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A RISING TIDE? THE ROLE OF ALTERNATIVE NETWORKS FOR WOMEN OYSTER FARMERS IN MAINE AND NEW HAMPSHIRE

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ACRONYMS

SES: Social-Ecological Systems
IAD: Institutional Analysis and Development
NHFG: New Hampshire Fish and Game
DMR: Maine Department of Marine Resources
NHFA: New Hampshire Food Alliance
HLPE: High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security

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ABSTRACT

A RISING TIDE? THE ROLE OF SOCIAL NETWORKS FOR WOMEN OYSTER FARMERS IN MAINE AND NEW HAMPSHIRE

By
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Aquaculture is one of the fastest growing forms of food production globally. In the United States, there has been a renewed interest in aquaculture development in domestic waters. With widespread expansion of shellfish aquaculture started by local entrepreneurs and fishermen, the states of Maine and New Hampshire have experienced aquaculture driven economic development in coastal communities impacted by the decline in wild capture fisheries. Additionally, aquaculture farming practices can provide ecosystem services such as water quality improvement, nutrient removal, and habitat availability. When implemented carefully, marine food products from aquaculture can be among some of the most environmentally responsible choices for consumers, and as such, they are in high demand.

New England supports some of the highest numbers of women owned oyster farms in the country. Although women make up half of the global workforce, their roles in the fisheries and aquaculture sector are poorly understood and have largely been unaccounted for, which may have pervasive impacts on opportunities for social and economic progress. This research analyzes women's experiences as oyster producers in Maine and New Hampshire, identifies gender-specific institutional barriers and resources, and the ways in which the use of a social network may support their businesses. A food system wide survey and a photovoice case study methodology was implemented with photography, narratives, interviews, and a focus group to accomplish the research objectives. Investigating aquaculture development through a gender lens

can provide insights to inform more socially equitable management and policy decisions for aquaculture development in the region.

The gender norms of the aquaculture industry create systemic barriers that impact the oyster businesses owned by the women who participated in this research. Using institutional analysis and social-ecological theory combined with a gender analysis, gender-specific barriers were identified. These barriers include lack of funding opportunities, training that does not meet their needs and business goals, farm equipment and clothing that does not fit, and gender discrimination in the workplace. As a tool to address the areas where institutional barriers are occurring, the women in this research leverage alternative social networks of women oyster farmers. Based on the study findings, recommendations to address gender equity in the region's oyster industry include investing in women's networks and providing multiple opportunities for engagement, funding opportunities for women owned aquaculture, and collecting demographic data to account for women's presence in the industry and to be able to track change over time.

CHAPTER 1: Introduction

1.1 Significance

Aquaculture is the fastest growing food production sector across the globe and provides half of all seafood for human consumption (FAO, 2022). Aquaculture holds great promise to change the way food is produced to meet the challenges of food insecurity, nutrition, and climate resilience through inclusive and sustainable pathways (FAO, 2020). As of 2019, the United States (US) imports over 60 percent of consumed seafood, half of which comes from aquaculture, and the sector is poised for expansive growth (Campbell et al., 2021; Gephart et al., 2019). There is currently significant investment in aquaculture by the US federal government to enhance domestic sustainable seafood production via aquaculture in offshore waters while also building a diverse blue economy workforce that is inclusive and equitable (Exec. Order No. 13921, 2020; NOAA Fisheries, 2022). Throughout the US, marine wild capture fisheries are changing, aquaculture development is expanding, and some coastal communities are increasingly reliant upon marine resources (Stoll et al., 2019). The Gulf of Maine is currently experiencing these social-ecological systems changes at an accelerated rate, which is why Maine (ME) and New Hampshire (NH) provide a useful case to analyze the social components of aquaculture development.

Only relatively recently has aquaculture research expanded beyond production to include understanding the social dimensions of the industry such as gender equity (Krause et al., 2015; Szymkowiak, 2020). However, the federal and state agencies in Maine and New Hampshire that are responsible for managing the aquaculture industry do not collect extensive demographic data for the workforce so there is no quantification of who works in the fisheries and aquaculture sector and what their experiences might entail (Personal Communication, March 25, 2022;

Personal Communication, February 27, 2022). Without gender data collection, decision makers have a limited understanding of women's experiences in the industry and may not be capitalizing on transformative insights for sustainable development. In fact, women have been found to make important contributions to sustainable development because of their broader range of experiences and collaborative nature (Agrawal, 2000; James et al., 2021; Gissi et al., 2018).

Women make up half of the workforce in the global seafood supply chain (FAO, 2020). However, evidence suggests that there is a gender division of labor, especially in the developing world where women's societal roles are more strongly influenced by gender and social norms such as childcare responsibilities which may have pervasive impacts on opportunities for social and economic progress (Brugere and Williams, 2017; Kruijssen et al., 2018; Weeratunge et al., 2010). In the US, participation is similarly gendered. For example, in Alaskan commercial fisheries, women in family operations often have childcare responsibilities that limit their participation in the more lucrative harvesting positions due to historical gender norms of the industry (Szymkowiak, 2020). There is a lack of large scale analysis of women's participation within the fisheries and aquaculture sector due to a lack of gender data for stakeholders in the industry (Harper et al., 2020; Kruijssen et al., 2018; Szymkowiak, 2020).

Without demographic data such as gender incorporated into fishery and aquaculture datasets, we lack a comprehensive understanding of resource management, distribution of benefits, and equitable engagement in the industry. Gender is an important component of aquaculture development, and there is an emerging body of literature that suggests addressing gender equity can enhance seafood production, household income, contribute to poverty reduction and food security, and improve governance and ecosystem health throughout the seafood sector (FAO, 2017; Kruijssen et al., 2018; Siles et al., 2019).

New England supports the high of women-owned oyster farming ventures in an industry and sector of the food system that has historically been male dominated (Maine DMR, 2022; personal communication, May 13, 2021). In New Hampshire, two of the 18 oyster farm operations are owned by women (New Hampshire Fish and Game, 2020). As of 2021 in Maine, there are 23 oyster aquaculture leases owned by women (Terry, 2021). A recent study of women's participation in the fisheries and aquaculture industry in Maine found evidence of increased gender equity through the transition from wild capture to aquaculture (McClenachan and Moulton, 2022).

The goal of this research is to analyze how women oyster producers experience gender dynamics by exploring their access to resources and experiences of barriers in oyster aquaculture production in Maine and New Hampshire through the lens of gender. The research draws on theories and methods across disciplines using both a survey and a photovoice case study designed to make the research findings accessible to a wide audience within the aquaculture community and beyond. The remainder of the chapter will provide a review of the literature on the food system and gender equity in natural resource management, followed by an overview of the frameworks for analysis, research design, objectives, methodology for data collection and analysis.

1.2 Study Location: Maine and New Hampshire

The coastal communities within the Gulf of Maine ecosystem have experienced economic development from aquaculture as shifts in the ecology, economics, and social components continue to impact wild capture fisheries (Bricknell et al., 2021). The marine ecosystem maintains ideal water quality characteristics for shellfish production including water

temperature, sunlight, salinity, and low levels of pollution such as nitrogen (Bricknell et al., 2021). Shellfish aquaculture also has the ability to restore coastal habitats with ecosystem services such as water quality improvement, nutrient removal, and habitat availability (NH Shellfish Growers Initiative and NH Sea Grant; 2021). These marine food products are also some of the most environmentally responsible choices for consumers (Gephart et al., 2020). They are also in high demand for the domestic seafood market, as the US is the number one importer of seafood globally (Campbell et al., 2021; White et al., 2020).

Since the 1970s, the state of Maine has been a national focus area for aquaculture with a variety of species cultivation including salmon (*Salmo salar*), blue mussels (*Mytilus edulis*), and the Eastern oyster (*Crassostrea virginica*), and seaweed (*Sacchrina latissimi* and *Alaria esculenta*). As of 2019, the industry maintains an economic value of $88 million (Britsch et al. 2021). The industry operates at a small scale within state waters, with the oyster industry maintaining 690 acres of leases in 2020 (Britsch et al. 2021). The New Hampshire oyster aquaculture industry is also operating at smaller scales, with 80 acres of oyster farms contributing a total of $4.7 million in economic value to the state's coastal communities (NH Shellfish Growers Initiative and NH Sea Grant, 2021). The diversification of marine products by small, local enterprises has kept the ownership and benefits of shellfish aquaculture within coastal communities, rather the international export-oriented markets such as finfish aquaculture in Maine (Stoll et al., 2019). Investigating aquaculture development through a social lens provides an opportunity for understanding how wild capture fisheries and aquaculture can sustainably coexist in the Gulf of Maine, as there is a need for both to address growing seafood demand (Knapp and Rubino, 2016).

The region is at a pivotal point for aquaculture development. However, the sector has yet to reach its potential as there has been little attempt to incorporate all dimensions of sustainability (ecological, social, economic) into high level decisions, instead focusing on ecological factors to enhance production and increase market value (Campbell et al., 2021; Costa-Pierce, 2010; Krause et al., 2015). Furthermore, neither state has an updated strategic plan for aquaculture development (Lester et al., 2022; Stoll et al., 2019; Personal Communication, March 5, 2021). Lester et al. (2022) provides a comparison of state level aquaculture policy between New Hampshire and Maine as the state of New Hampshire is the only state in the nation with marine aquaculture production that lacks supportive and comprehensive aquaculture policy. The authors demonstrate that Maine can be used as an example for successful state level aquaculture development policy that takes advantage of 'cross-sectoral collaborations' with academia, non-profits, and other science-based institutions that support the growth of the industry and provide resources for people interested in entering it (Lester et al., 2022). There is an opportunity for new policy for aquaculture development to address social equity and contribute to future discussions and long-term sustainability goals for the region, and this research on the role of gender for the oyster aquaculture workforce will contribute to the growing body of literature in the field.

1.3 Food System Concept

The accelerated pace of global aquaculture development has produced a renewed interest in the food system approach to research and policy making for the industry (HLPE, 2017; Tezzo et al., 2020). The conceptual frame of "food systems" encompasses all activities that relate to the production, processing, distribution, preparation, and consumption of food along with the

broader socio-economic and environmental concerns related to each activity (HLPE, 2017; NHFA, 2015). It is a multidirectional approach that takes into account all elements and their relationships, not confining to a single sector or sub-system (Ericksen, 2008; Ingram, 2011). This framing allows for a prioritization of outcomes that incorporate more than just producers, such as system-wide sustainability. The interdisciplinary perspectives within this approach are necessary to include environmental, economic, and social issues that contribute to how food is produced, distributed, and consumed (Tezzo et al., 2020). A food systems approach provides a framework to analyze the cause and effect of the multi-dimensional socioeconomic drivers that contribute to sustainable and equitable aquaculture development (Krause et al., 2015). Maine and New Hampshire operate at similar scales for oyster aquaculture and have maintained significantly lower cases of shellfish disease as compared to other New England states (Urquhart et al., 2016), which allows for oyster seed transfer across state boundaries and a more interconnected food system (NHDES, 2022).

1.4 Demographic Data Gap

The discrepancies for data collection in the domestic fisheries and aquaculture sector has been documented in the literature (Calhoun et al., 2016; Froehlich et al., 2022; Stoll et al., 2023; Szymkowiak. 2020). With a lack of incentives for data collection, there are gaps in social data, species data, and the nuances of permitting and leasing for the industry. Furthermore, social science research for the seafood sector has lacked an intersectional approach due to deficiencies in other demographic variables such as race and socioeconomic status (James et al., 2021; Krause et al., 2015; Lawless et al., 2021).

As discussed in the section above, the federal agency responsible for the management of our nation's marine resources, the National Oceanic and Atmospheric Association (NOAA) does not collect comprehensive demographic data (Personal Communication, February 27, 2022, Personal Communication, September 16, 2022). At the state level, agencies such as the Maine Department of Marine Resources and the New Hampshire Department of Environmental Services also do not collect demographic information on the fisheries and aquaculture industry (Personal Communication, March 25, 2022; Personal Communication, March 5, 2021). The lack of comprehensive demographic data collection on the fisheries and aquaculture sector is striking, especially considering the systematic data collection process the United States Department of Agriculture (USDA) completes via the Census of Agriculture. Furthermore, the USDA Census of Agriculture has gone through a series of revisions in order to accurately collect data on farmer demographics, particularly addressing the role of women as producers (Pilgeram et al., 2020). According to the latest USDA 2017 Census of Agriculture, the number of women holding 'principal producer' roles is 766,500 individuals. This is a number that currently cannot be quantified for the domestic seafood industry.

NOAA Fisheries has recognized the demographic data gap for the seafood sector. The agency has prioritized the identification of vulnerable communities, equity, and environmental justice in the 2022 Equity and Environmental Justice Strategy (NOAA Fisheries, 2022). Within the Human Integrated Ecosystem-Based Fisheries Management Research Strategy, there are coastal community characterization goals, community vulnerability assessments, and baseline data collection, and many more (Office of Science and Technology, 2022). With better demographic data, the industry will be able to track change over time as the industry continues to expand to address domestic seafood demand.

In settings where there is a quantification of women in seafood roles, which is often in high numbers, there is still a disconnect for gender equity with women not recognized in higher level management and policy decisions (Barclay et al., 2021). It is important to note that while collecting demographic data is an important first step towards gender equity for the seafood industry, it is not an all-encompassing solution. Incorporation of human dimensions into data collection will support governance of marine resource management (Blasco et al., 2020). To have long term sustainability and social equity, policy and management decisions must reflect the diversity of experiences of the industry.

1.5 Gender Equity and the Food System

Gender equity is another component of the food system that has been demonstrated to be important for food system resilience (Schipanski et al., 2016). Generally, gender equality is defined as ‘‘the equal rights, responsibilities and opportunities of women and men and girls and boys” (FAO, 2017; Lawless et al., 2021). Incorporating a systems approach to gender inequalities has yet to receive large scale attention in the literature (Njuki et al., 2022; Schipanksi et al., 2016). When analyzing gender equity, it is important to be clear on the distinction between gender and sex. Here, sex is defined as the physical biology of an individual assigned at birth, typically male, female or intersex. Gender is defined as an individual’s identity (i.e. as a man, woman, non-binary, third gender, etc). Sex and gender do not equate to sexual orientation. An individual whose gender identity coincides with their sex assigned at birth is referred to as cisgender. Someone whose gender identity does not align with their sex assigned at birth or does not conform to binary notions of gender (man/woman) may call themselves nonbinary or genderqueer. Our understanding of both sex and gender are shaped by social constructs (Bell et

al., 2015). Gender perceptions vary widely and depend on existing societal cultures. How a society defines masculinity and femininity dictates the opportunities and power relations for both genders (Bell et al., 2015). While there are diverse social constructions across cultures, the privileges and opportunities for women are often subordinate to their male counterparts (FAO, 2017).

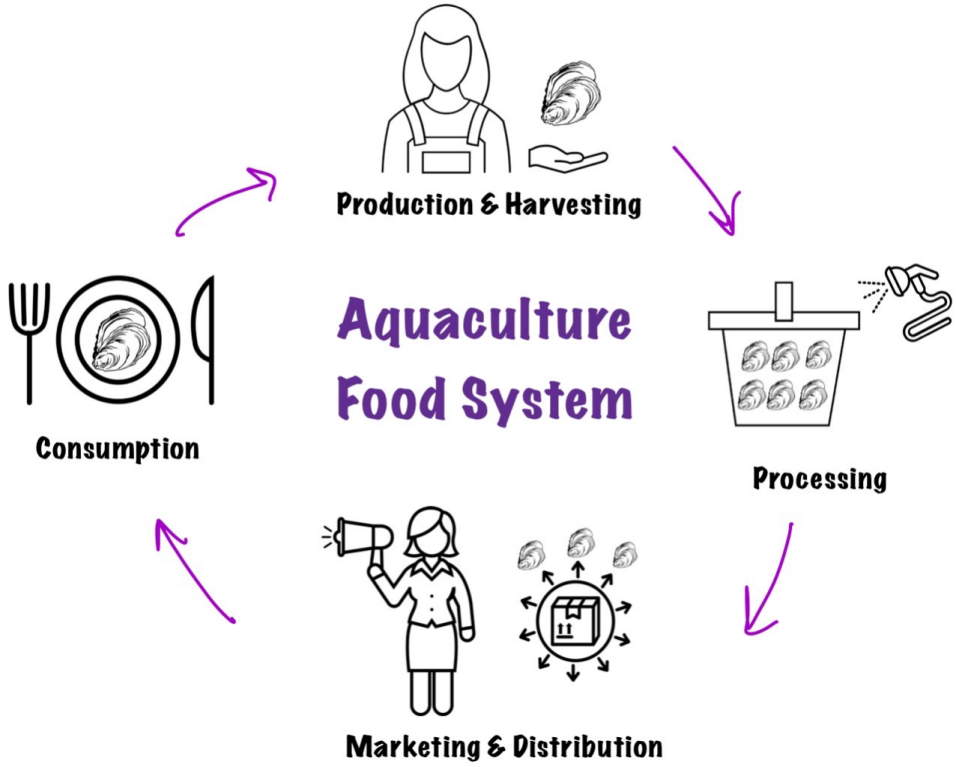

Figure 1. Diagram of aquaculture food system sectors (Lord, 2022).

Roles of women in fisheries and aquaculture

The gender division of labor in the global food system is well documented, and the seafood sector is no exception (FAO, 2020). Figure 1 demonstrates the various roles that women may play within the seafood system. Globally, the post-harvest, processing, and marketing sectors are where women are most dominant (FAO 2020; FAO 2017; Kruijssen et al., 2018). Pre and post-harvest work are often considered an extension of housework, and are therefore unpaid

and not included in data collection. The literature indicates that women may be in the lower sectors of the supply chain with little opportunity for upward economic mobility primarily due to customary beliefs and gender norms (FAO 2017; Kruijssen et al., 2018; Weeratunge et al., 2010).). These gendered social patterns continue when considering household finances, with women's income often disproportionately spent on household goods, children's health, and education (Harper et al., 2020). The gender division of labor in aquaculture production is contingent upon existing gender norms in the particular society where women work and reside (Kruijssen et al., 2018; Lawless et al., 2019). In other seafood settings such as Alaskan commercial fisheries, Szymkowiak (2020) found that women are responsible for childcare within fishing families and have less direct fishing participation than their male counterparts who may have inherited capital and permits from their family operation. The reliance on women for childcare may limit access to harvesting roles in the fishery and challenge their ability to take part in institutionalized licensing and permit programs that depend on time at sea and capital (Szymkowiak, 2020).

Gender equity is a priority to address global climate resilience, food security, and nutrition (FAO, 2020; HLPE, 2017; UNWomen, 2015). Gender equity is increasingly included in measures of international development outcomes such as the UN Sustainable Development Goals (Haward and Haas, 2021). However, there is little information on the considerations of gender within aquaculture value chains (Njuki et al., 2022). The rapid growth of the aquaculture industry may have detrimental effects on equity (Troell et al. 2014). As the New England aquaculture sector is experiencing a period of expansive growth, taking social equity into account now may avoid unequitable outcomes in the future. Women's participation in the seafood industry can be a mechanism for gender equity by increasing empowerment, providing

access to resources, decision-making capabilities, and enhancing household nutrition (FAO, 2020). Weeratunge et al. (2010) found that countries which have improved gender equity in their food production systems have gained higher levels of economic growth and social well-being.

As the aquaculture industries of Maine and New Hampshire are poised for expansion, now is the time to build an equitable marine food system for all actors involved. Incorporating gender equity into policy will require a gender-responsive approach, which acknowledges social roles and responsibilities of both men and women, along with power structures and cultural experiences of the communities they work in (Dugarova, 2018).

1.6 Gender Analysis

Integrating gender analysis in aquaculture research and policy is critical to ensure equal access and opportunity for women to a viable business, a community support system, and the ability to produce food with positive impacts on water quality, ecosystem services, and biodiversity. Gender analysis identifies, examines, and informs action to address inequalities that arise from gender norms and roles, division of labor, access and control of productive activities and resources, and power relations between men and women (Caro et al., 2020; USAID, 2018; WHO, 2002). There are four common components to a gender analysis: (1) gender norms, for example, determining women's roles in food system sectors in relation to societal beliefs and perceptions, (2) Participation and practice, for example, the gender division of labor, limited participation of women in aquaculture production, women's capacity to participate in various economic, political, social activities and decision making (3) access to resources, for example, control over decision making, knowledge sharing, social networks, and key assets and (4) institutions and policies, for example, men and women's different rights and how they are

affected by policy, rules, and governing institutions. The cross-cutting theme throughout all four dimensions of gender analysis is power relations, for example, who has the main decision-making power and what benefits that may provide (Caro et al., 2020; Kruijssen et al., 2018). Additional gender analysis frameworks to identify variables included the Harvard, Moser, and Social Relations approaches (March et al., 1999).

1.7 Institutional Analysis and Development

The Institutional Analysis and Development framework by Elinor Ostrom helps scholars understand institutional design and function for collective action problems (Schlager and Cox, 2018). This framework will be used to identify opportunities and barriers for women's participation as aquaculture producers. To analyze a collective action problem, an action situation is the center unit of analysis (Schlager and Cox, 2018). Ostrom (2011) defines action situations as "the social spaces where individuals interact, exchange goods and services, solve problems, dominate one another, or fight". These are most often used to study behavior within institutional arrangements that lead to specific interactions and outcomes. These variables can be used to understand the established rules and norms that influence women's participation in aquaculture production, their access and control over resources, decision making, and social networks.

1.8 Social-Ecological Systems and Gender

To analyze factors that contribute to women's experiences as aquaculture producers, a framework that provides a common set of relevant variables for complex human-natural resource systems is used. As described by Dr. Elinor Ostrom, the social-ecological systems (SES)

framework is a theoretical approach to organize variables identified in theories and empirical research on resource systems maintaining collective action (Ostrom, 2009). Johnson et al., (2019) use the social-ecological system framework to define action situations in a shellfish aquaculture producer setting in Maine. An SES framework can be used as guidance for policymakers and natural resource managers to integrate the human dimensions of aquaculture development with the environmental and economic components (Johnson et al., 2019). It is particularly useful for this research as Maine and New Hampshire are experiencing changes in the Gulf of Maine ecosystem with increased use and management of the common pool resource. Using the SES framework can help us understand how gender relations might be impacting social-ecological resilience for stakeholders involved (Kawarazuka et al., 2017). The SES framework has been used to examine human dimensions of aquaculture development (Krause et al., 2015). Yet the few studies have examined gender as a variable in the fisheries and aquaculture settings (Harper et al., 2020; Kawarazuka et al., 2017). Engaging gender analysis within social-ecological systems can be a useful tool for understanding social equity outcomes during periods of institutional change, such as development of the aquaculture industry in ME and NH (Kawarazuka et al., 2017).

1.9 Social Networks and Gender

The role of networks is an emerging area of research in food systems, with the most common literature analyzing producer-producer and producer-consumer interactions (Christensen and O'Sullivan, 2014). For aquaculture settings, social networks can be a determinant of access to markets and may also increase community organizing, trust, and reciprocity (Orchard et al., 2015). Within the literature for domestic seafood production, social

networks have been found to hold a critical role for knowledge transfer and resilience of the industry (Calhoun et al, 2016; Johnson et al., 2019). Agrawal (2000) found that social networks vary by gender, often functioning in separate spheres for men and women. Women use networks to build social capital "…since women's avenues for accumulating economic resources and their physical mobility are typically much more restricted than men's" (Agrawal, 2000). Other research has found that networks vary by gender but also their role and importance varies within gender (Novak Colwell et al., 2017). Furthermore, these networks became an important source for organized collective action among women at multiple different network scales (Agrawal, 2000). When women's opinions are incorporated into decision-making, communication and cooperation amongst stakeholders is increased, ultimately strengthening the social networks (Calhoun et al., 2016).

For women in the fisheries and aquaculture industry, the literature demonstrates that social networks can be of greater importance, providing benefits such as access to credit, promoting participation, enhancing marketing strategies, and general support during times of adversity (Kruijssen et al. 2018; Szymkowiak and Rhodes-Reese, 2020). Within the aquaculture food system, social networks are found to build trust and reciprocity among farmers and other industry stakeholders, ultimately enhancing knowledge transfer, social acceptance, and the success of an aquaculture operation (Johnson et al., 2019). In this research, the social network around oyster aquaculture was analyzed using the SES and gender analysis framework to identify actors and patterns of interaction between users and the role of gender within those networking activities.

1.10 Research Questions

In order to address the gaps in the literature and contribute to the development of an emerging aquaculture industry, this research analyzes the following question: "How and in what ways do women experience gender dynamics in aquaculture production in Maine and New Hampshire?" Within the overarching research question, this study examines four topic areas:

1. How do women have access and control of necessary resources, services, and decision-making abilities?
2. What are the barriers and opportunities to participation for production and economic growth?
3. How does engagement in social networks benefit or hinder women in their entrepreneurial aquaculture pursuits?
4. In what ways are the social networks influencing gender norms?

1.11 Study Objectives

The overall goal of this research is to support women's participation in the oyster aquaculture industry and improve knowledge of pathways into producer roles which can inform how other marginalized groups, more broadly, can enter the industry and have equal opportunity to start a business and be a part of the coastal economies here in New England. Therefore, the objectives of this research cover four main areas:

1. Determine if women's experiences as producers are influenced by gender dynamics in the aquaculture sector of Maine and New Hampshire
2. Identify institutional barriers and opportunities for women producers

3. Determine if the use of social networks provides benefits for women's access to knowledge sharing, decision-making, and resources
4. Make recommendations for addressing gender in aquaculture policy

1.12 Research Design and Methodology

This study included an oyster aquaculture survey and a photovoice case study to identify demographic information and gender-based barriers and resources for oyster farmers in ME and NH. To learn more about the gender dynamics of the industry, a case study was conducted of women oyster aquaculture producers in both states. Through a gender analysis that relies on qualitative data from in-depth interviews and narratives provided by the Photovoice method, I identified opportunities and barriers to participation by highlighting connections between variables that make up an aquaculture action situation from Ostrom's IAD framework and the governance systems, users, interactions, and outcomes variables in the social-ecological systems framework (Ostrom, 2009). The questions were designed to identify the following themes: participant relation and interactions, roles (productive, reproductive, and community), and the four domains of gender analysis: access, participation, gender norms, and institutions and policies.

To inform the research design, I conducted a literature review of peer reviewed research, reports, and grey literature to determine the state of research on women and gender in aquaculture and the barriers and opportunities for women to participate in the industry. I also engaged with institutions working towards building a more inclusive industry, such as New Hampshire Sea Grant.

