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Stakeholder Perceptions of the Benefits and Limitations of Shellfish Aquaculture Management in Rhode Island and Massachusetts

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**STAKEHOLDER PERCEPTIONS OF THE BENEFITS AND LIMITATIONS OF
SHELLFISH AQUACULTURE MANAGEMENT IN RHODE ISLAND AND
MASSACHUSETTS**

BY

LAURA HANSEN

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN MARINE
AFFAIRS**

UNIVERSITY OF RHODE ISLAND

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ABSTRACT

The shellfish aquaculture industry in the US has been steadily growing in recent years and demand is particularly high for oysters grown in New England. In 2010, the shellfish aquaculture industry on the US East Coast was worth \$100 million, with over 1000 shellfish farms in operation. Because shellfish aquaculture can provide jobs, economic growth and environmental benefits, it is in the interest of coastal states to manage this industry effectively.

Shellfish aquaculture is growing quickly in both RI and MA, but the way in which the states manage the industry differs in the levels of state and local involvement. RI is managed with a state run system, while MA allows local municipalities to have authority over shellfish aquaculture in their towns. The purpose of this study is to examine stakeholder perceptions of different levels of state and local involvement in managing shellfish aquaculture and to understand stakeholder's attitudes towards the different management systems in RI and MA.

Fifteen officials and farmers, involved in varying levels of management, were interviewed during the summer and fall of 2015. Respondents were asked about their experiences with shellfish aquaculture and their feelings about many aspects of the management system, such as regulations and permitting, as well as relationships among stakeholders. Interviews were transcribed and coded into themes and subcategories.

The results of this study indicate that both states have areas for improvement. However, respondents in RI seemed to have a more positive attitude towards the management system than respondents in MA. The management system in MA is more

complex and needs some updating; while in RI, there is a need to examine the engagement of a wider group of stakeholders in management processes and decisions.

Overall, the involvement of municipalities in management in MA allows for the opportunity for local interests to be incorporated into management. It also can help build relationships among farmers and officials and between farmers and the local communities. While the more streamlined system in RI offers a less complex and more approachable structure than MA, it can sometimes leave local communities feeling like they have no control over what happens in waters adjacent to their towns. Both states would benefit from evaluating the roles that other stakeholder groups, such as local communities and recreational groups, should play in management. Having a meaningful way for stakeholders to voice their opinions might result in less conflict among users and allow for continued growth of the shellfish aquaculture industry.

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CHAPTER 1

INTRODUCTION

In 2011, the Shellfish Aquaculture industry on the US east coast was worth approximately \$100 million (Rheault, 2011). Over 1200 shellfish farms were in operation on the east coast in 2011, totaling 15,000 ha and this number continues to increase as interest grows in the industry. The shellfish aquaculture industry provided an estimated 1162 full time and 1297 part time jobs (Rheault, 2011). The presence of oysters and other shellfish that are natural filterers can help to mitigate and even prevent problems associated with eutrophication, as the process of filtration removes nutrients from the body of water (Rice, 2000). One study estimates the ecosystem service value of the presence of oyster reefs to be between \$5500-\$99,000 per hectare (Grabowski et al., 2012). Because shellfish aquaculture can provide jobs, economic growth, social and environmental benefits, it is in the interest of coastal states to manage this industry effectively.

The shellfish aquaculture industry in Rhode Island is managed by the state, which recently lead the Shellfish Management Planning process (2014). The RI Shellfish Management Plan provides in depth guidelines for the regulation of shellfish in state waters (CRMC, 2014). The shellfish aquaculture industry in Massachusetts differs from RI because the municipalities manage the allocation of shellfish grant lease sites, with the state acting as an overseer of harvest methods and public health regulations. While the

two states are similar geographically and ecologically, the management systems for shellfish aquaculture vary. Few, if any, studies have explored these two management systems in detail. The purpose of this study was to further examine and compare the two management systems. The perceptions of those involved in aquaculture in both states provided insight into the benefits and limitations of each system.

The next section will provide an in-depth review of the two management systems, as well as literature relating to policy constraints for aquaculture and governance.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Management Structure in RI

Currently, 98% of shellfish aquaculture in Rhode Island comes from the eastern oyster (*Crassostrea virginica*). In 2015, there were 61 farms in operation, comprising an area of 241 acres (Beutel, 2015). The reported value of aquaculture products in Rhode Island in 2015 totaled \$5.59 million, an increase of just over \$370,000 from the previous year (Beutel, 2015).

All seafood products are regulated starting at the federal level. The US Food and Drug Administration (FDA) sets limits and requirements for the State Shellfish Control Authority in terms of the quality of the shellfish. Under the National Shellfish Sanitation Program, the State Shellfish Control Agency must classify shellfish growing areas, regulate shellfish harvesting, regulate factors relating to shellfish production and public health and regulate bivalve aquaculture (CRMC, 2014).

The General Assembly is required to conserve the natural resources of the state and engage in resource planning (RI Constitution, Article 1, Section 17). Three departments under the Rhode Island General Assembly regulate shellfish aquaculture in Rhode Island: The Department of Environmental Management (DEM), the Rhode Island Coastal Resources Management Council (CRMC) and the Rhode Island Department of Health (DOH) (RICRMC, 2014).

RI CRMC deals directly with major aspects of shellfish aquaculture management, such as lease applications and allocations (CRMC, 2014). DEM deals with regulations pertaining to harvesting, open/closure areas, seed and wild stock (RIDEM, 2015). DOH oversees any issues that relate to public safety and health concerns.

Stakeholder groups in RI such as aquaculture industry members, town officials and the general public have an opportunity to weigh in on decisions made about shellfish aquaculture through public hearings and meetings. In these forums, stakeholders can express their opinions, but do not have a formal authority or vote in the final decision making process.

In 2014, Rhode Island released the Shellfish Management Plan (SMP), following two years of development. The SMP addresses the current issues and concerns as well as outlines strategies for improvement moving forward. This plan was unique in that it placed specific importance on involving all stakeholders in the development of the plan. The purpose being that decisions made would be perceived as transparent and fair and represent the interests of all stakeholders. The effectiveness of the SMP will not be known until it has been in place for a period of time. However, this plan demonstrates Rhode Island's efforts in identifying and addressing the barriers associated with shellfish management and the need to move towards an adaptive management strategy.

2.2 Management Structure in MA

The estimated value of shellfish aquaculture landings in MA in 1996 was \$4.5 million. The industry has shown steady growth over time with an increased value of \$25.4 million with 349 shellfish farmers, 172 million oysters and quahogs sold, worth \$11 million and a total area under cultivation of 1030 acres in 2011 (Lapointe, 2013) (Augusto and Holmes, 2015). In 2003, Cape Cod was the most productive shellfish aquaculture area, contributing 58% of the total landings, and the south shore of MA contributed 28.3% of total landings (Reitsma et al., 2012).

In Massachusetts, the allocation of lease site and shellfish grants are regulated at the town level and are approved mainly through the town selectmen and other local officials (Leavitt, 2003). The state sets out general regulations to follow such as granting the town mayor, city council or selectman the power to approve shellfish aquaculture licenses, that the license will be granted for up to ten years and that the farm should not infringe on private property rights or disrupt navigational areas (Leavitt, 2003). Regulations that concern the harvest methods, sale of product and public safety and health are regulated by the state agencies: Division of Marine Fisheries and the Department of Health. While the state is responsible for establishing harvest and health regulations the municipalities have the strongest power in approving aquaculture permits and lease areas in their towns.

2.3 Barriers to aquaculture growth in RI and MA

Moving forward, the industry in RI and MA faces many challenges in continued growth. In Massachusetts, each town has different regulations, which can cause confusion

and conflict among aquaculture farmers, property owners and other stakeholders. Also, town selectmen and other local officials may not have the background or knowledge concerning aquaculture and those with the most political influence and means may sway the local government into following their own agenda (Tiler et al., 2012).

In RI, the Department of Environmental Management (DEM) as well as the Coastal Resources Management Council (CRMC) are the two agencies most actively involved in shellfish management. CRMC traditionally regulates the allocation of aquaculture leases, while DEM regulates shellfish within state waters (CRMC, 2014). In certain areas, jurisdictional overlap occurs between the two agencies.

Barriers to management in Rhode Island can be attributed to several factors. Having various agencies regulating the industry can cause confusion and frustration among those affected by the differing policies of each agency. Also, overlapping jurisdiction of the agencies can exacerbate confusion and also cause conflict among the agencies. One major issue is the jurisdictional overlap between DEM and CRMC in areas where both wild harvest shellfishing and shellfish aquaculture occur. DEM manages wild harvest while CRMC manages aquaculture and many times these two uses compete for space. With a largely state managed system, local officials have a limited say in whether or not shellfish aquaculture permits are ultimately approved. While public comments, meetings and hearings are part of the permitting process, the state officials have the final decision on the approval of aquaculture permits, which can leave local officials and towns feeling frustrated that their voice has no weight in the decision (Sousa, 2011).

2.4 Policy Constraints for aquaculture in the northeast US

In 2003, the Northeast Regional Aquaculture Center conducted a review of legal and policy constraints for aquaculture (finfish and shellfish) in the Northeast. Using literature review, surveys and telephone interviews of experts in the field, the review by Duff et al. (2003) identified factors that both enhance and impede the growth of the aquaculture industry. Duff et al. (2003) examined factors applicable to both shellfish and finfish aquaculture, but those factors most applicable to shellfish aquaculture will be discussed here.

Table 1. This table lists factors that facilitate or impede growth of the aquaculture industry as described in Duff et al. 2003.

Factors that facilitate growth	Factors that impede growth
Lead Agencies and Formal Guidance	Poorly defined agency jurisdictions and responsibilities
Information and Technology transfer	Poorly defined or enforced standards that fail to reduce conflict among competing resource users
Property Protection and Land Use Policies	Limited availability of Property Rights for aquaculture farmers
	Redundant regulations and overlap of responsibilities

Lead agencies and formal guidance describes the need for a central agency or leader to provide answers to jurisdictional issues and permitting process. Information and technology transfer has to do with the way information is communicated among different stakeholders and actors involved to address problems and share important information. Property protection and land use policies is the need for farmers to be confident in their investment and be able to protect and enforce property rights. Duff et al. (2003) also discuss the use of zoning to promote specific areas for aquaculture use.

Limited availability of property rights for aquaculture farmers impedes growth as it prevents expansion and limits capacity to exclude other users. Poorly defined or enforced standards as well as redundant regulations and overlap of responsibilities can cause confusion and increase conflict.

