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Exploring the Market Potential for Aquaculture Grown Quahogs in the Gulf of Maine

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Exploring the Market Potential for Aquaculture Grown Quahogs in the Gulf of Maine

Completed in Partnership with Manomet and the University of Maine-Orono

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Program in Environmental Studies October 21st, 2020

Executive Summary

This report is a qualitative analysis of the viability of establishing a market for aquaculture-grown quahogs (*Mercenaria mercenaria*) in the state of Maine. Our work is in conjunction with Manomet and the University of Maine Orono and is funded by the National Sea Grant Office. The aim of the project is to explore the barriers and opportunities of establishing such a market for farmed quahogs as a livelihood diversification strategy for Maine fisherman and aquaculturists.

Our research on the possibility of a regional quahog market relies on interviews with seven shellfish managers and four shellfish dealers from across the eastern seaboard. All interviews follow a prescribed set of questions provided by Manomet. The testimonies of shellfish managers and dealers provide a basis for qualitative coding, and our group categorized them according to environmental, human, and regulatory factors. Each of these subcategories contain numerous classifications of coded data populated with anywhere from one to five corroborating interviewees. We further classified these results as barriers and opportunities to the establishment of a farmed quahog market. These barriers and opportunities inform the recommendations for further study and aquacultural work.

Our results indicate that among the most prominent barriers to establishing a farmed quahog market are issues of siting and leasing for fisheries as storms and water temperatures. However, these climatic factors also provide the state of Maine with certain advantages that differ from those experienced by aquaculturists in other states. Furthermore, interviewees expressed the need to fill a gap in the seafood industry, affirming that farmed quahogs could expand and diversify fishing opportunities. None were opposed to a farmed quahog market, but all interest varied based on the perceived ability of such a market to be lucrative in comparison to the wild harvest.

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Introduction

Due to overfishing and climate change, many wild fisheries worldwide have reached their maximum sustainable capacity despite a growing demand for seafood (Ewart 2013). Given the limitations of wild-caught practices, aquaculture presents myriad benefits to a world with a growing population. In comparison to traditional land-based agricultural practices, aquaculture represents a significantly more sustainable solution that uses little to no fresh water or fertilizer. While there are many types and methods of aquaculture that vary in environmental impact, the husbandry of filter feeding species can improve water conditions (Morse et. al. 2016). Globally, the growth of aquaculture markets has come to account for almost half of all seafood production, yet is still lagging in the United States, which imports around 85% of its seafood (Morse et. al. 2016). Despite these benefits, as of 2013, bivalve shellfish only accounted for 20% of the over \$1.1 billion aquaculture industry in the United States (Ewart 2013). Aquaculture practices are both sustainable and in demand, offering vital ecological and economic incentives to coastal communities.

The state of Maine possesses significant opportunities in aquaculture; Maine has an approximated 1,633 square miles of territorial coastline, much of which serves as working waterfront space (GMRI 2016). However, it is becoming increasingly apparent that the state's long-time reliance on wild fisheries such as the lucrative lobster industry will require diversification in the face of ocean acidification and biodiversity loss, which are threatening the livelihoods of thousands of Mainers engaged in the state's marine economy. Thus, there is both opportunity and necessity in further establishing Maine's aquaculture market. The husbandry of species such as mussels and scallops have already proven to be economically viable, yet only a miniscule percentage of the state's marine economy is actually engaged in aquaculture, accounting for less than 5% of Maine's commercial fishermen (Morse et. al. 2016). Economically and environmentally, Maine has much to gain from the burgeoning aquaculture market that can augment its wild-caught fisheries.

Given the "Maine brand" that is renowned for its seafood, shellfish aquaculture could command competitive prices in the U.S. seafood industry at a higher volume (Coastal Enterprises 2019). In fact, the Gulf of Maine research institute estimates that from 2015 to 2030, Maine's farmed mussel industry alone will expand exponentially, bringing in a calculated \$20 million to the state (GMRI 2016). Furthermore, the Atlantic sea scallop fishery is one of the state's most valuable commodities, and around 600 licensed Maine fishermen account for this market that commands the highest average price per pound of meat (Coastal Enterprises 2019). Yet mussels and scallops are merely two of the many species that can be farmed using aquaculture. The quahog, which grows in many sizes and varieties, could be cultivated symbiotically with other shellfish while simultaneously filling a gap in the current market. While there is not an established market for farmed quahogs in Maine, they grow well in Maine waters and may provide a chance to expand fishing opportunities that are otherwise being curtailed by climate change. Manomet, a Massachusetts-based environmental non-profit, and the University

of Maine-Orono have been funded by a National Sea Grant to study the feasibility of introducing quahogs into the Maine aquaculture market as a means of species and product diversification. Our group of Bates College students will conduct exploratory qualitative research with shellfish managers and dealers to help determine the potential of a quahog market in Maine.

Research Aim and Objectives

Aim: This study aims to explore the barriers and opportunities of establishing a resilient market for farmed quahogs as a livelihood diversification strategy for Maine fisherman and aquaculturists.

Objective 1: Interview shellfish managers along the eastern seaboard to gain an understanding of the supply side of existing regional quahog markets to help predict the trends that might ensue in a new Maine aquaculture market.

Objective 2: Interview Maine-based shellfish dealers to gauge interest and feasibility of developing the demand side of a market for quahog aquaculture on the Maine coast.

