Stakeholder Engagement in the U.S. Offshore Aquaculture Permitting Process

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Stakeholder Engagement in the U.S. Offshore Aquaculture Permitting Process

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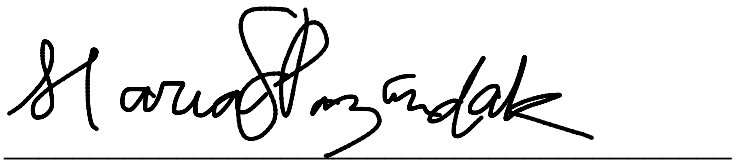
Declaration

I hereby confirm that I am the sole author of this thesis and it is a product of my own academic research.



Maria Pazandak

Abstract

The United States has been struggling with a growing seafood trade deficit, stagnation in wild-caught fishery landings, and declining coastal community economies. One solution to this, which was already recognized half a century ago, is offshore aquaculture. Today, 40 years after the first aquaculture bill was passed, there is only one commercial offshore farm in U.S. federal waters, a consequence of failed attempts of expansion. This research aims to document and compare the current regulatory regimes and permitting processes between the United States (West Coast and Southeast regions), Norway, and Panama, with a focus on stakeholder engagement. To do this, a literature review, literature analysis, and two theoretical framework applications were used.

Interviews and web-based literature reviews of the case study regions and countries found differences between regulatory regimes and permitting processes which have helped or hindered offshore aquaculture growth. The results confirm that the United States' regulatory regime continues to negatively impact the ability for companies to establish offshore farms, and that there are regional differences in the permitting processes. The country comparison found that Norway and Panama have regulatory regimes that streamline the permitting process which have helped promote the growth of the offshore aquaculture industry. The results of the theoretical framework applications document how stakeholders are engaged and found that the current U.S. offshore aquaculture industry is socially unsustainable. This thesis identifies several recommendations to improve stakeholder engagement and the permitting process.

I would like to dedicate this thesis to my Grandma Carol.
Her passion for Iceland inspired my love of the country and motivation to live there.

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Acronyms

ANFF — American Norwegian Fish Farm Inc.

ARAP — Autoridad Nacional de los Recursos Acuáticos

BOEM — Bureau of Ocean Energy Management

BPJ — Best Professional Judgement

BSEE — Bureau of Safety and Environmental Enforcement

CAAPs — Concentrated Aquatic Animal Production Facility

CCC — California Coastal Commission

CSR— Catalina Sea Ranch

CWA — Clean Water Act

DOC — Department of Commerce

EA — Environmental Assessment

EEZ — Exclusive Economic Zone

EIS — Environmental Impact Statement

EPA — United States Environmental Protection Agency

ESA — Endangered Species Act

HSWRI — Hubbs-SeaWorld Research Institute

IWG-A — Interagency Working Group on Aquaculture

JSA — Joint Sub-Committee on Aquaculture

LOP — Letter of Permission

MMPA — Marine Mammal Protection Act

MOU — Memorandum of Understanding

MSA — Magnuson-Stevens Fishery Conservation and Management Act

NAA — National Aquaculture Act

PATON — Private Aids to Navigation

NCCOS — National Centers for Coastal Ocean Science

NEPA — National Environmental Policy Act

NMFS — NOAA's National Marine Fisheries Service

NOAA — National Oceanic and Atmospheric Administration

NOI — Notice of Intent

NPDES — National Pollutant Discharge Elimination System

OCS — Outer Continental Shelf

OCSLA — Outer Continental Shelf Lands Act

RCF — Rose Canyon Fisheries

ROI — Record of Issuance

SCA — Subcommittee on Aquaculture

USACE — United States Army Corps of Engineers

USCG — United States Coast Guard

USDA — United States Department of Agriculture

USFWS — United States Fish and Wildlife Service

VE — Velella Epsilon

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Special thanks go out to my advisors, Dorothy and David, for their support throughout this research. This thesis would not be what it is without their thoughtful guidance and expertise.

I would like to also thank my family, friends, and cats for their support.

1 Introduction

1.1 Context of Research

The United Nations Department of Economic and Social Affairs released a report in 2017 that predicts the world population will reach 9.8 billion in 2050 (United Nations, 2017). They project that it will require a ~28% increase in our food supply (University of Minnesota, n.d.). Several solutions to this have been identified to address the food shortage including switching to a plant-based diet, reducing food loss and waste, and improving aquaculture productivity and environmental performance (Ranganathan et al., 2018).