2.5 Governance

Much of the research on environmental governance in recent years has examined the concepts of co-management and community based management systems (e.g. Berkes 2006, Carlsson and Berkes 2005, Armitage 2005, Pomeroy 1996). Community-based resource management has focused on moving away from centralized, “top-down” systems of governance to a more active stakeholder participant system at the local and community levels. Similarly, co-management is a sharing of power between state and local resource users (Carlsson and Berkes, 2005). One important factor influencing the success of community-based programs is whether or not a community has the capacity to self-regulate their natural resources (Hoffman, 2009). While community-based management sounds appealing, many times this view is over-simplified and certain social groups gain and control access to particular resources (Leach et. al, 1999). A case study examining aquaculture expansion in Norway (managed by the municipalities) noted that the municipality lacked the proper knowledge and expertise to make informed decisions regarding aquaculture management (Tiller et. al, 2012). This study also noted that stakeholder group’s objectives and viewpoints varied and each were out to promote their own objectives, so rather than having cooperation there was competition (Tiller et. al, 2012). In situations where the local management system is not well established and defined, stakeholder groups with the most political influence, time and money will most

likely have the strongest weight in the decision making process (Tiller et al., 2012). It is therefore important to examine contextually where the balance exists between state and local authority in regulating natural resources. This study examined the balance of state and local authority in the co-management and governance of shellfish aquaculture in RI and MA.

Other factors that can influence effective governance of human-environment interactions include: monitoring of resource use and low cost of verifying information, moderate rates of change of socio-economic and ecological factors, sustained face to face communication and “social capital” to increase trust and compliance, exclusion of outsiders at a low cost, support for effective monitoring and rule enforcement (Dietz et al. 2003).

Shellfish aquaculture planning and management in RI and MA involves a variety of stakeholders, including state and local planners and managers and other shellfish-related stakeholders. This study investigates stakeholder perceptions of benefits and limitations of the current regimes in MA and RI for planning, permitting and managing aquaculture.

CHAPTER 3

METHODOLOGY

3.1 Study Area

This study was conducted in the states of Rhode Island and Massachusetts. These states were chosen because of select similarities and differences. RI and MA are similar geographically and in coastal environments and suitability for aquaculture. Both states have a large amount of coastline and are popular locations for waterfront vacation homeowners. RI and MA have also experienced exponential growth in the shellfish aquaculture industry in the past 10 years (Lapointe, 2013). Shellfish aquaculture has a growing presence in both states; however, the structures of the management systems differ, serving as the basis for comparison in this study.



Figure 1. Map of New England, showing the location of MA and RI and their similar geography.

Table 2. Comparison of the shellfish aquaculture industries in MA and RI

State	Value (millions)	# of Jobs	# of Licenses	Farm Acreage
MA	\$25.40 (2013)	909 (2013)	349 (2011)	1030 (2011)
RI (2015)	\$5.59	142	61	241.38

The most up to date information on the status of the aquaculture industry in MA was available from 2011-2013. In 2013, the MA industry was valued at \$25.40 million dollars and provided approximately 909 jobs (Augusto and Holmes, 2015). In 2011, in MA there were 349 license holders occupying an area of 1030 acres (Lapointe, 2013). In 2015, the RI shellfish aquaculture industry had an estimate value of \$5.59 million, provided 142 jobs and 61 license holders occupied a total of 241.38 acres (Beutel, 2015). These numbers are higher today, as the industry in both states has continued to grow.

3.2 Study Population

The overall goal of this study was to compare the existing management regimes of shellfish aquaculture in Massachusetts and Rhode Island. This study addressed two main questions:

1. What are the stakeholder perceptions of benefits and limitations of the current management systems that involve different levels of state and local involvement?
2. What are the similarities and differences in perceptions among stakeholder groups (managers/officials v. aquaculture farmers; MA v. RI)?

Because this study evaluated perceptions of management regimes, the study participants were those who had been involved in the management process. Study participants included state and local officials in RI and MA, including officials from towns in Rhode

Island that have associated shellfish farms even though the local officials do not have formal authority for regulating aquaculture in RI, and aquaculture farmers. Respondents were selected from four towns in MA and one town in RI, with each town offering varying levels of shellfish aquaculture and local involvement in management.

A total of 15 state and local officials, as well as oyster farmers were interviewed from August 2015-November 2015. In RI, three officials and two oyster farmers were interviewed. In MA, five officials and five oyster farmers were interviewed. Participants were identified through background research about the shellfish aquaculture industry in both states as well as snowball sampling at the conclusion of the interviews. Snowball sampling provides a way to gain access and recruit hard to reach groups or individuals by utilizing the network of an interviewee (Barbour, 2008). Potential participants were contacted by phone and email to inquire about their interest and availability for an interview.

3.4 Interviews

This study used a mixed methods approach to collect both quantitative and qualitative data through in person interviews. This was an exploratory study as it attempted to identify and understand relationships between stakeholders and the management system and what respondents thought of the management system (Creswell , 2013).

Interviews with stakeholders were conducted in person and over the phone and ranged between 25-90 mins. The interviews were confidential, however, the use of one on one interviews provided a more personal and casual setting. In person interviews can

help the participant to feel more relaxed and allow for the use of probes to further explore topics (Barbour, 2008).

The survey questions were based on the literature on policy constraints related to aquaculture and governance (Duff et al 2003, Berkes 2006, Armitage 2005). The semi-structured interview setting allowed the conversation to be relatively open, providing flexibility of the discussion. This allowed more time for discussing important topics or those that may have been overlooked or unexplored (Robson 2011). The interview protocol included background questions on the participant’s experience with shellfish aquaculture. Following the introductory questions, participants were asked to respond on a likert scale (1=strongly disagree to 5=strongly agree) to statements about shellfish aquaculture management. An example of one of these statements is, “I feel that there is sufficient communication between farmers and officials”.

Table 3. Interview Protocol Likert Scale Statements

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The regulations of shellfish aquaculture are clearly defined					
The regulations are fair to everyone					
Regulations are enforced fairly					
I have an opportunity to participate in decisions made about shellfish aquaculture					
Regulations are generally flexible when changes are necessary					
There is sufficient communication among aquaculture farmers					
There is sufficient communication between aquaculture farmers and officials					
There is sufficient communication among officials					
The officials and the farmers work well together					
I think that managers/officials do a good job in regulating shellfish aquaculture					

Following the likert-type questions, participants were presented with open-ended questions about the shellfish aquaculture management system in their state and their attitudes and perceptions towards it.

3.5 Data Analysis

All interviews were recorded using a digital voice recorder. These interviews were transcribed and a script of the interview was created for qualitative data analysis. Confidentiality was an important aspect to this study as it assured the participants that their statements would not jeopardize their job, reputation, social status, etc. This also allows the participants to be more open and honest in their responses. Each transcript was assigned an identifying code for confidentiality purposes.

To perform the qualitative analysis, transcribed interviews were examined and reviewed. A provisional coding frame was used to identify major themes and sub categories (Barbour, 2008). Using this method, emerging themes and subcategories were noted and associated quotes from stakeholders were assigned to each theme. The quotes within these themes served as the basis for analysis for this study. Statements from officials and farmers within each state were compared, following a comparison between the two states and between officials and farmers.

Likert data from the interview was input into an excel spreadsheet and quantitatively analyzed. This data was used to show trends in agreement or disagreement about aquaculture management among the participants. It was also used to support findings from the qualitative analysis.

CHAPTER 4

FINDINGS

4.1 Quantitative Results

Overall, respondents in RI had more positive responses than in MA. RI farmers and almost all officials agreed that the regulations of shellfish aquaculture are clearly defined (Fig 2). Several farmers in MA did not agree nor disagree that the regulations were clearly defined while most officials in MA agreed. Most farmers and officials (except for one official) agreed that they have the opportunity to participate in decisions made about shellfish aquaculture. Some farmers in MA felt that they did have an opportunity to participate in shellfish aquaculture decisions, while others were neutral. Almost all officials in MA said that they have the opportunity to participate in decisions made about shellfish aquaculture.

RI farmers and officials were mostly split between neutral and agree when asked if they thought that managers/officials do a good job in regulating shellfish aquaculture. In MA most farmers felt that managers do a good job, while most officials in MA were neutral and two agreed. Survey responses to the remaining seven questions can be found in Appendix B.