Methodological Report

Research & Outreach

We started our research by gathering information from scientific resources and those that our partners from Manomet shared with us. These helped us gain an understanding of shellfish aquaculture and its current role as a substitute for wild seafood harvests in this time of climate change driven ocean & market instability. Before beginning interviews, we spoke with our partners about the roles of shellfish managers and dealers in the current quahog market. Managers are responsible for organizing the regulatory and educational aspects of the state's aquaculture and dealers procure, ship, and sometimes even harvest and process the seafood itself.

Data Collection

All members of the project completed IRB Certification before interviews, to ensure we knew how to protect the anonymity of our participants. To prepare for speaking with managers and dealers, we interviewed and recorded one another with our final questions and practiced using industry lingo and a google form note taking system. When possible, two people conducted an interview together so one could focus on conversation and one could take notes.

We emailed and set up meetings with managers while awaiting final IRB approval and began calling dealers after our first analysis of manager interviews as they were less likely to be active on email. If a first email or call was not successful, we followed up at a different time after two days. Our partners at Manomet provided us with lists of managers and dealers to contact and we prioritized contacting those who were known to work with quahogs.

We spoke with 7 managers overall, their locations ranging from North Carolina to Maine, and 4 dealers from the state of Maine. With permission, we recorded these conversations and asked a set of interview questions—focusing on gaining an understanding of existing market

supply and demand throughout the regions—that our partners had prepared (see appendix 2 for reference). We took notes on the answers to these questions in a google form, which in turn populated a spreadsheet.

Initial Coding

As we conducted interviews we searched for common themes and patterns in our conversations, and adapted our google form’s population format to account for these new factors as they came up. We refer to this strategy of regrouping data during our active study as qualitative coding.

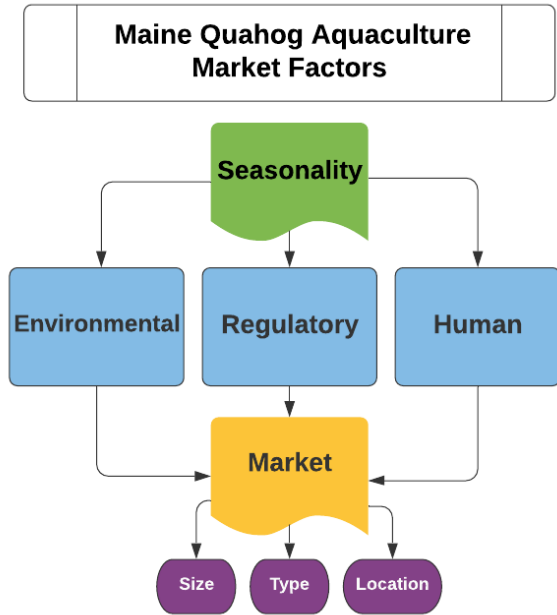
After each conducting one to two manager interviews we slightly altered the google forms, inserting a section at the end of the questionnaire for the interviewer to comment on any major themes mentioned. This category helped us compare understandings between individuals later on in the coding process. After completion of all seven conversations, we began grouping the major themes from these interviews into the two categories of barriers and opportunities to a potential market (mentioned in aim).

Below is a list of our initial themes from manager interviews. The number of corroborating participants is listed in red after each one.

Barriers	Opportunities
<ul style="list-style-type: none"> ● 1.1 - <i>Limited consumer palette</i> 1 ● 1.2 - <i>Predation</i> 2 ● 1.3 - <i>Siteing/leasing</i> 4 ● 1.4 - <i>Protein competition</i> 1 ● 1.5 - <i>Growth rates</i> 1 ● 1.6 - <i>Transport and</i> ● 1.7 - <i>Climatic factors</i> 3 	<ul style="list-style-type: none"> ● 2.1 - <i>Consumer preferences</i> 2 ● 2.2 - <i>Market gap/industry need</i> 4 ● 2.3 - <i>“Maine Brand” marketing</i> 3 ● 2.4 - <i>Reduced initial investment</i> 1 ● 2.5 - <i>Ecosystem services</i> 2 ● 2.6 - <i>Local Infrastructure exists</i> 1 ● 2.7 - <i>Seasonality of harvest</i> 1

Final Coding

After completing phone conversations with four Maine based dealers, we realized that we needed to re-code our themes in a more dynamic way under a larger structure of market factors in order to make sense of how different participants' understandings of the market connected or converged.



We created this chart (to the left) to help visualize how we coded themes and grouped them under the larger structure of different market factors. We found that all themes discussed by participants fit into one of three factors: (1) Environmental, (2) Regulation, and (3) Human (represented in blue on the chart). These three factors varied by season (represented in green) and subsequently, they influenced market size, market type, and market location (represented in yellow and purple). (See appendix 1 for full list of final codes). Below, the categories from this chart are outlined in a structure from largest to smallest. To create a code we associated a theme first under one number from the top row, then under a season from the second row, next under supply or demand and finally under one of the three market characteristics from the last row.

Environmental(1) Regulatory(2) Human(3)

Seasonality W(winter) S(summer) M(mix)

Market: Supply(Sp) Demand(D)

Size(S) Location(L) Type(T)

Here is an example of the code for the theme *Sea Ice & Winter Storms*: **1.W.Sp.L**

We have used this flow chart's structure to outline our results and discussion, beginning with the three major categories of 1. Environmental, 2. Regulatory and 3. Human.

Results and Discussion

1. Environmental

The changes as well as the constants of environmental factors greatly affect what investments could be made as well as threats and boons to quahog development. The main themes falling into the Environmental category are A) Climate Driven Supply shifts B) Sea Ice & Winter Storms and C) high summer biotoxin rates

Climate Driven Supply Shifts.