Aquaculture, as defined by the Food and Agricultural Organization of the United Nations (FAO), is the "farming of aquatic organisms including fish, mollusks, crustaceans and aquatic plants." It has been used for thousands of years as a way to increase or supplement the food supply coming from hunting and foraging. More recently, aquaculture has been used to offset the stagnation in wild-caught fishery landings (White et al., 2004). For decades, it has been one of the fastest growing food production sectors. In 2016, 28.7 million tons of fish were produced from coastal and marine aquaculture (FAO, 2018). It has historically taken place in inland, coastal, and marine waters that are carried out near shore. However, suitable space is decreasing due to the increase in coastal development and the degradation of environmental conditions (Cheney et al., 2010). Companies and governments are moving aquaculture to offshore waters which are from 3-200 nautical miles from the coast (Fairbanks, 2015).

The U.S. Government has been trying to expand aquaculture, specifically offshore operations, due to the belief that it could help address three important issues: a growing seafood trade deficit (in 2016, it was US$14B [NOAA, 2018b]), declining coastal community economies, and offset the stagnation in wild-caught fishery landings. The U.S. government has also backed many policies and plans for the sector (Fairbanks, 2015; White et al., 2004). In order for a company to establish an offshore farm, they need to acquire up to two permits from the U.S.

government. However, a long outstanding problem has been confusion about the permitting process for both the applicant and the government.

Currently, there are at least nine federal agencies involved in regulating offshore aquaculture with the Army Corps of Engineers and the Environmental Protection Agency being regarded as the lead federal agencies (Cicin-Sain et al., 2005; Fairbanks, 2015). This situation has created many procedural gaps and overlaps which makes the process complicated, inconsistent, and leaves the role of stakeholder engagement unclear. As a result, it drags out the permitting process, adds significant cost, and creates a very real barrier to the growth of the aquaculture industry in the U.S. (DeVoe, 1999; Fairbanks, 2015).

Many aspects of offshore aquaculture and the problems associated with it have not changed in the past five decades; and, the progress (or lack thereof) has been well documented and analyzed. The National Research Council in 1978 determined that the developmental constraints of the U.S. aquaculture industry "tend to be political and administrative" (National Research Council, 1978). Many other researchers have come to the same conclusion. Congressional offices, federal agencies, industry, and academic authors have offered countless recommendations to address the issues facing the U.S. marine aquaculture sector (DeVoe, 1999). But how can this situation improve?

In 2014, the Gulf of Mexico Fishery Management Council and the National Oceanic and Atmospheric Administration (NOAA) took steps to establish a lead permitting agency through the creation of a management plan for offshore aquaculture in the Gulf of Mexico and sign a Memorandum of Understanding (BOEM et al., 2016). This effort failed when NOAA was brought to court by a lobbying group made up of more than a dozen seafood companies and fishermen (Huffman, 2018). This left the current state of the regulatory regime, permitting process, and stakeholder engagement unclear.

1.2 Aim of Research

The aim of this research was to gain a better understanding of the current state of the offshore aquaculture regulatory regime, permitting process, and stakeholder engagement in the U.S. This was useful for understanding the evolution of offshore aquaculture development in the United States, for policy development, and for future research. It can also increase U.S. permitting transparency by sharing the results from the theoretical frameworks with relevant stakeholders. The analysis and recommendations can be used by the governments that were part of this analysis to push for future improvements in their regulatory regimes, permitting processes, and methods for stakeholder engagement.

1.3 Research Questions

In the scoping phase of this research, I emailed three regional aquaculture coordinators at the National Oceanic and Atmospheric Agency (NOAA). NOAA is heavily involved in the US Government permitting process (their role is discussed in detail in the Results section under questions Q1 and Q3). They all responded within a week's time and said they were willing and interested to talk via phone call. In discussions, we collaboratively identified one key overarching question. This became the focus of this thesis' effort:

> *How are stakeholders engaged in the U.S. offshore aquaculture permitting process and how can the current regulatory regime and permitting process be improved?*

This overarching question identified three key sub-questions:

Q1. What is the current regulatory regime and permitting process in the United States?