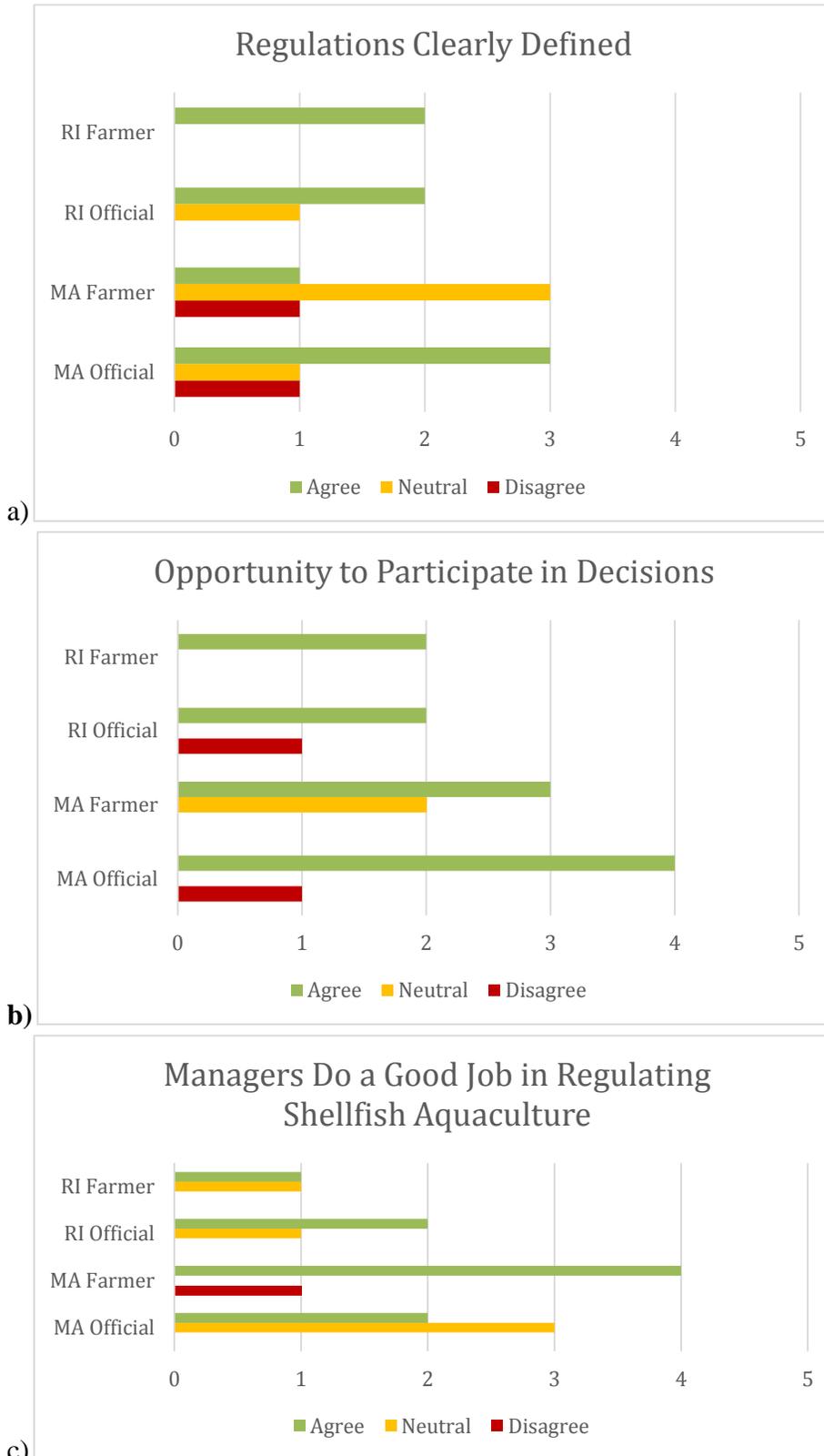


Figure 2. Selected survey responses to a) regulations b) opportunity to participate in decisions c) managers do a good job in regulating shellfish aquaculture.

4.2 Qualitative Results

Interviews were coded into five major themes, each with several sub-categories (Table 4).

Table 4. Summary of themes and sub-categories

Theme	Subcategories
Management Structure	<ul style="list-style-type: none">• Management Structure RI• Management Structure MA• Providing meaningful opportunities for input• Leadership
Rules and Regulations	<ul style="list-style-type: none">• Consistency• Enforcement• Updates and Clarifications
Permitting System	
Relationships	<ul style="list-style-type: none">• State-town relationship• Officials-farmers relationship• Public's relationship with aquaculture
Addressing the Growth of the Industry	<ul style="list-style-type: none">• Factors facilitating/hindering growth of the industry• User conflicts• Vibrio

4.2.1 Management Structure

4.2.1.1 Rhode Island Management Structure

In Rhode Island, respondents were generally satisfied with the current management structure. Some officials noted that they have been working to clarify some

of the agency jurisdictions and regulations for streamlining purposes. As one RI official stated,

“There’s lots of overlap currently. We’re not really getting rid of too much of the overlap, but we are sort of clarifying which permits and licenses are still needed, so I think there could be finer distinctions between what each agency is responsible for and I think that there is kind of a little bit of redundancy still, but maybe that’s a good check and balance type of thing.”

One farmer and one official noted that it would be less time consuming and less confusing if management was further streamlined under one agency, but did not have a major problem with the current structure.

While respondents noted that they were generally satisfied with the current structure, both farmers and officials discussed the issue of town involvement in decisions regarding aquaculture in associated waters. Some respondents noted that the town has the opportunity to voice their opinions at the preliminary determination meetings, but that the lack of ultimate decision-making power of the towns has caused some friction with the towns and their citizens, one farmer stated “they [town] feel like they don’t control anything in the waters even though it’s right in front of the community that lives in that town (RI Oyster Farmer).” The town feedback is incorporated into the application process; however, people are often times still not happy when the application is approved.

4.2.1.2 Massachusetts Management Structure

Respondents' perceptions of the management structure in MA were a little bit more varied than those in RI. Many farmers said things like, "it's good, but not great," "I think we're trending in a positive direction," and "it's probably reasonable." Having the authority to manage at the town level adds another level of complexity to the system. Both officials and farmers see the value in having local involvement, but also noted some frustrations that can come along with municipal-level authority.

Many respondents mentioned some sort of value or benefit associated with town management of shellfish aquaculture. In particular, they noted that there is a level of personal investment and oversight that comes along with local management that might not exist with a solely state-regulated system. Additionally, town management allows local citizen input and feedback that can build community support and positive perceptions towards aquaculture, as captured by the following statements from farmers and officials:

"... I think that the people that are from here know the harbor and know the problems or the benefits we have and they get it more, you know the state can't see every little area (MA oyster farmer)."

"I think there are more benefits having a town regulated system because it's important to get feedback from the citizens and the residents of the town. You can't ignore that and sometimes state regulations do, they don't take that into account or they don't put as much of a priority on it so I think it's definitely important to have that come from the town (MA official)."

“and I think you get a little bit more support from the community when you know we’re tied into this one area (MA official).”

Some of the limitations of having permitting authority at the town level included added complexity, the sway of the public on politics, and the ability of a town to completely prohibit aquaculture in their waters. Another limitation of town-level aquaculture management includes the potential lack of experiences and knowledge about aquaculture of town officials. As one aquaculture farmer highlighted “Perhaps a municipality would hire someone who might not have the experience or the education to have the sensitivity to challenging scientific issues and there a municipal shellfish constable could be a problem if they don’t have that sensitivity (MA Oyster Farmer).” Respondents also noted the challenge of having neighboring towns with completely different approaches for planning and permitting aquaculture farms; for instance, a farmer noted “The one thing is that there is a great discrepancy where you can have a farmer in one town have a heck of a time trying to farm whereas a farmer in our town they have the support of the town and they breeze right through (MA Oyster Farmer).”

At the state level in Massachusetts, some farmers and officials felt that the state side of management lacked a sense of innovation and creativity and that it was long overdue for an update. As one respondent noted,

“I think that there is a lot of work, and there is a daunting amount of work that needs to get done to make it truly an effective system. For a number of reasons, ranging from certain personnel, to research that we need to make effective

decisions, to just a general creativity and sense of innovation brought to what we are doing and how we are being regulated (MA Oyster Farmer).”

In addition, an official highlighted how regulatory capacity has not changed at the state-level despite industry growth:

“It [the industry] has grown by leaps and bounds and it is far bigger than it was when it was evaluated in 1996 so it’s time.. I think that the level of manpower, state manpower, dedicated to regulatory enforcement and management of aquaculture is not substantially different than it was fifteen years ago. I think that the number of people dedicated in state service to aquaculture hasn’t substantially grown in the past 20 years and yet the industry has grown ten fold at least. I think it’s because the towns are managing it (MA Official).”

One farmer mentioned that there is a need for more balance of decision-making power at the state level and that the lack of distribution of power affects the oyster farmers operations. They discussed that the state has the authority to close shellfishing after periods of heavy rainfall and mentioned that state could do a better job delegating decision-making power so that farmers can resume their operations, “I remember saying something and they said, “well none of us can make a decision because the head is on a ski trip in Washington.” So I think that he has veto power on too much. I do think there are a lot of smart people coming through that he could be trusting with some decision making (MA Oyster Farmer).”

A factor that came up in interviews with a farmer in RI and a few farmers in MA was the issue of residency. A few of the farmers in MA mentioned that they would like to expand their aquaculture businesses beyond their town’s waters, but cannot because

aquaculture farmers must be a resident of the town to obtain an aquaculture license. As one MA farmer stated, “I would like to just be regulated by the state because it would allow things to be a little bit more streamlined, it would allow us to grow beyond just the town...we can’t get a farm in another town which is kind of silly (MA Oyster Farmer).”

On the other hand, a farmer in RI mentioned that the lack of a residency rule allows people not from the community to obtain a lease, creating a disconnect between the aquaculture farmer and the local community. As he noted,

“I do like the way Massachusetts does it with their towns. I think it would be better for the local community if it was managed at a town level...well, in MA, most towns make it so you have to live in the community if you have a business in the community, where here [in RI] some of the farmers live in Providence and they’re not part of the community and they’re not seeing and hearing what I am. I live here, so I hear all of the complaints (RI Oyster Farmer).”

4.2.1.3 Providing Meaningful Opportunities for input

Stakeholders in both states discussed the potential opportunity to weigh in on decisions and the value of that input in the decision-making process. Farmers in MA and one official in RI noted that they have the opportunity to voice their opinions, however, they could not weigh in on the ultimate decision or that the input they provided was not really considered.

In Rhode Island, both farmers and most officials discussed collaboration in reviewing and implementing regulations. Both farmers felt that their opinions were in general heard and had an impact on the ultimate decisions. A couple officials noted the

towns in Rhode Island have an opportunity to voice their opinions at the preliminary determination meetings, however, they felt that their opinions did not have any impact on the decisions made. For instance, as one official explained,

“The town objected to one of the permits and went up to the state who hauled everybody up there to appear at a formal hearing and basically said we’re going to pass this because we want aquaculture...So is that fair, I don’t know. How much does any advice have an impact on that decision? Probably none (RI Official).”

One official noted that the system could be improved by creating a review panel that consisted of representatives of a more diverse group of stakeholders, explaining,

“I think there should be an independent panel for aquaculture application review made up of a more diverse group of fishermen at least. On our side, I think it would be even better if you included other user groups in that just to give more information to CRMC for their final decision. People including waterfront homeowners, sailors, coastal ponds kite boarding and wind surfing are pretty big, kayakers and just the general public. I think a lot of their concerns sometimes fall through the cracks (RI Official).”

Some Massachusetts’s farmers and officials also discussed lack of a participatory process. While there is public and industry input at the town level, some officials noted that the town does not have much say in decisions about shellfish aquaculture made at the state level. Some farmers and officials mentioned they would like to have more statewide stakeholder meetings to address issues in the industry. One official stated, “I think we really need to sit down with all the stakeholders, from the shellfish farmers all the way up to the end users and sit down and talk about things and see where there’s

areas where it's working and where it's not working and learn that way. There's no one person that's going to understand all of it (MA Official).”

Respondents mentioned the Mass Aquaculture Association, which is a “non-profit trade association whose purpose is to promote development of aquaculture and improve conditions affecting aquaculture in MA” (Mass Aquaculture Association, 2014). The Association was discussed as building a presence and voice for the industry. Several farmers, however, still said that they felt their opportunity for input on decisions about shellfish aquaculture at the state level was not necessarily effective, as summed up by one farmer, “I think if they had more meetings not only town wide, but state wide, I think that would be beneficial because then you could get a lot of people’s opinion.. There’s no input and even when there is, a lot of the times the state is like “this is the way it is, and that’s that (MA Oyster Farmer).”