During conversations with interviewees, 4 participants--dealers and managers alike--mentioned that the southern end of the quahog's range has been struggling to produce due to climate change and more intensified hurricanes. The damage incurred threatens all stages of the quahog process, driving the aquaculture supply market further north upon areas hit less hard. These Southern managers described that when a hurricane hits, it can move entire sandbanks, sometimes fully covering clam beds or locking them into areas of decreased salinity, destroying harvest ability in that area and making aquaculture more risky.

As one southern Manager stated, "For Aquacultured clams, predation tends to be the #1 [barrier], and then storms." Predation can be mitigated by internal company practice, changes such as storage methods, netting/cage types, and site controls. Yet storms are a constant threat that with increasing intensity ultimately cost more investment over time, making those most vulnerable locations non-optimal and eventually dropped.

Two other managers stated that damages to the quality of the sites take huge investments of repair or site movement. It is clear that Maine, in comparison to South Carolina and Florida has the advantage of many more protected inlets for aquaculture, especially in the mid coast region. This means that not only is it less vulnerable to rising problems with the duration of hurricane season and summer storms but also has more varied siting, allowing for better selection of factors and a more stable foundation for the market. The potential threat of a season wide regional crash due to climate shifts creating more disruptive force means that demand will have spikes, and ultimately require a secure supply in the market to address it. This also means that a new market potential is seen in a place like Maine when southern sites are struggling. The Maine coast has a more rocky structured bottom, and the coastal shelf is much wider than that of southern states. Along with cooler water, these factors help to weaken the brute force of hurricanes as they hit, and could potentially provide a growing market edge for Maine quahog aquaculture in the coming years.

Sea Ice & Winter Storms

Even with lessened hurricane impacts, There is still sea ice and winter storm conditions to contend with in Maine no matter the harvest type but some NH Aquaculturists have been farming solely in winter as their lease locations are too busy with recreation in summer months. Two separate participants have said larger clams are in demand for dishes such as chowders, meaning that there is a niche of large demand in a market mainly focused on small sizes. This is a unique opportunity as there is a low supply of both the size type and the season availability. Other aquaculturists in Maine might also capitalize on this if they figure out similar ways to

successfully harvest in winter. As stated by a Maine dealer, “We ship interstate when the local demand and supply slows down in winter because of ice and weather for wild fisheries, so a steady aquaculture supply could help fill demand for places like Chicago and Texas in the winter when quahogs are more seasonally popular there”. There are differences in needs state by state and the winter market nationwide can’t be ignored. The season shift means interest is not lost but what exactly is demanded (perhaps cherry neck or chowder) changes meaning now that the longer growth time can be exploited. As is further stated, “these items would be in meals, not alone like oysters. Texas and California and Florida get much busier during this time because it's less hot... We will always have a demand and want more clams.” The consistency of a year round market makes looking at different products and methods a must as these potentials can clearly be seen.

High Summer Biotxin Rates

Another environmental factor is that of the biotoxin increase in the summer. This results in a highly controlled process where interstate movement requires a lot of safety guidelines (see regulatory monitoring). An alternative to this is to be winter focused, or using year round indoor sites where the controlled settings avoid such issues. In our interviews we heard that throughout most states there are little to no limits on the season itself save for these breaks caused by biotoxin scares. This also ties into our concerns of climate change where storms and flooding might change these situations. For example, flow gauge regulation around these concerns resulted in a Maine dealer being closed half of the year until the practice changed and as a result had a 80% reduction in his product capacity. How local and state response to this threat is crucial in both regards to safety as well as the success of the market.

2. Regulatory

Siting/leasing

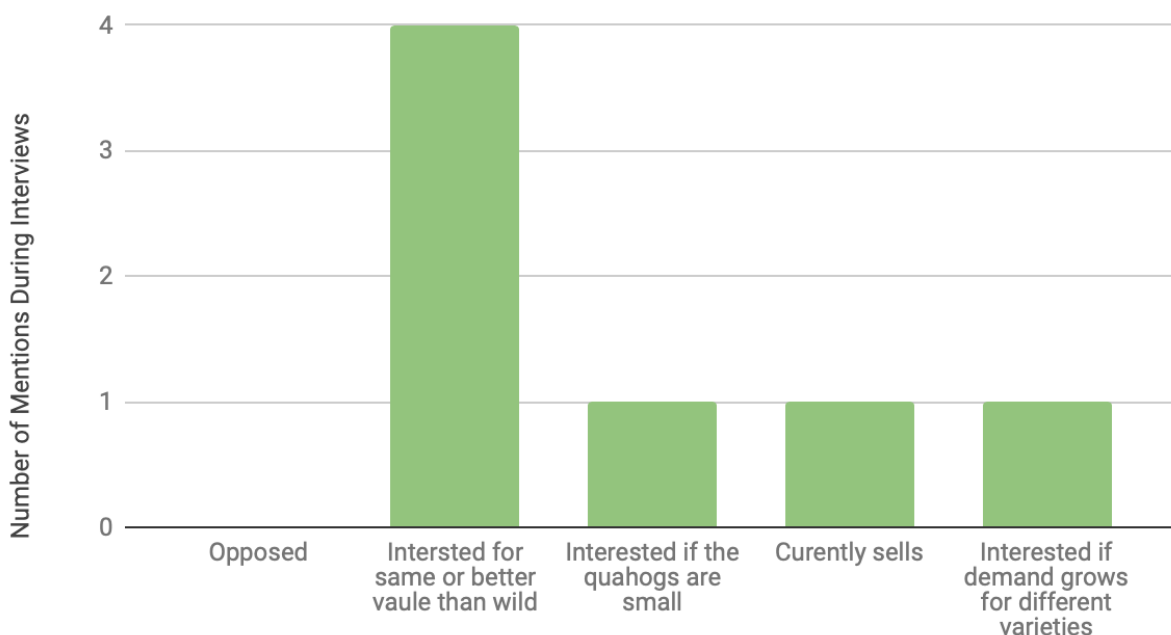
Potential ventures into quahog aquaculture are subject to a series of regulatory factors that were highlighted throughout data collection. Overall, one of the most prominent barriers to arise in interviews is siting/leasing. This was brought up by four separate interviewees, and highlights the fact that obtaining acreage to do aquaculture can be a cumbersome process. Two of these interviewees specifically mentioned yacht clubs as opposed to floating cages and cited specific legal issues that regulate aquaculture accordingly. These issues are exemplified by the following quote from a shellfish manager: “The major barrier is a system that is very slow to get a lease... the market is not a problem because the hard clam was a familial thing.” Thus, interviewees made it apparent that lease acquisition can be time consuming and that NIMBY can be an issue with use conflicts on the water, which of course is dependent on specific siting and cultural factors.