This research used a mixed methods approach that provided quantitative and qualitative data from a survey and qualitative data from a photovoice case study. A qualitative research approach is necessary for this research topic to examine experiences of underrepresented groups in the fisheries and aquaculture industry. A case study approach was selected as the methodology for this research as it investigates context-specific experiences and can be used to illustrate and evaluate real-life situations (Yin, 2009). Interviews have the ability to identify social patterns and processes that are underlying experiences of marginalized groups (Gerson and Damaske, 2021). A small sample size of interviews can limit the ability for the research to reach 'theoretical saturation', however it can also provide a greater depth of knowledge on the specific research topic (Gerson and Damaske, 2021). Furthermore, qualitative methods explore the institutional arrangements and collective action that shape the opportunities and barriers of society today. Specific components of this study included an oyster aquaculture survey and a photovoice case study.

1.12.1 Oyster Aquaculture Survey

To gain perspective on gender dynamics in the region's oyster aquaculture industry, the study included an online survey using Qualtrics software to survey participants across the oyster aquaculture food system in ME and NH (IRB #2021/2022-23). There is no publicly available sex-disaggregated data that are systematically collected for oyster aquaculture producers in either state to inform analyses of gender differences or improvements for gender equity. Therefore, the survey focused on gaining a preliminary understanding of the role of gender in oyster aquaculture, including perceived gender-based resources and barriers for men, women, and non-binary farmers. The survey was implemented electronically between August and October 2021.

Survey participants were identified using publicly available state agency aquaculture lease data from New Hampshire Fish and Game and the Maine Department of Marine Resources, and business name and contact information from the Maine Oyster Trail website. These sources were used because (1) the state agencies listed above are the regulatory authority for aquaculture leases and (2) the Maine Oyster Trail Business Directory provides contact information that is otherwise not publicly available. Participants were not compensated. Due to the unknown probability of selection into the sample, there are no survey weights, and these results do not represent the entirety of oyster aquaculture farmers in Maine and New Hampshire. However, of the total contacted oyster farmers (n=77), 39 participated in the survey to provide a response rate of 53%. Although this work is unable to claim generalizability to the entire population of New Hampshire and Maine oyster farmers, the work provides descriptive results in an area that has very little research. There are a total of 39 cases for this analytic sample, which is a subset of the larger survey with a total of 46 cases. This research is focused on gender-related experiences, so cases were removed if survey participants left the gender identification question blank or answered, "I prefer not to answer" or did not complete the entirety of the survey. Below are detailed descriptions of the survey recruitment methods for each state:

Maine

For Maine, 20 leaseholders were randomly identified out of a total of 285 leaseholders listed in the Maine DMR Open Data site. An additional 10 leaseholders were identified via non-probability purposive sampling from the Maine DMR Open Data site based on the following criteria: (1) oyster industry stakeholder including harvesters and seed producers, (2) at least one year of business operation, and (3) known or suspected use of a social network. Purposive

sampling was used because the survey was used as a recruitment technique for the second phase of the research project, the photovoice case study with four women oyster farmers who own and operate their own businesses. To account for lack of publicly available contact information, the Maine Oyster Trail Business Directory was used to recruit additional survey participant contacts (n = 34).

New Hampshire

All 13 oyster aquaculture lease holders with publicly available contact information in New Hampshire as of 2021 were selected for the survey for a non-random, non-probability based sample from the NHFG 2020 Marine Aquaculture Compendium.

1.12.2 Photovoice Background

Photovoice is a participatory research approach developed by Wang and Burris (1997) that is centered on feminist theory, constructivist learning, and documentary photography (Simmance et al., 2016). The overarching goals of Photovoice are "(1) to enable people to record and reflect their community's strengths and concerns; (2) to promote critical discussion and knowledge about important community issues through large and small group discussions of photographs; and (3) to reach policymakers" (Wang and Burris, 1997). The project includes photography, written narratives, one-on-one in-depth interviews, and a focus group session with all participants. This method was selected to address the study questions due to the rich set of data this methodology provides enabling visual storytelling and qualitative analysis to build research findings and recommendations. It provides participants with the opportunity to reflect on and critique community issues, while also retaining control over the documentation process

and having a part in building social change (Simmance et al. 2016; Wang and Burris, 1997). The culmination of the photovoice project involves a public display of photographs and narrative descriptions from participants to share experiences and bring awareness of community concerns to stakeholders in their networks.

Photovoice is increasingly used as a tool to address the social-ecological issues in fisheries and aquaculture (Bennett and Dearden, 2013; Pierce, 2020; Simmance et al., 2016). Photovoice is based in feminist theory and can be used to engage and empower women while also expanding their community networks, equality of voice, and experiences to decision makers (Pierce, 2020). Photovoice can be a safe and ethical method if processes are followed strictly. These processes include transparency throughout the entire research process, for example, participants are aware that their confidentiality cannot be maintained as the methodology involves sharing of results with their local communities, and full consent by participants. Photovoice training, interviews and the focus group were conducted remotely via Zoom. The protocols for the photovoice case study can be found in Appendix C.

1.12.6 Photovoice Methods

The photovoice method was used as a case study with (n=4) women oyster aquaculture producers to highlight their experiences and identify needs for equitable participation in the industry (Figure 2). The four women participants were recruited via the survey with additional recruitment using the sampling frame listed above. A training was provided via Zoom on November 17th, 2021, which lasted 60 minutes. During the training, participants received the prompt to share their experiences as oyster farmers in Maine and New Hampshire, along with

information about the methodology and the ethics behind photo documentation and qualitative research.

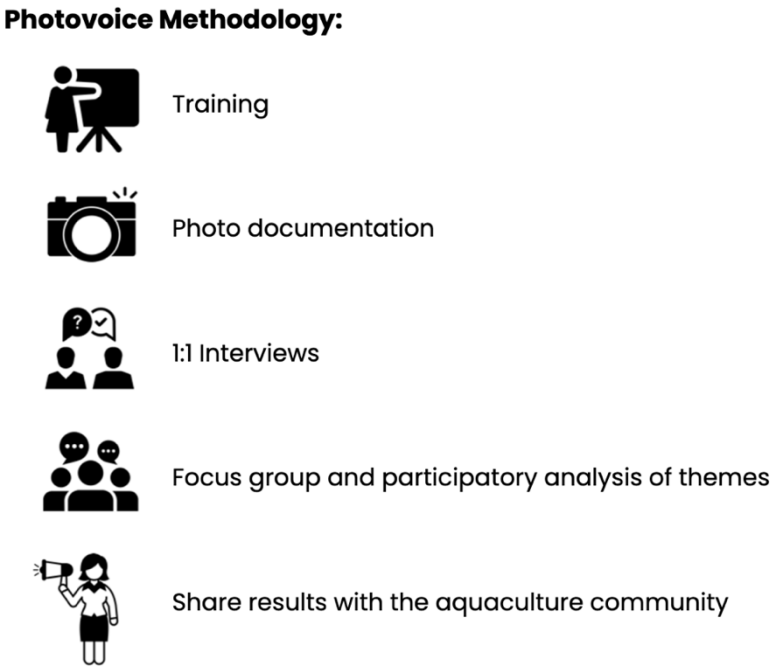

Figure 2. Overview of photovoice methodology developed by (Wang and Burris, 1997).

The participants collected data from November 2021 through February 2022. For data collection, the participants took a total of six photos and wrote descriptive narratives about each scenario depicted. One-on-one interviews and the focus group were conducted on Zoom for 60 minutes during the spring of 2022. The interviews used the photovoice SHOWeD method as guidance to discuss all six photos in depth (Shimshock, 2008). For more information on the interview protocol see Appendix C. During the photovoice process, the focus group is a time for the participants to interact again and share their experiences as researchers by providing one photo to the group and using the SHOWeD method. From there, the protocol is semi-structured, allowing participants to take the lead on determining any common themes amongst the photos as well as guiding the conversation. Here, the researcher takes a back seat and the participants lead

the discussion (Shimshock, 2008). the culmination of the photovoice project is a public exhibit of the participant photographs and narratives. During the focus group, the participants decide how they would like to share their experiences with their communities. For this case study, the participants chose a website, which is available at www.risingtidephotovoice.com.

1.13 Data Analysis Methods

For the qualitative analysis, a codebook was developed based on the variables from the literature review (Table 1), as well as emergent themes demonstrated in the analysis. Table 1 is my synthesis of variables from literature frameworks to identify codes for qualitative analysis. Within Table 1, there are SES and IAD framework variables as well as gender analysis variables which were selected for an interdisciplinary codebook that incorporates social theory of both frameworks. The interviews and focus groups were recorded via Zoom and transcribed using the Nvivo 12 transcription service. Referencing the frameworks for analysis that make up an aquaculture action situation (Table 1), the transcripts were coded and analyzed by themes using Nvivo 12 qualitative data analysis software. The themes included barriers and resources for an oyster aquaculture business, the use of a social network, and gender norms. For quality control, coding was discussed and revised with the research team.

All data from both data collection methods was secured on a password protected computer, accessible only by the research team, as required by UNH IRB protocol. Data management and protection included password protected access to the software, removed identifiers in transcripts, and participants were provided with written agreements for data sharing and use post research. For the photobook, participant names and identifiers were included as this portion of the research is meant to be shared widely within the participant communities.

Table 1. Literature concept table for framing the intersection between variables for analysis

Variable	Definition	Literature	Code
Access to Resources	Access is defined as the ability to use benefit from people, material objects, institutions, and symbols. One may have access to a resource but limited influence or control over issues discussed in the decision making process and outcomes. Resources include technology, capital, markets, labor, knowledge, authority, identities, social relations, legal rights. Furthermore, resources include five capitals: natural (land, water), physical, financial, human (health, knowledge skills) and social (group membership, social networks)	Johnson et al., 2019; Ostrom, 2009; Ostrom, 2011; Ribot and Peluso, 2003; Ferguson, 2021; Kruijssen et al., 2018; March et al., 1999	**Resource; barrier; funding; gear; training; access to farm; leases and permitting; information**
Observable metric: SES and IAD variables	**available information; level of control over choice; socioeconomic attributes**		
Social Networks	Social networks are systems made up of actors sharing strong social ties that often influence one another. Informal social networks among women can be a key source for collective action and solidarity.	Agrawal, 2000; Johnson et al., 2019;Ostrom, 2009 ;Ostrom, 2011 Prell et al., 2009; Plastrik and Taylor, 2006	**Social network; actor; informal actor; institutional actor; collaboration; conflicts between users; mentorship**
Observable metric: SES and IAD variables	**Information sharing; self-organizing activities; conflicts between/among users; networking activities; network structure; trust and reciprocity**		
Participation/Position in food system	Participation in fisheries and aquaculture includes (1) direct harvest participation, (2) pre-harvest work including getting bait and fuel, net mending, building out gear and (3) post-harvest work processing, marketing, selling product. Effective participation involves attending meetings, voicing opinions and experiences, and having those opinions be considered in the decision-making process.	Agrawal (2000); Johnson et al., 2019;Ostrom, 2009; Ostrom, 2011;Szymkowiak, Rhodes-Reese (2020)	**Participation; position in food system**
Observable metric: SES and IAD variables	**Positions; location in relation to resource and market; leadership/entrepreneurship**		
Gender norms and roles	Gender norms are the informal "rules", perceptions, and attitudes that dictate behaviors that are socially acceptable, appropriate or desirable for women and men in a particular society. "Traditional" gender roles expect women to fulfill reproductive duties such as household management, food provisioning, and childcare which prohibit their ability to participate in paid economic activities. Due to the influences of domestic responsibilities, women are predominantly working in pre and post-harvest sectors of the seafood food system.	Johnson et al., 2019;Ostrom, 2009 ;Ostrom, 2011; Kruijssen et al. (2018); Lawless et al., (2019); Szymkowiak, Rhodes-Reese (2020)	**Gender norms; childcare; autonomy**
Observable metric: SES and IAD variables	**Rules and norms; norms/social capital; history of past experiences of actors**		

CHAPTER 2: Oyster Aquaculture Survey

2.1 Introduction

Although women make up half the workforce in the seafood sector, their roles and experiences in the industry are poorly understood. To address this gap and gain new demographic information of region's oyster aquaculture industry in ME and NH, an online survey was conducted in 2021. It was inclusive of different genders, and reached participants involved in all sectors of the oyster aquaculture food system in ME and NH: production and harvesting, processing, and distribution and marketing (NHFA, 2015). The survey focused on understanding perspectives on the roles of gender in aquaculture, including perceived gender-based resources and barriers to participation in oyster aquaculture. This chapter analyzes survey data to help answer the overarching research question, "How and in what ways do women experience gender dynamics in aquaculture production in Maine and New Hampshire?" More specifically, the survey focuses on two of the supporting research questions on resources and barriers, "How do women have access and control of necessary resources, services, and decision-making abilities?" and "What are the barriers and opportunities to participation for production and economic growth?"

2.2 Survey Data and Analysis

The oyster aquaculture survey was designed to investigate the role of gender in the oyster aquaculture sector of ME and NH, with a total of (n=39) participants and a 53% response rate. The sampling frame was built from publicly available state agency aquaculture lease data, New Hampshire Fish and Game, Maine Department of Marine Resources and business name and contact information from the Maine Oyster Trail website. All results from Qualtrics have been organized via gender due to a significance in survey responses regarding the duration of work in

the industry and experiences of gender discrimination (p=0.059) (Table 2). The amount of time in the industry for the participant was selected as a variable for analysis as the literature indicates women may have less access to fishing rights and decision making due to institutional norms such as catch shares and professionalization strategies that use time in the industry for permitting access (Szymkowiak and Rhodes-Reese, 2020; McClenachan and Moulton, 2022). Table 2 provides chi square analysis data on the variables provided in the survey, with the only statistically significant finding between time working in the oyster industry and participants experiencing gender discrimination. Gender discrimination is pervasive in the maritime industry, regardless of how much experience one may have (Briceño-Lagos, 2018). The analysis is categorized as follows: (1) demographic information of survey participants, (2) participant roles in the food system, (3) participant identification of resources and barriers and (4) experiences of gender discrimination.

Table 2. Chi square analysis of survey variables and time working in the oyster aquaculture industry. The relationship between time in the industry and gender discrimination was statistically significate (p = 0.059)

Variable	Chi Square
Gender	0.14
Race	0.729
Age	0.152
Education Level	0.316
Parent	0.233
Pre-harvest	0.824
Harvest	0.857
Post-harvest	0.925
Business and Marketing	0.925
Research and Development	0.853
Farm Ownership	0.262
Primary Income	0.623
Resource: People, Organizations, Networks	0.614

Resource: Funding Opportunities	0.248
Resource: Gear	0.124
Resource: Training Opportunities	0.293
Barrier: People, Organizations, Networks	0.478
Barrier: Funding Opportunities	0.72
Barrier: Gear	0.326
Barrier: Training Opportunities	0.329
Gender Discrimination	0.059

2.2.1 Demographic Information

It is important to note that demographic data is not collected by state agencies in Maine or New Hampshire, which is why this information had to be gathered using a survey. As the aquaculture industry is still primarily male-dominated, the results of the participant gender identification reflects the lack of gender diversity in the survey sample.

Survey participants were asked to answer which gender they identify with. Here, gender is defined as an individual's identity and feelings. An individual whose gender identity coincides with their sex assigned at birth is referred to as cisgender. Someone whose gender identity does not align with their sex assigned at birth or does not conform to the binary notions of gender (man/woman) may call themselves nonbinary or genderqueer. In Figure 3, the order of respondents according to gender is as follows with men (n=26), women and nonbinary (n=13) There were (n=2) participants that selected "I prefer not to answer".

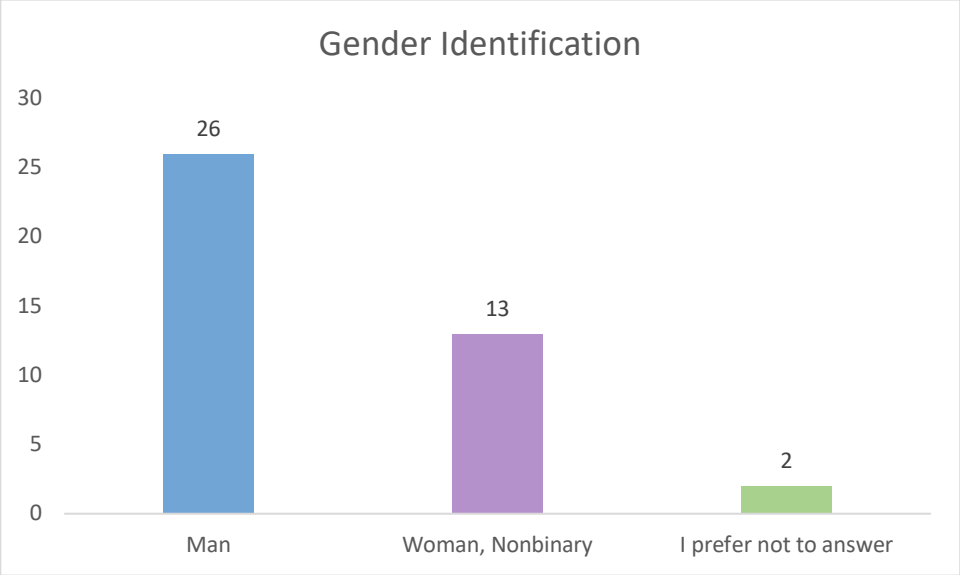

Figure 3. Participant gender identification total (n=41). Woman and nonbinary identifying (n=13), man identifying (n=26), "I prefer not to answer" (n=2)

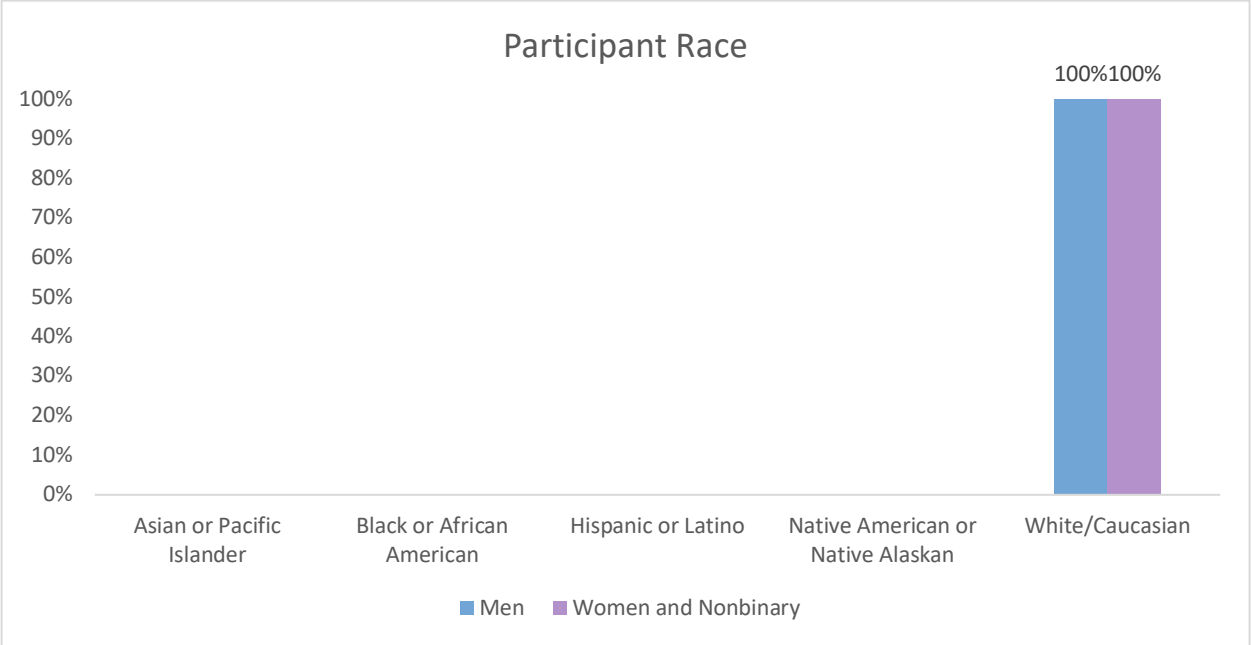

Figure 4. Percent of participant race identification by gender. Total (n=41) ,white or Caucasian identifying (n=40), "I prefer not to answer (n=1). Relationship between race and gender is statistically significant (p=<0.001).

As demonstrated in Figure 4, there is minimal racial diversity among the survey respondents, with 100% of participants who also identified their gender selected "White or Caucasian" for their racial identity. The relationship between gender and race is statistically significant (p=<0.001). This finding provides new demographic information for the subset of oyster aquaculture industry stakeholders in ME and NH who took this survey by illustrating a lack of racial diversity.

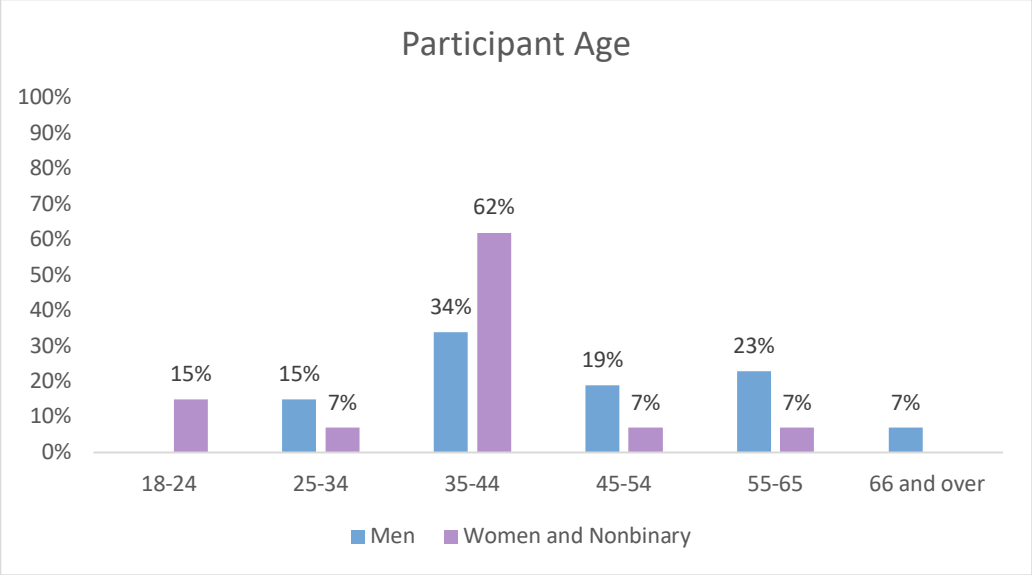

Figure 5. Percent of participant age by gender. The relationship between age and gender was not statistically significant (p=0.465).

In Figure 5, the majority of participants, 39%, are in the 35-44 age bracket (n=17). However, the relationship between age and gender was not statistically significant (p=0.465). This finding indicates that the age of survey participants does not relate to their gender identification.

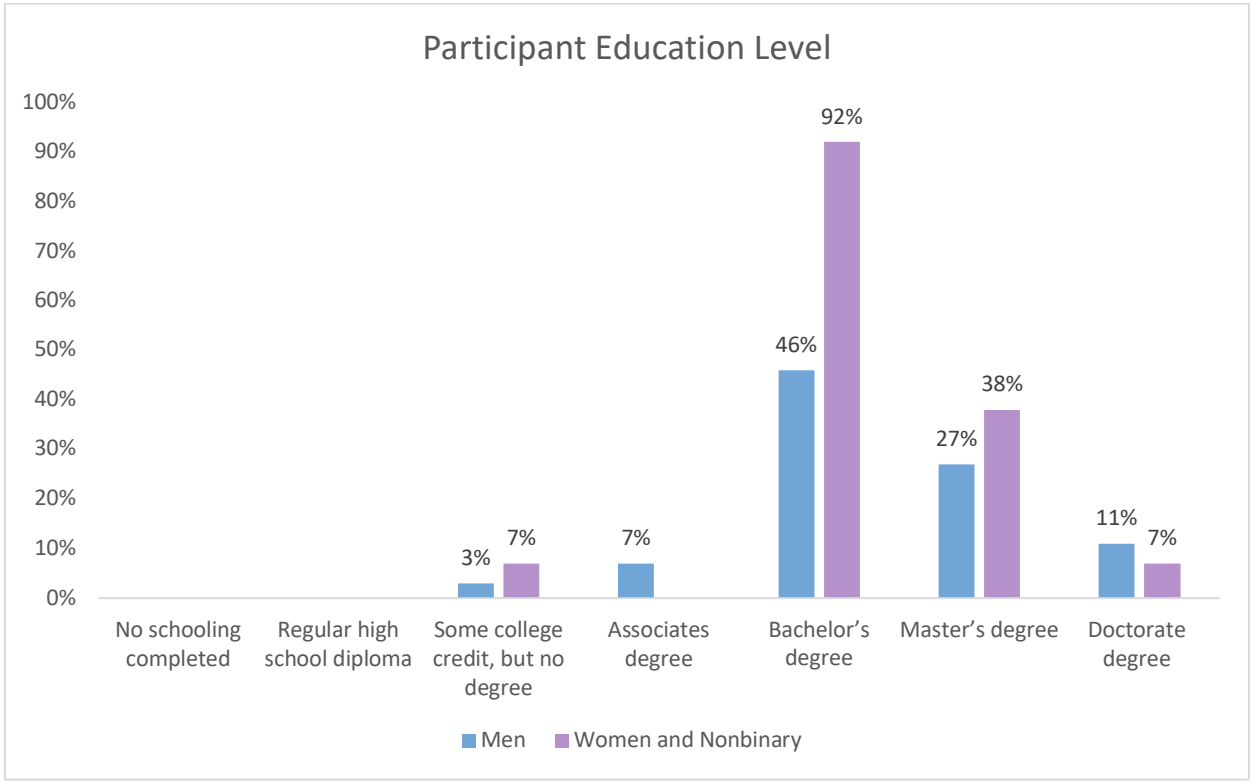

Figure 6. Participant education level by gender. The relationship between educational achievement and gender is not significant (p=0.962).

Figure 6 portrays the range of education levels of participants with 44% of respondents holding a Bachelor's degree. 32% of participants have achieved a graduate degree as the Master's level. The relationship between gender and education level was not statistically significant (p=0.962).