Another farmer noted the challenges of participating in planning and management, “... it takes a lot of work and time to get a voice in the process. They can participate through Mass Aquaculture ...I think the questions is how much impact does that actually have on what goes on. Again, I think that is trending in the right direction and there is some element of you have to build up credibility by going to a lot of these things before you get listened to (MA Oyster Farmer).”

4.2.1.4 Leadership

The importance of a lead agency or official was noted in Duff et al. (2003) as it facilitates growth in the industry and provides a clear source of information and clarification for stakeholders. Almost all of the stakeholders in Rhode Island identified a

specific single official that they approach for guidance and information. One official in Rhode Island noted that it would be beneficial to have a local official as a point of contact, stating “It [authority] shouldn’t be at the state level if you want to really educate people about it [aquaculture] (RI Official).”

In Massachusetts, farmers and officials identified a variety of officials at town and state-levels that they approach for guidance and information about aquaculture. Some stated that it depended on the issue and one official noted frustration in identifying the appropriate official, “we kind of got bounced around from Chapter 91 which is the state waterways licensing [statute] and the DEP Wetlands, and so it wasn’t quite clear who had the better answer or more jurisdiction or anything. It was kind of convoluted (MA Official).”

4.2.2 Rules and Regulations

4.2.2.1 Consistency

The topic of consistency came up during interviews with officials and farmers in Massachusetts. Stakeholders discussed the lack of consistency in regulations between towns as both positive and negative. Some farmers mentioned that it is beneficial to have town-specific regulations as growing methods and environmental conditions differ by town. As one farmer noted,

“We have a diverse industry here, we have some very big farms now and we have some very small farms. So it’s challenging to create regulations that are fair to everyone in that spectrum... trying to come up with a regulatory scheme that is equally applicable is hard and as much as I’m not happy with all regulations I do

think they've done a fairly good job of accommodating that (MA Oyster Farmer).”

One farmer in MA mentioned that the lack of uniformity in regulations creates issues and inequality for potential farmers depending on the social setting in the town.

Several officials noted that inconsistency occurs when people interpret the regulations differently, which leads to uneven application of the regulations. One noted, “It seems like every town has their own way of doing it. I think there should be in my opinion a more uniform, consistent across the board (MA Official).”

The lack of consistency in regulations and the variety in the industry methods contribute to the inconsistent application and enforcement of regulations. This was something that stakeholders in both RI and MA discussed.

4.2.2.2 Enforcement

Stakeholders in RI and MA mentioned insufficient and non-uniform enforcement. They attributed this to the lack of funding both at the local and state level for law enforcement, inaccessibility of the farms, size of the operations and a lack of understanding of the regulations among law enforcement officials and new farmers.

Officials and farmers in both states discussed the lack of manpower dedicated to enforcement. Both farmers and two officials in Rhode Island mentioned that they rely somewhat on “self-policing” in the industry. A few officials discussed that farmers are pretty good at complying with regulations; however, there can be issues with providing proper oversight of operations. One official discussed the limited manpower dedicated to enforcement and said that oversight could be improved, “I think we could do a better job

of keeping track of their operations. We're supposed to do two inspections a year. Up until last year, we were only doing one (RI Official)."

He also discussed that the environmental police are responsible for enforcing more than just shellfish aquaculture, "Our environmental police are already taxed, there's a staff of 20-24 of them and they have to cover the whole state, uplands, boating, commercial fishing they just can't get to aquaculture so they are somewhat self policed (RI Official)."

One town in Rhode Island recently implemented a Memorandum of Understanding with RI CRMC to better enforce aquaculture regulations in their town as they noted a need for better enforcement and a local on the water presence.

Respondents in MA discussed the impact of a lack of funding for enforcement at both the local and state level, which leads to uneven and inconsistent enforcement of regulations, and can have a negative impact on the industry. Also contributing to inconsistent enforcement in MA is what one farmer called "a lack of deep understanding" of the regulations. The farmer called for more law enforcement education. Local enforcement funding varies town to town in MA; some have a much larger budget than others. This can impact how regulations are enforced and to what extent people are complying with regulations, which can impact the industry overall.

One of the most mentioned topics in enforcement by farmers in MA was the lack of enforcement towards the minimum usage requirements for grants and clean up of derelict gear. Minimum usage requirements follow the "use it or lose it" policy and many towns require that farmers meet a certain usage standard in order to maintain possession of the grant. Most of the farmers mentioned that there have been issues in their town where grant holders will not be meeting the minimum usage requirements, or will not maintain

it, leaving it unkempt, which can cause social conflict and safety issues. One farmer in MA described this issue,

“I mean you do have some people that have [aquaculture] grants that don’t really do anything with the grants and I think that they should be a little bit more strict about what you do on the grant. In other words you shouldn’t be able to have it and just let it sit there all the time (MA Oyster Farmer).”

Regulations can be well thought out and perfectly suited to the industry, however, without enforcement, the regulation might be ineffective. Industry members do not want to be hovered over, however, their industry will not be sustainable without enforcement and compliance.

4.2.2.3 Updates and Clarifications

Reviewing and adapting rules and regulations periodically is beneficial for management. It allows regulators to examine the current policies and determine whether or not they are sufficient for the current state of the industry.

The Shellfish Management Planning process conducted in RI in 2014 provided the opportunity for regulators and other stakeholder groups to evaluate regulations and address the current issues within the industry. One official in RI mentioned that the Shellfish Management Plan helped to reduce redundancy, clarify regulations and update the management system,

(in referring to industry requests) “It’s quite a long process sometimes it takes years so we have had some success recently in making some substantial changes that resulted in the Shellfish Management Plan, but those are requests that had

been on the table for years and I think it really took a strong, statewide initiative to get them changed” (RI Official).

One RI official noted, the SMP process clarified issues and even lead to a Memorandum of Understanding between RI CRCM and RI DEM to cooperate on enforcement.

In MA, many stakeholders mentioned that many of the regulations need updating and that the management system has not kept up with the growth in the industry. To date, there has not been a comprehensive review of the current permitting and management system like the one done in RI as part of the SMP process. One MA official discussed updating regulations,

“I think that they could be updated. I think that a lot of regulations have been in place since basically regulations for milk have come out so at some point you have to look at them and say, ok could we update some of our approaches? (MA Official).”

A few officials and farmers in MA also noted that there is jurisdictional confusion on some regulations. One farmer highlighted his difficulty in getting clarification on aquaculture rules, “I feel like there’s been certain questions where I would go to the town and they would say, “well check with the state” so I would go to the state and they would say, “well you have to go to the town,” so sometimes you do get bounced around (MA Oyster Farmer).”

Stakeholders in both states noted the need for improvements; however, MA respondents seemed to express stronger feelings than those in RI about needing significant improvements in the MA permitting and management scheme.

4.2.3 Permitting System

The permitting systems in RI and MA occur at multiple levels of authority as local, state and federal permits may be required prior to starting a shellfish farm.

Respondents in both states discussed that the permitting process is cumbersome and time consuming. Some officials and one of the farmers in RI expressed a desire for a speedier process, and suggested implementing a time line or a specified time period for agencies to comment. One farmer in RI suggested the implementation of a comment period for agencies to respond to applications,

“There’s not a defined period where they have to respond by so sometimes an application can just sit there for a couple months without getting a response so I think there should be a 30 day comment period (RI Oyster Farmer).”

One official described the permitting system as the biggest challenge in managing the industry,

“I think we could do a better job of site selection, and potentially rezoning for aquaculture. As of now it’s just any farmer can pick any location and then it is sort of a burden on both CRMC and DEM to evaluate each individual site on an individual basis instead of us being proactive and setting aside some areas for aquaculture that are sort of preapproved already (RI Official).”

While MA has designated areas for aquaculture, many respondents expressed frustration with the permitting system. The industry has grown so rapidly that many towns have placed moratoriums on new leases or have run out of space for aquaculture. There are several towns where aquaculture is just starting up or new leases are opening

and officials in these towns have noted that there is no guidance from the state on how to permit aquaculture at the local level or how to establish new grants.

In addition to updating regulations, some MA officials felt that the permitting system could be updated and more streamlined. The complexity of the permitting system process and number of permits needed was also discussed as a major negative factor impacting the industry. Some farmers in MA discussed that permits under review sometimes go long periods of time with no action from the agencies. One farmer discussed his frustrations with the permitting system,

“There are so many bottlenecks in the system and the first of which is starting with the municipality...so that’s been a major impediment and you just go up the line and there’s bottleneck at DMF, the Army Corps is a joke, it can take a year to get someone from them to stamp your grant (MA Oyster Farmer).”

One MA official addressed the need for streamlining the permitting process, and that it really hasn’t happened, “I think that in 1996 they tried to streamline the process, unfortunately there are so many stakeholders that I don’t know how it would be streamlined. Everybody feels that their issue is the most important (MA Official).”

Creating deadlines for review of permits and more guidance from the state to towns in MA seemed to be the biggest topics regarding the permitting system.

Improvements in these areas could be beneficial to the industries in both states.

Additionally, the process of making improvements could facilitate better relationships among stakeholders.

4.2.4 Relationships

4.2.4.1 State-town Relationship

The relationship between the state and the town officials was discussed in a more negative than positive light in both states. The management structure in RI, in which towns do not have regulatory authority over shellfish aquaculture, creates a setting where the decision-making power for permitting aquaculture throughout the state rests in the hands of one agency. One official discussed that towns have expressed opposition to permits, and dissatisfaction with the process by which their objections are reviewed, “Sometimes a town will object to something and it wont be substantive [according to the state] but the residents think it is (RI Official).”

The same official described some town meetings as “contentious” if there is opposition and that often times, town officials in RI are not very knowledgeable about aquaculture. One official suggested annual town briefings on the current status of the industry,

“I think it would be very useful to get a briefing on the status of the aquaculture industry before the town council annually at least, because if we run into troubles, if citizens object to what’s going on, we need to be knowledgeable about what is going on (RI Official).”

Other than the opportunity to comment at public hearings it does not seem that town officials in RI have any other form of participation in the decision making process.

Officials in MA noted that relations between the state and the town officials could be improved, but that there is a good working relationship. Some officials discussed that there needs to be more involvement by state officials at the local level. Working more

closely with the harbormasters and providing more guidance to towns when needed were mentioned. One official spoke of a particularly contentious aquaculture operation in his town,

“They probably were saying all the while, the town has got this, we [state] don’t need to get involved and then when they [state] did get involved that’s when we [town] found out just how much that the state really should. I don’t want to say that they should be involved, but they should be more aware of it and there should be more guidance language for towns so that this kind of thing doesn’t happen again because it was just a tremendous waste of time and resources (MA Official).”