Biotxin monitoring and Seasonal Closures

Another barrier that came up a multitude of times was biotoxin monitoring and seasonal closures. Overall, five separate interviewees noted that seasonal closures had some effect on their business throughout the year. One dealer in specific issues complaints about the Department of Marine Resources regulations and other water quality measures that “decreased us to 20% capacity” and “wiped us out financially.” While depuration and biotoxin tracking protect the consumer, they can also play a limiting role. Due to upriver factors, this Maine dealer experienced detrimental closures through the implementation of a flow gauge that closed down the relevant mud flats for eight months initially, and then for half of the year for the next five years. This continual halt to production proved devastating financially.

An important thing to keep in mind is that Maine, as was described in interviews and data collection, is a relatively untapped market that has an opportunity to establish a beneficial regulatory system. There are currently no limits to sizing on the smaller end, and potential dealers and managers have a rare opportunity to establish the direction the regulations might go. The limitations to multiple seeding hatcheries are something that will certainly expand as the market gains more interest. Having few available sizes and sources can be a market issue, but unless there is an emergence of a market drive for larger seeds there will be little change in the current form. Regulation thus poses initial challenges to Maine growers, but it is possible to overcome these barriers. The market interest exists for farmed quahogs, but establishing new operations could be difficult depending on existing leases and regulations. The upfront roadblocks of slow leasing poses an initial threat to a farmed quahog market that does not currently exist, and varying seasonal regulations could interfere to some degree, although they must be worked within to ensure a safe product anyway.

Dealer Intrest in Farmed Quahogs



The above Figure reflects that within our responses, the interest is quite dependent on the pricing. The interest is in competing wild stock, and nobody is opposed to farmed quahogs outright.

3. Human

Throughout conversations with dealers and managers, we noticed that human behavior was impacting supply and demand and also the viability of the quahog market, depending on its location. Within this category of Human factors, we noticed the three main themes of:

Ecosystem Services as a Solution to *NIMBY*, Differing Perceptions of Supply & Demand, and Perceptions of a Market Gap.

Ecosystem services as a solution to NIMBY

NIMBY—not in my backyard—can be a real barrier for aquaculture. However, one summer community in Massachusetts seems to have at least partially solved this problem by engaging citizens and allowing them to harvest clams themselves. The manager we spoke to described how community members have grown to appreciate both the benefits that the clams provide to the ocean’s health as well as the variety of consumption methods they offer. There is a developed culture of support for quahogs in this community which has allowed for more floating cages to be set up without the push back that many aquaculturists usually receive from residents in coastal towns.

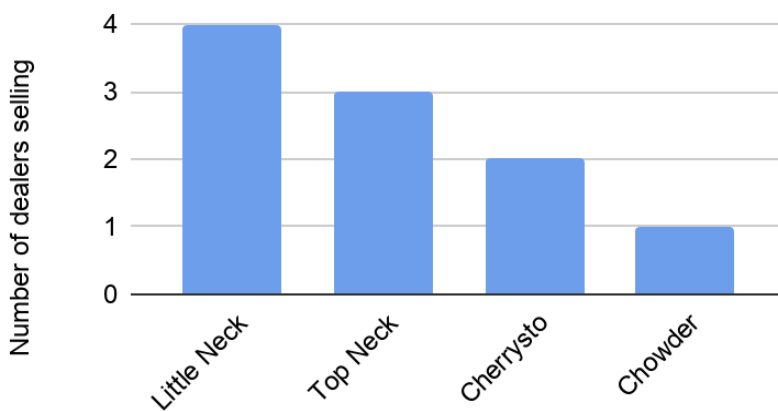
A second manager also expressed his hopes for the benefit of ecosystem service projects in New Hampshire. The Nature Conservancy would purchase quahogs that have grown too big for sale during covid—and in future moments of market instability—and seed them back into the surrounding coastline. He believes this type of work might help raise awareness for the benefits of growing quahogs and appeal to community members who care about ocean health while simultaneously stabilizing the market for farmers who have unsellable products.