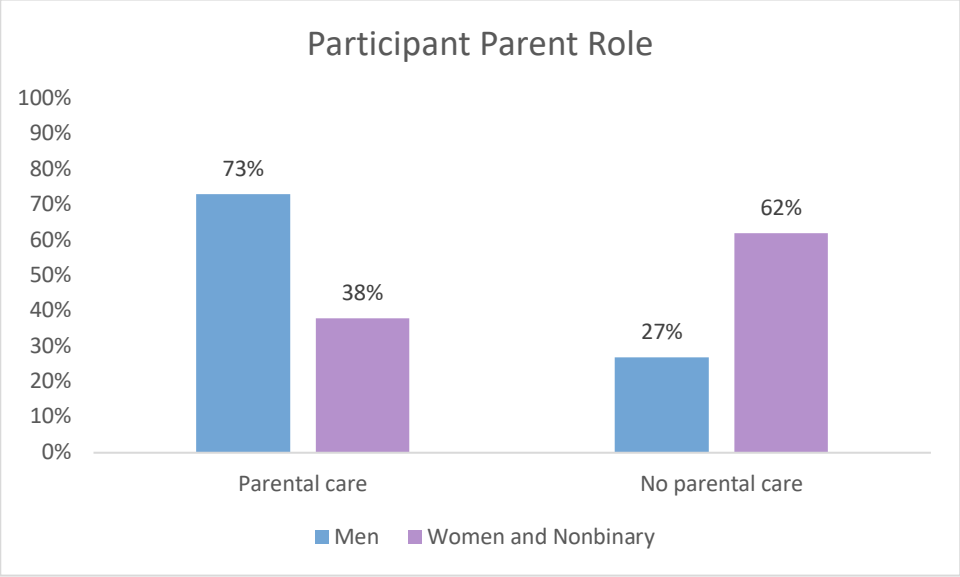

Figure 7. Participants that identified as a parental figure by gender. Men identifying as parents (n=19), women and nonbinary identifying as parents (n=5). The relationship between parenting and gender is not statistically significant (p=0.07).

The parent role question asked participants to identify if they have children and take on the role of parenting within their household. Figure 7 demonstrates the role of parenting for survey participants with 573% of men respondents and 38% of women and nonbinary participants identifying as a parent (n=24) and 27% of men and 62% of women and nonbinary participants identifying no parental role within the household. The relationship between parenting and gender is not statistically significant (p=0.07).

2.2.2 Participant Roles in the Food System

The aquaculture sector of Maine and New Hampshire remains primarily at the small scale operation level. The survey gained information about the tasks conducted within the food system sectors to determine if there is a gender division of labor when operating an oyster farm.

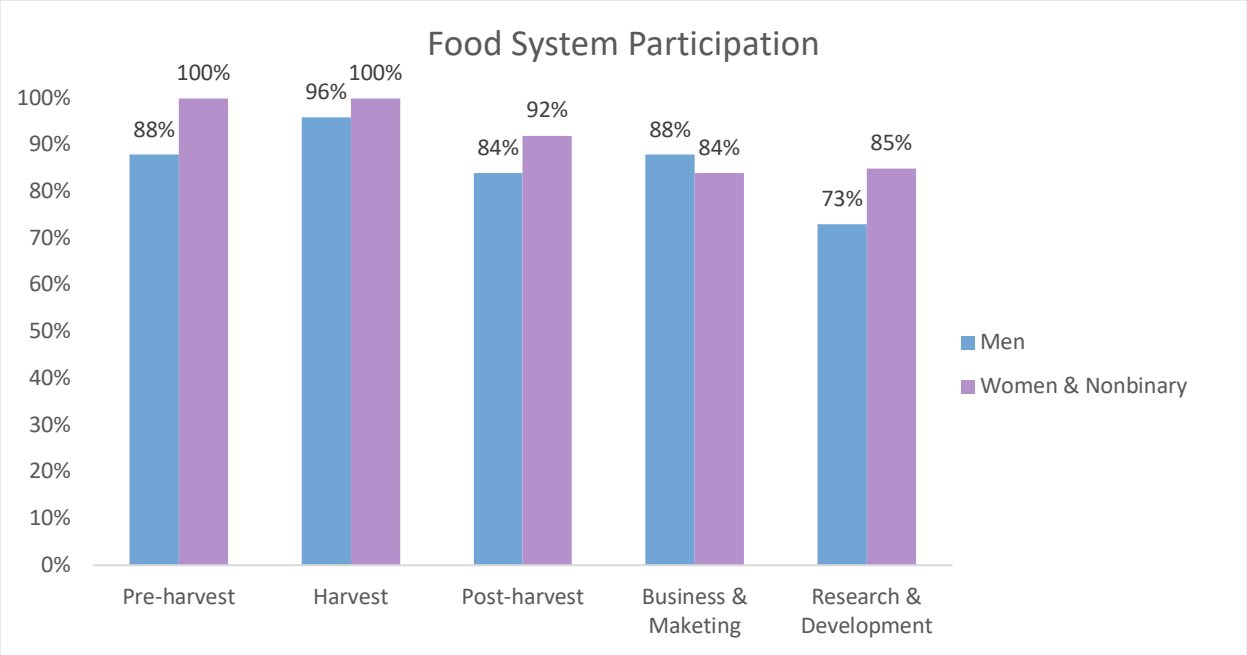

Figure 8. Percent of participants engaged in food system sectors by gender. Pre-harvest (p=0.444), harvest (p=0.744), postharvest (p=0.773), business and marketing (p=0.824) and research and development (p=0.672).

In Figure 8, sectors were divided into five categories that an oyster farming operation conducts for participants to select: (1) pre-harvest preparation work includes boat maintenance, gear construction, inventory, seeding, site preparation, (2) harvest and tending work is oyster growth monitoring, oyster cleaning, collection of product from site, (3) post-harvest work involves the processing, marketing, distribution of oysters, (4) business operations for the farm include finance, marketing, sales, and (5) research and development incorporates water quality monitoring and site selection for the oyster farm. Survey participants – regardless of gender – engage in all sectors of the food system from production to market (Figure 8). It is important to note that women and non-binary participants engage in the pre-harvest and harvesting sectors of the oyster aquaculture operation they are involved in. Two participants also selected the "I prefer to self-describe" option with a male participant commenting, *"I deal with regulators and the state regulation on new site selections"* and a woman participant adding *"hatchery production"*

to their work within the aquaculture food system. The relationship between gender and food system role was not statistically significant pre-harvest (p=0.444), harvest (p=0.744), postharvest (p=0.773), business and marketing (p=0.824) and research and development (p=0.672).

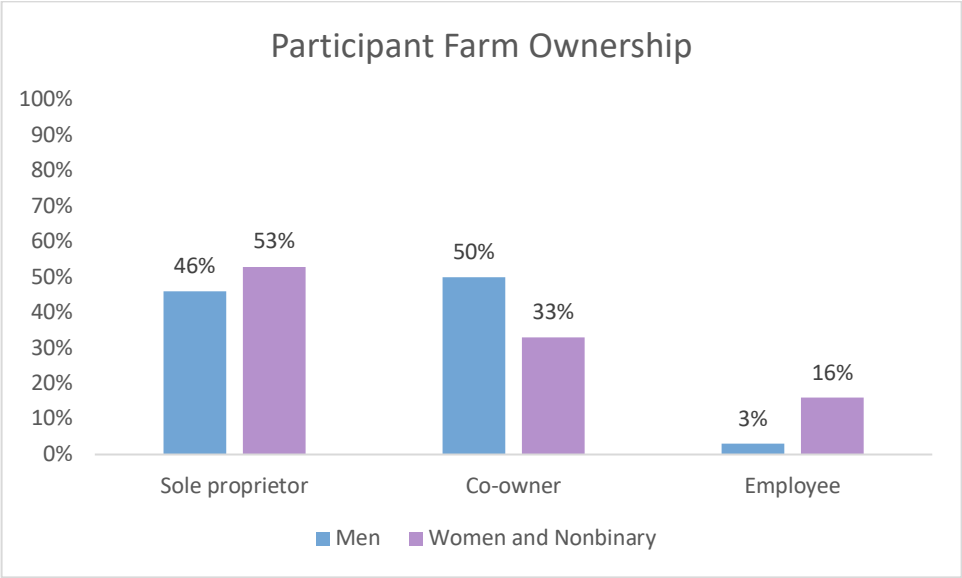

Figure 9. Percent of participant ownership level of oyster aquaculture business by gender. The relationship between gender and farm ownership was not statistically significant (p=0.341).

The level of ownership for oyster farms included sole proprietor, co-owner, and employee in Figure 9. This question helped to determine if there was a gender division of business ownership. 53% of women and nonbinary participants selected the sole proprietor position (n=8) while 50% of men selected co-owner (n=13) and 46% selected sole proprietor (n=12). There were only (n=4) participants that identified as an oyster farm employee. The relationship between gender and farm ownership was not statistically significant (p=0.341).

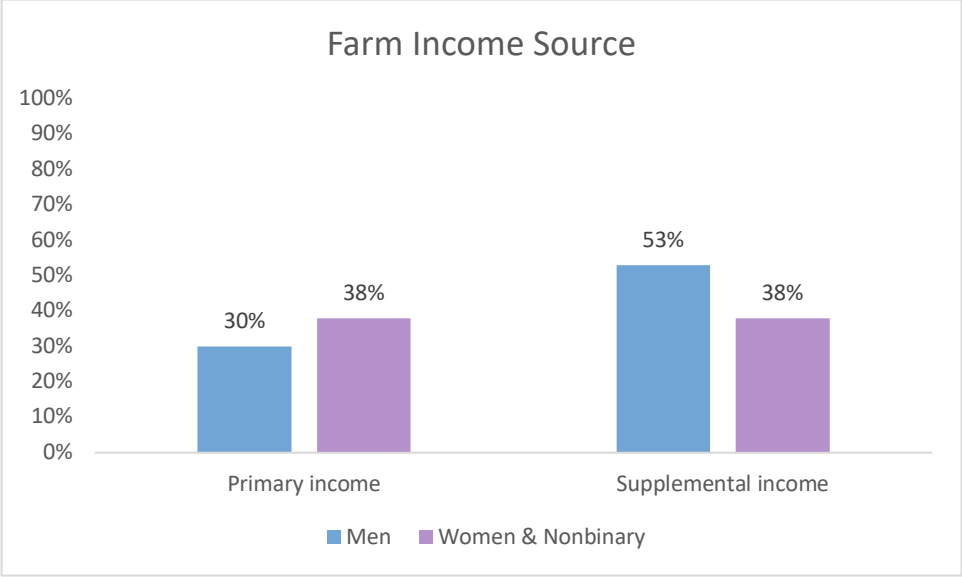

Figure 10. Percent of participants using the oyster farm business as a primary or supplemental source of income by gender. The relationship between income source from the farm and gender was not statistically significant (p=0.709).

To determine the level of income from participants' aquaculture businesses, the survey asked about the level of income participants' farms support them with. In Figure 10, 30% of men respondents and 38% of women and nonbinary participants (n=14) use their farm as their primary source of income. 53% of men and 38% of women and nonbinary participants have the oyster farming business as supplemental income (n=20). The relationship between income and gender was not statistically significant (p=0.709). In Table 1, participants also wrote in the qualitative portion to describe their employment circumstances.

Table 3. Oyster farm employment level for men and women participants who selected the "I prefer to self-describe" option (n=6).

Women	Men
"This year it may be, I pay myself inconsistently and have other sources of income."	"Small side passion"
"My husband and I own the company together. It is my primary source of income but it still relies on my husbands income for financing."	"Not yet profitable to owners... does support three PT Employees Seasonally"
"Primary and supplement depending on the year and season."	"I am an owner and do not take any profits or salary. The farm employs my two sons."

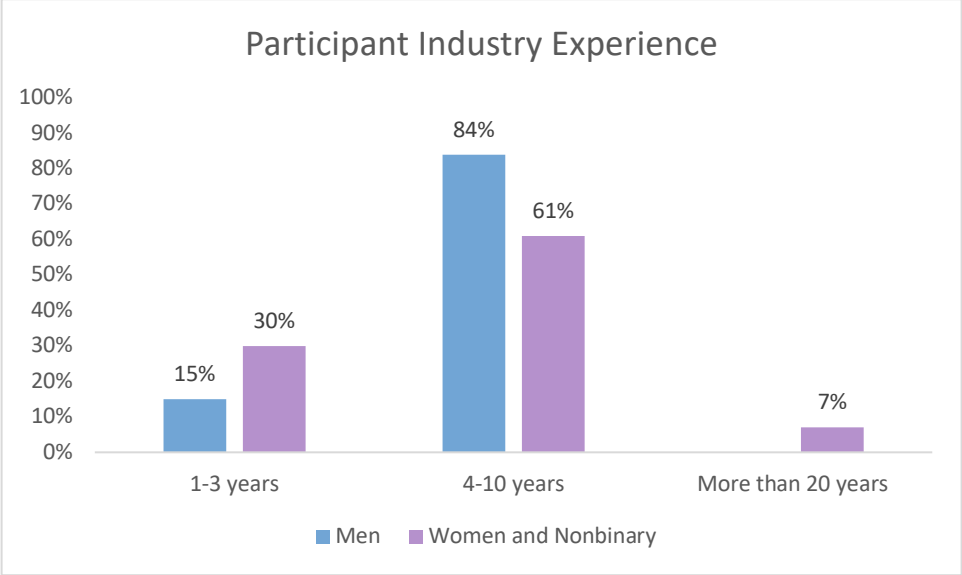

Figure 11. Percent of survey respondents that have spent time working in the oyster aquaculture industry and gender. The relationship between time in industry and gender is not statistically significant (p=0.14).

In Figure 11, 76% of participants in this survey have been working in the oyster aquaculture industry for 4-10 years (n = 31). The average eastern oyster (*Crassostrea virginica*) reaches market size after 3 years of cultivation (Maine Sea Grant, 2022). The relationship between time in industry and gender is not statistically significant (p=0.14).

2.2.3 Participant Identification of Resources

The section on resources and barriers was designed to learn more about the opportunities and challenges for everyone to own and operate an oyster as well as to determine any gender-specific differences in how women and non-binary/third gender participants run their businesses. The resources and barriers are defined in Table 4.

Table 4. Definitions for the resources and barriers of an oyster farming operation

People, organizations, networks	The social network components of aquaculture that assist with knowledge transfer, site selection, and hiring crew
Funding opportunities	Access to capital, grants, and assets to support their oyster operation
Gear	Species specific equipment for oyster aquaculture growing operations in the ocean
Training opportunities	Training sponsored in Maine only via state agency, Sea Grant, or local nonprofits to provide guidance to aquaculturists and citizens interested in entering the industry

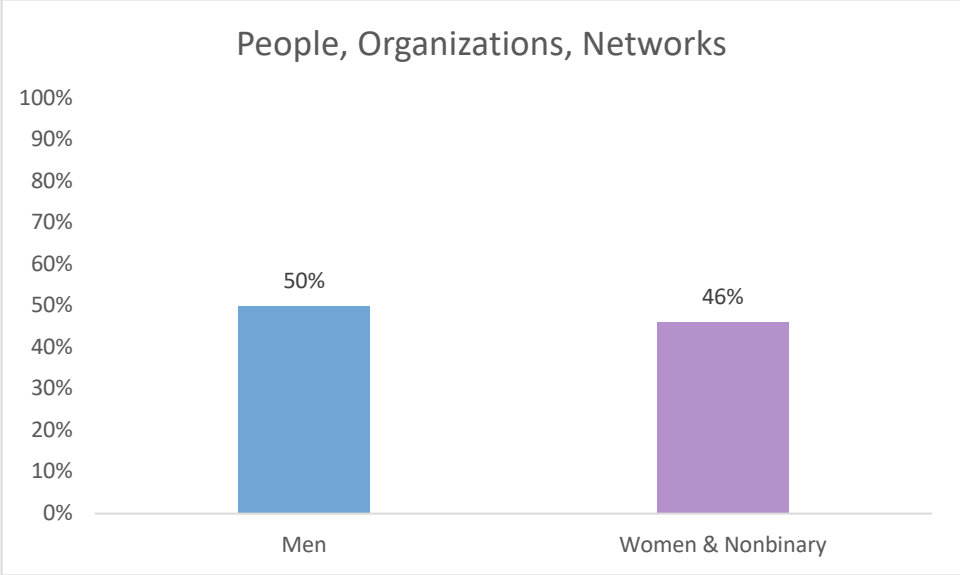

Figure 12. Percent of respondents that identified people, organizations, networks resource for their oyster aquaculture business in ME and NH by gender. The relationship was not statistically significant (p=0.44).

For resources, 100% of women and nonbinary respondents (n=13) and 88% of men (n=26) identified people, organizations, and networks as a tool to help their businesses get started or thrive (Figure 12). In the qualitative portion of the survey, the women and nonbinary respondents identified *"friends, fisherman, harbormaster",* other oyster farms in the area, and

organizations such as Maine Aquaculture Association, Small Business Association, SCORE, and the Maine Family Shellfish Cooperative. The men participants also identified other oyster farmers, however their responses highlighted more organizational actors such as Maine Sea Grant, Gulf of Maine Research Institute, the Island Institute, and the University Maine and New Hampshire. The social network of support for the survey participants are an important tool for the success of an oyster farming operation.

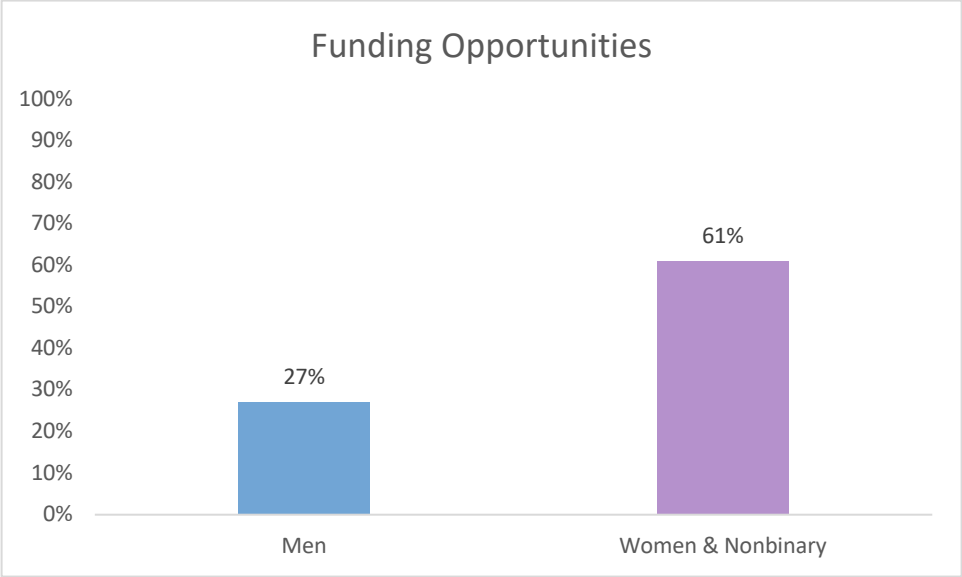

Figure 13. Percent of respondents that identified funding as a resource for their oyster aquaculture business in ME and NH by gender. The relationship between funding and gender is statistically significant (p=0.04).

In Figure 13, funding opportunities by gender was statistically significant (p=0.04). For women and nonbinary participants, 61% selected the funding category as a resource, while 27% of men identified funding for a resource. The women and nonbinary respondents identified grants from Maine Sea Grant, the USDA, Island Institute, Blue Hill Community Food Grant and the Libra Fund. Notably, one woman provided a response about her financial circumstances and

her ability to acquire funding for her business: *"I do not qualify for most funding due to lack of assets"*

The men participants also identified several grant opportunities from organizations including the Coastal Economic Development Corporation, the Libra Fund, and the Stavros Niarchos Foundation Small Business Growth and Recovery Grant. One man wrote *"none"* as a funding resource and another noted: *"We are self-funded and haven't applied for or taken ANY government grant money."*

The comments above provide insight into how access to funding may be a challenge for women and nonbinary oyster farm owners, especially as more men indicated not needing funding at all for their businesses.

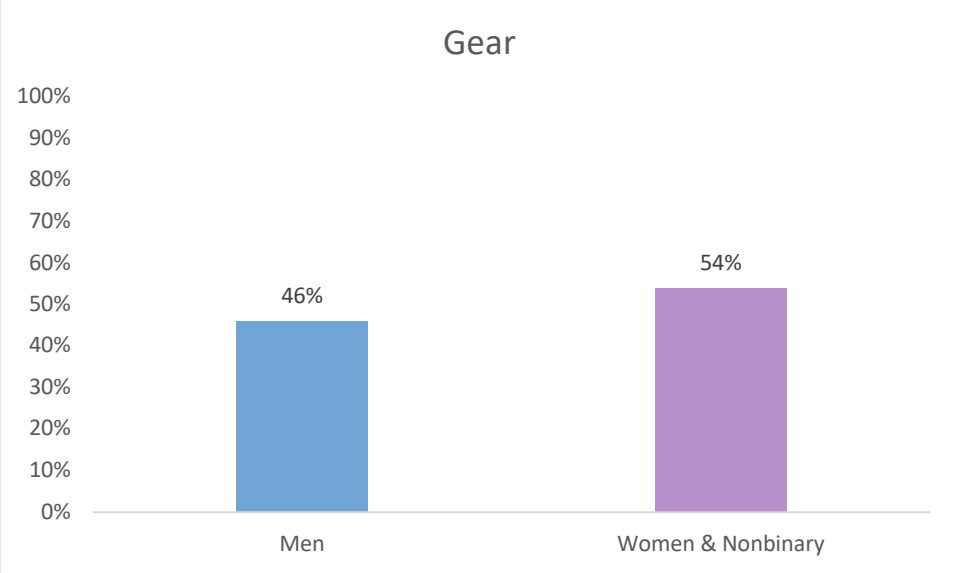

Figure 14. Percent of respondents that identified gear as a resource for their oyster aquaculture business in ME and NH by gender. The relationship between gear and gender is not statistically significant (p=0.48).

For the purposes of this research, the gear category includes aquaculture equipment, farm supplies, and clothing. For gear as a resource, 54% of women and nonbinary respondents and

46% of men survey participants selected this option (Figure 14). Across all respondents, Brooks Trap Mill, other oyster farmers, and the OysterGro farming system were common gear resources provided. The relationship between gear and gender was not statistically significant (p=0.48).

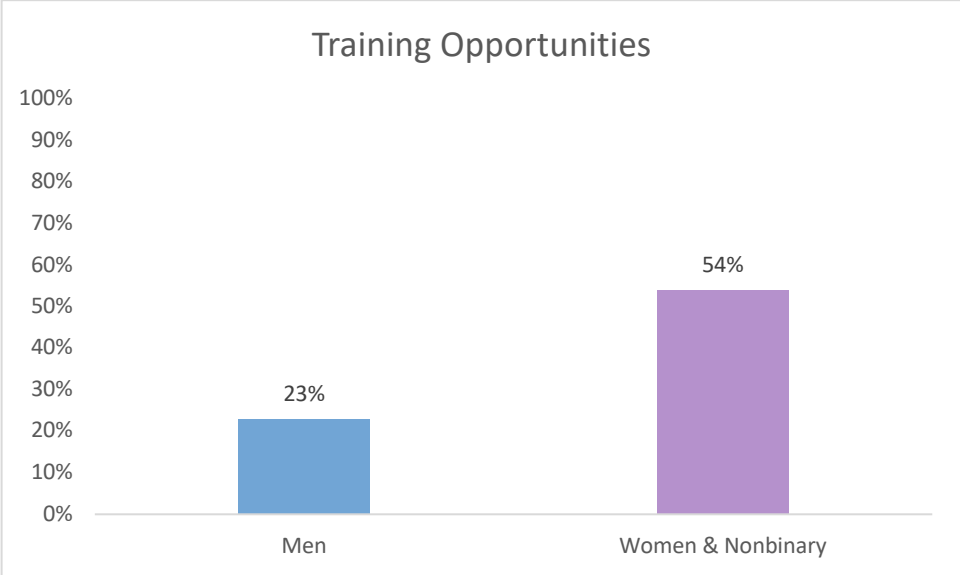

Figure 15. Percent of respondents that identified training opportunities as a resource for their oyster aquaculture business in ME and NH by gender. The relationship between training and gender is not statistically significant (p=0.4).

Training opportunities as a resource by gender were not statistically significant (p=0.41). 42% of the men participants and 33% of the women and nonbinary respondents identified trainings as a resource. The most common training opportunity listed by all respondents was the Aquaculture in Shared Waters program by the Maine Aquaculture Association, Maine Sea Grant, and the Maine Aquaculture Innovation Center. The women and nonbinary respondents also listed a training opportunity from the Nature Conservancy and the Island Institute. The men identified the Top Gun program by the Maine Center for Entrepreneurs,

Coastal Rivers Conservation Trust training, as well as working for other oyster farms. The women and nonbinary respondents identified other oyster farmers as a resource, and addressed challenges to starting a business on the water:

"Former owner of the farm helped us get started, husband was lobsterman and commercial fisherman"

"There were no training opportunities per se. I had zero hands on experience prior to starting. Additionally, being a single parent woman with limited income and working a full time job- I've yet to find any other funding sources other than myself- this has been a barrier"

Men survey respondents indicated organizations such as Muscongus Bay Aquaculture as a resource, as well as the leasing system in Maine. They also highlighted some challenges with gear and access to information on oyster farming.

"There were very few resources available when I was starting up, I just put oysters in the water and figured it out."

"The gear used in oyster aquaculture is not adequate for building a sustainable small family business. Farming systems are needed. I found the only available farming system and it transformed my farm"

These written responses provide more context on the gender-based resources and challenges that women are facing in the region's oyster aquaculture industry. Training opportunities, access to funding, and access to information and mentorship are all resources that women respondents of this survey have indicated being more challenging to acquire.

2.2.4 Participant Identification of barriers

The barriers for an oyster farming operation in replicate the four resources variables provided, however with a confidence interval of 95%, there were no statistically significant relationships between gender and barriers.

