Gun

program ran in 2018 and 2020, Maine Maritime Academy has a certificate program, and Maine Aquaculture Association's (MAA) recent apprenticeship program entered its second year in 2024 (Johnson and Veo, 2023). However, none of these programs explicitly target the needs of women in aquaculture or tailor programming to the needs of underrepresented minorities in aquaculture.

In Lord's (2022) recent study on oyster farmers in Maine and New Hampshire, thirty-nine participants were asked about their experiences with aquaculture training programs.[8] Though a minority of men identified training opportunities as a barrier to their aquaculture businesses (23%), a majority of women and non-binary respondents identified training opportunities as a barrier (54%). One respondent highlighted the lack of training opportunities specifically for women and minorities pursuing aquaculture. Women farmers described training programs as not aligned with their specific needs, and even commented on the discomfort caused by being the only female student in a room full of men (Lord, 2022). Lord's (2022) findings culminated in her recommendation for organizations to create women's specific training programs.

Affinity groups are a collection of individuals with a shared identity or interest. Commonly, universities or workplaces will have affinity groups for individuals of the same gender, sexual orientation, or race and ethnicity. Affinity groups provide social support and can improve self confidence amongst racial and gender minorities (Phun, 2023), and affinity support programs have also been shown to enhance retention of women in male-dominated fields (Barabino et al., 2020). In a racial affinity group supporting educators of color, participants shared that they felt they could truly be themselves in their affinity group, whereas in their workplace they altered their personality to appease their white colleagues (Pour-Khorshid, 2018).

[8] As there are currently no aquaculture training programs in New Hampshire, participant's discussions of their training program experiences are limited to training programs they took in Maine.

While some affinity groups solely provide social support, others incorporate educational training and professional development events. For example, at the University of Maine, Supporting Women in Forestry Today (SWIFT) is a case study in the implementation of gendered affinity programming in a male-dominated field. SWIFT formed as a response to the low number of female undergraduate forestry students, where in some years the number of female graduates was zero or one. While some SWIFT meetings center informal social networking, others incorporate hands-on forestry skills, career panels, and group discussions on relevant issues to women in forestry (Crandall et al., 2020). Crandall et al. (2020) found that SWIFT improved confidence and provided networking and skill-building opportunities for female students.

Affinity programming could be utilized by aquaculture training programs like AQSW to provide targeted training aimed at specific women's needs. The desire for this level of programming has been documented in Lord's (2022) study on women oyster farmers in Maine and New Hampshire, and even by former AQSW students who felt that AQSW organizers were not appropriately addressing women's needs in aquaculture training (Johnson and Veo, 2023). Further, enhancing diversity, equity, and inclusion practices in aquaculture workforce development is a priority of the Maine Aquaculture Roadmap (Sadusky et al., 2022). Though gender affinity programming is timely, and some women in the industry have discussed their desire for it (Johnson and Veo, 2023; Lord, 2022), determining the content of potential women-focused training programs that would be most useful and relevant to woman in Maine's aquaculture industry requires direct input.

Previous studies have identified that women struggle with finding appropriate aquaculture gear for their bodies (Lord, 2022), struggle to learn technical skills (Lord, 2022;

McClenachan and Moulton, 2022), have difficulty finding funding, and desire avenues for networking with other women farmers (Lord, 2022). Women have also described that they are often not as physically strong or as large as men, which leads to difficulties in using gear that has been designed for men's bodies (Lord, 2022; Yang Gonzalez, 2018). Studies have demonstrated that aquaculture farmers often have increased risk of developing musculoskeletal disorders as well as chronic lower back pain, regardless of gender (Dunleavy et al., 2022; Tortato Novaes et al., 2017), but women's body sizes and abilities not being considered in equipment design may result in more impact on women than men (Lord, 2022). In Lord's (2022) study, 61% of women oyster farmers noted funding as a barrier to their success as opposed to 27% of men oyster farmers. Women shared that they did not qualify for funding opportunities and that there were scant women-focused funding opportunities available (Lord, 2022). Other women in Maine's aquaculture industry have expressed concerns about finding funding, citing that women are more likely to be denied bank loans than men (Terry, 2022). The need for hands-on maritime and technical skills has been expressed by female farmers in multiple studies (Lord, 2022; McClenachan and Moulton, 2022). Even in fishing families, while women are typically given the opportunity to fish with their parents when young, they are not expected to take over the family business and therefore are not taught all the necessary, hands-on technical skills (McClenachan and Moulton, 2022). For those without any personal connection to commercial fishing, it is extremely difficult to gain technical skills (Lord, 2022).

While the identification of these barriers is important, it is crucial to gain direct feedback from students to determine what the features of an effective women's affinity training program might be. The purpose of this chapter was to determine what content would be most useful in a women-focused aquaculture training program. To explore this purpose, the research team

interviewed thirty-two women who had previously taken the AQSW and asked for their feedback on programming that would be most beneficial to them.

3.2. Methods

3.2.1. Case study background: Aquaculture in Shared Waters (AQSW)

AQSW is one of several aquaculture training programs in the state, and it is the longest running. AQSW is unique in the inclusion of a social science research program that has helped course organizers understand the demographics of the students as well as to shape curriculum based on direct, anonymous feedback (Johnson and Veo, 2023). Since AQSW's inception, participation from women has increased. While the first two years of the program only had male students, the most recent course, the 2023 Hybrid session, had 38% female attendance. However, some female students described struggling with the content of the course. One student shared that she found some male instructors' behavior made her uncomfortable, while another shared that she felt the course organizers were not adequately supporting female students in the course (Johnson and Veo, 2023). Because of the available information on women's experiences in aquaculture training programs and the imperative set by the Maine Aquaculture Hub to improve diversity, equity, and inclusion in aquaculture workforce development (Sadusky et al., 2022), a potential women-focused aquaculture training course seemed to be an ideal avenue to begin efforts to implement DEI in Maine's aquaculture training spaces. AQSW is a beneficial training program to explore the idea of women-focused training because of its longevity and the inclusion of social science research since its inception (Johnson and Veo, 2023).