Perceived Demand by Size

Supply and demand, the backbones of the market that are influenced by all the other

factors we have discussed, were brought up in every interview. Some things, like the perceived demand for quahogs depending on size, were relatively agreed upon. As you can see in this chart, smaller quahogs—the littlenecks and tops necks—seem to be the most popular. As our partners at Manomet hypothesized, dealers said they can get a higher price for 1-2”

Rate of Quahog Dealing by Size

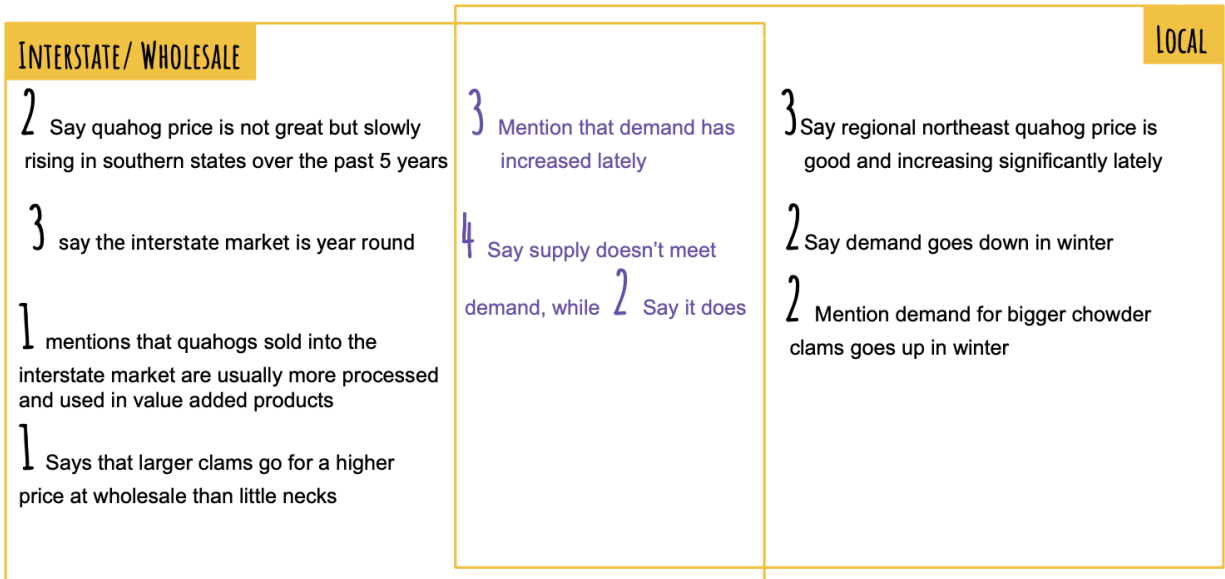


quahogs when they sell to restaurants or retail to individuals.

Market Value by Location

Although not everyone agreed on the degree of supply and demand that exists, we know that the location of demand seems to be affecting the price the product is sold for.

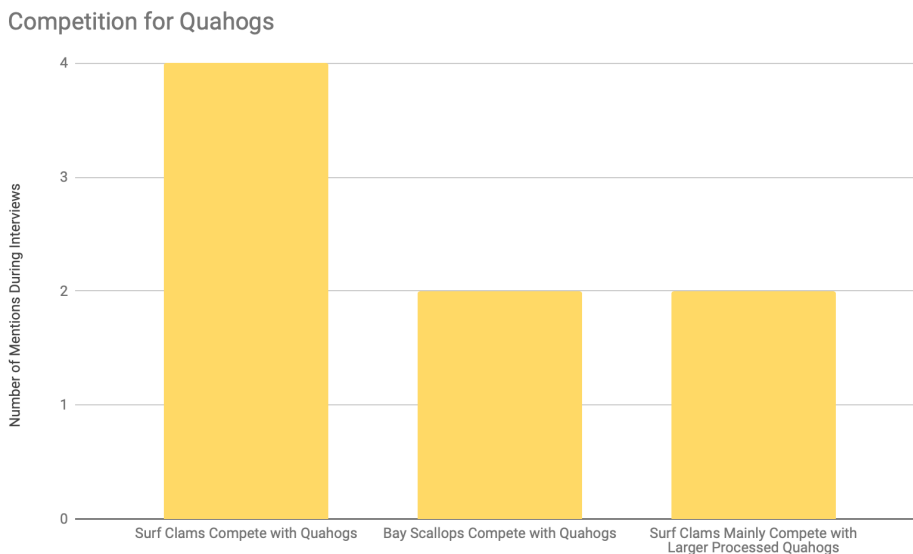
Commentary in the following section will reference the following venn diagram detailing market differences by location:



The center column (represented in purple) reflects that no matter market location, dealers and managers alike perceive that the demand for quahogs has recently been increasing. The difference by location seems to be in just how much that value has gone up. When asked about the interstate market, two interviewees agreed that quahog price is “not great but slowly rising in southern states over the last five years,” while three interviewees discussing local markets in Maine, NH, and Massachusetts, agreed that the quahog price “is good and increasing significantly lately.” The sense of slower market growth in southern states as of late could be explained by the intensified impacts of climate driven storms that dealers and managers highlighted.

However, if season is considered, three interviewees said the interstate market is year round two said that demand goes down in winter locally in the north east. It is important to note also that two interviewees saw an increase in demand for bigger chowder clams in winter, specifically on a local level. These shifts by seasonal demand will be critical for dealers and farmers to keep in mind in order to maximize profits year round depending on what quantity and size quahog is needed. Additionally, four participants said that supply doesn't yet meet demand while two said it does. Considering this in the context of seasonality, one might conclude that those who think the supply meets the demand are only selling locally.

Finally, two interviewees mentioned that quahogs sold into the interstate market are usually more processed and used in value added products. Another said that larger clams go for a higher price at wholesale than little necks. It is likely, as these two interviewees’ comments suggest, that although little clams may be more popular when served locally, especially in summer, big clams are preferred for processing and winter chowders. This market for sizable clams, however, might be more challenging for an aquaculturist to focus on, as the time it would take to grow such a large clam might outweigh the benefits of being able to sell in an additional size market. As the chart below reflects in the third column, two interviewees thought that larger quahogs would potentially have more competition with other types of clams in the market, providing an additional challenge that might not face smaller farmed quahogs.