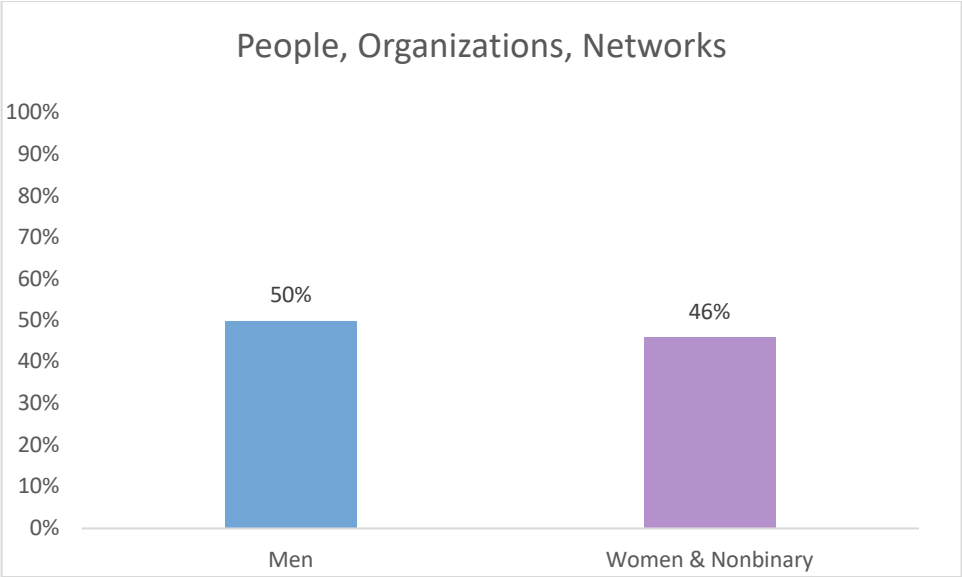

Figure 16. Percent of respondents that identified people, organizations, and networks as barrier for their oyster aquaculture business in ME and NH by gender. The relationship was not statistically significant (p=0.5).

For people, organizations, and networks, 50% of men respondents identified them as a barrier, and 46% of women and nonbinary respondents. Private landowners and "NIMBY" (Not In My Backyard) opponents to aquaculture were a common barrier identified across all genders, as well as the Maine Department of Marine Resources. One woman wrote:

"The fact that aquaculture in general is an old boys club and not one that feels inclusive or accessible to young self-starting women like myself."

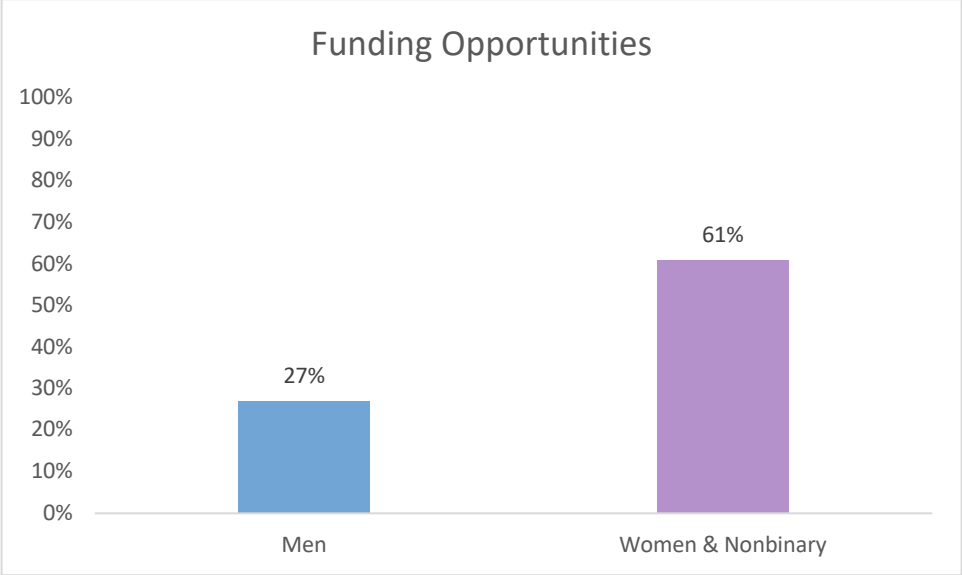

Figure 17. Percent of respondents that identified funding as a barrier for their oyster aquaculture business in ME and NH by gender. The relationship was not statistically significant gear (p=0.5).

The funding opportunities as a barrier were closely related, though not statistically significant (p=0.07) with 61% of women and nonbinary respondents identifying funding as a barrier and just 27% of men participants selecting this option. 33% of women and nonbinary participants (n=4) noted the challenges to access funding for their businesses:

"Larger grants for gear, non-existent or competitive"

"Do not qualify"

"Difficult to get full funding, previous owner financed a part"

"Not much out there in the way of grants specifically geared toward helping women start or grow businesses in traditionally male dominated sectors. And there should be, because the evidence is strong that we have less access to capital in general than our male counterparts do. It's not feasible for everyone to take out a business loan."

"I don't know how to write grants"

15% of the men survey respondents also highlighted some barriers in the qualitative portion of the survey. These responses provide context to the gender related challenges of funding in the aquaculture industry.

"Long haul to profitability"

"Banks had no idea about aquaculture businesses. They are now much more open to lending to aquaculture."

"None"

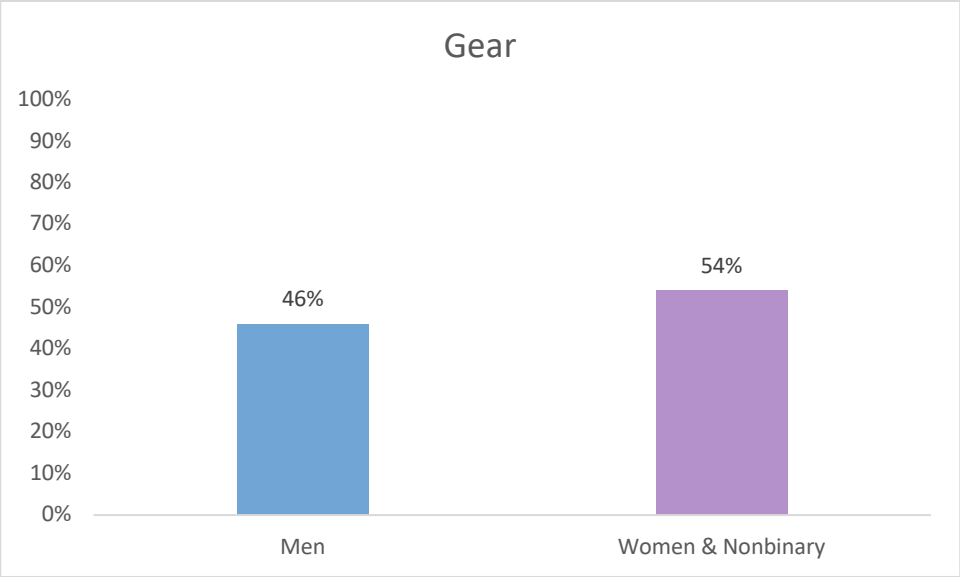

Figure 18. Percent of respondents that identified gear as a barrier for their oyster aquaculture business in ME and NH by gender. The relationship was not statistically significant (p=0.5).

Gear as a barrier was similar between men and women participants with 46% of men identifying the barrier and 54% of women and nonbinary participants. The relationship between gear and gender was not statistically significant (p=0.5). The survey respondents all identified the cost of gear as a barrier. One woman noted that the *"cages were heavy and difficult to transport".* Overall, the price of gear can be a barrier for oyster farmers to scale up their business and reach maximum efficiency for their farming operation.

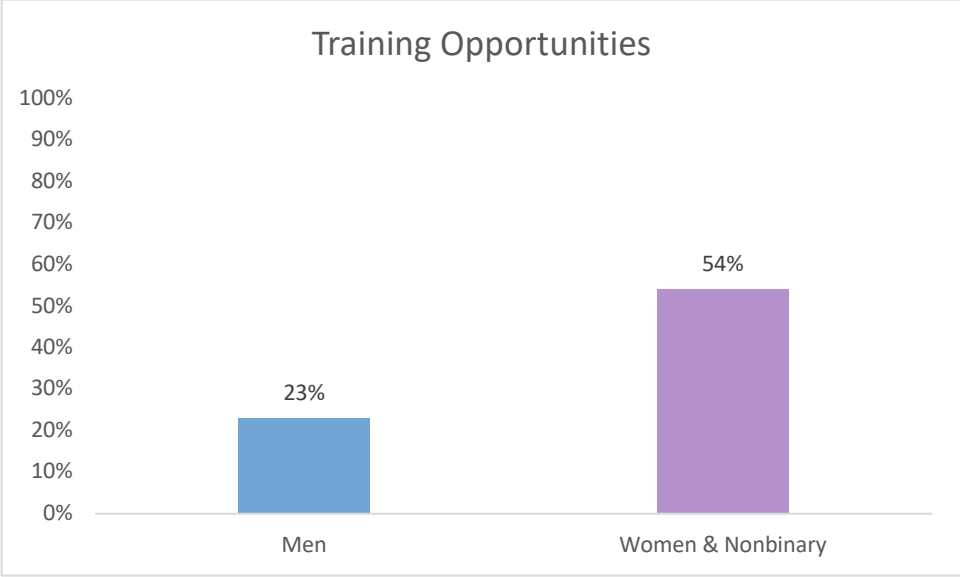

Figure 19. Percent of respondents that identified training opportunities as a barrier for their oyster aquaculture business in ME and NH by gender. The relationship was not statistically significant (p=0.06).

Training opportunities indicated a relationship by gender, although at a 95% confidence interval this was not statistically significant (p=0.07). With 50% of women and nonbinary participants and just 23% of men respondents identifying the barrier, this indicates a gender-based challenge for the training programs offered for oyster aquaculture. The women and nonbinary respondents wrote in the qualitative portion about specific challenges including geographic accessibility, negative experiences as a program participant, and lack of gender specific needs addressed:

"Not nearby"

"Top Gun program was alienating"

"Zero training opportunities specifically geared toward women and minorities and their specific challenges and needs"

The men survey respondents also acknowledged the lack of available training opportunities, and an issue with state agency processes for the limited purpose aquaculture lease training requirement.

"There were basically no training programs for aquaculture"

"Required DMR annual training"

The participants also had the option to add more information in the "other" category for this question. Table 5 provides the qualitative answers by participant gender. These comments further indicate that there are gender-based barriers in the industry that have yet to be addressed including access to capital, maritime skills, and the COVID-19 pandemic, which was only listed as a barrier by women respondents.

Table 5. Survey participant's comments on barriers for oyster farming business in the qualitative response section for "other"

Men	**Women and non-binary**
"Timeline of the leasing process and limited funding for employees"	"Lack of sales in 2020 due to pandemic, slow relief aid and lack of communication from federal govt organization overseeing this; Shut downs due to waste water plant construction in Portsmouth beginning the year we purchased the site"
"Regulatory requirements, permitting requirements, getting through them and understanding them"	"Engine maintenance, did not own truck. Did not know how to trailer boat, waterfront access expensive, no female role models"
"No significant barriers"	"Covid 19"
"Lack of easy public access and facilities, dock"	"Capital and trained labor force are two of largest barriers, as well as lengthy leasing process"
"Social license"	"Landowners do not want aquaculture but will put up with numerous lobster buoys on the surface of the water"

Overall, the survey results from the resources and barriers questions indicate gender-based differences, specifically for training programs and funding opportunities for women and nonbinary respondents

2.2.5 Participant experiences of gender discrimination

This section covers material on whether the survey participants have experienced differential treatment based on their gender while working on an oyster aquaculture farm in Maine and/or New Hampshire. All survey participants answered this question (n=41).

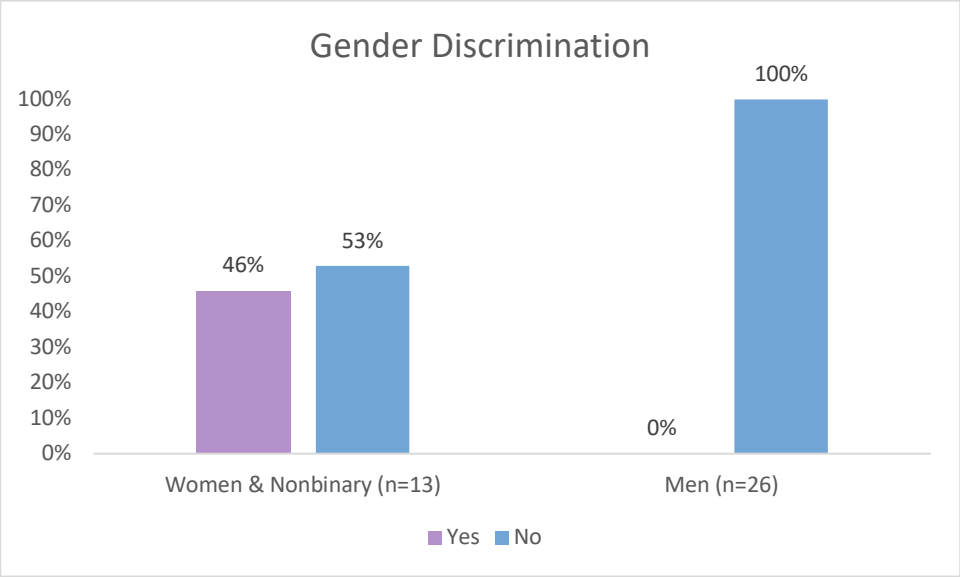

Figure 20. Survey respondents reporting differential treatment at work in the oyster aquaculture industry in ME and NH by gender. Women and non-binary identifying (n=12), men identifying (n=26). Relationship between gender and differential treatment is statistically significant (p<0.001).

Among survey participants, gender and work experiences in oyster aquaculture are related (Figure 20). With 46% of women and nonbinary respondents indicating differential treatment based on their gender, compared with 0% of men. The relationship between gender and differential treatment on an oyster farm is statistically significant (p=<0.001). These results indicate the women and nonbinary participants have an additional barrier for their oyster aquaculture operation than their male counterparts. In the qualitative portion of this question,

three women and nonbinary respondents provided additional context on their experiences in the industry.

> *"Not on my farm since I work mostly alone but in all other industries I have worked in, yes. Also at shucking events I have been harassed by customers (older, white men)"*

> *"I own the company and have both male and female employees. We are extremely committed to gender equity."*

> *"Yes. As a female I am treated differently, sometimes better, sometimes worse."*

While this context on gender discrimination cannot be generalized for the entire industry, it is important to note the gender norms related to the oyster aquaculture industry have impacted the experiences of women and non-binary participants in this research.

2.3 Discussion: demographic information on the Maine and New Hampshire aquaculture industry

This survey was designed to gain information on the demographics of the oyster aquaculture industry stakeholders in Maine and New Hampshire, food system engagement, resources and barriers for oyster farmers, and gender discrimination. The demographic survey responses provided data on oyster aquaculture farmers that is not publicly available or collected by the state agencies of Maine and New Hampshire responsible for managing the industry. The survey included responses from men, women, and non-binary/third gender participants, with the majority of participants being men, and all identifying as "white/Caucasian", reflecting a lack of diversity for race. The most common age for survey participants was 35-44, and the most common education level was Bachelor's degree followed by Master's. This indicates that the respondents' oyster farming operations include well educated individuals. The majority of respondents have been in the industry for 4-10 years, a finding that coincides with Whitmore and Safford (2020) research on NH oyster aquaculture industry. Survey participants of all genders

engage in all sectors of the food system from pre-harvest to research and development. It is important to recognize that the women and nonbinary respondents are also engaged in every food system sector, completing all farming operations themselves or with hired staff.

The resources and barriers identified by the survey respondents provide context for the gendered experiences for women and non-binary/third gender participants in the industry. Specifically, training opportunities and access to funding for their business are barriers. The use of a social network is a key component for the success of an oyster farming operation for the survey respondents. A common challenge that repeatedly came up in the survey was landowners opposed to oyster aquaculture, the leasing process, and access to farm sites.

Gender discrimination was experienced by almost half of the women and nonbinary respondents. Gender discrimination can reinforce the practices of gender inequality, limit safety at work, and diminish the ability for individuals to make entrepreneurial advancements in the industry (Brugere and Williams, 2017). These results call for continued research on the topic of gender for all participants in the sector, as it is an important social component to analyze for system-wide sustainability for aquaculture production in New England. The next chapter will continue to analyze the role of gender in the industry, focusing on the experiences of women through a case study analysis.

CHAPTER 3: Photovoice Case Study

This chapter reports findings from the photovoice case study, a collaborative research approach with four women oyster farmers from Maine (n=3) and New Hampshire (n=1). The photovoice methodology developed by Wang and Burris (1997) is a participatory research method that incorporates visual storytelling with interviews, a focus group, and a community photo exhibit. This chapter is divided into three sections, which address the research questions about (1) access and control of resources, (2) resources and barriers, and (3) the use of a social network and the relationship with gender norms for the aquaculture industry.

3.1 Participant Identification of Resources

The participants in this case study have built their businesses in order to have control over decision-making processes and access to specific resources that enhance their oyster farming operation. Here, access to resources is defined as the ability to benefit from people, material objects, institutions, and symbols. Resources may include technology, capital, markets, labor, knowledge, authority, identities, social relations, legal rights (Johnson et al., 2019; Ostrom, 2009; Ribot and Peluso, 2003). Photovoice data including photos, narratives, interviews, and focus groups were used to identify resources for a woman-owned and operated oyster farm (Table 6). The resources were organized into categories identified through the literature review.

3.1.1 People, Organizations, and Networks

The most frequently discussed resource by the study participants involved social relationships they have built within their aquaculture community. In the interviews, participants discussed the importance of collaborating with other oyster farmers for activities such as

receiving information about growing methods and site selection to access to wholesalers and markets for their products.

> *"We buy and sell to other sea farmers, I mean, we collaborate and talk with it there, I feel like we're a pretty tight knit community."*

> *"A lot of the marine working waterfront businesses, it's just the network of...my business relies on so many other people, not just market, but also on the gear and boat and dock side of things too that if anything happens to their business that affects mine as well."*

As discussed in the above quotes from interviews, social networks are a key resource for these four women oyster farmers to access information, labor, and a market is their social network. All four participants mentioned the use of a social network to support their oyster farming operation.

3.1.2 Funding Opportunities

Among the participants, funding opportunities were not discussed frequently during the interviews or focus groups, representing only 4% of the codes. References to funding involved using gear types and oyster growing methods that are more affordable. Two out of the four participants are income-dependent on their male spouses. Collaborating with other oyster farmers by sharing a lease space and gear was also mentioned:

> *"…If I were doing this completely on my own as a startup, being able to afford a space like this…I couldn't. We're lucky that we happened to know the people who own this because we have a family connection to the property next door. And so capital is definitely part of it and is a barrier that I don't specifically mention, but that comes to mind in this photograph, too. We also share this upweller with another sea farmer. He actually provided the floats and some of the barrels and we provide the space, so we give him access to the area that we lease. And then he provides some of the equipment and we kind of work*

together there. So that collaboration with another sea farmer allows us both to do well."

The only specific grant that was highlighted was a Maine Small Business Development grant. Otherwise, two of the women talked about relying on their spouses for financing the farm as well as help in the form of free labor from friends and family members to aid the financial burden of the business.

3.1.3 Gear

Equipment for the oyster farm was the second most frequent resource (7%) discussed besides the social network. Using gear that is affordable, efficient, and manageable for the participant's body size is critical for the success of their farming operation. Some participants choose specific site locations and growing methods that are different from the industry standard, such as Oyster Grow cages, and are instead using bottom seeding in a subtidal zone:

"I think this photo is really important because it just shows that you don't need a boat that cost tens of thousands of dollars and you don't need all of this gear and equipment, I mean, I have a six horse on the back of this boat, like I said , it's 11 feet because I'm working in shallow water like this does the trick, so I know this boat's been in some videos and stuff, and I feel like when people see those, when people see me working on this boat, they feel like if I can do it, that they can do it too."

Acquiring oyster farming gear that enhances harvesting and processing efficiency that is also of appropriate size for women can be a challenge. The interviews and focus groups highlighted the importance of using gear that works for all body sizes:

"When we tumble and grade all of our oysters, we go through this at least once a summer to get them all organized and tumbled and handled, and she is a smaller woman and she does not fit comfortably at this work table. You can see that she, she also has worked on fishing boats, and she's got this makeshift stool for herself with what she had available to make her workday more comfortable."

One participant purchased a custom oyster tumbler machine to fit her boat and body size specifically:

"Yeah, this I can lift it up, it's really light and it actually fits really well. My boat, I've moved my center console over to kind of be on the right side, so it's a little bit tight, but I can put my bins underneath and I can tumble all my oysters on my boat, which makes it really efficient. I have a small generator, inverter, that I can lift. It's on wheels and plugs right into the little motor, right behind my back. But this was a huge deal because the year prior when I tumbled all my oysters, my mentor had asked me for every line of my gear to tumble two of his. Yeah, I think 't relates because we all just have that experience where automization of the farm is valuable. You need to be more efficient to be competitive, to make it make sense. I can't hand sort my oysters and shake the bag. I think that finding equipment that can do the same job for less money is important for access, for efficiency. Like I said, autonomy, I think that's valuable."

3.1.4 Training Opportunities

Photovoice participants discussed several training programs available for people interested in learning how to start an oyster farm in Maine including Maine Sea Grant and the Island Institute. At the moment, the state of New Hampshire does not provide training other than an annual meeting with the Department of Environmental Services. Another participant has not completed any trainings and has learned from other farmers, YouTube, and as a board member of the Maine Aquaculture Association. Training programs that participants did partake in had a positive impact on their aquaculture business:

"It was really informative. The first class I took was 2020. Last year, I took the second course and I think just in part, I'm actually friends with the girl who's the aquaculture coordinator."

Other participants found ways to teach themselves along with guidance from others in their social network:

"So I think the biggest thing that we learned, I mean, we learned a lot from YouTube, but we didn't know about oysters specifically, and there was a lot of "OK , how do we do this?" So a lot of school of hard knocks, a lot of research and looking at videos and trying to figure it out. But one of the hardest things to navigate was the leasing system and the market, and that avenue. It's not the actual husbandry of the animals, but the leasing system and the sales of it. And my friend, she was the one who kind of helped us in that leasing process."

Of the four participants, only two have completed a training program offered by an organization. If the participant did not go through a program, they gained information through collaboration with other oyster farmers in the area. While the training can be an important resource for some, it is not a critical resource for the participant's farming operation success. For example, within the photo documentation and narratives, participant Alicia Gaiero wrote about her challenges with learning boating skills such as engine maintenance on her own, with the help of the internet:

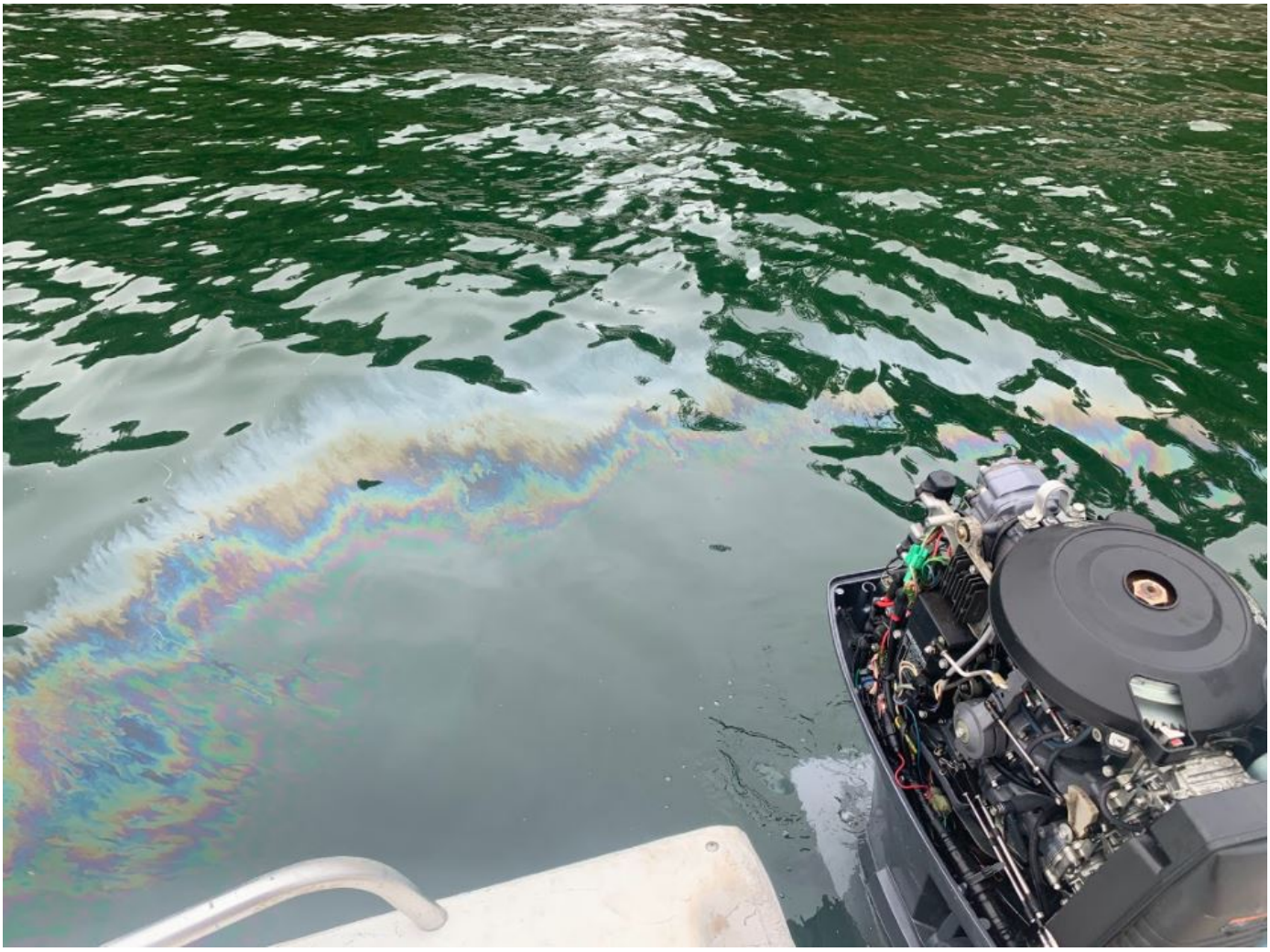

Figure 21. Photo documentation by Alicia Gaeiro titled "Boat Problems and Triumphs"

"Boat problems…summer of 2021 I had some ongoing problems. I struggled to get a mechanic to look at my engine due to peak season and high demand. I wasn't raised on the water or working on engines. When I finally shared to a boat yard that I was an oyster farmer I was given the time of day. I appreciated that they got me right in and took care of my boat. Every day on the water provoked anxiety. The thoughts of "Am I doing this right? Is my engine too loud in the morning? Am I going to fast in the mooring field? Did I make a mess on the dock – will locals be mad at me? Are they mad I have a mooring in a residential field despite not living on this island?" I was often concerned about how I looked. I don't have a lifetime of experience on the water. In truth, summer of 2021 was the first time I was really out on the water operating my boat and farm alone. I didn't know what was wrong or right and I feared a rookie mistake could damage my boat, harm someone else, harm the gear or damage relationships with waterfront homeowners. I am proud of my boat and the things I learned from the internet. I learned to change my prop. I also properly diagnosed my boat problems on YouTube and ended up impressing my mechanic who did not expect me to be right. My proudest moments were when I was forced out of my comfort zone and things felt high risk."