Q2. How does the United States' regulatory regime and permitting process compare to regimes of countries that have established offshore farms?

Q3. What are stakeholders' roles, and how are they impacted by the current permitting process?

In order to address these questions, several U.S. federal agencies (including NOAA, EPA, USACE) and key stakeholders were used as valuable resources to help document the current offshore aquaculture regulatory regime and permitting process in the United States. In addition, case studies were conducted to compare current U.S. offshore aquaculture permitting with two other countries that have established offshore aquaculture facilities. These activities contributed to the literature review in Section 3.

The structure of this thesis is laid out as follows. First, background information regarding offshore aquaculture is presented in Section 2. Following this in Section 3 are theory and theoretical frameworks regarding sustainability, regulatory regimes, stakeholder engagement and public participation theory, a stakeholder power analysis framework, and a sustainability framework. The methodology is presented in Section 4. Section 5 contains the results for Q1-3. The remaining sections present the discussion, conclusion, and recommendations.

2 Background

2.1 The Emergence of Offshore Aquaculture

Offshore aquaculture, also known as open ocean aquaculture, is the farming of aquatic organisms "in the open sea with significant exposure to wind and wave action, and where there is a requirement for equipment and servicing vessels to survive and operate in severe sea conditions from time to time," (Drumm, 2010). Offshore aquaculture pens are installed in U.S. federal waters from 3-200 nautical miles from shore (Fairbanks, 2015), in the exclusive economic zones (EEZ), or in depths greater than 20m (Aguilar-Manjarrez et al., 2013). Countries around the world, including the U.S., see offshore aquaculture as a solution to meet growing demand for seafood and food security; they believe it can also help avoid further degradation of environmental conditions and declines in suitable space due to the increase in coastal development (Cheney et al., 2010).

Offshore aquaculture has been present worldwide as both commercial and experimental farms for over two decades in countries such as Mexico, Australia, the United States, Puerto Rico, and Japan. In 2005, it was recorded that as many as 25 countries had offshore aquaculture efforts (Aquaculture Collaborative Research Support Program, 2008). Generally, companies have chosen to produce and experiment with finfish, shellfish, and macroalgae for their high economic value and/or low environmental impacts. In the United States, the Department of Energy has invested money in experimental offshore macroalgae aquaculture projects to research its human consumption and biofuel potential (Martin, 2018). Shellfish and macroalgae are less energy intensive crops because they are extractive species and do not require extra feed. This also means that they do not have the same environmental concerns as their finfish counterparts (Buck et al., 2017).

2.1.1 Offshore Finfish Aquaculture, the Environment, and Criticisms

The offshore finfish aquaculture industry has been criticized for decades. Some of the most popular criticisms are that 1) offshore finfish aquaculture would contribute to marine pollution; 2) fish meal used in the feeds is unsustainable; and 3) escapees will negatively impact wild stocks. A report prepared by the National Aquaculture Association refuted these criticisms and described them as unfounded (NAA, 2019). Environmental NGOs such as Greenpeace and The Nature Conservancy acknowledge the benefits of offshore aquaculture if it is done well although they still see fish meal and escapees as issues of contention (Allsopp, et al., 2008; The Nature Conservancy, 2017).

While *coastal* aquaculture can produce large volumes of fish in small areas, which contribute to economic gains, negative environmental impacts associated with this activity has made it controversial. Its ecological impact has been well studied. It is known for the destruction of natural ecosystems, a negative impact on water quality, escapees, and the transmission of diseases. In systems with a high density of fish located in a small area, a large amount of waste is produced both from unconsumed feed as well as fecal matter. This can accumulate due to decreased water circulation at the coasts (Primavera, 2006). While offshore aquaculture has similar environmental concerns and impacts as its coastal counterparts, the literature often assumes that water quality will be less of a concern due to higher flow rates the farther a pen is from shore (Belton et al., 2004). A study conducted on the waters surrounding a Panamanian commercial offshore aquaculture operation found a minimal nutrient footprint and low environmental impact (Welch et al., 2019).