3.2.2. Data generation

As described in Chapter 2, this study analyzes semi-structured interviews with thirty-two women who have previously taken the AQSW course between 2015 and 2023. Participants were asked questions about what they would want to see in potential women-focused training programs. These questions included: *What would you like to see in a course that is focused on women in aquaculture? Do you have any suggestions on content that would work best for you?* We employed an inductive study design to determine the important phenomena within our project (Miles et al., 2020). The interview guide was determined collaboratively between researchers, and three researchers were involved in the interviewing process.

3.2.3. Data analysis

As described in Chapter 2, the researcher employed a thematic analysis (TA) to analyze my data. TA is a method of analyzing and interpreting themes and patterns within qualitative data (Clarke and Braun, 2017). The researcher utilized NVivo 12 Plus to code the data.

3.3. Results

3.3.1. Interest in women-focused training

When asked about potential women-focused programming, some participants had different opinions on whether they felt a women-focused class should happen (Table 4). Some participants discussed that they were not interested in a women's focused course, while others discussed not personally wanting a women-focused course because it did not suit their individual needs, with one participant sharing: "I probably wouldn't participate unless…I felt like my being there helped in some way. Because I feel like the things I need at this point are very specific, and

niche and I'm just going straight to people." One participant expressed hesitation surrounding a women-focused training program, stating that she hoped that men and women had the same experiences and needs in aquaculture, and therefore a women-focused course would not be necessary. She shared: "You would hope that most things that a woman is dealing with in aquaculture is also something that a man was dealing with." However, the same participant went on to share her opinions about potential women-focused course content.

	Wants	Doesn't Want	Doesn't want for themselves
Desire for Women-Focused Class	"I'm always an advocate of affinity group programming…. I think sometimes magical things come from affinity group programming."	"By parceling it out by gender, it would actually make it so less information sharing is happening."	"I'm not really interested…. I just don't feel like gender has affected my experience that much."
	"I know you said maybe there will be a class for just women. I think that's a wonderful idea."	"Don't do that. Don't separate everybody, keep them together."	"I probably wouldn't participate unless I felt like my being there helped in some way. I feel like the things I need at this point are very specific."
	"If there was a course that was run entirely by women, for other women, I think that would be amazing. And I would attend again."	"I don't think it necessarily needs to be a separate course. Maybe a side working group or workshop."	

Table 4. Participant's desire for a women-focused class. While some participants felt strongly that they wanted a class for women, others felt strongly against having a women-focused class. Some participants felt ambivalent about a women-focused course, sharing that they likely wouldn't attend if there was one.

While some expressed hesitation around their personal desire for a women-focused aquaculture training program, they acknowledged that others may find it useful. Some

participants did not want a women-focused training program at all.[9] One such participant expressed their view that there were no gender-based barriers to entry for the aquaculture industry, and therefore a class focused on women and women's issues would be irrelevant. She explained: "Hmm! Well there's certainly no barriers to entry, as far as I can see, woman or man. Certainly there can be heavy lifting work, but certainly not something that a woman can't do." One participant discussed that she didn't think women needed an entirely separate course, but rather a group or workshop where women can discuss their challenges within the industry without having to separate them from the main course. Another participant described anxiety at the thought of having a separate course for women:

> I spent a lot of years… in [a male-dominated field]…. I almost always worked with all men. And so my initial reaction is, don't do that. Don't separate everybody, keep them together…. I just had to plow through, myself. And it feels like the only way…. My worry is when you separate out, you're identifying a sort of other and the only way this works is, you know, my success and my oyster farm is really linked to my relationships with the other farmers. And most of the farmers are men. All the farmers in my co-op are men. And so if I think of myself as different, or needing different things, or I don't know, I just worry.

[9] Participants were not asked if they wanted a women-focused aquaculture training program. The participants who did discuss not wanting a women-focused training program brought it up on their own volition and for the most part did not provide any recommendations for potential women-focused training programs. One participant who did not want a women-focused course described that she often struggled to lift heavier objects on the farm, but shared that she would want training on ergonomics in a mixed-gender course as she believed it was an issue for both men and women.

This participant describes her fear that marking herself or other women as different from men would create additional barriers for women's success, and shared that if she thinks of herself as different from her male counterparts, she struggles even more, so she chooses to view herself as the same. She also shared concerns that a women-only class with women as instructors would not have enough instructors with the necessary skills to teach the course because of her perception that there are so few women in aquaculture.

Though some participants described not wanting a women's-focused course, many participants described either wanting to take a women's focused course or stated that while it wasn't something they personally needed, that it would be beneficial for others and provided feedback about potential course content.

3.3.2. Women's course content

When asked for recommendations for course content for a women's focused program, participants that did want women-focused training programs described a variety of needs they would have for the program. Participants described wanting a course that would help them facilitate connections with other women in the industry, teach them practical on-the-water safety skills, hands-on technical skills, and gender-related business skills. Participants also described structural changes they might want to see in such a course, including adjusting instructor gender.

3.3.2.1. Connection

Some participants shared a desire for women's focused programming to center around fostering connection and camaraderie between other women in the aquaculture industry. Some participants discussed wanting networking opportunities built into a women-focused course through mentorship opportunities, others described wanting to have women's networking events,

and some discussed the creation of a women's aquaculture farmer network or co-op. One participant shared how mentorship has shaped her aquaculture career, and how she now wanted to connect with other women so she could serve as a mentor for those now entering the industry. Another participant discussed the formation of a women in aquaculture social network, which she envisioned as facilitated by the course. Though she acknowledged that she could create a women in aquaculture social network herself, she felt that having the structure of the course to facilitate those connections would be helpful.