3.1.5 Other Resources

The participants identified a few resources that did not fall into above categories including the specific roles of working on an oyster farm. Three out of the four of the participants identified that being a woman was a resource for owning a farming operation. One participant discussed the ability to have women as staff in different working roles on the farm to help change the narrative of who gets to work in maritime spaces:

> *"I think being aware of it, and the sooner we draw people in and don't expect women to have to be in the roles of the stewardess on a yacht or the cook. But just to normalize this idea that women can have their own company, that girls can drive boats. It makes it easier for them to learn at an earlier age and makes them feel more confident and comfortable doing it."*

The ability for the participants to have autonomy over the decision-making and general farming operations was a common resource discussed. The participants designed their farms to be to able run them independently by using a combination of the resources listed above, including their gender:

> *"And then I think honestly, I think being a female has really boosted my business, people love the story. It benefits me. They like the idea of supporting a young female. I'm getting inquiries from random places all over the country that I can't support, from Chicago to Nashville to Florida to Denver like interest in Austin, Texas, which is great. And it's because of the story, and I think that's what strengthens my product as this young female farmer."*

The role of gender as a resource was discussed by all of the participants as an opportunity to have a unique product within the aquaculture market and to draw customer attention to a new community of oyster farmers:

"One thing that that I'll readily admit and something that I discussed with the men that I work with is that we're just treated differently. Sometimes that's better, sometimes that's worse. So there are advantages. There are definitely advantages in a woman too."

Table 6: Identification of Resources for a Woman-Owned Oyster Farm

	Resource
People, organizations, networks	Conversations about oyster aquaculture with general public, NIMBY
	Relationship with harbormaster
	Farm help from a friend, family member, spouse
	Help/guidance/information from other oyster farmers
	Being a woman farmer
	Support from working waterfront community: marketing, cold storage access, boat rides, safety
	Collaboration with women farm employees and women oyster farmers, creating innovative designs and methods, expressing failures, learning
	Support from aquaculture organization
Funding Opportunities	Financial support from spouse
	Small Business Development Center grant
Gear	Equipment for efficiency and mechanization: Tumbler, hauler, and upweller
	Farm Access: Location of boat mooring in relation to farm site
	Bottom seeding, shallow water site low investment growing methods + boats
	Sharing lease space with other farmers
	Self-taught gear maintenance, boat driving, trailer hauling
Training Opportunities	Island Institute
	Aquaculture in Shared Waters: Maine Sea Grant
	Maine Maritime Academy
	YouTube
	NH Department of Environmental Services
	Maine Center for Entrepreneurs Top Gun program
Other	Autonomy and independence as a business owner
	Oyster farm roles for women and girls to learn to work on the water
	Diversity of the type of work and schedule in aquaculture industry compared to commercial fisheries

3.1 Discussion: Resources for a woman-owned oyster farm

The photovoice case study data provides a comprehensive list of resources that these four women oyster farmers use for their aquaculture businesses. These resources include the use of a social support system that is place-based, tailoring oyster farm gear and equipment to fit their specific operation and body sizes, accessing institutional training and funding opportunities if desired, or seeking guidance and financial support from their social network. The data highlights several discrepancies in the offered training programs that will be discussed in the barriers portion of this chapter. Two of the four participants identified their gender as a resource for accessing a productive market for selling their oysters from their woman-run farming operation. Participants in this case study rely on their social network as a resource but also as a tool to access other resources such as knowledge about alternative growing methods or farm labor. The participants have demonstrated a collaborative approach to oyster farming that capitalizes on the social support system they have cultivated within their local harbors. Other aquaculture communities in the region, for example finfish aquaculture in Maine and Canada, have also been found to use an informal social network to facilitate production through knowledge transfer of information such as job opportunities, harvesting schedules, and fish escapes (Krause et al., 2020). In Maine specifically, Krause et al. (2020) found that mussel farms collaborate via partnerships amongst each other and with educational institutions in the state. The findings of this research on oyster farmers add to the growing body of literature on the use of social networks in aquaculture settings.

3.2 Identification of Barriers for a Woman-Owned Oyster Farm

As completed with the resources for an oyster farm, the barriers were organized into categories based on the literature review. These include (1) people, organizations, and networks, (2) funding opportunities, (3) training opportunities, (4) gear, and (5) other (Table 7).

Table 7. Barriers for a woman-owned oyster farm identified from photovoice case study participants

	Barrier
People, organizations, networks	Mentor overstepping role
	Community members in opposition of oyster farming
	Oyster poaching
	Information from industry associations that do not represent all oyster farmer interests
	Geographic separation of women-owned farms, lack of collaboration opportunities outside of immediate farm area
	Lack of agency support due to low staffing and funding
	Lack of public knowledge of the aquaculture industry and sustainable oyster farming
	Controversial lease proposals and hearings
	Reliance on others for help on farm, lease access, equipment access
Funding Opportunities	Limited funding and loan opportunities for someone with no assets
	Financing from non-traditional sources are difficult to access
	Difficulty qualifying for crop insurance
Training Opportunities	Emphasis on high cost equipment, boats, gear and growing methods
	Emphasis on direct to consumer marketing
	Being the only woman participant in a training program
	Pressure to scale up farm size, production, and market
	Lack of representation of aquaculture industry stakeholders at training events and conferences for instructors and presenters
	No training opportunities offered in NH
Gear	Knowledge of engine/boat maintenance, boating skills
	Sharing leases
	Equipment expense, cost of maintenance

	Hauling oysters at the dock, heavy weight lifting and occupational health and safety hazards
	Leasing delay due to COVID
	Access to equipment, trading oysters
	Industry standard gear types taught by aquaculture organizations, lack of knowledge of other, less expensive growing methods
	Gear that doesn't fit all body sizes: height, weight, etc.
	Permitting process for shallow water and subtidal zone sites
	Close proximity of other oyster farms
	Building own equipment to fit for body size, boat size, etc.
	Clothing does not fit women's body type
	Lack of recognition of diversity of aquaculture industry by marine suppliers, manufacturers
	Lack of farm design and methodologies that are sustainable for smaller bodies and physical labor
	Ability to scale to commercial size on an LPA lease system
Other	Imposter syndrome, low confidence in abilities as an oyster farmer
	Gender norms of masculinity for the maritime industry
	Gendered perceptions of the working waterfront and owning and operating an oyster farm
	No background of working on the water, late to learn hard skills within the maritime industry
	Differential treatment as a woman
	Perception of women as hobby farmers
	Expectation of women in maritime roles such as stewardess or cook, not a business owner
	Balancing childcare responsibilities with farm management
	Market navigation: wholesaler, shellfish dealer license, etc
	Sexual harassment within the working waterfront space
	Being the only female in maritime spaces
	Farm access that is public and safe

3.2.1 People, Organizations, and Networks

All four participants discussed challenges with local community members in opposition to oyster farming in the area. The aquaculture leasing process in Maine and New Hampshire includes a public participation component if the farm is in 1,000 feet of a riparian landowner.

"It looks very remote in this picture, but for whatever reason, her proposal's really controversial. So, you know, we're up against an entire legal team"

In some locations, public opposition can limit the expansion of oyster farming as well:

"But we don't have the ability to expand, and some parts of one of the rivers opened up, and lawyers came out because of the NIMBYs (Not In My Backyard), and they said, we'll sue you if you try to get a spot here"

"You know, we kind of get around a number of barriers there where we don't have to include the public in the process necessarily, which just helps expedite it, truly. It removes a level fear and question"

The low number of women-owned farming operations and the geographic separation between them was highlighted as a barrier by three out of the four of the participants. The participants depend on social networks as a support system for their businesses, and the ability to transfer knowledge on leasing processes, gear types, and general advice and support:

"I've been on 34 farms...all of them pretty much have been male farms. I've almost never visited a female farm."

"Now, the one thing I would add is that I feel like so many people are, we're so geographically separated that it explains a lot of the disconnect. I feel like there are a lot of women that either own their own farms or run farms as part of a family unit or work on farms, but our paths don't really cross"

All four participants detailed a general lack of support from aquaculture organizations either due to low staffing and capacity or lack of appropriate representation and an intimidation factor from large scale size of the organization:

"I'm more likely to call up someone that I know or to respond to someone that seems smaller, I am just more comfortable asking questions of another farmer that I know as opposed to trying to get through an association that might be a bit more intimidating"

"They're getting their information from industry associations that don't really represent my interests"

One participant highlighted challenges with a mentor. Due to the fact that she has no background of working on the water and no hard skills for the maritime industry, she is reliant upon guidance from a more seasoned oyster farmer. While this relationship has been influential to the success of her business, sometimes she feels like the mentor is overstepping their role:

"Sometimes it feels like that fatherly criticism or different things where… I appreciate that, but I am a young, independent adult, and sometimes I would like the opportunity to feel like, 'oh, I can make a mistake and just let me learn from it.'"

3.2.2 Funding Opportunities

Funding opportunities were discussed by all four participants as a barrier for getting their business started as well as scale to a sustainable size due to lack of capital for purchasing equipment and hiring staff.

"I'm independently poor. I'm broke. So, I'm not in the same place. So, when someone's like, we'll just get financing, they give out money…one hundred thousand dollars… no one's giving me a hundred thousand dollars and they shouldn't and I shouldn't ask for it. That's horrifying."

"I mean, capital is such a huge... depending on how you want to grow, capital is such a barrier, it is a little bit gendered...you know, I mean, women still make less than men... so if you're talking about like trying to like, get money to start a farm, but I don't think that it's hugely different."

Funding capacity also dictates the ability for the participants to have a selective market for their product and mechanize their farming operation. Two of the four participants have purchased equipment for oyster processing and detailed the barriers to affordability for the machines such as a tumbler:

"So I think this represents the industry… up until I founded this company pretty much anything north of Maryland, any tumbler is going to be twenty thousand dollars or so up to thirty

thousand, depending on what kind of equipment you want, like if you get a conveyor belt and different things and then you have to buy the generator, the dock to put it on…there's just so many costs included, so big scale farms, it's a big investment, like if you have a dock just sitting there and it's got like 50 grand of equipment on it. I paid seven thousand dollars and that included twelve hundred dollars' worth of freight, just to get it from Florida to Maine. But I think it's representative of…this is good for me…and it's also good for the people I work with because I am working with smaller scale farmers, and these are people who want this kind of equipment accessible. How do we promote this industry when the barrier of entry is low and then you find out that there's this really expensive piece of equipment that you need to grow?"

"A lot of people who are in my position would end up selling directly to a wholesaler because it's really expensive to have a facility. It's a lot of work and added expense to actually have your wholesaler license, your dealer's license, and a shellfish aquaculture license and then licenses and all the vehicles that you want to deliver them and all the packaging…it's a lot of what I end up doing. Yeah, it's complicated and it's expensive."

In Maine, two participants identified a challenge with funding ability to scale their farming operation from the Limited Purpose License lease due to leasing prices:

"No, I will say that they did increase the cost, which for me as someone who's paying for everything themselves out of pocket, it felt like a big whammy. But I knew it was coming…meaning it went from being 50 dollars per application to a 100 dollars per application. So my renewal cost was eight hundred dollars"

"It's hard to scale any real commercial business on LPAs"

3.2.3 Training Opportunities

Participants had varying experiences with the oyster aquaculture training opportunities offered by industry organizations. Two participants did not complete any training program because New Hampshire does not provide any such opportunities and one participant began her farm before the training programs were developed in Maine. Of the two participants that did complete a training program, the barriers they experienced included training material that did not

align with their business goals and capabilities, a lack of representation of diverse aquaculture stakeholders for instructors and conference speakers, as well as being the only woman participant in the program.

In Maine, aquaculture organizations offer free training programs for new farmers interested in starting a business. The program curriculum includes industry standard oyster growing methods, which may be cost prohibitive for an individual without investment capital for their business:

"I feel like a lot of those programs had a lot of the emphasis on professionalism and having these new shiny things and that I think deters a lot of people from even entering this space specifically"

One program was discussed by two out of the four participants as divisive due to being the sole woman participant in a program that did not align with their small business goals and ideals:

"I'm in a training program…but I'm kind of plateauing…I have good mentors in this space, but not like-minded thinkers of why I need to be successful."

"The other one I hated it was like it was such a miserable thing it was...that one was a training program where I was the only woman participant…I felt really, really out of place, because the way I conduct business is so different from the way that they wanted me to conduct business and I just felt like if I'm not doing things right and if I'm not scaling up and fitting into this mold of what I feel like a lot of people want to see in me in aquaculture."

3.2.4 Gear

Oyster farm design, equipment, and growing methods were the most common barrier among the four participants. From cost of specific gear types, to challenges with size and weight

of gear for specific growing methods, and clothing that never fits, the participants have navigated this challenging environment to design their farms in a way that works best for them.

"Aquaculture is still relatively new, particularly in Maine, and boats and gear are not designed for smaller people. And there I think there are, you know, there are different technologies and types of gear. And you know, there are smaller cages that are lighter weight. So there are ways that we're working around this, but it it's still an obstacle, it is still a barrier."

"There's a lot of physically demanding work that goes into sea farming, and that is harder if you have less physical strength, which is typical of the female anatomy. And I think that we need to see more advancements in technology that allow things to be mechanized and sized appropriately so that we can do this without, you know, bodily harm and actually be effective."

Two out of the four of the participants discussed challenges with finding appropriate clothing that is functional for working on the water. Maritime clothing companies make more durable foul weather gear only in men's sizing, so it is a barrier for women to find clothing that fits and is comfortable. Some of the clothing necessary for farming:

"So it's a concern because I don't want to go out in December and I don't want to go out in January because I'm freezing. But if I had the proper gear, I would work all year long…being uncomfortable every day where you're working is just when it wears on you."

For the photography and narrative data collection, Laura Brown of Fox Point oysters in Great Bay, NH discussed her challenges with finding clothing that fits her specific body size:

Figure 22. Photovoice documentation by Laura Brown titled "Clothing"

"On the farm I wear insulated waders while submerged in cold water. Clothing for the fishing and hunting industry is created mainly for men or 'one size fits all'. One size does not fit all. Women's waders, when available, are two to three times more expensive and don't have leg lengths that fit. Women often order men's waders in kids shoe sizes to fit the feet, but the legs are too short, the bodice too tight and the seams split. Water jackets for men are more narrow and sleeve cuffs too loose allowing water in."

3.2.5 Other

In addition to the four guided topic areas, all four participants also discussed a range of barriers including the leasing and licensing process and challenges with the gender norms and masculinity of the aquaculture industry. Both the state of Maine and New Hampshire have legal systems for acquiring rights to an aquaculture site, one participant noted that it was one of the largest barriers to starting their business and scaling their commercial operation:

"One of the hardest things to navigate was the leasing system and the market"

All four women participants discussed the barriers of being a woman in a male dominated industry. Gender experiences include differential treatment and sexual harassment, perceptions of women as hobby farmers, and the gendered roles of women working in the maritime space for example as a cook or stewardess, not a business owner.

"I surround myself with women in general, and I wonder if part of it is because I want to make sure people know it's my farm."

"I don't always feel looked at like I could be a competitor. I think there's plenty of market for all of us, but they just don't see me as someone who's growing to this larger scale. You know, that's not their vision. They're like, oh, "she has her cute little farm, and she's going to get a little bit bigger and maybe sustain herself" is kind of what I think they perceive."

The participants also expressed a mutual feeling of being behind their male counterparts with specific maritime skills necessary to run an oyster farm because they did not grow in the working waterfront space or in a household that included women in the industry roles such as driving a boat:

"I know that in many cases, working on the water, I was the only female or I was really late to learn how to do things, I think in part because I was female. There are a lot of hard skills that I was late to learn because it was harder to kind of feel comfortable just joining that working scene."

Contributing to the gender norms about the roles of women in the fisheries and aquaculture industry is the overall paucity of women oyster farmers in the region, so finding other women to learn from and work within the industry is also a barrier for the participants in this case study:

"You still see it as still predominantly men who are fishing there. It's still probably men who are in aquaculture. It still is kind of a man's world. And so I think the more that you see women in there, I think it's changing. I'm hopeful about it."

"I think it's for those salty old men that are doing their job, they've been doing it for a long time. I don't think they know the industry anymore. They've been making something for an industry they think they know and I get stuck there because I don't want to just keep talking about a problem. I was like, 'well, what's the solution? What's the barrier that's causing this?' And I think a lot of it is that people don't know women are out there."

One of the participants discussed her role as a mother and her duties of balancing childcare with operating an oyster farm:

"If I'd had access to childcare that day, I probably wouldn't have brought her out on the water. And I don't think that as a woman, I have any less access to childcare as a sea farmer than I would in any other occupation, but I guess the only thing that can be done is just, I don't know, just an awareness of this part…that it is easier than some other things on the water and that it is still sometimes an obstacle. It's also an issue. That day was a lot harder because of that..."

3.2 Discussion: Barriers for a woman-owned oyster farm

The barriers identified by participants in this case study include six main categories (1) people, organizations, and networks, (2) funding opportunities, (3) training opportunities, (4) gear, (5) the leasing process, and (6) gender norms and perceptions of the maritime industry. The most frequently discussed barriers among all four women participants were the gender norms of the industry and lack of women owned aquaculture businesses. The masculine nature of the maritime industry has led to challenges for women in obtaining funding opportunities, receiving

training that is representative of their gender-specific needs, and acquiring gear for their farming operations that is suitable for their body types. The gender norms of masculinity have fundamentally shaped the fisheries and aquaculture sector and influences women's experiences (Knott and Gustavsson, 2022; Salguero-Velazquez et al., 2022).

Furthermore, because women are new to the industry, the participants in this research have a general lack of knowledge on boating skills, engine maintenance, and other maritime skills because they did not have access to these types of roles on the water growing up. Similar results were found in Alaska commercial fishing, with women using different gear types and experiencing barriers to participation due to gendered stereotypes for women in the industry and a 'patrilineal fishing heritage' within fishing families (Syzmkowiak, 2020). This lack of a maritime skillset creates a reliance on their social network to gain knowledge and expertise for their oyster farms. The participants rely more on informal social network actors, such as other oyster farmers in their harbors rather than the larger organizations that support aquaculture on the statewide level. Participants noted that the organizations do not represent their interests in aquaculture development and business growth, and the programs did not provide cost effective growing methods or methodologies for smaller body sizes, such as bottom seeding. One participant noted that the associations supporting aquaculture in the region can be intimidating to work with. Due to the fact that the majority of aquaculturists in Maine and New Hampshire are men, the women participants are receiving advice on growing methods, gear types, and marketing techniques that do not always align with their gender specific needs or goals for their businesses.

There is a similar issue occurring with the training programs offered in the state of Maine, as New Hampshire does not offer any. The participants identified that the training

program material focuses on capital intensive gear and equipment and marketing methods that do not align with their capacity or business mission. Barriers for funding included obtaining grants and loans as a beneficiary with few assets. The cost of gear for an oyster farm was a barrier discussed by 100% of participants, along with the challenge of equipment and clothing that does not function for all body sizes. Due to the barrier of a lack of appropriate gear types, the participants have built innovative farming techniques that are different from the industry standard methods taught in the training programs. Women are largely unrecognized in the maritime industry due to the barriers of gender norms and perceptions of the industry as masculine. This has created gender-specific barriers for women to overcome, which they are doing, in order to have a successful aquaculture business.

3.3 Participation in Aquaculture Food System

The four women participants have positioned themselves at every sector of the food system in order to have access to resources and control over decision-making for their oyster farms. The food system sectors they engage in include production and harvesting, processing, distribution and marketing, and consumption (NHFA, 2015) (Figure 23).

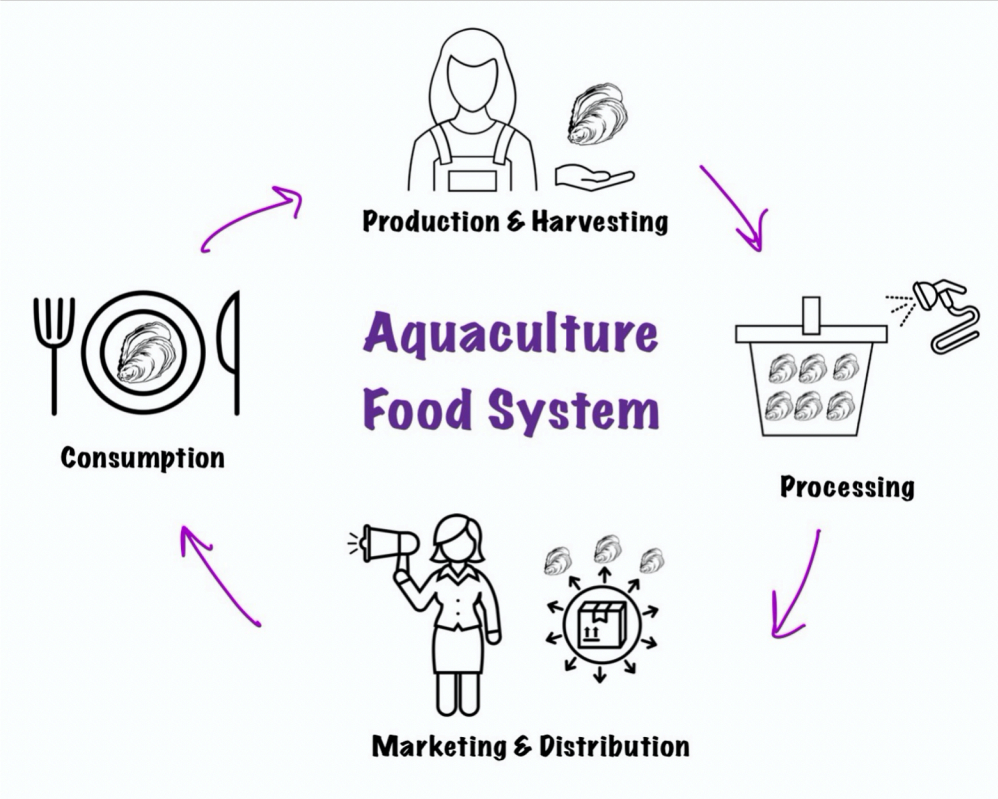

Figure 23. The roles of case study participants in the aquaculture food system.

The interview and focus group data indicate that the women are engaged in a variety of tasks to successfully manage the oyster farm. Activities range from scuba diving on farm sites to shucking oysters at weddings (Table 8).

Table 8. Participant position in aquaculture food system identified by interview and focus group process.

Aquaculture Food System Sector	Participant Activity
Pre-harvest	site scuba diving, mapping for lease hearing, gear preparation and build out, seed grow out
Harvest	Processing and harvesting oyster product, gear maintenance and repair
Post-harvest	Marketing and distribution of oysters, selling product, outreach and education to general public and landowners

Three out of the four participants sell their own oyster products with a wholesaler license or shellfish dealer's license. One participant sells her product to a local seafood market:

> *"My experience was that it was small scale farmers who also have their dealer's license, who run the local seafood markets or sell at the farmers markets. Those are the ones that were helping me sell my product at a time when the restaurants were shut down. So my small scale owner-operator business relies on others to purchase my product, but also because we share some infrastructure like cold storage."*

Throughout any given workday, the participants conduct a diverse array of tasks from harvesting oysters to bringing them to market. The social network support the participants receive at all stages of the food system are integral to the success of their businesses. Some participants have carved out a market for themselves, and now support other women sea farmers in the area by also selling their oysters:

> *"Once we got oysters to restaurants, people loved them. I really only had to try to make sales our first season, thankfully, we have a really good product. After that, they sold themselves. I mean, I was like, , 'Oh gosh, I now have to call this restaurant, talk to this chef and bring over samples.' And it was stressful versus 'I just want to be on the boat. I don't want to be a salesman.' But I navigated that process and kind of figured it out. And now this is part of what I do. I'm a dealer and now I deal other people's products. And again, it's not easy to do, and thankfully I have enough experience now that I can make it work. And I also have two female friends who are sea farmers, that it's helpful for them, they got a higher price, and we have a great working relationship. They both have agreed to not move their product any other way on the island. So, I get to corner the market here in exchange and boom, it works."*

The ability to support other local sea farms in the area was an important role that all participants discussed. The support can include selling oysters, advice about site selection and gear type, or working on the farm as an unpaid employee.

Another relevant topic to participation in the aquaculture industry as a woman is the role of gender norms and childcare responsibility. One participant highlighted that they specifically chose to work as an oyster farmer because they are the primary childcare provider in their household:

> *"I think it's pretty common for sea farmers to include their family in what they do, just like it's common for land farmers to do that. And so I think that this is a symbol of how the community works, we bring our kids out on the farm and it resembles kind of the lifestyle of sea farmers. It's been a lot easier, I think as an aquaculturists, to be a mom than it would be if I were still commercial fishing. In part, it's because I work for myself and so I can bring my daughter. Whereas like, if this had been someone else's truck and maybe it would've been too early in the morning. I think the lifestyle of sea farming is conducive to having a family, at least more so than other types of jobs that are on the water."*

The regulatory barriers for entering the aquaculture industry in Maine and New Hampshire are low, especially compared with the commercial fishing industry. As an oyster farmer, the participants can be a business owner and take part in all sectors of the food system which allows them control over decision-making and in the case of one participant, the flexibility necessary to be a mother.

3.3 Discussion: participation in the aquaculture food system for women oyster farmers

As business owners, the four participants in the case study have positioned themselves at every sector of the food system from production to market in order to have control over decision-making and access to their social networks which comprise their most influential resource in order to have a successful business. There was no mention of barriers to participation due to gender norms. In fact, some participants noted that being a woman has promoted their product

and assisted with more sales and marketing opportunities. In order to avoid gender discrimination and negative perceptions of women working in the waterfront space, the participants have designed their business to have autonomy over their decision making processes. This finding of women's participation in the aquaculture food system within the US is not replicated in the literature for women working in the fisheries and aquaculture sector in developing nations. For example, in the Southeast Asia and Pacific Islands tuna fishery, as of 2021 there is a gender division of labor with men harvesting offshore and women working within the onshore sectors of the food system in processing, marketing, and business operations (Barclay et al., 2021). However, similar to the women of this research, Barclay et al. (2021) found that some women developed informal processing businesses in order to have control over their schedules with childcare responsibilities.