When carnivorous fish are farmed, they are fed fishmeal and fish oil that is derived from wild-caught fish. In 1980, it was estimated that salmon diets were comprised of ~70% fishmeal (NOAA, 2018b). A common concern is that as aquaculture production increases so will the demand for fishmeal; and, in turn, the demand for wild stocks (Wijkström, 2009). To ensure that this is not an issue in the future, considerable effort has gone into finding plant-based alternatives through both public and private research. Soybeans, wheat gluten, insects, algae, and lupine are thought to be potential alternatives. This led the percentage of fishmeal in salmon diets to drop to ~25% in 2017 (NOAA, 2018b).

It has been said that escapees from aquaculture appear inevitable (Naylor et al., 2005). In 2017, a net pen, rearing 305,000 Atlantic salmon, collapsed in Washington State waters (Clark et al., 2017). In 2019, a 15x50 cm tear in a salmon farming pen was found in Arnarfjörður, Iceland. While it was not recorded that the salmon managed to escape, there was a possibility that they had and it was noted that salmon had previously been found in a river in the fjord (Ástvaldsson, 2019). These structural and operational failures as well as natural wear and tear (Arechavala-Lopez et al., 2018), maritime accidents (Soto et al., 2001), and storms (Toledo-Guedes et al., 2014) can lead to many concerns relating to the spread of diseases, competition for food and habitat, and hybridization with wild fish populations (Waknitz et al., 2002). Because offshore aquaculture allows for larger facilities and an increase in exposure to oceanic conditions, many have the concern that there is a higher likelihood of damage to the facility and that the escapees will impact the wild populations. Technological innovation in the facility design (cbinsights, 2017) and using sterile salmon whose genomes were edited through CRISPR-Cas9 (Dankel, 2018) are seen as solutions to reduce these concerns. The industry supports the beliefs that fish farmed in offshore waters will have a low survival rate if they escape due to morphological and physical differences as well as being outside of their native range. Studies have shown that farmed salmon have lower spawning successes and that their competition for food is "unlikely to be strong," (Thorstad et al., 2008).

2.1.2 Finfish Pens and Cages

When the pens/cages are farther from the shore and in the open ocean, they are more vulnerable to strong currents and damage. There are different types of cages and general approaches when designing them. Offshore finfish cage types include the following five types: floating flexible or rigid (Figure 1), semi-submersible flexible or rigid (Figure 2), and submersible rigid (Figure 3). The type of cage chosen depends on ocean conditions and depth, along with the type of species being raised. They must be able to withstand routine wear and unusual forces. Generally, the offshore cage design must provide the following: 1) a stable cage shape as to not stress the stock; 2) adequate water exchange to remove waste and meet metabolic requirements; 3) a good working environment where harvestable fish and feed can be handled; 4) a secure location that does not impact navigation and keeps operating costs as low as possible; and, 5) a sound structure by absorbing and deflecting environmental forces. (Scott and Muir, 2000)

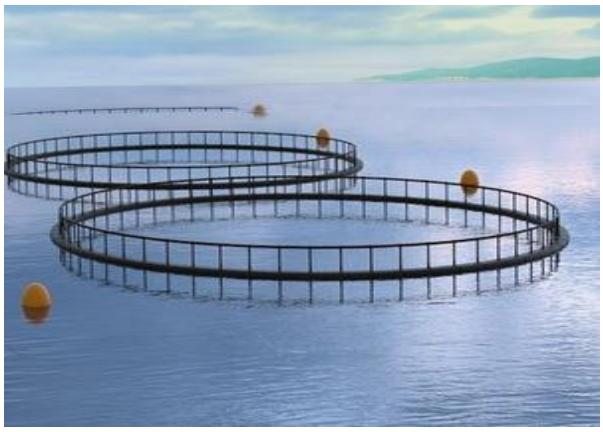

Figure 1 Semi-Submersible rigid cage (Alibaba.com)

Figure 2 Floating rigid cage (chinadaily.com.cn)

Figure 3 Submersible rigid cage (©InnovaSea Systems Inc)

3 Theory and Theoretical Frameworks

3.1 Sustainability Theory and The Three Pillars

Sustainability is a broad concept, and while many definitions exist, they mostly overlap in semantics. One representative example is: "the capacity to maintain or improve the state and availability of desirable materials or conditions over the long term," (Harrington, 2016). As a core concern at regional and global scales sustainability focuses on biodiversity and ecosystems but does not explicitly mention human well-being.