Other participants described wanting to have structures within the class that provided space for story sharing, further facilitating connection between women in the class. Some participants also expressed wanting to have successful female farmers come to the course and discuss their career trajectories and strategies for succeeding. One participant discussed wanting a space to share with other women about the different kinds of challenges associated with farming:

> I think there would have to be a space to kind of talk at a deeper level about the challenges that specifically women experience…. Why not just actually normalize it and make it part of what could be a really cool opportunity to come together in a training experience? You know, because the challenges are not just physical, or financial. There's a lot of emotional challenges.

Some participants wanted to discuss how other women handled microaggressions and other difficult situations while working on the water, and discuss how to safely resolve these kinds of conflicts while working on the water:

> It would probably honestly be valuable to have some type of… reflection that… doesn't get too harpy and negative. But just about like, here are things that have been said to me in these spaces on the working waterfront and here's how I've responded, and ways to respond that are not escalating a situation. But also not just letting it slide.

3.3.2.2. Safety

Many participants described wanting to discuss ergonomics and physical safety while working on the water. Some participants discussed the physical nature of aquaculture farming, and shared that they were concerned about their longevity in the industry due to workplace related injuries. One participant reflected: “I'm thinking a lot about doing things in smart ways…. I don't need to be more crippled.” Others expressed that many of the methods of working a farm that male farmers use are inaccessible and difficult for most women, particularly those who are short in stature. Some participants wanted a women-focused course to focus on safe and alternative working methods that could improve their career longevity. One participant shared: “I think just proper working with your body, knowing how to work with your body is really important, it’s why people get injured…. [Women are] not as big [as men], our joints are smaller. We take a lot of load impact. And it really takes a toll.” However, some acknowledged that this was not just a problem for women but also men. Some participants shared that they knew of male farmers that were struggling to work in the same methods as they aged, and expressed that they wanted alternative and safer working methods to be encouraged broadly, across genders.

Additionally, some participants discussed that the regular AQSW course focused heavily on large scale businesses and farms as the model to aspire to, while many participants either were operating their businesses on a smaller scale or had no intention of growing to a larger scale business. Participants who noticed this wanted the course to acknowledge small scale businesses and discuss methods of operating a small-scale farm safely without having to have access to expensive equipment. This participant stated:

> There's some gender baked into that, too, like examples of how women can farm without equipment, you know, who don't have quite the brute strength that you know, somebody who has been lobstering for their whole life might have…. because there are a lot of different types of gear out there that aren't hugely massive and heavy and expensive.

3.3.2.3. Hands-on technical skills

Some participants discussed wanting to shift from lecture-based content to hands-on, experiential learning, learn maritime skills and knowledge, experience gear demonstrations, and spend more time on the water rather than in a classroom. Some participants shared their desire for learning hands-on skills in a classroom setting, including driving and trailering a boat. Some participants even shared that they wanted an AQSW demonstration farm where students could go and learn farming methods within the course. Some participants described that their lack of fishing connection and experience prevented them from gaining hands-on maritime skills, while even participants that grew up on the water shared that there were certain things they were not given the opportunity to learn, in part because of their gender.

Some participants discussed their perception that women are not as physically strong as men, and that gear that is easy to use for men can be difficult for women to use. They described that a women-focused class would allow them to work through these challenges with other women who had also experienced them. This participant shared:

> And this is a strength issue... when anything is heavily dependent on gear, and aquaculture is, I think if you had women in the group, you're going to see [that] we're going to have similar issues with that kind of thing. By having that women focus, it allows the innovation to move forward.

3.3.2.4. Business-related skills

Some participants shared wanting more women-specific lessons surrounding operating a business, including marketing. Some discussed wanting DEI-focused marketing lessons, such as how to market their aquaculture business as a minority-owned business to attract potential buyers. As one participant stated:

> I think it would be really cool to… [learn how to] market women in aquaculture products, because I think that there is a specific, inclusive, DEI lens that can kind of go on that. Like I know [women-owned aquaculture businesses] where… part of their branding is that they are women who do this work.

Some participants also described frustration around AQSW's focus on large-scale businesses and its focus on growth and expansion as the primary goal for all farmers. Others

expressed wanting more openness and encouragement around different businesses at different scales - acknowledging that there are different business models that can operate successfully in Maine's aquaculture industry. This participant explained her frustration about the AQSW course only sharing the stories of successful large-scale farmers:

> Yeah, yeah, [in the class] we heard so much from [an established male farmer] and there were so many images of how they farm and that's not super helpful. It's cool. And it's, it's good for, like, you know, envisioning where you might want to wind up someday, but, like, for the here and now, not a great example of how to get started…. I think [I would like to see] a greater range of like, acceptable outcomes for your business. From small scale to large scale. High tech to low tech. Not just focusing on… the biggest is the best.

Some participants also wanted clarity on how to find external funding for their businesses, and if there were women-specific funding opportunities available to them.

3.3.2.5. Structural changes

Some participants described some desire for structural changes to the course to improve the course for women. There was no consensus on certain logistical changes to the course - including the timing, location, or duration. Some participants described that they disliked having the Zoom option, while others shared that the only reason they could attend at all was because of the Zoom option. Some participants with flexible work schedules described wanting the course to occur earlier in the day, but participants without flexibility felt the 6:00-8:00 p.m. time frame was the only feasible time for them within the work week. Since the location of the course

changed yearly, some participants thought it was convenient and others did not, depending on their place of residence.

In addition to these scheduling aspects, some participants described structural changes they would like to see in women-focused programming. Some participants shared that in a women-focused course, they would only want women instructors to teach the course. This participant shared her feelings on wanting a space solely for women:

> Honestly, if it's like, fully a thing for women, about women in aquaculture, I think it should be exclusively women instructors, or at least the parts that are focused on the women should be the women instructors. So like, no offense, guys, but like, I don't want to hear men talk about women's lived experiences in aquaculture.