3.4 Overcoming Barriers With Alternative Social Networks

Although there are a number of barriers that challenge the participant's ability to run a successful oyster farming operation, the women also identified pathways for overcoming these obstacles every day. All four of the photovoice study participants use a social network to sustain their oyster farming business and overcome barriers (Table 7). For the participants in this case study, their social networks were comprised of primarily women and informal actors (Table 9). The other method for overcoming barriers for all four participants was custom designing their farm, growing methods, and clothing to fit for their gender specific needs. The best method for the participants to learn about farming techniques that works well for women was through their social network, as these methods are currently not offered in training programs. The following

sections will cover the social network actors, patterns of interaction, and analysis of the networks as a tool for women oyster farmers.

3.4.1 Identification of Actors

Within the photovoice case study, the participants identified 31 different actors that comprise their social networks for their oyster aquaculture businesses. Table 9 lists the institutional actors and their authorities within aquaculture development and Table 10 covers the informal network actors.

Table 9. Institutional actors included in the social networks of photovoice case study participants classified by their jurisdiction for aquaculture development.

Institutional Actor	*Jurisdiction*
Harbormaster	Regulatory
Maine Sea Grant	Advisory/Academic
New Hampshire Sea Grant	Advisory/Academic
USDA	Regulatory
Maine Department of Marine Resources	Regulatory
Maine Aquaculture Association	Advisory/Organization
New England Ocean Cluster	Advisory/Organization
Maine Oyster Company	Business
OysterGro	Business
Maine Small Business Alliance	Advisory/Organization
Maine Small Business Development Center	Advisory/Academic
The Island Institute	Advisory/Organization
Xtra Tuff	Business
Hamilton Marine	Business
Nature Conservancy	Advisory/Organization
Blue Ocean Society	Advisory/Organization
Atlantic Sea Farms	Business
NH Department of Environmental Services	Regulatory
NH Department of Health and Human Services	Regulatory
NH Fish and Game	Regulatory
University of New Hampshire	Advisory/Academic
University of Maine Cooperative Extension	Advisory/Academic

Regulatory Actors

For the Maine and New Hampshire aquaculture industry, there are several regulatory bodies that permit aquaculture production and sales referenced by case study participants. In Maine, the Department of Marine Resources and the harbormaster were discussed as important gatekeepers for entering aquaculture production via lease hearings or expanding sites and growing operations with new, larger lease applications. In New Hampshire, there are three main bodies for regulating aquaculture: NH Department of Environmental Services, NH Fish and Game, and the NH Department of Health and Human Services. One common thread discussed in the New Hampshire participant interview is the lack of capacity and staffing of New Hampshire state agencies. One regulatory agency was discussed by participants from both states was the USDA in regards to their Pandemic Response and Safety Grant for COVID-19 relief.

Non-regulatory Actors

The non-regulatory institutional actors within the aquaculture industry fall under three categories in this case study: (1) academic institution in an advisory role, (2) organization in an advisory role, (3) business. These actors do not have a legal function for providing aquaculture rights, however they are influential in the success of the industry as a whole.

Within the academic advisory category, there are the two main universities from each state, University of New Hampshire and University of Maine. Both have conducted applied aquaculture research to aid the sustainable development of the region's fisheries and aquaculture industry. The Maine and New Hampshire National Sea Grant College programs provide research, funding, and in Maine, training programs. Maine Small Business Development Center

is a program of the University of Southern Maine that provides grants and a training □rogramm for Maine business entrepreneurs.

The advisory organizations in the aquaculture sector of Maine and New Hampshire fall under two types: nonprofit and private sector. Some provide training opportunities and industry reports, such as the Maine Aquaculture Association and the Island Institute. Other organizations such as the New England Ocean Cluster are membership based and working towards collaboration for all stakeholders within the region's blue economy. There are also nonprofits such as the Nature Conservancy and the Blue Ocean Society that support broader marine ecosystem health initiatives in both states.

The case study participants mentioned several aquaculture businesses that are actors within their social networks. Staff at the Maine Oyster Company encouraged one participant to start her own farm and offered guidance to get started. Participants also discussed purchasing farming gear, clothing and equipment from OysterGro, Xtra Tuff, and Hamilton Marine. Atlantic Sea Farms is a women-run kelp aquaculture business and was discussed by participants as one of the only representative businesses for women in aquaculture included in a training program they attended.

Informal Actors

For the women in this case study, informal actors comprised the greater part of their social networks. These actors include members of the working waterfront community including other oyster farmers with sites nearby, commercial fishermen including wild clammers, boat mechanics, farm employees or boss, oyster hatcheries and wholesalers. Also, part of the working waterfront for two participants were cooperatives among oyster farmers. For example, in New Hampshire, all 17 farms have monthly meetings to discuss environmental conditions, growing

issues, and marketing strategies with the group called the New Hampshire Shellfish Farmers Initiative. All four participants have the general public as well as waterfront landowners as part of their social networks. Three of the women in this case study do not have full time employees on their farms so their family members, friends, mentors, roommates, and neighbors are important actors for labor support.

Table 10. Informal actors included in the social networks of photovoice case study participants.

Informal Actor	
Oyster farmer	Neighbor
Friend, family member	Co-op members
Mentor	New Hampshire Shellfish Farmers Initiative
Employer	Boat Mechanic
Oyster farm employee	Oyster hatchery
General public	Roommate
Landowner	Wholesaler
Wild clammers	

Data from the photo documentation and narrative by Amanda Moeser further detail the importance of informal network actors for her oyster business:

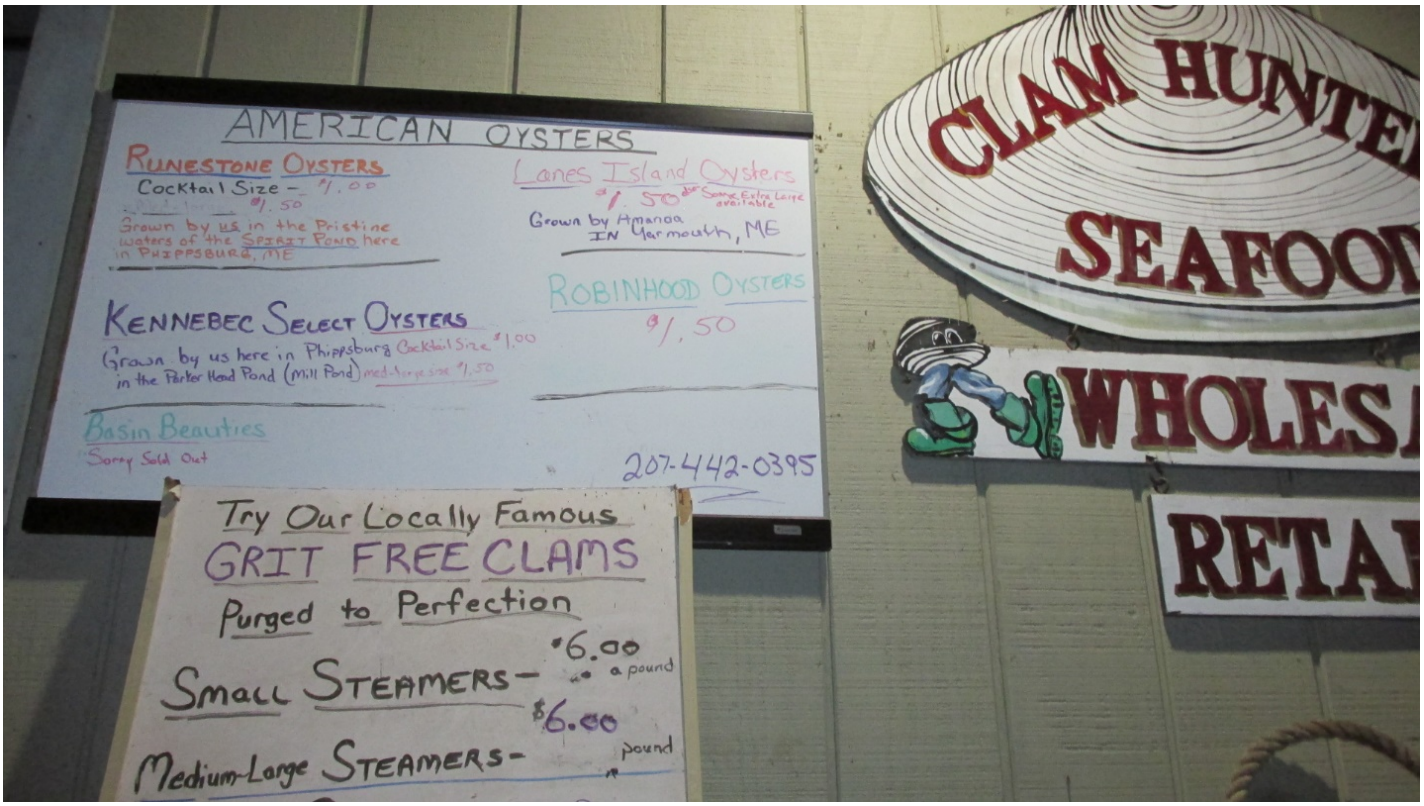

Figure 24. Photo documentation by Amanda Moeser titled "Lanes Island Oysters—'Grown by Amanda in Yarmouth'"

"Terry and Sally were my first ever customers and have been buying from me ever since. I appreciate their shop because I overwintered oysters in the cooler, it's close to home, and they always treat me fairly. Every time I drop off oysters, I'm there for at least an hour because we like to catch up and talk about our farms. Sally has her own farm and a clam license, too, and does all the day-to-day stuff with customers at the shop. It takes the two of them, working full-time and more, to keep the business going. It annoys me when the "people in charge" encourage direct-to-consumer consumer marketing as a way to sustain small-scale fishing and farming ventures. It's another full-time job that I don't need on top of my already full-time job, various part-time jobs, community service, and family responsibilities. I like my middle(wo)man and our businesses work in tandem."

3.4.2 Patterns of Interaction Between Actors

Within the social networks of the case study participants, there are several interactions between actors at the institutional level as well as informal interactions (Table 11). For the participants in this case study, all four women completed 100% of these activities within their social networks. Farming oysters is the fundamental activity in the social network and involves the cultivation, harvesting, and processing of the Eastern oyster in marine waters. Information sharing is important for public support of aquaculture in a specific geographic location. Farmers in this case study complete this activity to educate landowners who are vocally opposed to aquaculture in the area as well as oyster poachers. Furthermore, participants also share information about their farming operations with the larger aquaculture community to contribute to the sustainable development of the industry. Technology transfer is another fundamental activity for the participants, particularly within their women-only networks to share information about gear types and growing methods that function for smaller body sizes with less occupational health risks. Conflicts between users occurred for the participants at the farm site, working waterfront docks, oyster events, and in lease hearings. Investment in aquaculture by organizations within the industry included grant funding to farmers as well as free training programs and business advice. Self-organizing among actors took shape in two different methods: oyster farming cooperatives such as the New Hampshire Shellfish Growers Initiative and organizing farm employment without compensation from friends and family members as well as collaboration between women employees and owners. Networking for the participants involved knowledge transfer of farming techniques, marketing methods, and happenings along the working waterfront. Evaluation activities were completed by the regulatory institutions and included aquaculture leasing, site selection, and shellfish safety.

Table 11. Patterns of interactions with associated activities for an aquaculture action situation. Interaction variables sourced from (Johnson et al., 2018).

Patterns Of Interaction	*Activities*
Farming	Oyster harvesting, processing
Information Sharing	Educating general public, aquaculture community about their farming operation
Technology Transfer	Sharing information regarding farming techniques to enhance efficiency and safety
Conflicts Between Users	Farmer interaction with opposed landowners, conflict between oyster farmers
Investment	Aquaculture organization resources to support industry's sustainable development
Self-organizing	Farmer cooperatives, organizing farm support with friends, family members
Networking	Knowledge transfer of farming techniques, waterfront news
Evaluation	Site selection and permitting, shellfish safety

3.4.3 Analysis of participant social network

Due to the gender norms of the maritime sector, women are often not recognized by industry institutions that provide equipment, clothing, and training opportunities. Furthermore, the participants indicated challenges with access to capital and funding opportunities for investment in their businesses. To overcome the gender-based barriers of the aquaculture industry, the women in this case study use their social networks to reinforce the areas that larger organizations and academic institutions are not supporting them in, listed above.

Three out of the four participants received guidance from other women oyster farmers when starting their businesses and now also help other women farmers begin their aquaculture pursuits. One participant highlighted that she is more comfortable learning from other farmers rather than going through a large aquaculture organization:

"It might also be my kind of personality that I'm more likely to call up someone that I know or to respond to someone that seems like smaller, I'm just more comfortable asking questions of another farmer that I know as opposed to trying to get through an association that might be a bit more intimidating. I think for me, it probably was circumstance that I happened to actually be contacted by one female farmer in particular, she's just like the mother hen of aquaculturists and happens to be a neighbor, and she's brought me into multiple committees and boards and

councils and things since then. So I feel like I'm kind of doing, you know, payback a little bit. But I have always tried to also in the same way extend that kind of information and support to other people who ask."

Information sharing with the general public and working waterfront stakeholders was a social networking activity that one participant leveraged in hopes of maintaining a positive relationship and perception of her business for public comments during lease hearing or getting equipment at the local dock that would help her haul oysters to market:

"So I think those conversations are what strengthens the support for this industry, and that's really valuable because we want to have...you know even people who might not have a say in the leasing process, but like the planning board or in particular, there's someone on the harbor committee on this island who has been in opposition of potentially getting a winch or something to pull up gear from this dock".

For one participant, information sharing from a family member was a significant factor in starting her business:

"We all have the same problems, but my sister luckily had her farm and so she could give me all the paperwork and get me in and help me understand everything. So I was just really, really lucky there."

Technology transfer within the social network is fundamental to the success of the participant's oyster businesses. Specially, the participants focused on making connections with other women to learn more cost-effective growing methods with fewer financial barriers to entry:

"That's why I really respect those ladies because they do so much alone, but they work kind of cooperatively together, which is part of why I want to learn about what they do because I think that they're doing things for a lot less money. I think their business plan makes way more sense and is less labor intensive. And why wouldn't I want that?"

The self-organizing activities are a tool oyster farmers use to fill in labor gaps on their farm, or challenges in hiring employees. If participants cannot afford specific oyster farming

gear for efficient growing methodologies or do not have the finances to hire employees, they turn to their social networks to share equipment and enhance processing efficiency:

"So being able to collaborate and share our equipment that would be innovative and that would help us save and mechanize this process. It's going to be a must… unless I have tons of expendable labor, which I don't think I will ever have this area. And even so, I wouldn't want to do that to people's bodies…So I think the more people we have working on designs like this and even systems for sharing it. Because again, a piece of equipment that could actually mechanize this process would be really expensive. And if a farmer really needs to use it for one day a week, if they're close enough, then being able to share that equipment would be huge"

Networking activities vary by participant their unique business needs. One participant chose her farm and business location based on the social network she had established in the area:

"And part of why I opted not to farm there is because the water is warmer in Casco Bay, and I had relationships with existing farmers who were really supportive in helping me start my farm"

3.4 Discussion: using social networks to overcome barriers

The women participants of this case study experience gender-based barriers in access to capital, relevant training opportunities, gear and equipment that works for their body size, and gender norms on their farms every day. There are current institutional arrangements of the aquaculture industry that are gender-blind, as in there is no consideration of gender norms and the corresponding patterns of interaction among aquaculture stakeholders, or the presence of women as members of the industry. The participants of this case study have identified challenges in training programs offered by academic institutions and aquaculture organizations, aquaculture equipment, gear, and clothing produced by industry companies and access to funding opportunities. However, what was discussed at length in the individual interviews and the focus

group was the adoption and cultivation of a social network that supports all aspects of their businesses.

The participants own and operate small scale farms, and only one of the four women have financial capacity to hire seasonal staff, because access to capital is a barrier for women entrepreneurs. All four participants rely on friends, family, and other oyster farmers to support their farming operations. The participants most frequently identified informal actors as key members for their social networks, especially women. One participant noted that they would rather work with other oyster farmers than gain information or support from a larger institution. This constraint on the relationship between an organization and an individual farmer might indicate the larger issue of gender blind policies for aquaculture within the institution. All participant patterns of interaction are gendered, due to the expectations of roles for women working in the maritime industry that are driven by societal gender norms. By building alternative networks with women farmers, the participants have created their own support systems where the larger aquaculture institutions currently are not meeting their gender specific needs for their businesses.

3.5 Social Networks and Gender Norms

The participants are selective about the actors they choose to engage with for their social networks to support their aquaculture businesses (Table 9). This case study data demonstrates that the women are using social networks for two purposes: (1) as a tool to dismantle gender norms and the perception of the role of women in the maritime industry and (2) to overcome barriers due to the gender norms of the industry. The gender-based barriers experienced by participants include lack of access to institutional support networks and training programs, gear

types and growing methods that function for their physical abilities, and the gender norms and perceptions of historical roles for women in the maritime industry, shown in Table 11.

3.5.1 Identification of Gender Norms

The most frequently discussed barrier amongst the four participants in the case study was gender norms of the aquaculture industry. Throughout the interviews and focus group, the women highlighted three main gender norms they face daily on their farms, or within their work in the greater aquaculture community: (1) the perception of the maritime industry as a male dominated workplace, (2) women are responsible for childcare responsibilities, and (3) differential treatment as a woman. With each gender norm there are multiple outcomes that the women experience as a part of their participation in the industry, as shown in Table 11.

Table 11: Participant identification of gender norms they experience while working on oyster farm or aquaculture business related activity.

Gender Norm	*Outcome*
Perception of maritime industry as male dominated	General public questioning women in maritime positions: launching boat, driving boat, driving trailer, owning and operating an oyster farm
	Commercial fishing rights to male family members only
	Lack of maritime skill set
	Differential treatment as a woman
	Gear types and clothing that are not manufactured for people with smaller body sizes
	Perception of women as hobby farmers, not competitors
	Aquaculture organizations do not address women's interests
	Lack of trust in ability to be on the water alone: constant mentorship and advice from older, male oyster farmers

	Women are often overlooked or not recognized as stakeholders of the aquaculture industry
Childcare responsibilities	
	Owns and operate aquaculture business to tailor schedule and hire crew to maintain childcare schedule
	Brings child on oyster farm when necessary
Differential treatment as a woman	
	Sexual harassment in working waterfront space
	Verbal harassment on farm
	Men taking advantage of their position as a woman oyster farmer to gain competitive lease sites nearby or engage in illegal activity on their farms, such as oyster poaching

3.5 Analysis of gender norms

Managing the gender norms of the industry was the most frequently discussed topic among participants. In order to overcome these challenges and dismantle the historical gender norms for the fisheries and aquaculture sector, these women use their social networks.

The participants highlighted that working with other women can be a successful tool to dismantle the negative gender perceptions of women working in the maritime industry as oyster farmers and business owners. By using their social network of women, the women oyster farmers of this case study are claiming the identity of oyster farmer and business owner:

"I surround myself with women in general, and I wonder if part of it is because I want to make sure people know it's my farm."

Whenever possible, the participants sought out women actors for their social support system or in some cases collaboration for physical work on their farms. One participant noted that when working with other women, they generate innovative farming techniques and designs that decrease occupational health and safety risks:

"So being able to employ other women and working with other women to come up with creative ideas to like flip a cage together, it's an example of us overcoming this barrier of hard manual labor."

One participant opted to not join a local cooperative of oyster farmers in the area that consisted of all men. She indicated that she would rather have autonomy over her business operations and decisions:

"These men creating a group of farmers, like this elite group, they have a shared tumbler. I have opted at this time to still not be a part of the co-op. I think there are some benefits for me, but I haven't pursued it yet. I love those people. I think they're OK farmers. I don't think they're the most amazing farmers, and I don't know if I want their name representing what I do. So I also didn't want anyone to tell me what day or time I could go out and use my equipment and where I could use it and have these agreements. I want autonomy. And so that's kind of representative of that. There is a shared tumbler right nearby but I was like, this is something that I'm adamant that I need."

To address the lack of women's specific training opportunities provided by aquaculture organizations, the participants use their social networks to gain knowledge on alternative farm designs and growing methods that are more suitable for smaller body frames and individuals with less access to capital:

"I think that they're confident in their methods and straying away from this industry standard that people are preaching. And I want to experiment with that. I've purchased some of the gear to start doing that. But when I honestly, I'm like a creep, I have all their lease applications downloaded. I try to learn from them as much as possible because I do think that they're obviously doing something right."

For the photovoice documentation, participant Joanna Fogg noted the challenges she faces with childcare and oyster farm duties:

Figure 25. Photovoice documentation by Joanna Fogg titled "Joanna and Iona".

"I woke my daughter early one winter morning to go harvest at high water. I packed her a breakfast burrito and put her warm gear on top of her pajamas. After helping me for a while on the floats she got chilly and went to play in the truck. She took off her winter coat and hat and mittens and messed about for a bit before she came back to see if I was nearly done. After several trips of lugging the heavy harvest up the icy ramp I went to open the truck and realized we were locked out. I had been thinking a great deal about this Photovoice project and barriers that women face. The metaphor of being locked out of my own truck in the middle of nowhere, with a child, stung like the seawater on my hands. There was no spare key. She didn't even have her hat. The closest house was over a mile away. After a few expletives and a kick at a snow bank I became very aware of what my four-year-old would learn in this moment. I decided I did not want this to be a lesson in blame, anger, or fear. I bent down and gave her a hug. We took this picture and then proceeded to figure it out."

3.5 Discussion: gender norms identified in the oyster aquaculture industry

To overcome the challenges created due to the gender norms of the aquaculture industry, the women in this case study use social networks, and they also position themselves as business owners and participants at every sector of the supply chain to avoid gendered outcomes. The overarching gender norm identified by participants was the perception of the maritime industry as male-dominated. This finding, and participant experience, is demonstrated in literature across the globe (Kleiber et al., 2017; Knott and Gustavssn, 2022; Salguero-Velazquez et al., 2022). This social norm for women permeates the everyday activities of participants, from launching their boats, to selling oysters. The alternative social networks these women have built are dismantling the gender norms by helping the women claim their identity as oyster farmer and aquaculture business owner. The patterns of women-only groups has been demonstrated in other male-dominated natural resource management settings as a tool for women to have their voices heard in decision making (Agrawal, 2001).

CHAPTER 4: Conclusion

Globally, half of the seafood consumed is sourced from aquaculture (NOAA Fisheries, 2022). Here in the United States, responsible aquaculture production can be a sustainable source of protein and healthy food options. The goal of this research was to analyze gender dynamics in women oyster farmer's experiences in the Maine and New Hampshire aquaculture industry. This region is experiencing increased aquaculture development in a changing Gulf of Maine ecosystem (Stoll et al., 2019). Although there are contextual specifics to this case study such as oyster growing conditions, wild fishery stock status, and coastal economic dependence on the sector, the overarching challenges of sustainable aquaculture development and incorporation of

social equity can be applied to a range of contexts in different geographic regions, for example in the Southeastern region of the US.

Understanding gender equity in marine food systems is an emerging research area and this research identified the resources and barriers to participation for women oyster farmers as well as the tools they use to overcome the gender-based challenges they experience as business owners in a previously male-dominated sector. To determine if gender influences women's participation in the oyster aquaculture industry, this research implemented an industry-wide survey that was inclusive of all genders and completed a photovoice case study with four women oyster farmers and business owners. The methodology was developed to be community-based and participatory for the women involved. This research engaged gender theory and the social-ecological system frameworks with an interdisciplinary approach for an analytical framework, a methodology for analysis that the literature demonstrates is needed for effective research on social-ecological resilience in marine resource management settings (Kawarazuka et al., 2017). By completing this research project and sharing their stories with the larger aquaculture community, the women strengthened their social networks and embraced their role as a woman oyster famer, paving the way for more women to enter the industry.

4.1 Gender Discrimination

In the oyster aquaculture survey, this study found that 41% of women participants have experienced differential treatment based on their gender, compared with 0% of men. These results correlate with the experiences of the photovoice case study participants, as all four of them discussed occurrences of gender discrimination while running their farming businesses. The interviews and focus group from the photovoice case study provided deeper insight into the

potential sources of gender discrimination amongst participants. The most widely discussed barrier amongst participants were the gender norms of the maritime industry – including perceptions of the industry as male dominated, assumptions about childcare responsibilities, and differential treatment based on their gender. Understanding how gender norms influence the participation of women in the aquaculture industry is important to improve gender equity and the social considerations of aquaculture development to build an equitable marine food system in the region (Njuki et al., 2020, Szymkowiak, 2020).

4.2 Resources and Barriers

This research provides important insights to an area with limited information on resources and barriers for an oyster aquaculture operation in Maine and New Hampshire. The data demonstrates the use of social networks as a key resource for oyster farmers who participated in the research. Gender specific barriers for women survey participants include access to funding, appropriate gear types, and training programs. This coincides with the photovoice case study data and conveys a need to address potential gender-based barriers to participation with aquaculture institutions in the region. In the fisheries sector other parts of the country, women face similar barriers with sexual harassment, gender norms, and stereotypes regarding the masculinity of the commercial fishing industry (Syzmkowiak, 2020).

The gender norms of the fisheries and aquaculture sector impact women's participation and influence their access to resources and create barriers such as access to capital, relevant training opportunities and gear types for their gender-specific needs, all gender-based barriers that researchers McClenahan and Moulton (2022) also found in their case study on women aquaculturists in Maine. Another barrier among both survey and photovoice participants was experiencing gender discrimination in their workplace. Gender discrimination, prejudice, and

unequal opportunity for women have been documented elsewhere, such as the 2017 global seafood industry survey by the International Organization Women in Seafood (Briceno-Lagos and Monfort, 2017). Women's experiences with the societal norms of masculinity have been found to occur across the global seafood system and it perpetuates gender inequality in the industry (Knott and Gustavsson, 2022; Salguero-Velazquez et al., 2022).

4.3 Social Network

Social networks are used as a tool by all participants regardless of gender. This finding is mirrored in other research on stakeholders in the domestic fisheries and aquaculture setting (Calhoun et al., 2016; Johnson et al., 2019). Networking between farmers and other stakeholders can enhance knowledge transfer and social acceptance (Johnson et al., 2019). The goal of this research was to determine how women engage in these established social relationships among oyster farmers in Maine and New Hampshire. The survey provided insight into how different genders interact with their networks and share information. The men respondents identified using institutional actors such as Maine Sea Grant, while the women noted informal actors such as their family members or other oyster farmers in the bay. Use of informal networks for women has been documented in the literature in other natural resource management settings (Agrawal, 2000; Westermann et al., 2005). With gendered outcomes for social networking suggested in the survey results, the photovoice data provided evidence as to why women are using alternative social networks. Due to the gender norms of the aquaculture industry, the women participants identified several areas where their gender-specific needs are not being met by the larger aquaculture organizations supporting the industry. These findings coincide with recent research

by McClenahan and Moulton (2022) on fisheries transitions to aquaculture for gender equity in Maine specifically note an 'intimidation factor' of institutional training events in the state.