One reason used as a driving motivation to develop offshore aquaculture is to "meet the needs of the present without compromising the ability of future generations to meet their own needs," (Meadowcraft, 2000). This satisfies the concept of sustainability as its goal is to increase the *current* availability (of fish) while avoiding any long-term negative impact. This meets the definition for sustainable development (WCED, 1987). It is, of course, implicit that it focuses principally on human well-being. However, the need to avoid impacting future generations will require considering other factors.

In fact, when considering human-centered sustainability it often has three pillars: economic, environment, and social considerations (see Figure 4). The economic pillar pertains to projects, policies, plans, etc. that impact employment opportunities, generate revenue, allow for trade competitiveness, and that are efficient and productive. The environment pillar focuses on managing pollution (marine, air, and soil), promoting biodiversity, adapting to or mitigating the impacts of climate change, and working to reduce resource depletion. The foundation of the social pillar is equity, social inclusiveness, and community involvement (UNCTAD, 2015; Purvis, 2018). It has been previously concluded by policy makers and planners involved in aquaculture that the industry's development "must be people centered... and socially sustainable," (Sevaly, 2001).

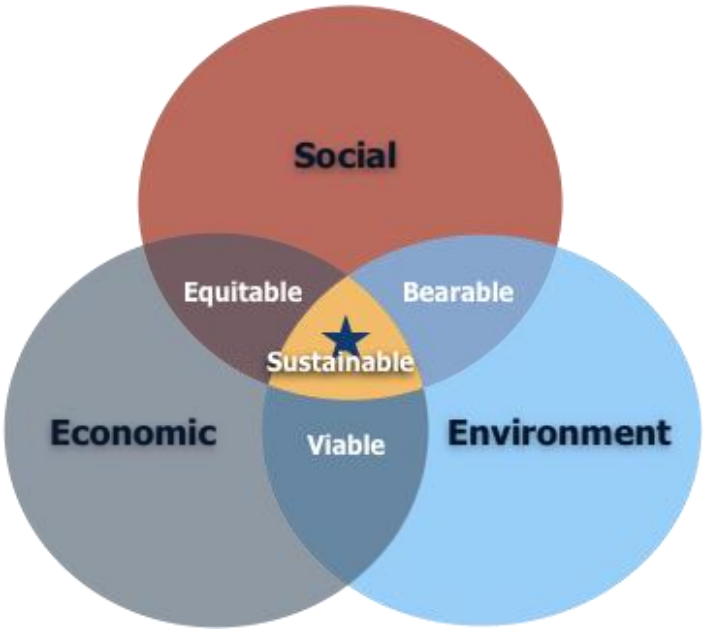

Figure 4 The Three Pillars of Sustainability

3.2 Stakeholder Engagement and Public Participation Theory

In this thesis, stakeholders are considered to be individuals, social groups, communities, or organizations that have rights or interests in a system (Mayers, 2005). Public participation allows stakeholders to interact with governing bodies and decision makers that implement public policies and programs. In a democracy, it is presumed that citizens are important stakeholders and that public participation is a fundamental part of public-government relationships. Public participation can be used to inform, explore potential solutions, and fulfill legal requirements (Bryson et al., 2013).

Public participation further improves democratic governance and promotes the representation of a wide variety of interests (Ridley and Jones, 2002). A democratic approach to participation is valued for the empowerment of ordinary citizens (INVOLVE, 2005) as well as the promotion of equity for underrepresented groups (Innes and Booher, 2004). Groups that are not included in the decision and policy making process may "disproportionately bear the negative (social, economic or environmental) impacts of projects or policies while not benefiting from the positive," (Innes and Booher, 2004).

Stakeholder engagement can be broken down into three different categories: consultations, informing, and participation. A consultation is when stakeholders are included in the decision-making process and that their ideas can directly affect the direction of the project. This is considered to be a two-way flow of information. Informing occurs when stakeholders are told about project decisions and its status. This is considered to be a one-way flow of information. Last is participation, which includes stakeholder's involvement in the project through funding, attending workshops, and attending public hearings. (Pacific Invasives Initiative, n.d.)