There seemed to be good communication when needed among state and town officials, however, there is a desire by some town officials to be more involved in management and for state officials to be more cognizant of issues in the towns.

4.2.4.2 Officials and Farmers Relationship

The relationship between farmers and officials is important, as these stakeholders are most involved and most affected by changes in the system. Officials felt they had a good relationship with farmers, but noted that some officials have a better relationship than others. Some officials and farmers discussed that there has been strong political support for the growth of aquaculture as it creates jobs and revenue for the state. As one official noted,

“I think that in recent years, the officials have been really promoting aquaculture. They recognize it as a growth industry. The new governor sees the value of a

growing economic industry so I think at least in the last couple years it has been a pretty good relationship (RI Official).”

Farmers and officials described the relationship in a relatively positive tone. State officials respect the growers and know of their commitment to the success of the industry and farmers generally felt comfortable with the officials representing their interests. One farmer talked of his view of officials,

“People who are at the top of the agencies are responsive and open to ideas. I don’t know if it was always that way in the past. I don’t know enough of the history to say of the past. I just know right now, good people at the top level (RI Oyster Farmer).”

There was little mention of relationships between the oyster farmers and local officials in the towns in RI. One official stated,

“Nobody on the town council, no other official elsewhere in the town ever deals with them [farmers] with the exception of the harbormaster and the GIS staff who often deal with them (RI Official).”

Officials and farmers in MA discussed a good working relationship between farmers and local officials. Often times, the farmers and local officials will collaborate with and offer advice to each other. There seems to be a mutual respect among the officials and farmers, where they understand each other’s expectations and time. One MA oyster farmer described their relationship with regulators,

“I would say, like I said if there was a problem we have each other’s cell, we know where to find each other, that there’s some respect that the regulator is busy and the regulator knows were busy (MA Oyster Farmer).”

Several officials discussed a good working relationship and respect for the farmers. One MA official described a positive relationship with farmers,

“They’re good workers, they’re not hacks, they understand that it’s their investment, they spent a ton of money trying to get this stuff going and they run a business, they run everything, so I think we’ve got a good working relationship with them (MA Official).”

One farmer noted that he felt that officials and farmers working well together was “the exception and not the norm,” however overall there seemed to be a stronger relationship between the town officials and the farmers in MA than the state officials and farmers in MA.

4.2.4.3 Public’s Relationship with Aquaculture

Demand for oysters in southern New England has grown significantly in recent years. This has provided an opportunity for growth in the aquaculture industry. Thus the public’s relationship plays a significant role in the shellfish aquaculture industry. Overall stakeholders felt that the public was generally supportive and enthusiastic about shellfish aquaculture. As one farmer described, “People love oysters and I think oysters and clams have a way to bring people together, that a lot of foods don’t. People on the whole are really into it. There’s a tremendously positive zeitgeist about what these things are doing for the environment, for local economies, and things like that. So in this part of the country, people on the whole are pretty jazzed about it (MA Oyster Farmer).”

Officials and farmers in both states addressed the need for increased public education and outreach to further develop understanding and support. Stakeholders in

both states noted that conflicts arise between the industry and waterfront property owners as well as user groups of local waterways. As noted by an official in RI, the coastal salt ponds along RI's south coast were mentioned as a particularly ripe area for conflict,

“It really depends on location. So in the coastal ponds, one of them in particular, there is the general opinion that aquaculture encroaches on their recreational opportunities. Many of them will say to me, I love aquaculture and I love being able to eat oysters, I just don't want it in my way (RI Official).”

Opposition from waterfront property owners was also discussed in MA, however, some farmers noted that there is less conflict in towns where aquaculture has existed for many years, as illustrated by a quote from an oyster farmer,

“Here there is a lot of acceptance, because the industry has been around for a while and has become, I think for many people, a point of pride. So in the communities where shellfish are a part of the community I think overwhelmingly it's pretty positive, save a few grumpy upland land owners here and there (MA oyster farmer.)”

4.2.5 Addressing the Growth in the Industry

4.2.5.1 Factors Facilitating and Hindering Growth

The increase in demand for oysters in the past few years is one of the major reasons stakeholders attributed to growth in the industry. In both states, farmers and officials noted that the supply of oysters is not keeping up with the current demand. In Rhode Island, strong political support for aquaculture has been beneficial for growers, as state aquaculture officials and political officials have pushed for more aquaculture as a job and revenue generator. One farmer in RI mentioned that some officials have fought

the growth of the industry, but that it's growth has allowed the industry to overcome those who oppose it.

One factor mentioned as limiting to the industry in Rhode Island was the availability of seed. Rhode Island does not have a hatchery, so growers are limited on how much seed is available for them to purchase from out of state.

The biggest factor facilitating growth of the industry in MA, discussed by officials and farmers was the increased demand for oysters and state support. Stakeholders mentioned more limiting factors than growth factors in the current state of the industry. Farmers were particularly concerned about education of new growers, which was also mentioned as a concern by one RI farmer.

The other major limiting factor in MA is the limited availability of space. Some farmers expressed their frustrations in not being able to expand their operations due to town acreage limits and the limitations of areas suitable for aquaculture in some towns. Growers would like to be able to expand their operations, however, some officials noted that continued growth of aquaculture needs to be balanced with the needs of the many other user groups of the coastal waters.

4.2.5.2 User Conflicts

Officials in both states discussed the increasing amount of uses occurring in the same areas where aquaculture occurs. These user groups compete with aquaculture for use of the area and several officials noted that this has brought some conflict around shellfish aquaculture. Some growers have requested to switch from bottom cages, which

allows for surface use of the area, to floating cages, which would exclude surface users.

One official described the potential conflict with floating gear and other user groups,

“Kayaking, canoeing, stand up paddle boards are all becoming more popular so I think there is some competing usage with that..Anything that is submerged is compatible with surface uses of the pond, but once you start putting gear on the surface, you can no longer access it in the same way you would so I think there are people who perceive a conflict with their own usage of the pond might have a negative view of the aquaculture industry (RI Official).”

While officials and some farmers in both states discussed managing multiple uses of the areas, several farmers were more concerned with new entrance into the industry and the effect it will have on the industry. One farmer in MA discussed issues with access to the water, “There’s only one town landing and it’s small, the parking lots are maxed out with pick-up trucks and boats at the landing, so it’s an infrastructure issue as well (MA Oyster Farmer).” New entrance into the industry came up throughout the interviews.

4.2.5.3 *Vibrio*

With the increased number of growers and increased demand for oysters, managing public health concerns has become one of the biggest driving factors. The number of *Vibrio* outbreaks and illnesses associated with consuming raw shellfish has become more frequent in recent years. A few officials in both states said *Vibrio* was the biggest challenge in managing the industry. While there is concern by both farmers and officials in both states to meet strict standards to minimize risk, there was more support from

farmers in RI for the strict regulations in Rhode Island than from MA farmers for MA regulations.

In MA, a few farmers noted that they did not agree with some of the regulations that had been implemented with the new *Vibrio* plan in MA. One farmer expressed his views on the stricter regulations,

“To an extent I understand that, yes, the ice is supposed to keep the oysters cool and at a certain temperature but they’ve been doing this for years and there’s never really been that big of a problem. I personally think that the biggest problem is how the restaurants are handling the oysters” (MA Oyster Farmer).”

Another farmer discussed that it can take up to five weeks to trace a *Vibrio* outbreak back to a farm, which then gets shut down a significant amount of time after the potential outbreak occurred. Farmers understand the need for strict regulations to protect public health, but have a need to keep their business running.

Because *Vibrio* poses a potentially serious public health risk, it will continue to be a major issue moving forward in the shellfish aquaculture industry.

CHAPTER 5

DISCUSSION

5.1 Overall Findings

The respondents in both states recognized positive and negative aspects associated with the two planning and management systems. Respondents in Rhode Island seemed more satisfied with the management system than respondents in Massachusetts. The Shellfish Management Plan process in 2014 in Rhode Island helped to identify issues in the industry and provide some streamlining of management. Several respondents from RI noted contention between the towns and aquaculture officials, which may stem from the lack of involvement of towns in the decision making process. Political support from the state and federal government and growing demand for oysters has allowed continued growth of the industry in Rhode Island.

One of the biggest issues in shellfish aquaculture management in MA is that the management system has not grown along with the growth in the industry. Additionally, respondents noted that the regulations and permitting system could be updated. Respondents stated that progress has been made, however, there is still a lack of opportunity for effective input from stakeholders on regulations. Town-level management of shellfish aquaculture was described as both a benefit and a limitation to the industry. Local involvement adds complexity, but also fosters positive relationships with citizens and between local officials and farmers. While there is general support for shellfish

aquaculture, expansion is limited by town residency rules, which require leaseholders to be a resident of the town their farm is in. Several officials expressed the need for more awareness of and guidance by the state for local aquaculture issues.

In both RI and MA, enforcement issues were discussed, particularly the lack of funding for sufficient enforcement resources. Respondents in both states also discussed *Vibrio* as one of the biggest problems facing the industry and that it will continue to be a major factor moving forward. The relationship between shellfish aquaculture and the general public as discussed was overall positive, however, in both states conflict can arise between shellfish aquaculture and waterfront homeowners and other user groups.

5.2 Examining Perceptions towards Different Levels of State and Local Involvement

The management systems in RI and MA represent two different approaches to governance of shellfish aquaculture. Rhode Island has some level of user input; it functions more as a traditional “top-down” form of management with authority for planning and permitting at the state-level. In comparison, Massachusetts brings some aspects of co-management to its approach. The World Bank defines co-management as, “a decentralized approach to decision-making that involves the local users in the decision-making process as equals with the nation-state (World Bank, 1999).” Neither state fits perfectly with the definitions of these forms of governance (top-down or co-managed), however, it seems that each state is missing some important elements that, if addressed, could improve the management systems.

One element missing from the RI structure that occurs in MA is the allocation of some power to the town to make decisions about shellfish aquaculture in adjacent waters.

Several officials in RI noted that because the adjacent waters are state owned waters, they should be managed by the state. However, this has led to some contention surrounding shellfish aquaculture and between user groups, the towns and regulators. One official discussed that towns and other user groups have the ability to voice their opinions at hearings, but that they were unsure how much weight the opinions really had in the decision making process. This can lead to the towns and other user groups of the area feeling like they have no control over what goes on in waters adjacent to their town.