This multitude of market value variation by market size—local vs interstate—, market location—north vs south—and market type—restaurant sales vs wholesale for processing—combined with the additional factor of seasonality is very complex, but still possible to navigate if you pay attention to all the factors that are interacting.

Aside from supply and demand, two different interviewees noted that the high young person turnover and mass exodus of “experienced folks leaving the wholesale industry,” is leading to greater instability in the market. Here is how one Maine dealer is navigating these changes. He describes spending time adapting from “mostly wholesale to mostly retail locally where things are more stable.” He says that “the wholesale market jumps too much daily from \$1-2 to \$40 for a bushel in one day,” and that, “there are too many young guys in the big industry who just want money.” This idea of industry culture, as well as product value being important incentives for market participation as a dealer, reflects that the challenges of this industry are not just coming from a changing environment but are very influenced by the people working on the ground. Being adaptive and able to fill the gaps of the existing market seems to be the best way

current market players have survived in challenging times.

Market Gap

When looking for what requires cultural change its mainly the handling and relationship the consumer themselves has with the food. Though there is a small well established culture in the Northeast the lack of consumer knowledge is clear in both preparation and use. One manager explained that, “Expanding the palette and educating consumers to be more diverse in their consumption patterns” and “creating value added products that consumers are comfortable with using” would allow quahogs entry into the market. It is important to note that shucking is a problem as well as larger unfamiliarity with shellfish preparation. There is thus a need for culinary expansion as many consumers are not diversifying how they eat quahogs or prepare them. Quahogs can be used as a wider protein or be specifically catered as a high end seafood product. Oysters already have a firm grasp in this market and quahogs are able to be their competitors. One of the northeastern managers thought that quahogs would have no trouble finding themselves treated the same way in both bulk dealing and retail.

Furthermore, one manager noted the advantage of growing and selling quahogs locally, as their flavor is affected by the conditions in which they were raised. One northeast manager noted how “Sand clams are usually a little bit saltier” than mud clams while clay clams are a little sweeter and mud clams. “It all changes with what they’re feeding on,” he explained. With constant variation comes an ability to cater towards different dishes buyers, and customers. Selling them with clear indication of their differences will make customers coming back throughout the year for these flavor changes and buying a couple of each type of marketed clam, as the manager had experienced in his oyster trade. Also exposure through methods such as mixed platters will help consumers to find their individual wants and discover new ones. Therefore, educating consumers on how to eat and prepare different shellfish products and marketing quahogs locally are two important strategies that can be employed to establish farmed quahog market viability

Discussion of Barriers & Opportunities

In conclusion, there are some outstanding barriers that will need addressing in establishing a greater farmed quahog market. These barriers span the environmental, regulatory, and human factors that all influence the establishment of a farmed quahog market. Primarily, NIMBY can be an issue, especially with yacht clubs, and siting can be an upfront roadblock alongside the slow system to acquire an aquaculture lease. As for environmental factors, colder temperatures can mean slower growth rates, and sea ice, flooding and storms are always an increasing threat to waterfront operations. Regulatory issues encompassing leasing and DMR rules will need to be navigated in the establishment of new operations. Finally, it is important for new farmers to be aware that aquaculture can be time consuming in practice, especially when

establishing a new batch of product that could take a certain amount of time to reach market size. It is important to note, though, that Maine has certain advantages in addressing these barriers that other states don't necessarily have.

In spite of these potential barriers, there are many reasons why the quahog is ultimately a viable option. The financial burden put on the farmers as an initial investment is lower than that of oyster, making it a viable alternative. The most cited opportunity from manager interviews is market gap/industry need, as the seafood industry has vacant room in the supply and demand that could indeed be filled by quahog aquaculture. Industry diversification has been an especially prominent subject of conversation in the COVID-19 context which has rendered oysters and raw bars less viable for the moment. Thus, the gap could be filled by quahogs in processed and value-added products. Additionally, the ecosystem services provided by bivalve species further incentivize the establishment of quahog aquaculture. Bottom cages can provide shelter and forage for wild species, and filter feeders are useful in restoration projects that may be of interest across coastal Maine. In sum, the market gap exists, and quahogs are a viable option to fill this demand if existing barriers can be overcome.

Recommendations

Recommendations for Partners

- Contact important fisheries members that we did not get to speak with, especially dealers and current farmers.
- In further research, try to make calls in the middle of the day, as dealers and managers will be more likely to pick up. We found that diversifying the methods of contact (calling, emailing, facebook, LinkedIn, etc.) is valuable in addition to perseverance.
- In future interviews, make sure to ask dealers if they face challenges with interstate transport of shellfish or if they have found solutions. This will be key if dealers want to grow their markets depending on season specifics.

Recommendations for Dealers and Managers

- Develop community interest in quahogs through education and local marketing. Searching for what people are already familiar with and what they seek to add is a must.
- Determine which specific value-added products consumers are interested in buying and why those interests arised. Exposure will depend mainly on local forms to grow larger industrial interest so seeing the success of things such as mixed local dishes would be crucial tests.
- Establish mapping/zone considerations for prospective growers including environmental factors, seasonal factors, and NIMBYism across a range of leasing sites. This might take polling community reactions to aquaculture beside just looking at established regulation. Looking for how one can involve and contribute to improving regulation is also important, as being ignored or unheard during the process will prove harmful.

- Pay attention to changing seasonal market dynamics as climate change progresses. How to address or incorporate changes years in advance necessary for creating safety in the initial investments.
- Find niches, these paths of industry expansion mean that dealers can find demand unique to their product, making quahogs an answer to consumers' needs without competition from other aquaculture products.