However, one participant felt differently, and shared that only having women instructors may be hurting the students by not allowing them to interact with and learn from male farmers, who make up the bulk of the sector:

> Do I think that the whole course should be taught just by women? Not necessarily, I think it should be women heavy. But I don't think that there needs to be an ignorance of the fact that there are lots of men too, you know, doing this work. And that many, most of the pioneers in the industry are actually men, you know, and so I don't think that that, I'm not in a space where I feel like I need a whole, an only woman space for that kind of learning to happen. Because it's also just not realistic.

Some participants wanted to incorporate assessments into the course, or some method of accountability for the students. They shared that while the unstructured nature of the class reduced barriers for those just wishing to get familiar with aquaculture, they were looking for more formal training that prepared them for a venture into aquaculture and felt that being assessed and receiving a grade would help them better understand what aspects of the content they needed to spend more time on. Other participants described wanting shorter intensive courses, rather than a spread out 8-14 week program. They described wanting to spend a few days entirely focused on the course, which would allow them to gain hands-on experience at farms and hatcheries, rather than piecemeal classes for two hours at a time.

Finally, some participants shared that they wanted the course to be more transparent and realistic with students about the difficulties of pursuing aquaculture. Some participants shared that they feared the course painted an optimistic picture of farming and wanted potential entrants to be aware of the financial risk and hardships they had experienced within the industry. This participant stated:

> I would say my biggest feedback is… encouraging people to understand this is truly a business and it's a large expense. And it's a lot of time…. I'm watching people whose [farming is] really detrimental to their finances or their life. And, like, that's scary and disappointing.

Similarly, another participant discussed her own feelings of confusion and frustration trying to join the aquaculture industry after taking the class. In the class, she felt aquaculture was

an achievable career option, but the more people she encountered outside the classroom made her feel differently:

> It's funny, though, because, you know, in the class… [aquaculture] felt more accessible, I think, but as I've had other conversations with people…. it feels like I talked to a mass of people that were just like: 'It's impossible. Don't even try'.... I was like, that's not really how I felt in the class at all. I felt like it was, it seemed very accessible…. And you're like, actually, maybe it isn't accessible anymore. Maybe I missed the boat.

3.4. Discussion

Though previous studies had identified barriers for women in Maine's aquaculture industry (Lord, 2022; McClenachan and Moulton, 2022) this study identifies what content would be most useful in helping women in aquaculture overcome those barriers. This study provides recommendations for a women-focused aquaculture training program from women who had previously taken an aquaculture training course. It provides specific topics that should be covered for women-focused training programs to be effective, and even includes recommendations for logistical and structural components for effective programming.

The implications of this research apply directly to those that offer aquaculture training and workforce development programs. The findings can be utilized to implement more equitable aquaculture training programs in the future. Though perhaps a women-only affinity training program is not always necessary nor a feasible option, aquaculture training providers can incorporate some of the feedback from this study into future mixed-gender educational offerings.

This study found that some women did not want women-focused programming, while others did. Participants that did want women-focused programming didn't just want the regular

AQSW course without men, but rather wanted content that was specific to women's needs. The potential course offerings women described in this study were gender-responsive rather than gender-blind and acknowledged that women have different needs than men in training programs (Figure 5). Gender-responsive trainings are those that consider and accommodate the different needs of men and women. Institutions that create gender-responsive educational opportunities can help women overcome barriers (UNFPA and UN Women, 2020). For example, while AQSW has business training in their core offerings, the course has not tailored programming to discuss how minority-owned businesses can take advantage of their identities to sell their products more effectively. Other topics that participants felt could be more sensitive to the different needs of men and women included gear demonstrations and social license.