Respondents in MA discussed benefits and limitations of involving the town in management of shellfish aquaculture. Some farmers discussed frustrations in dealing with some of the town's regulations, such as those related to issuing new licenses and or putting limits on the methods of farming allowed (e.g., cages can only be a maximum of 18" above the ground). Some towns restrict growth of aquaculture due to acreage limitations, residency requirements and limited availability of space in the town's waters. Duff et al. (2003) listed the limited availability of property rights to farmers as a factor that impedes the growth of aquaculture. Farmers are limited in the amount of acreage they can use by town limits and the size of the area available for farming. Farmers also have limited rights to these areas, and cannot fully exclude other users.

Some farmers noted that, in some cases, local officials do not have as much expertise and knowledge about aquaculture as they would like to make informed decisions, but that overall they have a decent working relationship. Tiller et al. (2012) found, in their case study of integrated coastal zone management and aquaculture expansion in Norway, that limited knowledge and expertise of local officials lead to conflicts among user groups as each wanted to promote their own objectives. Some towns

in MA seem to be handling well the management of shellfish aquaculture, while others lack adequate knowledge and capacity to do so effectively. Some officials discussed the need for more state guidance and involvement with towns in issues related to shellfish aquaculture. Respondents discussed needing guidance on how to permit aquaculture in their towns and more collaboration with harbormasters on local issues.

Co-management has been researched and discussed as a popular approach to managing common pool resources (Berkes 2006, Carlsson and Berkes 2005, Armitage 2005, Pomeroy 1996). Carlsson (2000) notes that many traditional definitions fail to understand the levels of complexity that occur in different levels of governance. One complexity that is discussed is the “complexities of the conditions available to support the system” (Carlsson and Berkes 2005). This complexity is particularly applicable to aquaculture in MA and RI.

In both states, there is some level of community involvement in the management structure. The state of RI does not formally include towns and other user groups in the decision making process, other than allowing them to express their opinions at public meetings and hearings. There is one exception where RI CRMC entered into a MOU with a town in RI to allow the harbormaster to provide local enforcement support, as some of the farmers were not operating within their grant site boundaries. In this case, the town has proven that they have the resources necessary to enter into this agreement. In RI, it would be useful to determine the interest and capacity that towns have to be involved with management and whether giving them a bigger role would improve some of the conflicts discussed by respondents.

Massachusetts has granted some of the decision making power to the towns, by allowing them to decide if they want to permit aquaculture in their town and how to site it. Some MA officials noted a desire for more local involvement in state regulatory processes and decisions or the implementation of a multi-stakeholder meeting with state regulators. Interviews with respondents also revealed that some towns in MA are more effectively managing aquaculture than others. It seems as though the state has granted permitting and management authority to the towns without fully understanding their capacity to manage the industry and without sufficient oversight or guidance. This sometimes results in wasted time and town resources. Respondents also discussed that local officials add value to management because they have a personal investment and an interest in the town, and they often take local perspectives into account where a state run system may neglect to do so.

The largely state-run system in Rhode Island is more streamlined and less complex that allows for a simpler, more approachable structure than in MA. While RI respondents were generally satisfied with the current system, they noted that public hearings regarding aquaculture applications sometime become very contentious. Local management in MA adds a layer of complexity and prevents aquaculture operations from expanding beyond town limits. However, it allows local interests to be incorporated into management and builds relationships with the community.

Both states could benefit by allocating some time and resources into evaluating the role that local communities can and should play in managing shellfish aquaculture. In RI, it would be helpful to determine if towns have the interest and the capacity to be involved in more formal management to potentially improve contentious relations

between other user groups and the regulators. MA by law has allocated some management power to the towns already, but should be more aware and more involved in towns that may need assistance in building the capacity to manage shellfish aquaculture in their town effectively.

5.3 Representation of stakeholders in management

The subject of representation was briefly mentioned in the previous section as it relates to the structure of the management systems. In both states, there is a lack of formal representation of local communities in state-level decision making.

The farmers that were interviewed in Rhode Island did not discuss an urgent need for active involvement in industry associations to voice their opinions to regulators. They seemed to have confidence that the regulators were generally supportive of the industry needs and incorporated their opinions into regulations and permitting decisions. Farmers in RI also noted that their voice in the process and their relationship with regulators have improved with the growth of the industry. While farmers do not have authority in the decision making process, they were not dissatisfied with the current management structure.

Oyster farmers in MA expressed the need to be actively involved in state and local management to have their voice heard in order to ensure the interests of the industry. They used phrases like, “It is a necessary evil” and that they participate in the management process to “mitigate regulatory risk.” Several farmers in MA discussed that improvements to aquaculture management have been made, such as better communication between state regulators and the industry. However, some farmers

discussed that it takes time for each farmer to build a reputation in order to have his/her opinions carry weight with regulators. The Massachusetts Aquaculture Association was discussed as a means to participate in state regulatory processes. One farmer noted that a board appointed by the Division of Marine Fisheries votes on final decisions made regarding aquaculture. This board is primarily made up of ground fishermen and there is no representative from the shellfish aquaculture industry. The farmer noted that he feels that sometimes shellfish aquaculture regulations get “rubber stamped” so that they can move on to regulations concerning the ground fishery. He discussed that the industry is trying to get a representative on the board, but that it has not happened yet. Several farmers discussed that they have the opportunity to participate in decisions made about shellfish aquaculture, but they were not confident in the effectiveness of their participation.

Providing a way for stakeholders to voice their opinions and feel that their voice has weight in decisions is an important aspect of effective resource management. Simply providing an opportunity is not always enough. Early involvement, motivated participants and influence over the final decision have been noted as important aspects of a successful participatory process (Dalton, 2005). Dalton et al. (2012) found that involvement in management and more importantly, the quality of the participatory process influences perceptions towards marine resource management. Bonnell (2003) explains the value of a participatory process in that it can foster understanding and mitigate conflicts among user groups. Aquaculture managers in MA and RI will need to carefully consider how they involve stakeholders (towns, farmers) in the management process.

As the aquaculture industry continues to grow in MA and RI, it will create a larger network of stakeholders that are affected by changes in the industry. It is important moving forward that both states determine how to incorporate and better represent stakeholder interests. As it stands, the local management in MA seems to account for some of the other stakeholder groups that use the same areas that are suitable for aquaculture. However, it seems that the shellfish aquaculture industry is not properly represented in state regulatory processes and many industry members feel their opinions have little influence over decisions. Both RI farmers were more satisfied with their voices being heard by regulators. However, there is growing concern from other stakeholder groups, such as recreational users of coastal waters, about the continued growth of the industry. Incorporating relevant stakeholder's interests more directly in the decision making process might help to mitigate potential conflicts.

5.4 The Role of Relationships and Social Capital

Building positive relationships and the maintenance of relationships has been discussed as an important factor in effective governance (Dietz et al. 2003). Young (2014) defines social capital as, "the generalized reciprocity present in networks characterized by trust, which, when exchanged, may result in benefits to members of the network (p. 38)." Young goes on to describe that social capital cannot be achieved unless there is group involvement, she states, "Potential benefits of group involvement are stored as social capital until they are exchanged. Without exchange they would have no value (p. 38)." Therefore there is significant benefit to facilitating meaningful relationships among stakeholder groups.

The fact that shellfish aquaculture allows for private gains off public lands and waters and can exclude other user groups from that area has provided for some negative attitudes and rocky relationships between local communities, other user groups and the shellfish aquaculture industry and regulators. It is clear by the increasing demand for oysters that the general public enjoys eating oysters (Augusto and Holmes, 2015). Respondents felt that members of the general public were supportive of shellfish aquaculture, however, conflicts arise with particular user groups and waterfront property owners. These conflicts will likely continue to be an issue if the industry continues to grow at a fast paced rate.

Respondents in MA noted that in towns where shellfish aquaculture has existed for a long time and in areas well known for their oysters, it has become a staple of the community and a point of pride. In the towns, growers are active members of the community and sometimes will do outreach and education about shellfish aquaculture in the local schools. While some farmers noted their frustration in being restricted to the waters of their town of residence, there is an element of social capital that comes along with being a member of the community.

The involvement of local officials in shellfish aquaculture management in MA also fosters positive interactions between local officials, such as the harbormaster, and the growers. The harbormaster is out on the water many days and maintains the face-to-face communication that can build trust and social capital. Several respondents in MA noted having a good relationship with local officials and spoke about collaborating on town related projects such as rebuilding local oyster populations. The frequent face-to-face interaction is not necessarily maintained with state officials as they mostly interact with

them for inspections. There are exceptions, however, as one MA official felt that local officials have little to no interaction with farmers in many towns.

While some farmers are members of the community where their farm is located, there is no residency requirement in RI. For example, a farmer could live on the other side of the state from his farm. One farmer in RI noted that it would be beneficial to have a residency requirement like MA because, often times, the growers that actually live in the town are the ones who have to deal with local issues. Farmers in RI noted that they have good relationships and communication with some officials, but work better with some more than others. The relationships and social capital in RI do not seem to be developed to the same level as those in MA, which could be attributed to the lack of local involvement and investment in planning, permitting, and management.

Social capital helps to build trust, which potentially leads to users viewing regulations as legitimate increasing compliance (Dietz et al., 2003). Dietz et al. (2003) also note the importance of support for effective monitoring and enforcement, stating “Whether enforcement mechanisms are formal or informal, those who impose them must be seen as effective and legitimate by resource users or resistance and evasion will overwhelm the commons governance strategy (p.1909).” Respondents in both states discussed the lack of resources for adequate enforcement and inconsistent enforcement of regulations. In Rhode Island, the DEM Environmental Police do not have enough manpower to effectively enforce shellfish aquaculture regulations on a consistent basis. Respondents in RI noted that growers rely somewhat on self-policing and they feel the need to educate new growers themselves on proper handling techniques. Similarly, some farmers in MA noted that there is a need for a top down outreach effort to educate new

growers and state and local enforcement officers on regulations. Some farmers in MA felt that enforcement of regulations varied among officers. While farmers have strong motivation to comply with regulations, especially those concerning public health, many issues that have the potential to initiate negative attitudes towards the industry are not being enforced. Many farmers in MA noted issues with derelict gear and poorly defined and enforced standards for maintaining grant sites. Derelict gear or untidy maintenance of a lease site is not only aesthetically displeasing, but it also poses a public safety risk. Additionally, some farmers in MA noted that minimum use requirements of grants are not often met, but the town does not do anything about it. This can lead to public dissatisfaction as the area has been taken away from them, but is not being used to its full potential. This can lead to not only public distrust, but also distrust and negativity among farmers and between farmers and officials.