Appendices

Appendix 1.

List of Final Codes

<p><u>Further Code Symbols</u></p> <ul style="list-style-type: none"> ● ! stands for barrier ● + stands for opportunity ● ? signifies the theme might answer an overarching questions ● A red number after a quote signifies the # of corroborators 	<p>1. Environmental</p> <p>1.W.Sp.(TLS) Sea Ice 4 storms 3 winter harvest 1</p> <p>1.Sp.S. <i>Predation</i> 2</p> <p>1.M.Sp.S. <i>Growth rates</i> 3</p> <p>1.M.Sp.(T23) Climate Change 2</p> <p>1.M.D.S.Demand has increased for wholesale from Maine due to weather/ disease failures in south 1</p> <p>1.Sp.S The south has been struggling to produce lately due to shifts in harvester dynamics and storms/climate change 4</p> <p>1.S.Sp.(LS) Summer Biotxin rates are higher 2</p>
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<p>2. Regulatory R.S.Sp. Seasonal closures 5 2.M.Sp.(LS)! Dealer talks about DMR impacts on market scale 1 2.M! Regulations by season 3</p> <ul style="list-style-type: none"> • Most have less regulations for aquaculture Ex: On the cape you can harvest aquaculture at ¾" and wild at 1" • Most states regulate seed extensively 	<p>3. Human 3.M.Sp.D Supply doesn't meet demand 4 Supply meets demand 2 3.W.D.S Demand goes down in winter 2 3.W.D.T Demand for bigger clams for chowder in winter 2 3.S.D.S Local Demand 2 3.M.D. Interstate demand Increase 1 3.L.S Limited consumer pallet 3 3.(TL) year round processing plants more feasible 2 3.D.3.S Demand has lately increased 3 3.D.Sp.(TLS) <i>Market gap/industry need</i> 5 3.Sp. <i>Ecosystem services</i> Ocean restoration projects 3 3.S High young person turn over & many folks leaving 2</p> <ul style="list-style-type: none"> • Maine Dealer has spent time adapting from mostly wholesale to mostly retail locally where things are more stable. The wholesale market jumps too much daily <p>3.M.Sp.L Competition location could effects price</p> <ul style="list-style-type: none"> • Northeast price is good and increasing significantly 3, Southern prices are slowly rising
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Appendix 2.

Interview guides

Quahog market analysis
State manager/ biologist Interview Guide

DRAFT

Updated: 06/05/2020

Note: Keep in mind that all questions assume a non-covid market.

Bound this by geography - region and possibly the size of their quahog industry

Objectives:

- Understand the supply side of the shellfish fishery by size, species, and geography
 - Portion that is farmed vs. wild
- Determine regulatory constraints on supply (e.g. ability to ship out of state, size limits, seasonality of fisheries)

Interview Guide

[Add in IRB script]

Section 1: Background - First, we'd like to get some information about your background and position.

1. What is your position and affiliation?
2. How long have you been in this position?
3. What is the purpose of your agency or department?

Section 2: General overview of the shellfish fishery and aquaculture industries in your state. - Now, we would like to learn more about the shellfish fisheries and aquaculture industry in your state, particularly for quahogs, but other species as well.

4. Which species are harvested? Can you provide the scientific and common names used in your state? (e.g., ocean/ Mahogany quahogs, surf clams, soft-shell clams, oysters, mussels, etc.)
5. Do harvesters or growers use different names for different sized quahogs? If so, what are they and what are their corresponding sizes and are those sizes shell height, length or depth?
 - a. Table of common names by size, size in inches (height, length, depth)
6. For each species of clam - we are focused primarily on the quahog (*Mercenaria mercenaria*), but we're also interested in learning more about species that might be substitutes or direct competition in the market:
 - a. Is there a size limit (a min/ max)? Is that shell height, depth or length?
 - b. Do you regulate the harvesting season? If so, what is it? Is it different for wild harvest vs. aquaculture?
 - i. Are there other factors that affect the seasonality of the harvest? (e.g., waiting for the price to go up, weather, biotoxins/ bacteria, etc.) Are these factors the same for wild harvest vs. aquaculture?
 - c. Is interstate transport of shellfish seed or product regulated in your state beyond the requirement NSSP? If so, how?
 - d. Is the sale of shellfish regulated in your state? If so, how? Anything specific to quahogs? (i.e., shellfish dealers, processors, restaurants, direct-to-consumer)
 - i. How many permitted or licensed shellfish dealers are in your state?
 - ii. How many permitted or licensed processors are in your state?
 - e. How many licenses for wild harvest? How many active wild harvesters?
 - i. Have there been changes in the number of licenses, active harvesters? If so, why?
 - f. How many aquaculture businesses/ farmers? How many aquaculture leases? Approximately how much area do these represent?
 - i. Have there been changes in aquaculture activity? If so, why?
 - ii. What culture technique do the majority of farmers use?
 - g. What were total landings in 2019? What portion was wild harvest vs. farmed?
 - i. What has the general trend in landings been?
 - h. What was the 2019 ex-vessel value for the fishery? What portion was wild harvest vs. farmed?
 - i. What has the general trend in value been?

Quahog market analysis
Shellfish Dealer Interview Guide

DRAFT

Updated: 07/10/2020

Note: Make sure to think about if questions need to be asked differently to smaller shellfish dealers (e.g., local to Maine) or larger national shellfish dealers - like can the larger ones speculate about other places in the country (e.g., don't have local seafood identity) that might be potential markets. Keep in mind that all questions assume a non- covid market.