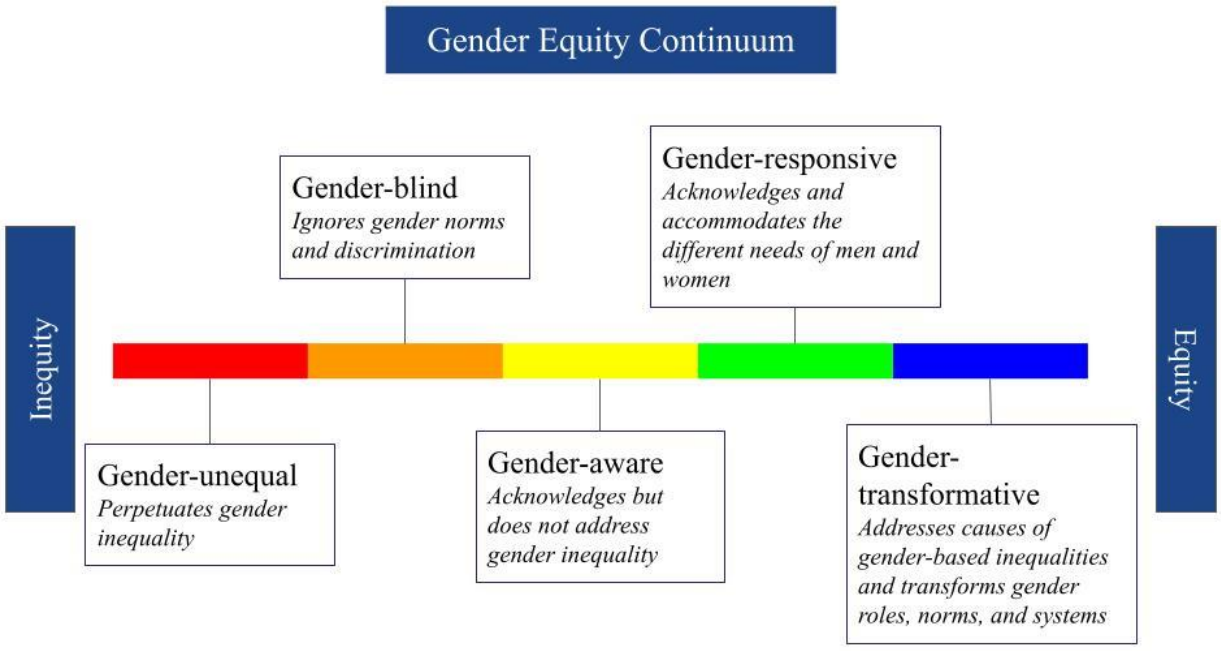

Figure 5. Continuum of gender approaches to programs and trainings. Gender-blind approaches ignore gender norms and discrimination, treating all individuals as if they are the same. Gender-responsive approaches acknowledge and accommodate the different needs of men and women. Adapted from Pederson et al. (2015) and UNFPA and UN Women (2020).

Much of the content that participants described wanting covered in a potential women-focused course was consistent with other studies. Some described wanting social connection with other women in aquaculture and those interested in joining the aquaculture industry. This was expected based on prior research, as participants in Lord's (2022) study described utilizing informal social networks to facilitate connection with other women. Due to Maine's large coastline, many women farmers have described feeling isolated from one another (Lord, 2022). A women's aquaculture training course could provide a space for women farmers and potential farmers to meet, to connect, and to create lasting social connections that aid their personal and business development.

Some participants in this study also described wanting to learn safety skills in a women-focused course, including how to navigate dangerous on-the-water social interactions with men as well as how to utilize ergonomics to safely use aquaculture gear that was designed for those who are physically stronger and bigger than themselves. Other studies have described women in Maine experiencing harassment while working on the water (Lord, 2022; McClenachan and Moulton, 2022), and Lord's (2022) participants discussed having physical limitations that impacted their ability to effectively use gear. The need for spaces where women can learn technical skills in a safe, judgment-free learning environment is evident. Other studies have documented that women face difficulty learning technical maritime skills, even those who grew up in fishing families (McClenachan and Moulton, 2022; Szymkowiak, 2021). However, this study has shown that women want formal training structures to teach them those skills, rather than attempting to learn them informally or on the job.

Further, some participants wanted the course to discuss different acceptable business practices and outcomes, from the very small scale to large scale. In McClenachan and Moulton's

(2022) study, women described feeling misaligned with organizations that only promoted rapid economic growth. Some participants in this study echoed a similar sentiment, describing that the AQSW course often pushed an ideal of the large-scale business, which left many participants who operate on smaller scales feeling alienated from the programming.

Logistical changes to the AQSW course structure were discussed by many participants but no consensus was reached - participants wanted different structures to accommodate their very different schedules. The AQSW course rotates the location of the course from southern Maine to midcoast Maine, and with the introduction of the Zoom option the course is fairly accessible to many people. The timing of the course, winter, takes into consideration Maine's busy season, summer, when both the lobstering and tourist season is in full swing. The time of day the course is held, typically from 6 p.m. to 8 p.m., takes the average workday into account to ensure most people can attend.

Unexpectedly, there was no consensus about the instructor demographics of a potentially women-focused course. While some participants firmly wanted only female instructors, others didn't mind or wanted male instructors. Other affinity groups have encountered similar conundrums. University of Maine's SWIFT, the group focused on improving gender equity in the University of Maine's forestry school, initially only allowed women to join or teach in their group. They found over time however, that male forestry students and faculty wanted to learn more about gender bias in forestry and how to become better allies. Their solution was to provide events for people of all gender identities in addition to their core, women-only offerings (Crandall et al., 2020). In addition, the UNFPA and UN Women (2020) state that: "Ending patriarchy and challenging restrictive gender norms is not the sole responsibility of girls and women" (3) and encourage programs that engage men into conversations of gender equality.

Future women-focused aquaculture training programs should perhaps consider involving men in conversations about gender equality and incorporating mixed gender classes to foster allyship from men in the aquaculture industry. Alternatively, the regular, mixed-gender AQSW could incorporate conversations about gender equity in Maine's aquaculture industry into the regular programming to provide men access to tools and resources to combat gender inequality.

This study was limited by the fact that only former AQSW students were interviewed. Students of other training programs may have different perspectives on what content is necessary for a women-focused course. Further, this study only interviewed white women. The content needs of women of color may differ from those of white women, and as such we didn't capture the training needs of women of color in this study.

Overall, participants expressed enthusiasm over a potential women-focused aquaculture course. The content they envisioned was gender-responsive and addressed women's needs in Maine's aquaculture industry. Participants in this study were diverse regarding their backgrounds and experience level, and as such many had conflicting views of the same topic.

CHAPTER 4. CONCLUSION

This study aimed to better understand the experiences and perceptions of women in Maine's aquaculture industry, as well as the needs of women in aquaculture training programs. It also aimed to provide aquaculture training providers with concrete feedback on what content is beneficial for women in Maine's aquaculture industry.

4.2. Lessons from the substantive equality framework

The inequity in the global aquaculture industry, identified by Brugere et al. (2023), highlights the need for prescriptive, action-oriented guidelines to guide stakeholders towards a more equitable industry. The substantive equality framework (Fredman, 2016) provides such guidelines, and Brugere et al. (2023) argue that it should be used to transform human relationships with aquaculture. This study reaffirms that women have many gendered experiences in aquaculture and encounter gendered barriers. To address these barriers, this study recommends utilizing the substantive equality framework (Fredman, 2016). The substantive equality framework is action-oriented and could serve as a pillar of socially sustainable aquaculture development (Brugere et al., 2023). The four dimensions of substantive equality are equally important, and feed into one another (Figure 6).