3.3 Regulatory Regimes

Regulatory regimes are used by authorities worldwide to limit, influence, or prohibit activity undertaken by a stakeholder (Yoo and Yang, 2005). They can be thought of as a way to achieve regulatory goals (May, 2007). A regime is comprised of "an institutional structure" and assigns responsibilities in order to carry out regulatory actions (May, 2007). It consists of a "body of rules that govern the industry including laws, policy statements, guidelines, and standards," (Howlett and Ramesh, 1995). A regulatory regime is considered appropriate when it is effective at achieving its objectives – when it is coherent, efficient, and simple (Basedow and Kauffmann, 2016).

The U.S. has been considered to have an inappropriate offshore aquaculture regulatory regime because current policy has been unable to achieve its objectives of increasing and expanding the activity. (Fairbanks, 2015; National Research Council, 1978)

3.4 Sustainability Framework

One reason identified to develop offshore aquaculture is to "meet the needs of the present without compromising the ability of future generations to meet their own needs," (Meadowcraft, 2000). This is also the definition for sustainable development. Mathur et al.'s *Conceptualizing stakeholder engagement in the context of sustainability and its assessment* is used as a guide to determine whether sustainability is being pursued when considering stakeholder engagement. According to Mathur et al., 2008, for a project to pursue sustainable development it must include the following three stakeholder engagement perspectives: 1) a strategic management perspective,

2) an ethical perspective, and 3) a social learning perspective. Current practices often apply the perspectives separately or as a combination of 1 and 2, but rarely are elements from all three perspectives combined. If current offshore aquaculture projects are truly sustainable, it would engage stakeholders from three different management perspectives.

The strategic management perspective is used by management to identify claims or groups that should be paid attention to and are important for the company. This perspective is considered "utilitarian in nature" because it urges the use of stakeholders to ensure "the well-being of an organization or the achievement of its objectives," (Brugha and Varvasovszky, 2000). Included in this perspective is the engagement of stakeholders to educate them of scientific and objective knowledge in order to gain support for decisions. These stakeholders are engaged in order to ensure that the project is not jeopardized by resolving and avoiding any possible conflicts.

The second approach, the ethical perspective, includes the democratic principle of participation which considers stakeholders as citizens who have a right to influence a service or activity. Stakeholders in this perspective are viewed as the public and that their "participation enhances democratic governance and promotes representation of diverse interests," (Mathur et al., 2008). An aim of this perspective is to promote equity and citizen empowerment. Stakeholders that aren't included from the decision-making process may not benefit from the positive impacts, and they may experience an excessive amount of negative impacts (Meppem and Gill, 1998).

The last approach, the social learning perspective, values shared communication and learning between all involved stakeholders. Essential criteria for this perspective include the sharing of cultural knowledge, consensus building, respect for perspectives, and the distribution of power equally between all stakeholders (Van Driesche and Lane, 2002; Innes and Booher, 2004). In this context, stakeholder engagement is used to "understand the diverse needs and expectations" and to make sure that their input is respected and included in the development of the project (Mathur et al., 2008; Thomson et al., 2003; Olander, 2007).

3.5 Stakeholder Power Analysis

To determine the role of stakeholders, a stakeholder power analysis can be used. It is used to determine how people impact institutions, policies, and vice versa. It can also reveal the key actors in the system and their influence on a project, plan, or process, as well as stakeholder relationships and power differences. Relevant to this research, this type of analysis has been used in recent years to explore stakeholder engagement in Chinese mariculture development (Yu & Yin, 2019), to understand the role of aquaculture stakeholders in traditional fisheries management (Martínez-Novo et al., 2017); and, it has been implemented to understand and analyze the power of local stakeholders in south-western Bangladesh in a participatory biodiversity conservation policy program (Sadath, Schusser, & Kabir, 2017).

James Mayers' 2005 Stakeholder Power Analysis is one example of a framework that can be used. The outcome of the application of this tool is a chart that describes stakeholders' key interests, their importance to a project, their influence on a project, and how much they participate. The results are placed onto a graph which displays a classification of stakeholders based on their relative influence and importance.

The Stakeholder Power Analysis framework by Mayers, 2005 is a six-step process, including:

1) Developing an initial understanding of the system
2) Identifying key stakeholders
3) Investigating the interests and characteristics of the stakeholders
4) Identifying interaction patterns between stakeholders
5) Assessing the power and potential roles of stakeholders
6) Using findings to make progress and assess options

4 Methodology

To answer the research question *How are stakeholders engaged in the U.S. offshore aquaculture permitting process and how can the current regulatory regime and permitting process be improved?* the following sub-questions were constructed.