To adapt to norms and barriers, the women engage in alternative networks, primarily made up of women and this pattern is demonstrated in agricultural settings by Leslie et al. (2019). These alternative networks challenge the gender norms of the industry. The women are using alternative support networks to claim their identity as an oyster farmer and business owner and to find innovative ways to overcome barriers in accessing capital, growing methods, and farm design. Similar findings have occurred in the artisanal fisheries sector of Chile, with women forming a union of seaweed gatherers experiencing more decision-making capabilities and access to more income generating activities for their families (Gallardo-Fernandez and Saunders, 2018). This research highlights the importance of social network engagement for women oyster farmers in ME and NH to run their businesses successfully.

This case study demonstrates that social networks can be used as a tool for aquaculture institutions to dismantle gender norms in the industry. An example of an institutional network within the academic and policy realm is the "Sisters in the Arctic Blue – Advancing a Gender Perspective in Arctic Marine and Coastal Social Science Research (SAB)" network, funded under the Nordic Council of Ministers Arctic Co-operation Program in 2021 to address the knowledge gap for gender equity within the maritime industry (Svels et al., 2022). So far, the SAB network has highlighted a need for increased academic research on women's participation in the blue economies of Nordic countries as well as funding for gender-specific programs (Svels et al., 2022). This framework for a gender-specific institutional support network can be used as an example for aquaculture practitioners in the Gulf of Maine for continued integration of gender and social equity into aquaculture development decision making and policy in the future.

In an industry that maintains strong gender norms and does not recognize the contributions of women's participation due to lack of demographic data collection at the local, state, and federal level, there is a clear knowledge gap for gender and social equity. Although the body of literature is growing, fisheries and aquaculture settings across the globe still maintain a lack of understanding for women's contributions and an absence of institutional support for women in the industry (Barclay et al., 2021; Lawless et al., 2021; Syzmkowiak et al., 2020). This research contributes a place-based case study on the role of gender to the knowledge gap labeled the "people-policy gap" by Krause et al. (2015). Increasing our understanding of social dimensions can assist sustainable development of the seafood industry.

This research provides a contribution to a much-needed area of aquaculture development policy that hopes to address social equity components for the industry (Bennett et al., 2021; Campbell et al., 2021; Cisneros-Montemayor et al., 2019; Lester et al. 2022). Addressing gender equity will enhance equitable outcomes for those involved in the maritime sector. This research contributes a new perspective of experiences for oyster aquaculture producers and demonstrates a need for continued focus on the role of gender and social equity in the aquaculture industry of Maine and New Hampshire.

4.4 Recommendations for Integrating Gender Equity into Aquaculture Development

The findings of this research project have identified several areas to enhance aquaculture organization's ability to address social equity in their work with stakeholders:

- **Invest in the network:** Organizations can prioritize funding for networking for women farmers specifically with a more informal approach that allows them to have autonomy over network design, topics, and goals. Furthermore, providing support for an additional network that is inclusive of all genders with a more formal structure and set subjects would also be beneficial for the industry. Networking events in different geographic regions in Maine and New Hampshire will allow for more collaboration amongst the small-scale oyster producers.
- **Women's specific trainings:** As of December, 2022 there are two women's specific training programs being developed by Maine Sea Grant and the Island Institute. This is a great opportunity for women to learn about aquaculture farming techniques and maritime skills without the underlying presence of gender norms and masculinity. Furthermore, it will allow women to develop networks of support across the region. Curriculum recommendations include hard skills to own a sea farm such as engine maintenance and troubleshooting, boat trailering and driving, as well as conflict resolution and negotiation practice.
- **Invest in women owned businesses:** providing gender-specific grant opportunities for women entrepreneurs will be a critical step forward for gender equity in the aquaculture industry.

- **Collect demographic data:** quantifying the presence of women in the industry is crucial for the progress of gender equity. We need sex-disaggregated to understand how women are participating, if they have any gender specific barriers, and to measure progress. Criado-Perez (2019) covers how the gender data gap in the agriculture sector leads to research, development programs, and even basic farming tools designed for men. With the lack of data, a cycle is initiated and women have less access to land, financial credit opportunities, and new farming technologies so their production is lower. These findings coincide with the experiences of women oyster farmers in this research, with similar barriers in access to funding, gear, and training programs.

4.5 Study Limitations and Lessons Learned

The greatest limitation to this study is conducting the photovoice portion of the study with solely oyster producers who identify as women. With more time and funding, incorporating participants across genders would build a stronger gender analysis and provide insights into the power dynamics across genders. Furthermore, expanding the survey sampling size to include all aquaculture lease holders regardless of gender and species type may provide a better representative sample of the region's gender dynamics in this burgeoning industry. Focusing on women-specific issues within the fisheries and aquaculture setting has been identified as a knowledge gap in the literature (Lawless et al., 2021). With a larger sample size, the statistically significant variables, including barriers to oyster farm businesses by gender, might yield different results. Expanding the variables for analysis to include other demographic information such as race and socioeconomic status would provide more intersectional insights into the potential power dynamics limiting social equity in the industry.

Several lessons were learned for incorporating gender studies into natural resource management research. The survey asked participants to self-identify their gender with the question "what gender do you identify as?". However, the provided answers were sex identification "female" and "male" and followed the definitions from (March et al., 1999). Since the March et al., (1999) publication, there has been an expansion of research and understanding of gender identities with more modern definitions for gender and sex that integrate the role of societal norms and this was incorporated in the literature review section of this thesis. Another lesson learned was in regards to developing research questions and survey protocol to conduct a social network analysis.

Highlighting women's experiences owning a business in a previously male-dominated industry like aquaculture is an emerging research area. To the best of my knowledge, only a handful of studies have been completed on gender in the fisheries industry in the United States by a NOAA fisheries staff member in Alaska (Szymkowiak, 2020), West Coast fisheries (Calhoun et al., 2016) and one recently published article in Maine (McClenachan and Moulton, 2022). This case study-based research was highly context specific and included a small geographic range. The literature calls for research on the gender dynamics within food systems that can be applied across geographic scales (Njuki et al., 2022).

4.6 Next Steps

Upon defending and submitting this thesis, my next steps are to begin the manuscript writing process to publish this research in an academic journal. A few target journals include Marine Policy, Society and Natural Resources, and Ocean and Coastal Management. The MS thesis will be published in the UNH Scholar's Repository as well as the survey instrument and the photovoice case study photobook. I am currently enrolled in the UNH Natural Resources and Environmental Studies PhD program. For the 2023 academic year, I will be completing the Knauss Marine Policy Fellowship Program in Washington, DC. I look forward to continuing being a member of the academic community here at UNH.

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APPENDICES

Appendix A: UNH Institutional Review Board Acceptance

From: do-not-reply@cayuse.com
Subject: IRB-FY2022-23 - Modification: UNH IRB Mod App Ltr
Date: March 18, 2022 at 4:44 PM
To: Catherine.Ashcraft@unh.edu, nl1109@wildcats.unh.edu

D

CAUTION: This email originated from outside of the University System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

University of New Hampshire

Research Integrity Services
51 College Road, Durham, NH 03824
research.integrity@unh.edu

Mar 18, 2022 4:44:04 PM EDT

Natalie Lord
Dean of COLSA, Natural Resources & The Environment

Study Title: A rising tide? The role of networks for oyster aquaculture producers in New Hampshire and Maine
IRB #: IRB-FY2022-23
Modification: Updated PhotoVoice Questions
Modification Approval Date: March 18, 2022

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved your modification to this study, as indicated above. Further changes in your study must be submitted to the IRB via Cayuse IRB/Human Ethics for review and approval prior to implementation.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the document, Responsibilities of Directors of Research Studies Involving Human Subjects.

Note: IRB approval is separate from UNH Purchasing approval of any proposed methods of paying study participants. Before making any payments to study participants, researchers should review the Payment of Incentives/ Compensation to Research Participants guidance to ensure they are complying with institutional requirements. If such institutional requirements are not consistent with the confidentiality or anonymity assurances in the IRB-approved protocol and consent documents, you may need to request a modification from the IRB.

If you have questions or concerns about your study or this approval, please feel free to contact Melissa McGee at 603-862-2005 or melissa.mcgee@unh.edu. Please refer to the IRB # above in all correspondence related to this study.

For the IRB,

Julie F. Simpson
Director

Appendix B: Oyster Aquaculture Survey Instrument

Oyster Aquaculture Survey Instrument

Natalie Lord
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Julia Novak-Colwell
University of New Hampshire, Durham, NH, USA, Julia.colwell@unh.edu

Oyster Aquaculture Survey Introduction

Researchers at the University of New Hampshire designed and implemented an oyster aquaculture survey with the following objectives:

- To gain a food system-wide perspective on gender dynamics in the region's aquaculture industry, inclusive of different genders
- Understanding perspectives on the role of gender in aquaculture
- Identify potential gender-based barriers and opportunities to participation for men, women, and non-binary/third gender oyster aquaculturists

The University of New Hampshire Institutional Review Board for the Protection of Human Subjects in Research approved this study (IRB #: 23; Study approval date: 8/12/2021; Modification approval date: 3/18/21). The survey was conducted online using Qualtrics throughout August and October of 2021.

The sampling frame was built from publicly available aquaculture lease data from New Hampshire Fish and Game and the Maine Department of Marine Resources as well as business contact information from the Maine Oyster Trail website. These sources are the best choice for this research because (1) the state agencies listed above are the regulatory authority for aquaculture leases and (2) the Maine Oyster Trail Business Directory provides contact information that is otherwise not publicly available. Due to the unknown probability of selection into the sample, there are no survey weights, and these results do not represent the entirety of oyster aquaculture farmers in ME and NH. However, of the total contacted oyster farmers (n=77), 39 participated in the survey to provide a response rate of 53%. Although this work is unable to claim generalizability to the entire population of New Hampshire and Maine oyster farmers, the work provides descriptive results in an area that has yet to be researched.

The goal of this document is to provide open access of the survey questions and protocol for anyone interested in the survey portion of this research.
A Rising Tide: Oyster Aquaculture Survey

Start of Block: Default Question Block

Survey Consent

RESEARCHER AND TITLE OF STUDY
Principal Investigator: Natalie Lord, Graduate student in the Department of Natural Resources and the Environment at the University of New Hampshire
Title of study: A Rising Tide? The role of social networks for oyster aquaculture in Maine and New Hampshire

WHAT IS THE PURPOSE OF THIS STUDY?
The purpose of this research project is to highlight the experiences of people working in oyster aquaculture in Maine and New Hampshire to inform regulatory agencies and the local aquaculture community of their contributions to the industry and strategies they use to maintain successful businesses on the water. This survey will include a food system-wide perspective on gender dynamics in the region's aquaculture industry. About 40 participants will contribute to this survey. All participants must be at least 18 years old to participate.

WHAT DOES YOUR PARTICIPATION IN THIS STUDY INVOLVE?
You will complete the survey online via smartphone or computer using Qualtrics survey software. The survey should take no more than 15 minutes of your time.

WHAT ARE THE POSSIBLE RISKS OF PARTICIPATING IN THIS STUDY?
Participation in the survey is expected to pose minimal risk to you.

WHAT ARE THE POSSIBLE BENEFITS OF PARTICIPATING IN THIS STUDY?
Participants may benefit from this survey through recommendations for future trainings and offerings by state and federal aquaculture organizations and community partners in the aquaculture sector. Therefore, this data can contribute to the workforce development of the coastal communities of Maine and New Hampshire.

IF YOU CHOOSE TO PARTICIPATE IN THIS STUDY, WILL IT COST YOU ANYTHING?
There are no costs associated with participating in this study.

WILL YOU RECEIVE ANY COMPENSATION FOR PARTICIPATING IN THIS STUDY?
No.

DO YOU HAVE TO TAKE PART IN THIS STUDY?
Taking part in this study is completely voluntary. You may choose not to take part at all. If you

agree to participate, you may refuse to answer any question.

CAN YOU WITHDRAW FROM THIS STUDY?
If you agree to participate in this study and you then change your mind, you may stop participating at any time. Any data collected as part of your participation may remain part of the study records. If you decide to stop participating at any time, you will not be penalized or lose any benefits for which you would otherwise qualify.

HOW WILL THE CONFIDENTIALITY OF YOUR RECORDS BE PROTECTED?
I plan to maintain the confidentiality of all data and records associated with your participation in this research. There are, however, rare instances when I may be required to share identifiable information with the following: officials at the University of New Hampshire, regulatory and oversight government agencies such as NOAA, Maine Department of Marine Resources and New Hampshire Fish and Game, or the sponsor of the research project, New Hampshire Sea Grant. Further, any communication via the internet (email) poses minimal risk of a breach of confidentiality. To maintain confidentiality with your information, all data will be stored on a password protected computer within the password protected UNH Box cloud storage. The results of the study will be de-identified and aggregated so that no individuals can be identified in published documents, presentations, or web-based summaries. People with access to data include Natalie Lord, research committee members, including Dr. Catherine Ashcraft, Dr. Lindsey Williams, and Dr. Julia Novak-Colwell and members of the Environmental Policy, Planning, and Sustainability Lab at UNH. I will report the research results my final MS thesis, research reports, including for the project sponsor, New Hampshire Sea Grant, academic publications, and academic presentations

WHOM TO CONTACT IF YOU HAVE QUESTIONS ABOUT THIS STUDY
If you have any questions pertaining to the research you can contact Natalie Lord, Graduate Student, 603-553-8200, nl1109@wildcats.unh.edu and/or Catherine Ashcraft, Assistant Professor, 603-862-3925, Catherine.ashcraft@unh.edu If you have questions about your rights as a research subject you can contact Melissa McGee in UNH Research Integrity Services, 603-862-2005 or melissa.mcgee@unh.edu to discuss them.

- ○ Yes, I agree to participate in this research survey (1)
- ○ No, I do not agree to participate in this research survey (2)

Skip To: End of Survey If QID1 = No, I do not agree to participate in this research survey

Q2 How long have you worked in the oyster aquaculture industry?

- ○ 0 – less than 1 year (1)
- ○ 1-3 years (2)
- ○ 4-10 years (3)
- ○ 11-20 years (4)
- ○ More than 20 years (5)
- ○ I prefer not to answer (6)

Skip To: End of Survey If Q2 = 0 – less than 1 year

Q3 Is the oyster aquaculture business your primary or supplemental source of income?

- ○ Primary income (1)
- ○ Supplemental income (2)
- ○ I prefer to self describe: (3) _____
- ○ I prefer not to answer (4)

Q4 What is your role in the oyster aquaculture business you are a part of?

- ○ Sole proprietor (1)
- ○ Co-owner (2)
- ○ Employee (3)
- ○ Other: (4) _____

Q5 What sector(s) of the oyster aquaculture industry are you engaged in? (select all that apply)

- ☐ Pre-harvest preparation work: boat maintenance, gear construction, inventory, seeding, site preparation (1)
- ☐ Harvest and tending work: growth monitoring, cleaning, collection of product from site (2)
- ☐ Post-harvest work: processing, marketing, distribution (3)
- ☐ Business operations: finance, marketing, sales (4)
- ☐ Research and development: water quality, site selection (5)
- ☐ I prefer to self-describe: (6) _____
- ☐ I prefer not to answer (7)

Q6 When considering the resources that helped your business get started or thrive, list 5 important resources:

- [ ] People, Organizations, Networks: (1) _____
- [ ] Funding Opportunities: (2) _____
- [ ] Gear: (4) _____
- [ ] Training Opportunities: (5) _____
- [ ] Other: (6) _____
- [ ] (Optional) Provide any details about the resources you listed: (7) _____

Q7 When considering the barriers to getting your business started or thriving list 5 important barriers:

- [ ] People, Organizations, Networks: (1) _____
- [ ] Funding Opportunities: (2) _____
- [ ] Gear: (4) _____
- [ ] Training Opportunities: (5) _____
- [ ] Other: (6) _____
- [ ] (Optional) Provide any details about the barriers you listed: (7)

Q8 Have you experienced a work situation where you have observed differential treatment based on gender?

- ○ Yes (1)
- ○ No (2)
- ○ (Optional) Provide details about the kind of experience: (3) _____

Q9 What gender do you identify as?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ I prefer to self-describe: (4) _____
- ○ I prefer not to answer (5)

Q10 Please specify your race (select all that apply):

- ○ Asian or Pacific Islander (1)
- ○ Black or African American (2)
- ○ Hispanic or Latino (3)
- ○ Native American or Native Alaskan (4)
- ○ White or Caucasian (5)
- ○ I prefer to self-describe: (6) _____
- ○ I prefer not to answer (7)

Q11 Are you a parent?

- ○ Yes (1)
- ○ No (2)
- ○ I prefer not to answer (3)

Q12 What is your age?

- ○ 18-24 (1)
- ○ 25-34 (2)
- ○ 35-44 (3)
- ○ 45-54 (4)
- ○ 55-65 (5)
- ○ 66 and over (6)
- ○ I prefer not to answer (7)

Q13 What is the highest degree or level of school you have completed?

- ○ No schooling completed (1)
- ○ Regular high school diploma (2)
- ○ Some college credit, but no degree (3)
- ○ Associates degree (for example: AA, AS) (4)
- ○ Bachelor's degree (for example: BA. BS) (5)
- ○ Master's degree (for example: MA, MS, Meng, Med, MSW, MBA) (6)
- ○ Doctorate degree (for example, PhD, EdD) (7)
- ○ I prefer to self describe: (8) _____

Q14 Would you be willing to participate in follow-up research related to this project?

- ○ Yes: add name below (5) _____
- ○ No (6)

End of Block: Default Question Block

Appendix C: Photovoice Protocols

1.8 Training Protocol

Photovoice is a community based participatory action methodology – this means that as participants, you are helping collect data! Photovoice collects information and shares issues, experiences, and concerns through photos.

There are three main goals of photovoice:

1. To enable people to record and reflect on their experiences and their community's strengths and weaknesses.
2. Promote a dialogue about personal and community-wide experiences with one-on-one interviews and a focus group discussion
3. Provide a visual representation of the community's experiences and issues to engage decision makers within their community

Objectives of photovoice:

1. Provide a visual component to the participatory research process while also assisting with the engagement of the community and it's decision makers.

Outcomes of photovoice:
This methodology has the ability to provide concrete evidence of the visual elements of an issue or specific experience of the participants. Photovoice provides a visual record of the participant's suggestions for improvement in their community issues.

How do you use photovoice?

- To engage a community
- To determine community concerns
- To create an action plan for change
- To communicate an issue
- To build comradery and consensus
- To empower a community

Who can participate in photovoice? Just about everyone!

- Youth
- Community members
- Stakeholders
- Industry partners
- Policymakers
- Volunteers
- Students
- Professional staff members

Ethics of photovoice

Photovoice is centered in the fundamental principles in the code of ethics for the health education profession, where it was first developed: respect of autonomy, promotion of social justice, and active promotion of good and avoidance of harm (Wang and Redwood-Jones, 2001). It is crucial for all photovoice organizers, facilitators, and participants to be well informed of the ethics involved in this methodology.

Image Ethics

Wang and Redwood-Jones (2001) highlight that there are four areas of privacy that must be taken into consideration when participants take photographs during their photovoice participation:

1. **Intrusion into One's Private Space**
   A person's private space may include their home, workspace, or anywhere outside of the general public space that the individual has not consented to be photographed in. Therefore, it is unethical to photograph any individual without their consent. This is why we have provided consent forms for all individuals you wish to photograph.

2. **Disclosure of Embarrassing Facts about Individuals**
   Everyone has the right to determine what aspects about themselves and their lives that can be shared via photography. That's why all individuals who will be photographed must sign the photo release form for consent to be in a photo for this research project. With this consent form, individuals will be notified that their photo may appear in a public exhibit as well as in research documents and presentations. No individual should be forced into signing this release form.

3. **Being Place in False Light by Images**
   This ethical dilemma may occur in three areas of the research, (1) in the process of photo documenting, (2) in the interpretation and narratives of the photos, and (3) if the subject's thoughts and feelings are misinterpreted by the photographer's narrative. In order to avoid this dilemma, photographers must be actively aware of this issue throughout the entirety of their photo documentation period.

4. **Protection Against the Use of a Person's Likeness for Commercial Benefit**
   In photovoice, the participants make the decisions on how their photographs are used, and it is vital that the organizers and facilitators of this research project are required to respect the participants' decision. It is unethical to use the photos for promotions, websites, or profit without the participant's permission. Participants will have the option to select which photos are used for research and future use and that will be made clear in the consent form.

When conducting photovoice research, facilitators will hold the safety of the participants and their subjects to the utmost importance.

Citations:

Shimshock, Kate (2008) Photovoice Project Organizer and Facilitator Manual. Internal/Unpublished Manual <http://hdl.handle.net/2027.42/108548>

Wang, C., Redwood-Jones, Y.A. (2001). Photovoice Ethics: Perspectives from Flint Photovoice. Health Education and Behavior. 28, 560-572

1.9 Photovoice Semi-Structured Interview Protocol

Photo analysis… Photovoice SHOWeD Method of 5 selected photos

1. **What do you See?**
2. **What is really Happening here?**
3. **How does this relate to the aquaculture community? What is ti about this picture that is important for the broader community?**
4. **Why does this situation, concern, or strength Exist? What's the underlying concern?**
5. **What can we Do to educate others about this situation, concern, or strength?**
6. **What can or needs to be done?**

2. **Let's get to know each other. Can you tell me a bit about yourself?** *Probing questions if necessary:* Where are you from? How do you think where and/or how you grew up helped shape where you are today? Was there something you always wanted to be when you grew up?
3. **Did you have any formative life events that lead you to this role now?** *Probing questions if necessary:* What made you decide to have a career in aquaculture? How did you choose your farm location/species/size?
4. **Returning to survey questions and responses: the barriers and resources to your aquaculture business. Is there something that particularly stands out for your success or challenges?**
5. **Describe any relationships that have helped in your work in the ME + NH aquaculture industry.** *Probing questions if necessary: have you worked with a mentor? Who taught you how to grow oysters? How to market your product? Do you seek guidance still today?*
6. **Have you encountered any gender related challenges in the sector?**

Anything you'd like to add?

1.10 Photovoice Focus Group Protocol

Each participant will share 1 photo to the group with the following questions from the Photovoice
SHOWeD Method:
1. What do you See?
2. What is really Happening here?
3. How does this relate to Our lives?

4. Why does this situation, concern, or strength Exist?
5. What can we Do to educate others about this situation, concern, or strength?
6. What can or needs to be done?

---

1. Themes of barriers and resources: funding, training, access, gear. From your perspective, what's specific to women for these themes? Have social networks helped to fill any gaps you may have?
2. How does your social network support your work? Farming techniques, gear type, efficiency, worker safety, occupational hazards…
3. Do you support other women farmers in their leasing process? Funding was a barrier in the survey. Only 5 (now that Amanda has one!) women hold standard leases in Maine. In what ways are they more challenging to obtain?
4. Participants discuss how they want to share their photos with the aquaculture community, Some options include website, Zoom event, in-person photo exhibit
5. Any last pieces of information or experiences that you wish to communicate through this project? Any questions you have for each other?

THANK YOU!!!!

Code	Subcode	Definition	Literature
Resource		An opportunity or situation that will help the actor achieve efforts for oyster farming business	Johnson et al., 2019; Ostrom, 2009; Ostrom, 2011; Ribot and Peluso, 2003; Ferguson, 2021; Kruijssen et al., 2018
Barrier		A challenge experienced by an actor	Johnson et al., 2019; Ostrom, 2009; Ostrom, 2011; Ribot and Peluso, 2003; Ferguson, 2021; Kruijssen et al., 2018
Gear		Equipment for oyster farm: growing methods and types, clothing, boat, engine, etc	
Funding		Grants, access to capital, money	
Training		Educational program to provide knowledge on basic oyster aquaculture growing methods, site selection, leasing process, species grow out, business operations, marketing of product. Lead by organizations	
Access to Farm		How the actor reaches oyster farm site: via public dock, private property, boat, walking, etc	
Social Network		Social networks are systems made up of actors sharing strong social ties that often influence one another	Agrawal, 2000; Johnson et al., 2019;Ostrom, 2009 ;Ostrom, 2011 Prell et al., 2009; Plastrik and Taylor, 2006
	Actor	the number of individuals acting within the SES	
	Informal actor	A specific individual that is not a state agency staff or NGO staff: oyster farmer, family member, other marine user	
	Institutional actor	Organization or state agency (sub codes)	
	Collaboration	Enhances knowledge transfer and best practices amongst a group of actors. Actors decide for themselves who to collaborate with, goals of accomplishment, and the place to do it	Bodin, 2017

	Conflicts between users	Challenges, negative circumstance, between two actors that have different perceptions, interests, and positions	
	Mentorship	Guidance and knowledge transfer from a more experienced actor	
Information		What information do oyster farmers have about the harvesting practices, ecosystem conditions, or knowledge to complete their business actions? The information can come from different sources	
Participation/Position in Food System		The roles of actors within the aquaculture food system: pre-harvest, harvesting, post-harvest, business/marketing, research and development	
Leases and Permitting		The governance rules and regulation for property rights to conduct oyster aquaculture in marine waters. In Maine, can refer to LPA lease and standard lease. In New Hampshire, aquaculturists receive a license to farm and harvest oysters	
Gender Norms		Gender norms are the informal "rules", perceptions, and attitudes that dictate behaviors that are socially acceptable, appropriate or desirable for women and men in a particular society.	Bell et al., 2015
	Child care	Gender roles expect women to fulfill reproductive duties such as household management, food provisioning, and childcare which prohibit their ability to participate in paid economic activities	HLPE, 2017; Kleiber, 2017
	Autonomy	Rights to own oyster farm, level of control over choice and decision, independence	

Appendix E: Photobook

A Rising Tide Photovoice Photobook

Natalie Lord
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Photobook Introduction

Researchers at the University of New Hampshire designed and implemented a photovoice case study with the following objectives:

1. Determine if women's experiences as producers are influenced by gender dynamics in the aquaculture sector of Maine and New Hampshire
2. Identify institutional barriers and opportunities for women producers
3. Determine if the use of social networks benefits women's ability for knowledge sharing, decision-making, and access to resources

The University of New Hampshire Institutional Review Board for the Protection of Human Subjects in Research approved this study (IRB #: 23; Study approval date: 8/12/2021; Modification approval date: 3/18/21). The case study was conducted throughout November 2021 to March 2022.