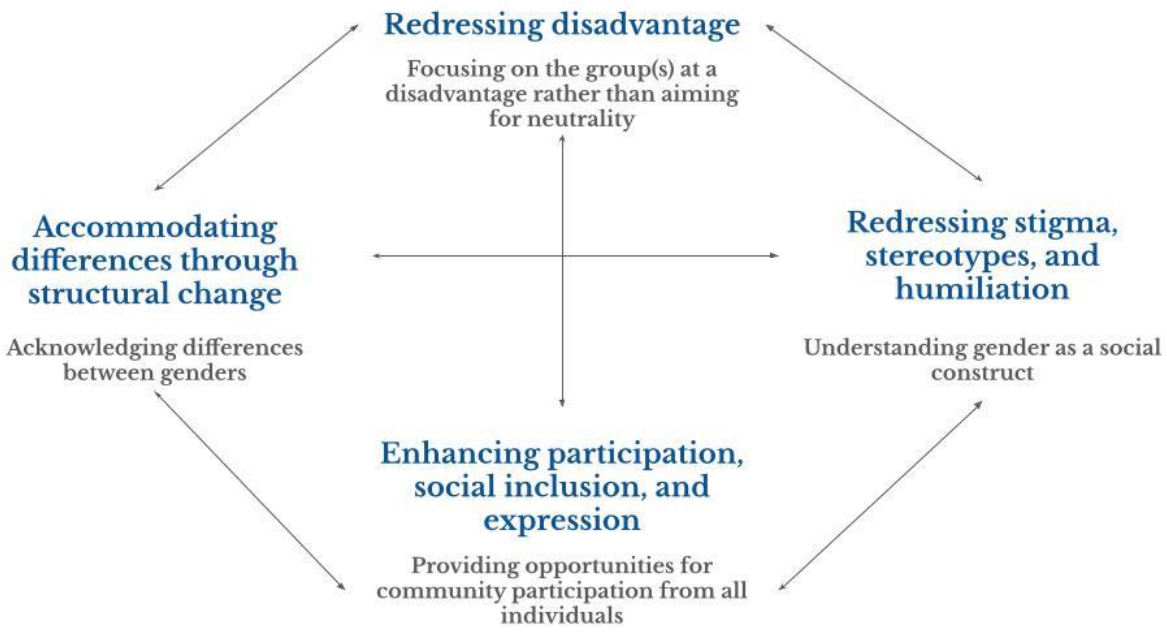

Figure 6. Diagram of the substantive equality framework, specifically taking women's issues in aquaculture into consideration. The diagram is adapted from Brugere et al. (2023), which took Fredman's (2016) substantive equality framework and turned it into a diagram focused on aquaculture. This diagram builds on Brugere et al.'s (2023) work by tying the concepts of the substantive equality framework specifically to women in aquaculture, however the framework can be applied to any disadvantaged group.

We recommend the consideration and implementation of the four dimensions of substantive equality, with these specific considerations of women's issues in aquaculture:

1. **Redressing disadvantage.** Fredman (2016) argues that in the substantive equality framework, one should focus efforts on the groups at a disadvantage, rather than attempting to aim for neutrality, or treating everyone the same. To do so, one must understand the nature of disadvantage, which can include race, gender identity, and socioeconomic status, amongst others. However, as identified in this study, other facets of identity can impact an individual's success in aquaculture, including their connection to fishing, the place of their birth, and their parental status, amongst others. To redress disadvantage, one must improve the range of actually feasible options for those at a

disadvantage by. For example, an individual's lack of connection to fishing, and therefore their limited access to maritime skills and knowledge, should not prevent them from pursuing a career in aquaculture.

2. **Redressing stigma, stereotypes, and humiliation.** To achieve this dimension, one must first understand that gender is a social construct. To acknowledge gender as a social construct is to understand that the stigma, stereotyping, and norms associated with gender are socially constructed, and not related to essential traits attributed to biological sex. While these are socially constructed, they have real world impacts on how women and other gender minorities move through the world. One must reduce the stigma, stereotypes, humiliation, as well as violence that individuals experience due to these social constructs. For example, a woman should not be told that she is better suited for administrative roles in aquaculture rather than production roles due to gender stereotyping.
3. **Enhancing participation, social inclusion, and expression.** This dimension focuses on providing opportunities for community participation from all individuals, and centers on an individual's right to agency and voice. Agency refers to an individual's ability to make independent decisions, while voice refers to an individual's ability to express concerns that are listened to and acted upon (Brugere et al., 2023). To achieve this dimension individuals must be able to participate in all community structures and be able to express their identity and be included in social processes regardless of their disadvantage. Examples of this dimension in action in the aquaculture industry could include women's social networks and support groups, gender-responsive aquaculture training, and avenues to foster allyship from men in the aquaculture industry.

4. **Accommodating differences through structural change.** The final dimension of the substantive equality framework focuses on acknowledging the difference between genders and accommodating those differences through changes to systems. The purpose of the framework is not to pretend that we are all the same, but to acknowledge and embrace our differences while dismantling the disadvantage that has been attributed to difference (Fredman, 2016). Examples of structural changes to the aquaculture industry that accommodate differences include providing funding for women-owned aquaculture businesses, avenues for reporting on-the-job harassment, cultivating a culture of respect in aquaculture, and zero tolerance policies for inappropriate language or behaviors in aquaculture.

While the substantive equality framework may be difficult to implement in practice, consideration of the framework during aquaculture training program development could aid in implementation of more equitable workforce development.