> Q1. What is the current regulatory regime and permitting process in the United States?
>
> Q2. How does the United States' regulatory regime and permitting process compare to regimes of countries that have established offshore farms?
>
> Q3. What are United States' stakeholders' roles, and how are they impacted by the current permitting process?

This was done through conducting a literature review, literature analyses, semi-structured interviews for the U.S., U.S. case studies, and case study countries as well as an application and analysis of theoretical framework tools to the United States.

4.1 Q1: What Is the Current Regulatory Regime and Permitting Process in The United States?

To answer Q1, literature reviews, case study selection, stakeholder identification procedure, semi-structured interviews, and conference attendance were completed. This question was split up into two portions: "what is the current regulatory regime in the United States?" and "what is the current permitting process in the United States?" To answer the first portion, a literature review was conducted. To answer the second portion, a literature analysis was conducted from information gathered from a literature review, semi-structured interviews, and from attending a conference.

4.1.1 Literature Review

In order to answer the first portion of Q1, "what is the current regulatory regime in the United States?" a basic understanding of what offshore aquaculture is, a basic knowledge of what regulatory regimes are, and a knowledge of the history of offshore aquaculture legislation was required.

This information was collected from several academic research papers, federal government documents, and highly cited theory (cited more than 100 times). The literature review was used to review offshore aquaculture science and practices, and the history of offshore aquaculture legislation in the United States.

4.1.2 Literature Analysis

In order to answer the second portion of Q1, "what is the current permitting process in the United States?" a web-based literature review was conducted to document the current offshore aquaculture related events as well as the permitting process in the United States. This was done using the following key words: offshore aquaculture, offshore aquaculture United States permitting process, offshore aquaculture United States regulatory regime, United States offshore aquaculture companies.

4.1.3 Case Study Selection

For the United States, two regions determined to have significant offshore aquaculture efforts were chosen. During the research stage, the regions were identified through interviews with the NOAA Regional Aquaculture Coordinators from the New England/Mid-Atlantic, West Coast, and Southeast regions. The three coordinators were asked about the current efforts in their regions. This highlighted which regions currently had the most significant efforts.

4.1.4 Stakeholder Identification Procedure

To begin identifying stakeholders, the federal agencies involved in the permitting process were identified. This initial identification occurred as a result of the literature analysis and preliminary interviews with NOAA. From here, other stakeholders were identified using a combination of approaches:

i. *Identification by key agencies:* The federal agencies involved in offshore aquaculture can identify groups whom they know to be interested in the key issues

ii. *Identification by other stakeholders:* Stakeholders can identify other stakeholders involved in offshore aquaculture (Mayers, 2005)

4.1.5 Semi-Structured Interviews

To augment this information collection, semi-structured interviews with relevant federal agencies and stakeholders, who were identified as an outcome of the previous step, were conducted. Initial contact was made via email informing the individual of the intent of the study. Data protection and informed consent policies were observed at the beginning of the interviews. This provided additional details that were not available or clear from the sourced documents. The literature analysis and semi-structured interviews focused on addressing the following questions:

- How many commercial offshore farms are in the country/region?
- How many offshore farms have been proposed and granted/non-approved?
- How many projects were cancelled? Why were they cancelled?
- How much did it cost? Cost breakdown? How long did it take?
- How many offshore farms are currently in the pre-planning and permitting process?
- When were these processes started, and what are their current statuses?
- Is there collaboration between permitting agencies when planning public hearings?
- Does your region have a Memorandum of Understanding?
- Are public hearings required as part of the permitting process?

4.1.6 Conference Attendance

To gather the most up to date information and science regarding offshore aquaculture and improving U.S. regulatory efficiency, I attended the Aquaculture America 2020 conference from February 9-12th (Appendix C). In preparation to participate in the conference, I identified specific sessions regarding offshore aquaculture, U.S. permitting, and stakeholder engagement that would provide more empirical information to aid my thesis questions.