5.5 Other Factors Affecting the Industry

One of the biggest threats to shellfish aquaculture in RI and MA right now is the increased occurrence of *Vibrio* outbreaks and infections. *Vibrio* is a food borne pathogen that occurs naturally in seawater, but increases in concentration with warmer temperatures. The increase in reported cases of *Vibrio* illnesses in humans has led to more strict regulations on harvest times and traceability during the peak summer months when the waters are at the warmest. These strict harvest regulations are meant to minimize the risk of bacteria multiplying by limiting the exposure of the oysters to warmer temperatures. If an outbreak does occur, however, the farms associated with the waters where the pathogen came from are shut down for a period of time. While the strict

regulations make harvesting more difficult for farmers, it is in their best interest to follow them so that they minimize the risk of an illness from one of their oysters. Farmers often times take extra measures to make sure that their fellow farmers are following proper harvesting methods, to prevent the whole area from being temporarily closed.

Another issue raised by some farmers was the way in which restaurants handle the product. In most cases of a reported food borne illness due to oysters, the farmer takes the blame rather than the restaurant as a potential source of improper handling. Respondents discussed the increased amount of scrutiny that farmers have come under and that they are unsure of the direction that regulations are headed concerning *Vibrio* outbreaks. The goal for farmers is to be able to stay in operation, without a seasonal closure due to the bacteria.

5.6 Limitations and Further Research

The findings from this study provide valuable insights into the governance structure of shellfish aquaculture in two New England states, however, there are some limitations that should be noted. For instance, the respondents represent a small sample of the stakeholder groups involved in the management of shellfish aquaculture in RI and MA. The results may provide some insight into the benefits and limitations of each management system; however, results do not necessarily represent all farmers or all officials in MA and RI. This exploratory study provides a starting point to further examine some of these issues, potential discussion points and solutions.

Further research could extend this study by including more individuals from each stakeholder group and representatives from other groups, like environmental

organizations and recreational user groups. In MA, it would be interesting to further examine if the involvement of local towns in permitting decisions really does have a positive effect on building social capital and fostering positive attitudes towards shellfish aquaculture. A study could also be conducted to determine the interest and capacity for local involvement of towns in shellfish aquaculture in RI, and its potential to build positive attitudes and relationships.

CHAPTER 6

CONCLUSION

This study examined stakeholder perceptions of the varying levels of state and local involvement in shellfish aquaculture management in RI and MA as well as officials and farmers' feelings towards the current management systems. Overall, there are improvements that can be made in managing shellfish aquaculture in both states. The findings from this study can provide useful information and insights to both managers and farmers about issues that should be addressed moving forward.

Three major themes that emerged from the interviews in this study relate to different levels of involvement in management, representation and relationships. Currently in Rhode Island, local towns do not have a seat at the decision making table in regards to shellfish aquaculture. Managers in RI should determine if local officials as well as other user groups that are affected by shellfish aquaculture want to be more involved in management and their capacity to occupy that role. This could help to minimize conflict and mitigate some of the already negative attitudes towards shellfish aquaculture among those stakeholders. In MA, the towns have authority at the local level, but some would like to see more awareness and guidance by the state in local issues. Additionally, farmers expressed a desire to be more involved in state regulatory planning and decision-making.

In both RI and MA, there is a participatory process that allows stakeholders to voice their opinion. Industry members in both states use non-profit trade associations to unite under a collective voice and build a rapport with regulators. While farmers in RI do not have any formal decision-making power, they expressed less of a need for the association than farmers in MA. Both farmers in RI felt that their opinions were generally well represented and taken care of with state regulators. MA farmers discussed the need for more consideration of industry input and representation of their needs. In MA, the local management can provide the opportunity to incorporate local community interests. This opportunity does not necessarily exist in RI because the communities have no formal authority over the waters adjacent to their towns. Potential solutions to this problem in RI would be to include some local officials and other user group representatives on a board that reviews aquaculture applications or to have annual briefings with state and local officials as well as other user groups on the status of the aquaculture industry.

The relationships among stakeholders in the aquaculture industry can have a significant impact on the way the management system functions. In RI, farmers and most state officials have a good relationship. In MA, farmers discussed better working relationships with local officials than with state officials. While local involvement adds complexity to the management system, it can help to build positive relationships and social networks within the community. These positive relationships can build trust, which is beneficial for enforcement and compliance. The relationship between shellfish aquaculture and the general public at times is rocky, however, fostering positive

relationships with aquaculturists and local communities can improve relations and build respect and understanding.

The results of this study indicate that shellfish aquaculture is a growing industry and deserves attention as it can provide environmental, social and economic benefits. Implementing solutions to these issues can help mitigate some of the conflict and provide a better arena for multiple stakeholder groups to voice their opinions without feeling excluded. This will allow a balance of interests, continued enjoyment of coastal areas and sustained development of the shellfish aquaculture industry.

APPENDIX A: INTERVIEW PROTOCOL

Interview Questions

Background/Introductory Questions

- 1) How did you get involved with _____? (shellfish aquaculture, public representation, state agency)
- 2) How long have you been _____? (farming shellfish, with your agency, in your position)
- 3) What is your experience with shellfish aquaculture?
 - Can you describe/give an example of an experience you had with shellfish aquaculture?
- 4) Have you been involved at all in the management of shellfish aquaculture?
 - Management plan, permitting process
 - What do you think about your role?
 - Would you like to be more or less involved (
 - On a scale of 1-5 how much would you like to be involved in shellfish aquaculture management (1=not involved at all, 2=minimally involved, 3=Somewhat involved, 4=very involved, 5=fully involved)

Quantitative Questions

To what degree do you agree with these statements (Likert Scale)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The regulations of shellfish aquaculture are clearly defined					
The regulations are fair to everyone					
Regulations are enforced fairly					
I have an opportunity to participate in decisions made about shellfish aquaculture					
Regulations are generally flexible when changes are necessary					
There is sufficient communication among aquaculture farmers					
There is sufficient communication between aquaculture farmers and officials					
There is sufficient communication among officials					
The officials and the farmers work well together					
I think that managers/officials do a good job in regulating shellfish aquaculture					

Benefits/Limitations of Town vs. State Regulation

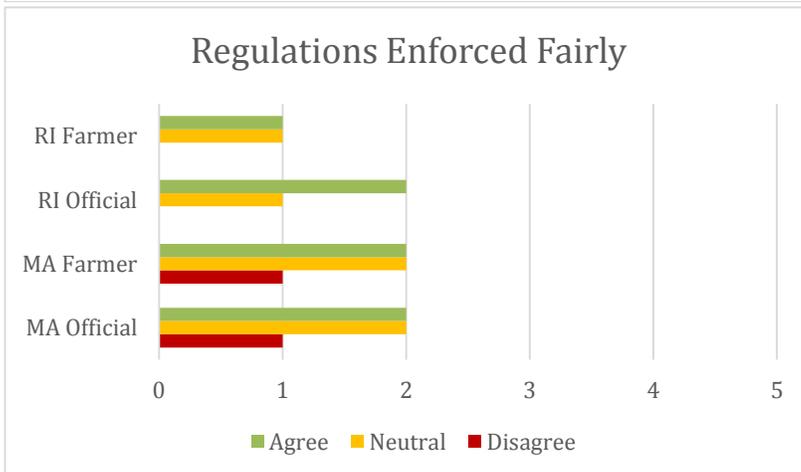
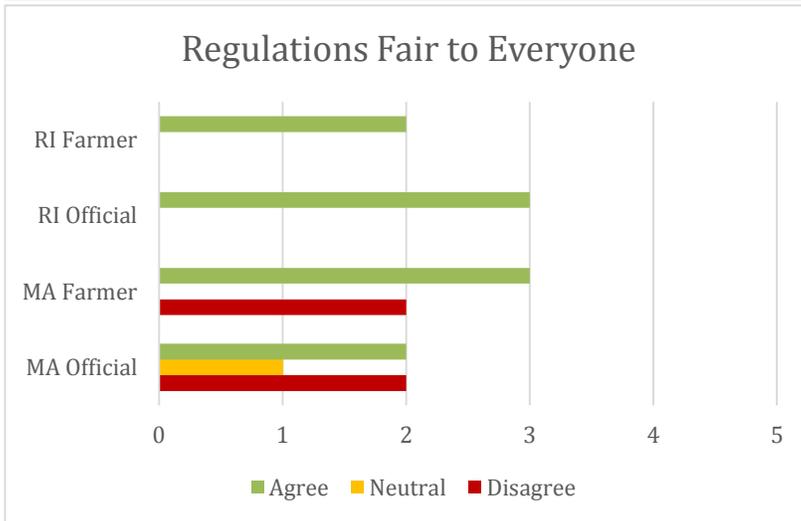
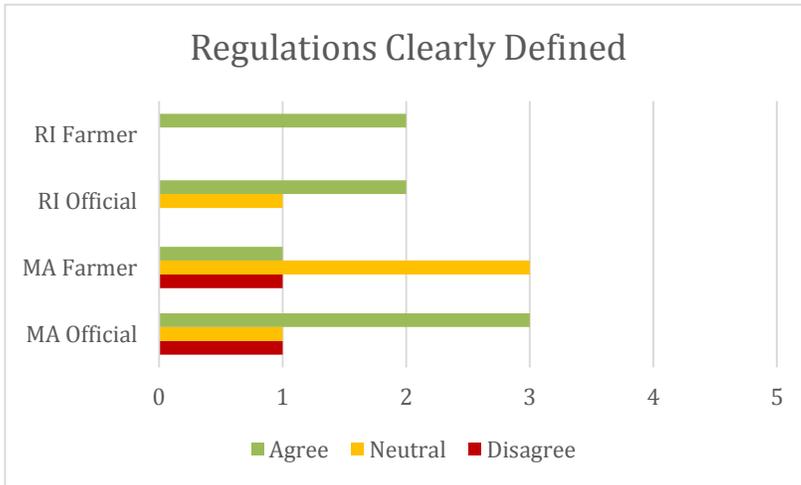
- 5) What are your feelings towards the current management system?
 - How are rules and regulations enforced?
 - Benefits/limitations of having a town/state regulated system