4.4. 2024 Women in Aquaculture Series

In response to data generated by this thesis, AQSW organizers decided to pursue a women-focused workshop for the 2024 AQSW offering, titled: 2024 Women in Aquaculture Series (WAS). The creation of this workshop series was informed by a needs assessment, as well as personal feedback to course instructors from former students who wanted women's only programming (Schreiber, 2024). The needs assessment included a review of historical data collection on the program, including pre- and post-course surveys as well as prior interview rounds. The historical data review, as well as emerging literature on gender in northeast U.S. aquaculture industries (Lord, 2022; McClenachan and Moulton, 2022) led the needs assessment to interviews with AQSW alumnae (see Chapters 2 and 3). Organizers took the preliminary

results of these interviews, and in consideration of personal feedback they had received over the years as well as emerging literature, decided to create the women's workshop series for this iteration of AQSW.

The 2024 WAS ran from February 2024 through May 2024, and hosted an array of topics including Women in Aquaculture 101, Social License in your Community, Strong Bodies, Strong Minds, Women in Business, Maritime Skills, and Telling Your Story. The course employed an in-person and virtual model, but did not provide a hybrid option. Past AQSW provided a hybrid option, in which some students could come in person while others attended virtually, but it often created technical challenges and left in person and virtual students feeling disconnected from one another. The 2024 WAS had four two-hour virtual workshops, and two all-day in person workshops. Each in-person workshop had two dates and locations, one in southern Maine and one in midcoast Maine, to hopefully improve accessibility for students located across the state.

The 2024 Women in Aquaculture Series was created in direct response to preliminary findings from the needs assessment. The course addresses many of the needs participants in this study discussed, including connection with other women in aquaculture, safety on the water, business skills, and technical skills. The 2024 Women in Aquaculture Series is the first of its kind in aquaculture training, especially in the northeast U.S. where prior research has recommended the creation of women-focused training programs (Lord, 2022). Pre- and post-course surveys, as well as general feedback from students, will determine if this program is useful and effective at achieving its goals, which are stated as such:

> "By empowering underrepresented aquaculturists to build skills and meaningful connections, the workshop series aims to foster greater diversity, equity, inclusion, and accessibility in Maine's aquaculture sector." (2024 Women in Aquaculture Series, 2024).

4.4. Conclusion

Participants in this study shared their experiences and perceptions at various stages of pursuing (or not pursuing) aquaculture. Ultimately, participants described Maine's aquaculture industry as an exciting and promising opportunity for women, but also described significant barriers to access. Participants in this study highlighted barriers specific to women including physical limitations, lack of access to gear and technical skills, childcare responsibilities, and finding funding for women. Participants also described negative experiences they had had in working waterfront industries, including harassment, inappropriate language, and being underestimated. Even within training programs, some women experienced inappropriate language and behavior. Some participants described the working waterfront as a space that isn't safe from gender-based violence, creating stressful and dangerous working conditions for some women. Because of the inequity experienced by women in Maine's aquaculture industry, this study suggests that Maine's aquaculture industry has not yet achieved triple-bottom line sustainability.

When discussing a potential women-focused aquaculture training course, participants described their desire for a gender-responsive course that addresses the specific needs of women. Participants discussed wanting space for connection and networking with other women in aquaculture, as well as wanting to learn safe working practices, hands-on technical skills, and business skills. Participants also discussed structural changes they wanted in the course, however due to the diversity of backgrounds and experiences there was no consensus reached regarding

logistical and structural changes. This study provides aquaculture training organizers with specific content that would help in meeting women's aquaculture educational needs.

This thesis adds to the body of knowledge on Maine's aquaculture industry, and to the scholarship surrounding gender equity in aquaculture globally. Women are passionate about aquaculture and are eager to participate in the industry but face systemic cultural barriers that prevent them from succeeding. More care should be put into addressing the barriers that women, and other underrepresented groups, face to improve equity in Maine's aquaculture industry.

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APPENDIX A

AQSW INTERVIEW GUIDE

Background and experience: Can you very briefly tell us a little bit about yourself?
When and why did you first start thinking about doing AQ? When did you take the ASQW course? Did you take any of the advanced AQSW courses or workshops? Why or How did you come to take the ASQW course specifically?
About the course: Overall, how useful did you find the Aquaculture in Shared Waters Training program? What did you like most about the training program? What did you like least about the training program? Were there any topics not covered that you wish or think should have been included in the program? Or that should be covered in more depth?
Did you have any issues with the way information was conveyed or presented in the course?
Did you have any issues regarding the timing, location, duration, or other logistical aspects of the course?
Were you able to attend/participate in the course for as much time as you would have liked?
Did you ever feel uncomfortable while attending the course, for any reason? Please share.
Do you feel you had any (other) specific challenges with participating in the course that are unique to your being a woman?
Do you feel like you can reach out to any of the instructors for more information or to discuss AQ? What about other class members? Post class, have you reached out to/connected with/stayed connected to instructors? Other students?
What would you like to see in a course that is focused on women in aquaculture?
Do you have any other specific recommendations or additional feedback for those who offer aquaculture training?
Post-course: Are you currently doing aquaculture in any form, or have plans to do AQ in the near future? If you currently, or have previously worked on an aquaculture farm, what was your role?
Do you think you have enough support and resources moving forward? If not, what kind of information or resources do you think you need? Do you think you'll need help with any particular aspects moving forward?
For existing farmers or folks about to enter: What does your support network look like? Who (individuals) or what (organizations) have been helpful to you during your time in the industry?
As a woman, have you ever felt uncomfortable working as an aquaculture farmer?
If not or sounding unsure/hesitant to do AQ: What are the main reasons that you either do not want to or are uncertain about doing AQ? Did taking the class help them decide not to do AQ?
What do you see as the most critical barriers for those interested in doing AQ?
Wrap up: Do you have any specific recommendations or additional feedback for those who offer aquaculture training?
Demographics: What year were you born? How would you describe your race or ethnicity? What is your marital status? How many people, including yourself, live in your household? Do you have any children under the age of 18 living in your household?
Are you currently a full-time resident of Maine? Have you served in the military? What is the highest level of school you have completed or the highest degree you have received?