Objectives:

- Understand the demand side of the equation
- How do farmed quahogs fit into the larger quahog marketplace? Size-wise (both interspecies and intraspecies), product type (e.g., half-shell vs. chowder), geography
- Determine competition, substitutions for the farmed quahog and vice versa - what is the market niche for Maine farmed quahogs

[Add in IRB script]

(<5 minutes) Background - First, we'd like to get some information about your background and position.

1. What is your position? How long have you been in this position?

General background on clam products - we want to know more about the existing quahog market and how it varies by the size of the clam. Please respond as if it were still pre-Covid.

2. Which quahog species do you purchase and sell? [Use table below to make sure information is captured for each species]
 - a. Can you provide the common names and the sizes you purchase and do you purchase by the piece or volume [make sure to find out if the size given represents shell height, depth or length]?
 - b. Do you purchase quahogs by piece or volume? Does this vary by size of quahog?
 - c. Approximately what volume of clams [quahogs specifically?] Do you purchase/sell each year?
 - d. From which states do you purchase clams [quahogs specifically]? And approximately what percent of the total amount you purchase comes from each state?
 - e. What percentage of that total comes from wild harvest? From aquaculture?
 - f. During which months/seasons are these products available?

Type of clam(s) Comm	Confir m size range	By piece of	Volume	States where purcha	% wild harvest	% aquaculture	Season available
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Common name (make sure to clarify species)	(height, depth, length?)	Volume?		Weight (& % of total if given)			
Count necks (<1" across hinge)							
Cockles							
Manilas							
Little necks (1" across hinge)							
Top neck (2" across hinge)							
Cherry stone (3" across hinge)							
Chowder (4" across hinge)							

Shellfish markets - Now, we're interested in learning more about where you sell your shellfish, particularly for quahogs and their substitutes, but also the larger quahog market. Please respond as if it were pre-Covid.

3. Are your [quahog common name] sold locally, regionally or nationally?

Clam species	Locally	Regionally	Nationally
Count necks (<1" across hinge)			
Cockles			
Manilas			
Little necks (1" across hinge)			
Top neck (2" across hinge)			
Cherrystone (3" across hinge)			
Chowder (4" across hinge)			

4. What portion/percentage of [quahog species] that you purchase are sold into national seafood service distributors? Grocery chain/ regional retail? Consumer (retail/ mail order)? Restaurants? Food service (hospitality/ schools/ etc.)?

Clam species	National food service distributor	Grocery chain/ regional retail	Consumer (Retail/ mail order)	Restaurants	Food service (hospitality/ schools / etc.)
Count necks (<1" across hinge)					
Cockles					
Manilas					
Little necks (1" across hinge)					
Top neck (2" across hinge)					
Cherrystone (3" across hinge)					
Chowder (4" across hinge)					

5. Do you have a sense of regional quahog markets and the degree of saturation? Does supply outpace demand or vice versa?

Perspective on farmed quahog product - Now, we are interested in getting your perspective on the market potential for a farmed quahog product from Maine. We're trying to figure out if there might be sufficient demand for this product at a price that makes quahog aquaculture viable. [Make sure to flag that we know there isn't a big market for this yet and to answer as if it were pre-Covid].

6. Would you be interested in developing a market or is there a particular market for a < 1" Maine-farmed quahog?
7. How much of a supply (volume and consistency of supply) do you need before you start marketing that product on a regional or national scale (e.g., to other parts of the country besides local markets)?
8. What size(s) would you prefer to purchase? Would you prefer to purchase by piece or volume?
9. Would you have preferences about different attributes of the product in terms of: [Try to get specific details about each of these attributes in terms of what the dealer would be looking for in this product]
 - Shell color? Does the anoxic black shell matter to the price you would be willing to pay?
 - Availability/Seasonality
 - Shell condition?
 - Shell shape?
 - Meat quality?
 - Flavor?
 - Other?
10. What price would you be willing to pay per piece or by volume for a farmed quahog?
 - a. LOW to HIGH, ie 25¢ to 50¢ per piece
 - b. Or By the LB - \$low to \$high
11. If you were purchasing Maine farmed quahogs, would you label and promote these quahogs as farm-raised? As "Maine-Raised"? By farm similar to how oysters are marketed by location or farm where they are grown?
12. What do you see as the potential opportunities for Maine farmed quahogs?
13. What are the potential barriers to selling Maine farmed quahogs?

(<5 minutes) Wrap up - We were hoping to gain a better understanding of the existing market for quahogs and their substitutes as well as the potential for developing a market for Maine-grown quahog products.

14. Is there anything that didn't come up today that you would like to add?
15. Is there anyone you recommend we talk to about this topic?
16. Do you have any questions for us?
17. As we move forward, we may come across additional questions, is it OK if we reach back out as we move forward?

Thank you so much for your time, we really appreciate it!

Section 3: Markets - Now we'd like to know a bit more about the shellfish market from your perspective.

7. Can you tell me what you know about market dynamics for quahogs? For other clam species generally?
8. Does the supply meet the demand? For wild? For aquaculture?

Section 4: Opportunities/ Barriers

9. What do you see as major barriers to the shellfish industry, both wild-harvest and aquaculture?
10. What do you see as opportunities to the shellfish industry, both wild-harvest and aquaculture?

Section 5: Wrap-up - we were hoping to understand more about the shellfish fisheries in your state both for aquaculture and wild harvest, specifically how they're regulated, the level of activity, etc.

11. Is there anything that didn't come up today that you would like to add?
12. Any questions for us?
13. Is there anyone else we should talk to about this?

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