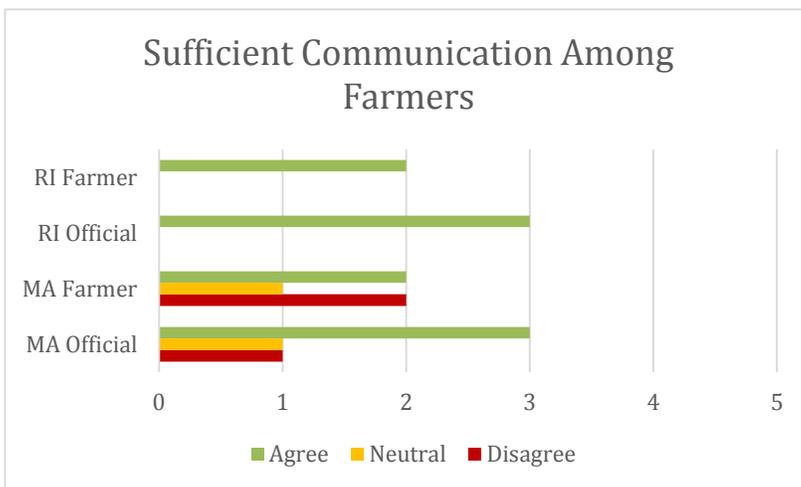
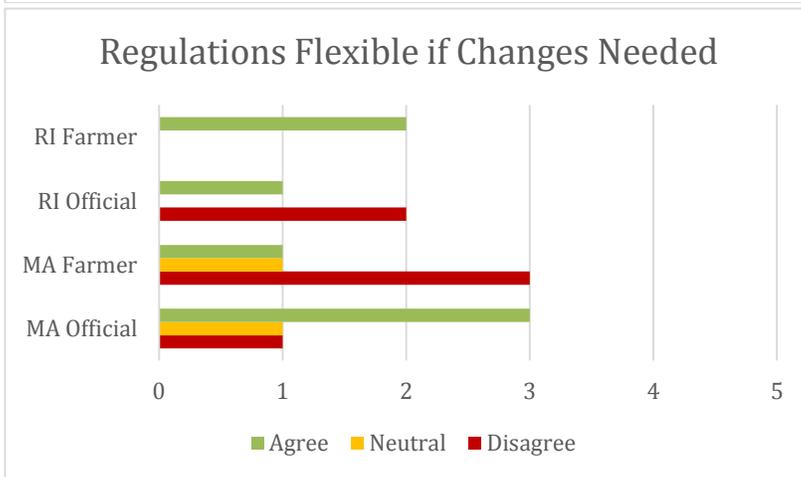
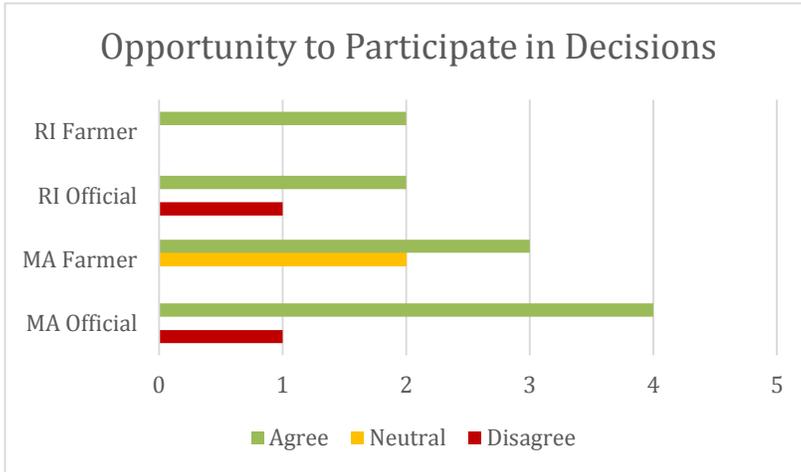
- Structure
 - Are responsibilities of agencies and jurisdictions clearly defined?
 - Complexity
- 6) What do you think about the current permitting system?
 - Farmers: how long did it take to get your farm approved
 - Officials: on average how long does it take for a farm to get approved?
 - 7) Are there challenges within the current management system?
 - What do you think is the biggest challenge in managing shellfish aquaculture in your town/state?
 - Private vs. public property rights, public opposition
 - Factors that facilitate/impede growth of shellfish aquaculture
 - 8) Is there a lead agency/official that stakeholders can approach for guidance and information?
 - Should lead agencies/officials be someone at the town or state level?
 - 9) How is information transferred among stakeholders
 - Among officials, among farmers, between officials and farmers
 - Ex. When new rules are put into place, new proposed farms
 - 10) What do you think about the rules and regulations?
 - Complexity?
 - Are rules and regulations clearly defined, are they fair?
 - Too much enforcement, not enough (ex. In regards to farmers being able to protect their investment)
 - 11) Can you tell me more about the relationship between shellfish aquaculture and the general public?
 - Supportive?
 - Significant opposition
 - Who opposes?
 - Public vs. private property rights

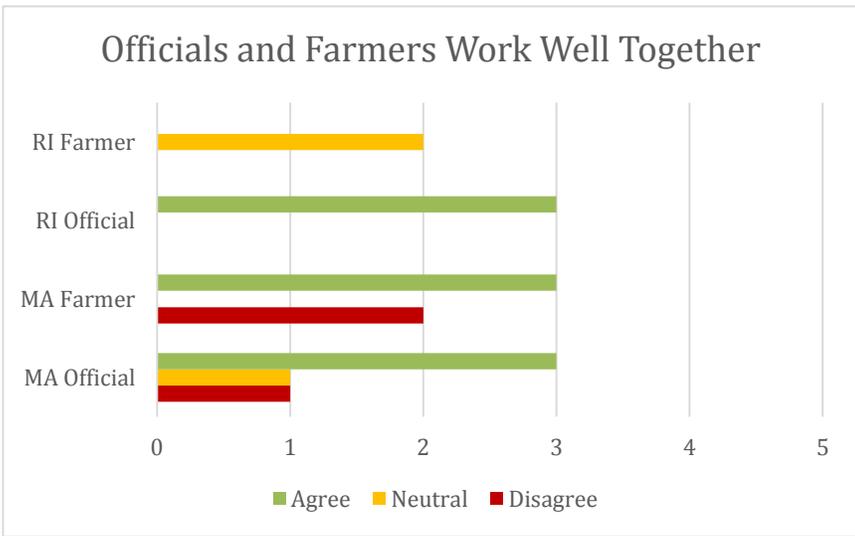
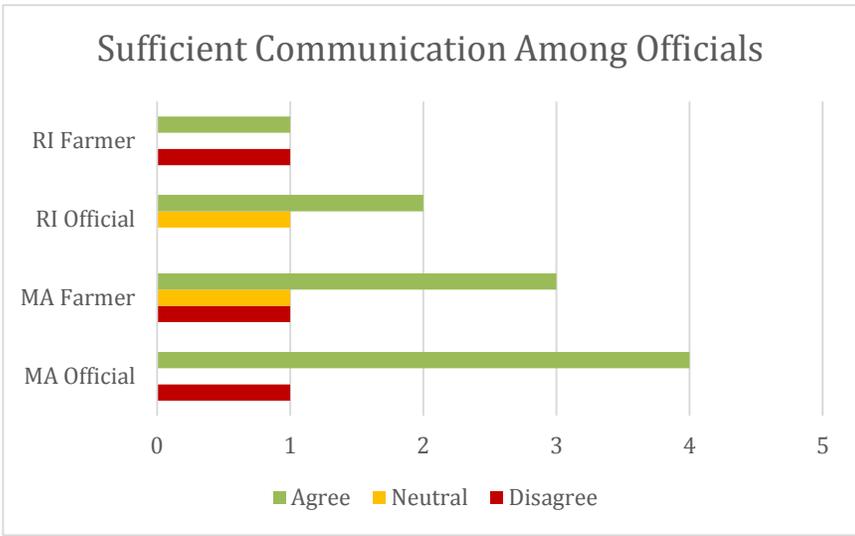
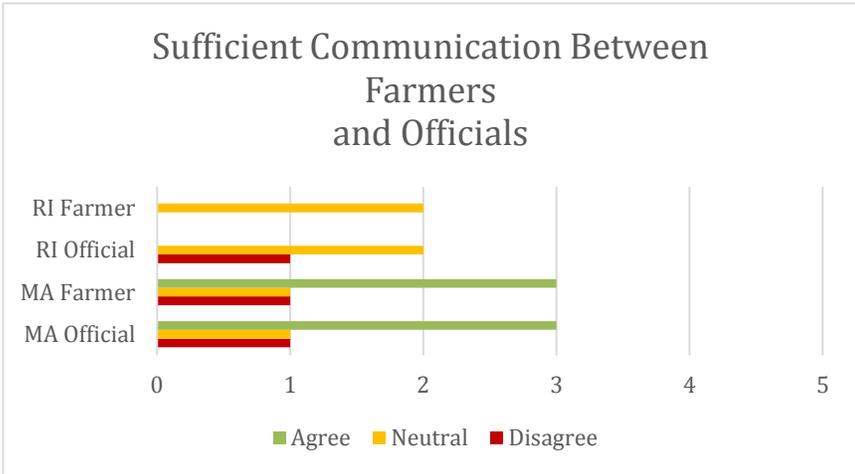
Governance

- 12) Can you tell me more about your interaction with _____?
 - For famers: with officials
 - For officials: with farmers
 - How often do you have face-to-face interaction?
 - Scale (1=never-7=very often)
 - Expand: is it a formally scheduled meeting?
 - Once a week? Once a month?
- 13) What do you think about how conflict is managed?
 - Main method of dispute settlement?

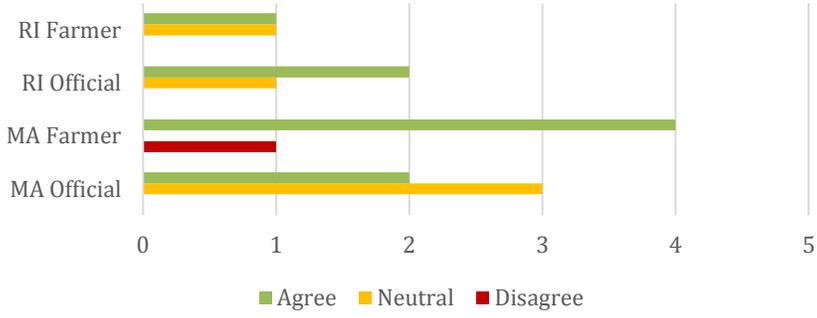
APPENDIX B: QUANTITATIVE SURVEY RESPONSES







Managers Do a Good Job in Regulating Shellfish Aquaculture



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