APPENDIX B

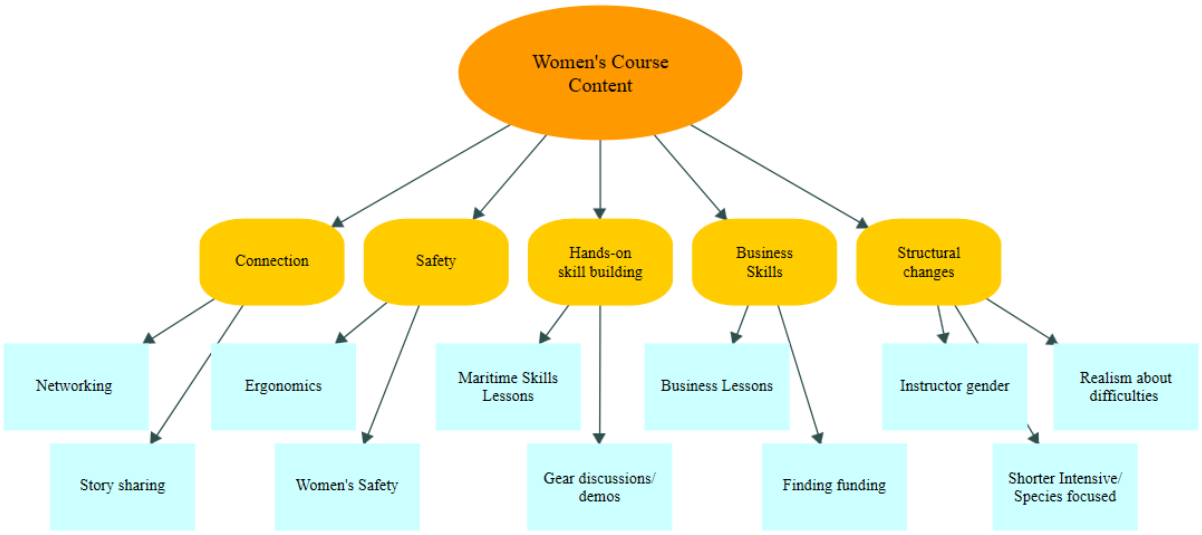

Figure 7. Example of a concept map utilized to group themes and subthemes. This concept map was used to demonstrate the content participants wanted to see in a potential women-focused training course.

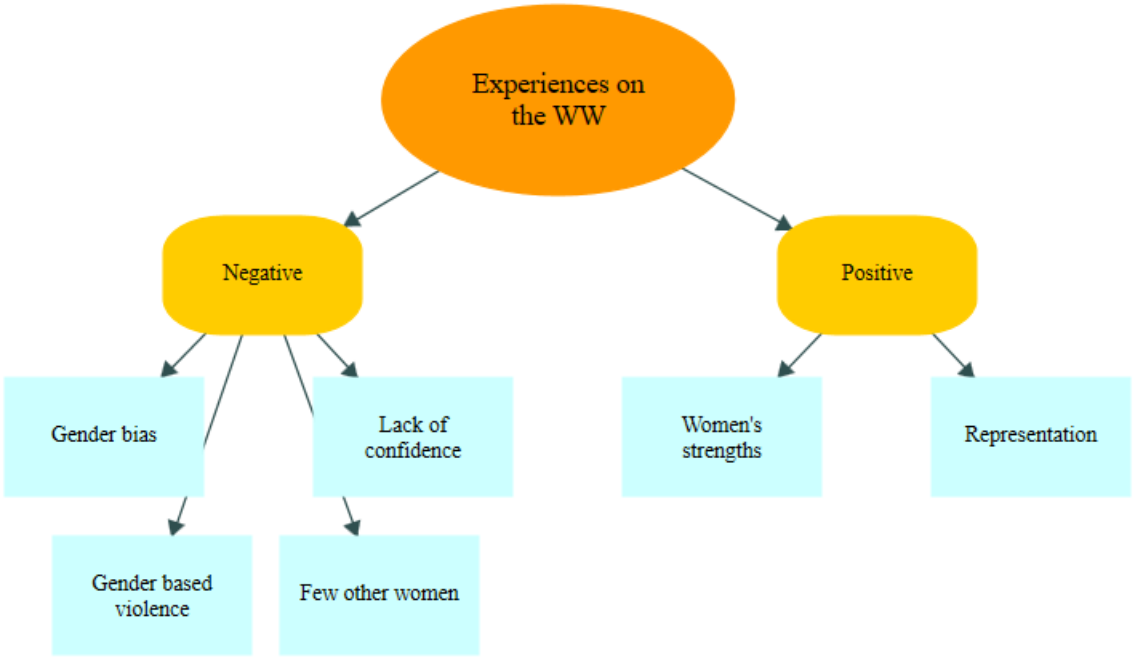

Figure 8. Example of a concept map utilized to visualize themes and subthemes. This concept map was used to demonstrate different experiences participants had on the working waterfront.

BIOGRAPHY OF THE AUTHOR

Jessica Veo was born in Boston, Massachusetts and graduated from Masconomet Regional High School in 2015. She attended the University of Massachusetts Amherst where she received a Bachelor of Science in Biology in 2019. Jessica has conducted research at institutions including the New England Aquarium, Shoals Marine Laboratory, the International Fund for Animal Welfare, Woods Hole Oceanographic Institution, Dauphin Island Sea Laboratory, and the Massachusetts Division of Marine Fisheries. She has studied American lobsters, marine mammals, and diadromous fish. She has also worked in education and outreach for the National Park Service, the Seacoast Science Center, and Penikese Island School. She is a candidate for the Masters degree in Ecology and Environmental Science from the University of Maine in August 2024.