The sampling frame included women-owned or led oyster production businesses chosen based on the survey data and a demonstrated use of social network. For this case study, the purposive sampling criteria includes (1) woman owned/operated business in Maine or New Hampshire, (2) commercial oyster aquaculture production, (3) demonstrated use of a social network. The participants (n=4) were asked to document their experiences owning and operating an oyster farm with the prompt "what do you want to communicate about the work that you do on your oyster farm?". The participants were also provided four general themes for resources and barriers to identify including people, organizations, networks, gear, funding, and training opportunities. Each participant took five photos and wrote a narrative description for each one.

The goal of this document is to provide open access of the data the participants collected and for anyone interested in the results of the case study portion of this research.

A Rising Tide? The role of alternative networks for women aquaculture producers in Maine and New Hampshire

Photovoice Case Study

Principal Investigator: Natalie Lord
Advisor: Catherine Ashcraft, PhD
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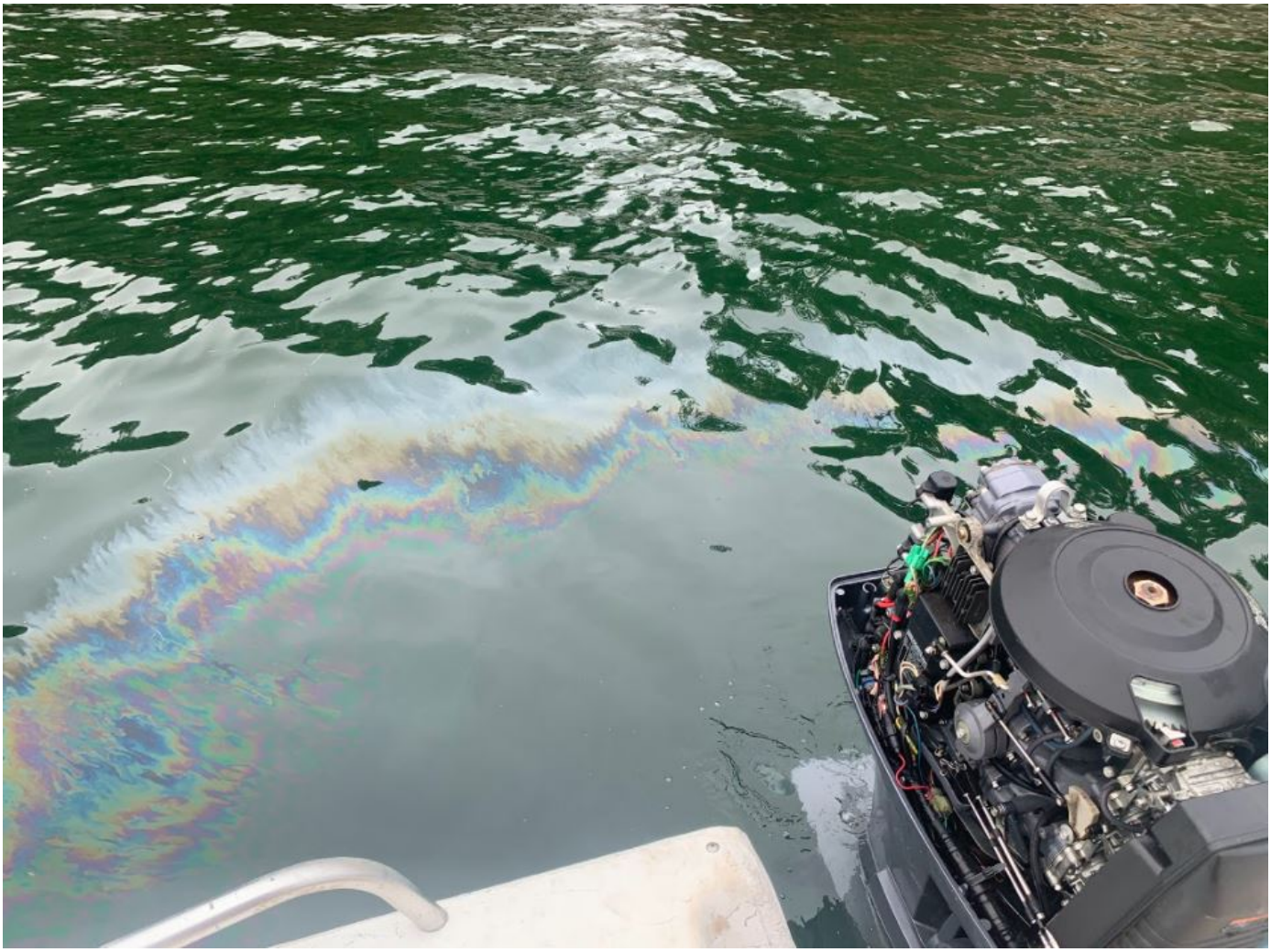
Alicia Gaiero - Nauti Sisters Sea Farm, Yarmouth ME

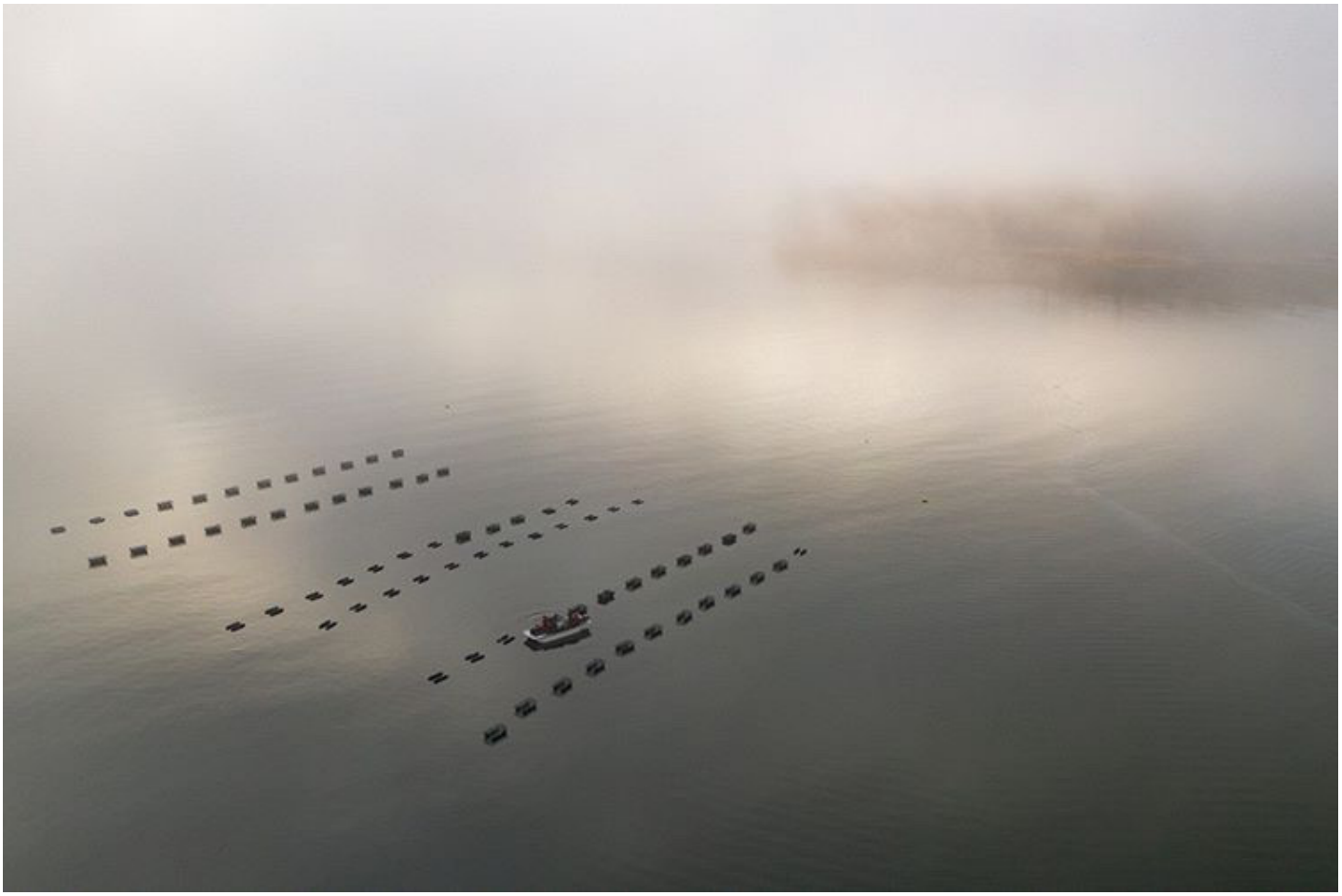


"Boat Problems and Triumphs"

Boat problems…summer of 2021 I had some ongoing problems. I struggled to get a mechanic to look at my engine due to peak season and high demand. I wasn't raised on the water or working on engines. When I finally shared to a boat yard that I was an oyster farmer I was given the time of day. I appreciated that they got me right in and took care of my boat. Every day on the water provoked anxiety. The thoughts of "Am I doing this right? Is my engine too loud in the morning? Am I going to fast in the mooring field? Did I make a mess on the dock – will locals be mad at me? Are they mad I have a mooring in a residential field despite not living on this island?" I was often concerned about how I looked. I don't have a lifetime of experience on the water. In truth, summer of 2021 was the first time I was really out on the water operating my boat and farm alone. I didn't know what was wrong or right and I feared a rookie mistake could damage my boat, harm someone else, harm the gear or damage relationships with waterfront homeowners. I am proud of my boat and the things I learned from the internet. I learned to change my prop. I also properly diagnosed my boat problems on YouTube and ended up impressing my mechanic who did not expect me to be right. My proudest moments were when I was forced out of my comfort zone and things felt high risk.

“The Public Dock”

The dock is where I had some interesting interactions. At the public boat launch I’ve had people clap when backing my trailer in to launch my boat and when loading it on the trailer. I’ve had people ask my male friend who I had back my car and trailer into the water “why he was making me do all the work?” This often made me laugh because I understood the novelty. Often there were older people in the community who go to the boat launch as a place to eat launch or sit by the water and they don’t usually see people who look like me, out there doing what I do. I would like to know one day that there are just as many female boat owners and commercial female fishermen as males but for now I’ll keep enjoying the authentic conversations at the dock. I take pride in being different than the norm. I enjoy when these onlookers say they’re proud because I think I often forget to be proud too. As silly as it sounds, I am helping to pave the way for other women one interaction at a time. I am also proud of how my confidence has grown at the docks. In the summer and fall of 2020 my anxiety peaked at the launch. I was new and it felt like I was driving without a license! How do they not require training for this? I feared how many times it might take me to back my boat in and park my car and trailer. I was worried I’d make a mistake – like the time I unhooked the boat from the trailer, and I was alone so I had to go for an unexpected swim while the boat floated away. I was embarrassed and scared of the harbormaster. Now I have a really excellent relationship with him.



“Overhead View”

Here is a deceiving look at my farm. I applied for leases in the first weeks of COVID. The world shut down and there were a number of new barriers. The DMR lost some staff due to funding, and harbormasters were difficult to tract down. I struggled to get my leases approved and I had already place a deposit on gear and seed. My mentor offered to let me use his lease. This was intended to be for his expansion but he allowed me to use to of his lines. Mine are the two to the right. The two in the middle are another farmer’s. He experienced a similar issue with the leasing process taking too long. The two on the left are the actual lease holders. I am grateful that he share his space. I had to use the same gear as he did which was no problem but ever since I’ve been working towards independence. I’ve since been able to get 8 leases for the farm and move one of my two lines. The second will be moved as soon as I can this spring. At this time I did not yet have my own tumbler either and was reliant on my mentor. Often he asked for a free labor in exchange. I look forward to no longer being on the hook for the favor that was done for me. I have since had my own tumbler built and it was designed so I could go along my lines to be as efficient as possible. I was asked to not tumble or play music at the site and having to move my product added significant time to the process as my boat was not large enough to really carry the oysters, the tumbler and new bags easily. I am excited to continue towards my independence.

“Big Sale and Big Mistake”

This is a photo of my largest harvest and biggest sale. This was an exciting day and the image I shared on social media. It was 2,300 oysters heading to New York City. What isn’t photographed is that on this day I made a big mistake. I spent the morning changing the prop on my boat in an unconventional way. We – myself and my friend Emma who had also never changed a prop brought the boat to shore while I worked on it with the help of YouTube. The tide was coming in and the boat was getting moved up the beach. Once I had everything apart I learned I needed an additional part. I had to leave Emma with the boat for more than an hour while she made sure it didn’t get stuck on the beach – since it had no prop it could not be returned to the mooring. I was able to get the part and eventually returned and successfully put things back together. We went on a quick ride to the farm where I had hope to check on things and make sure the boat worked in preparation of this large harvest that I *thought* was for the following day. On a hunch, I texted the buyer and learned I needed to harvest the 2,300 oysters that day! I freaked out. I was unprepared. I didn’t have enough coolers or ice but fortunately the temperature was cold, and I had presorted the product. So, we harvested and I figured out the rest later. To the average person they see a big sale but they don’t see the problems that we overcame to come to this point. I was stressed, as harvesting is only a very small piece of bringing the product to market. I would have to wash, bag, and tag the oysters as well as keep them on ice until delivery. So, on this day I learned a few lessons and this photo means so much more to me than a big sale. It represents my ability to overcome unexpected barriers and persevere.

“**Closer to Independence”**

The purchase of this tumbler allowed me to continue to step towards independence. My mentor had offered to let me use their tumbler for my oysters in exchange for tumbling his oysters at a 1:2 ratio. I could tumble one of my lines of gear in exchange to tumbling two of his. This was beyond my abilities. It is difficult for me to gather the people necessary to tumble just my own oysters and found this idea incredibly stressful. I would have rather paid to use it. I felt like I had to make sure that I could work independently to be successful. So, this was a big day.

Joanna Fogg – Bar Harbor Oyster Company, Bar Harbor ME

“Joanna and Iona Near the Tiller”

I have spent a great deal of my lifetime near the water. I’ve always been drawn to the ocean. Growing up we had a 14-foot aluminum dinghy that my father treated like a yacht. Despite the amount of time I spent in it I never learned how to steer. Perhaps it was because I preferred to sit in the bow and watch the waves getting pulled beneath us while sucking on the salty straps of my lifejacket. Perhaps it was because I was the baby in the family. Or maybe I wonder, as I picture my dad handing the tiller to my brother, it’s because I’m a girl. I didn’t start to learn how to drive boats until I was 19. At that point I was determined but I was also far behind my male counterparts and self-conscious. Because I was often the only female on the waterfront I felt the weight of representing all women. This is a barrier I want to break for my daughter. I want her to know that her hand is welcome on the tiller--that it is natural for a woman to be at the helm.

“Joanna and Teagan White”

Sea farming is physically demanding work. The limits of my small frame can be very evident in the course of day on the water. Finding innovative ways to maneuver and learning to work collaboratively is a big part of our daily life. I have found working with women particularly rewarding because we have an aptitude for finding unconventional ways to get things done and we expect to help each other by towing the same line, pulling the same cage.

“Giulia Cardoso on Work Barge”

Most boats and equipment have not been designed or built for us. It is hard to work at a table that requires you to have your hands above your shoulders all day. It’s hard to stand out by being the only one that doesn’t fit. These are things we are working to change.

“Upweller”

The summer I was 17 I got my first job as a sternman on a lobster boat. I would show up at the dock in the darkness before sunrise and be the only female getting out to work. Sometimes there were lewd comments and gestures. It could be an intimidating space for a young woman. Now I go out of my way to flood our docks and boats with women. I find jobs for even the smallest girls in my family so that the waterfront not only becomes a place where we feel safe and welcome, but also our own.

“Joanna and Iona”

I woke my daughter early one winter morning to go harvest at high water. I packed her a breakfast burrito and put her warm gear on top of her pajamas. After helping me for a while on the floats she got chilly and went to play in the truck. She took off her winter coat and hat and mittens and messed about for a bit before she came back to see if I was nearly done. After several trips of lugging the heavy harvest up the icy ramp I went to open the truck and realized we were locked out. I had been thinking a great deal about this Photovoice project and barriers that women face. The metaphor of being locked out of my own truck in the middle of nowhere, with a child, stung like the seawater on my hands. There was no spare key. She didn’t even have her hat. The closest house was over a mile away. After a few expletives and a kick at a snow bank I became very aware of what my four-year-old would learn in this moment. I decided I did not want this to be a lesson in blame, anger, or fear. I bent down and gave her a hug. We took this picture and then proceeded to figure it out.

Laura Brown – Fox Point Oysters, Great Bay NH

“Shore”

The shellfish farming industry is rapidly growing. State agencies that control aspects of the shellfish program are unable to scale effectively and are often short staffed. We have one lab in the state to handle water and shellfish samples that determine harvest closures/openings leaving farmers unable to harvest and sell for extended periods of time. This image depicts the farm’s proximity to shore which allows recreational harvesters to walk out to the farm at low tide where oysters are spread on the ground and easy to rake. The department that monitors such activity is unable to continually monitor the farm sites during recreational harvesting times leaving farmers vulnerable to poaching.

“Stairs”

Access to the farm site is a problem. There is one large private marina located in a turbulent channel and a few privately owned marinas filled to capacity. Public ‘fishing’ access, or non-motorized boat launching areas, are not conveniently located or require walking through a mud flat at or around low tide to get to the water. This makes hauling equipment and loading harvested oysters difficult. The stairs are not maintained by any agency.

“Clothing”

On the farm I wear insulated waders while submerged in cold water. Clothing for the fishing and hunting industry is created mainly for men or ‘one size fits all’. One size does not fit all. Women’s waders, when available, are two to three times more expensive and don’t have leg lengths that fit. Women often order men’s waders in kids shoe sizes to fit the feet, but the legs are too short, the bodice too tight and the seams split. Water jackets for men are more narrow and sleeve cuffs too loose allowing water in.

“Erosion”

Because of the limited access from shore to the water, mooring fields and aquaculture farms, the shoreline is being damaged. Small boats are dragged over shore grasses and mud banks and excessive water run off from increasing storm events through culverts creates channels in the mud and erosion of the banks. Climate change and human interaction are dramatically affecting the shoreline.

“Trash”

Access to my farm is in a very public place, at a parking lot. Though the lot provides parking for me to load/unload gear, it has also encouraged people to sleep in their vehicles and defecate in the woods. It is a common meet up spot for fishing, exercise, lunching and taking bathroom breaks. There is, however, no public bathroom or public trash receptacle. In a two hour span, I and two friends collected 743 pieces of trash from bottles tossed over the banks, fast food wrappers, broken fishing gear and debris washed ashore.

Amanda Moeser – Lanes Island Oyster, Yarmouth ME

“Birds Eye View”

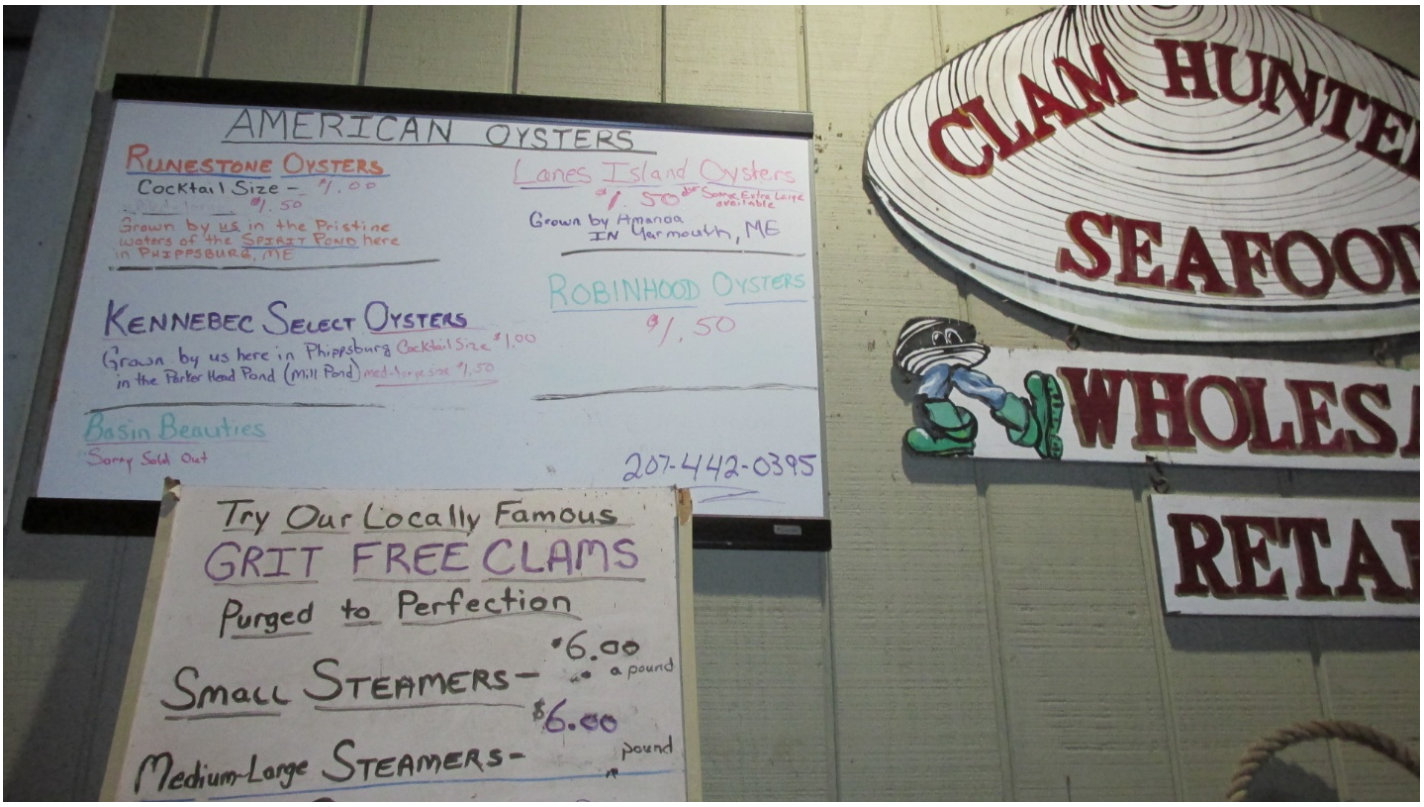
Here I am with another oyster farmer, doing some reconnaissance for her upcoming standard lease hearing. From the air, we look so small, which is odd because that’s not how I feel when I’m out there. Of all the people I work with in the area, her and my friend Emily are the easiest to get along with and the most inspiring and relatable. They are both supportive, tenacious, and independent.

“Shuck ‘Em”

I laugh and am mildly disgusted when I see people invest $30,000 in a shiny new boat for oyster farming. Part of it is jealousy—I think it would be nice to feel safe, have a navigational system, a hauler, a motor that starts without fail, all the bells and whistles—things that were out of my reach when I got up and going. But the bigger part of me is immensely proud and grateful. I started my farm with a 1995 Buick Century and an 11’ skiff. I built a beautiful farm in a prime location with very little aside from my own brains and brawn. I have zero farm debt which makes me better able to withstand market and environmental fluctuations. What’s best is that this model is replicable and accessible to all, not just dudes with cash to blow.

“**Bottom Seeding”**

This is my favorite way to grow shellfish—bottom seeding and hand picking. All I need for gear is a 5-gallon bucket, harvest bags, and a sled to drag across the mud. Oysters grown this way are hearty, flavorful, and top notch quality. It frustrates me that as a woman and beginning farmer, I qualify for no-cost catastrophic crop insurance through the USDA; however, the species I want to grow (quahogs) and the methods I prefer to use (bottom-seeding) are not eligible for coverage. In my opinion, this is a prime example of long-standing, unaddressed institutional bias at the federal level, but it also happens within state policy, university research initiatives, financing, and industry advocacy organizations. Of all the barriers that I’ve encountered, institutional bias is the most concerning and difficult to address.



“Lanes Island Oysters—'Grown by Amanda in Yarmouth’”

Terry and Sally were my first ever customers and have been buying from me ever since. I appreciate their shop because I overwintered oysters in the cooler, it’s close to home, and they always treat me fairly. Every time I drop off oysters, I’m there for at least an hour because we like to catch up and talk about our farms. Sally has her own farm and a clam license, too, and does all the day-to-day stuff with customers at the shop. It takes the two of them, working full-time and more, to keep the business going. It annoys me when the “people in charge” encourage direct-to-consumer consumer marketing as a way to sustain small-scale fishing and farming ventures. It’s another full-time job that I don’t need on top of my already full-time job, various part-time jobs, community service, and family responsibilities. I like my middle(wo)man and our businesses work in tandem.

“Wharf”

One of my favorite journal articles on the role of gender in fisheries is titled, “Before we ask permission, now we give notice.” That’s partly how I feel about the wharf where I work and keep my boat. Now I am free to come and go as I please. It’s a critical access point for my farm because it doesn’t always freeze up in the winter and I have parking in the summer thanks to one of the fishermen. I look forward to going to the dock because I love the people and the stories that I hear while I’m down there. I strongly believe that gender norms have a foothold in our society and function in insidious ways, but I also know these guys accept me and genuinely want to see me succeed. For me personally (and gender relations more broadly), it’s important to continue working with men, as well as women.


HONDA

Photo above: “Night Closing In”, photo bottom: “Night Tides”

Most oyster farmers pack things up for the winter--but my schedule, where I work, and gear are more similar to wild clammers—so they comprise a bulk of my social network. It took me a long time to get up the courage to take the boat out alone after dark in the winter. It’s pitch black and hovering around freezing. I don’t have the luxury of a heated cabin, lighted decks, navigational systems, depth finders, and GPS, which are all common on lobster boats and other fishing boats. For the first couple years, one of the guys would drop me off at Lanes Island (the uninhabited island where I farm) before the tide and pick me up on their way in. Last year, one of them took the time to help me practice navigating in the dark. Now I am confident enough to go alone, but we still check on each other and make sure everyone gets in safe at the end of the night. It’s not an understatement to say that I trust them with my life and these relationships are a matter of life and death.

This is just a pretty picture of my farm before sunset. It isn’t until the tide drains out that I can see the fruits of my labor. I like that it’s hidden away under the surface.