Presentations made by well-known key stakeholders such as Michael Rubino (senior advisor for seafood strategy at NOAA), Neil Anthony Sims (CEO of Ocean Era, LLC), and Don Kent (President and CEO of Hubbs-SeaWorld Research Institute and former CEO of Rose Canyon Fisheries), and presentations related to offshore aquaculture, U.S. permitting, and stakeholder engagement were attended.

4.2 Q2: How Does the United States' Regulatory Regime and Permitting Process Compare to Regimes of Countries That Have Established Offshore Farms?

In order to answer question Q2, a case study selection, literature analysis, and semi-structured interviews were completed.

4.2.1 Case Study Selection

Two countries were used comparatively and were selected based on having substantial offshore farms. This was done using the following key words and phrases: offshore aquaculture world's first, and offshore aquaculture world's largest. The selection was limited to two countries to allow for more in-depth analyses to occur.

4.2.2 Literature Analysis

The literature analysis was also used to answer question Q2, "How does the United States' regulatory regime and permitting process compare to that of countries that have established regimes?" of the research question. Two case study countries were selected for a comparative analysis and to inform recommendations.

A web-based literature review was conducted to document the current offshore aquaculture related events as well as the permitting process in the selected case study countries. This was done using the following key words: offshore aquaculture Panama/Norway, Panama/Norway offshore aquaculture permitting process, Panama/Norway offshore aquaculture regulatory regime, Panama/Norway offshore aquaculture companies.

4.2.3 Semi-Structured Interviews

To augment this information collection, two semi-structured interviews were conducted. One stakeholder from each case study country was selected based on having first-hand experience with the permitting process either through distributing the permits or through being a permit recipient. Initial contact was made via email informing the individual of the intent of the study. One interview was conducted via phone call with the stakeholder from Panama. The other interview was conducted in person in Norway. Data protection and informed consent policies were observed at the beginning of the interviews. The interviews provided additional details that were not available or clear from the sourced documents. The literature analysis and semi-structured interviews focused on addressing the following questions:

- How many commercial offshore farms are in the country/region?
- How many offshore farms have been proposed and granted/non-approved?
- What is the current permitting process? How many permits are needed?
- How many national agencies are involved?
- How long does it take to get all permits?

4.2.4 Comparative Analysis

A comparative analysis was used to look at similarities and differences between the selected case study countries and the United States to allow for recommendations to be made. Important factors such as the current state of offshore aquaculture in each country and the current regulatory regime and permitting processes were analyzed.

4.3 Q3: What Are United States' Stakeholders' Roles, And How Are They Impacted by The Current Permitting Process?

In order to answer question Q3, semi-structured interviews and an application of the theoretical frameworks that were introduced in Section 2 was completed.

4.3.1 Semi-Structured Interviews

To determine how stakeholders are engaged in offshore aquaculture permitting, the following questions were asked during the initial interviews:

- Who are the stakeholders? What are the relationships between the stakeholders (e.g., independent, dependent, or collaborative)?
- How are stakeholders engaged? What roles do the stakeholders play, and do they have decision authority?

4.3.2 Theoretical Framework Application

To answer research question Q3, "what are stakeholders' roles, and how are they impacted by the current permitting process?", I applied the two previously introduced theoretical frameworks. While there are no existing theoretical frameworks specifically designed to analyze stakeholder engagement in offshore aquaculture, theoretical frameworks designed for construction projects and stakeholder power analyses were used to answer the question. The collected answers facilitated the generation of suggestions on how to improve the current permitting process and increased our understanding of it.

The Stakeholder Power Analysis framework was applied to the results from the literature analysis from question Q1 and from the semi-structured interviews to determine stakeholders' roles in the permitting process.

1) Develop an initial understanding of the system

   The initial understanding of the system was determined from the results from the Q1 literature review and literature analysis.

2) Identify key stakeholders

   Stakeholders were identified using a combination of approaches:

   i. *Identification by key agencies:* The federal agencies involved in offshore aquaculture can identify groups whom they know to be interested in the key issues

   ii. *Identification by other stakeholders:* Stakeholders can identify other stakeholders involved in offshore aquaculture (Mayers, 2005)

These stakeholders were identified through the semi-structured interviews with NOAA, EPA, USACE, and presentations made at the Aquaculture America 2020 conference. The stakeholders were then categorized into three groups based on whether they are affected by or can affect the process/project and how they benefit from it: 1) internal or direct primary stakeholders are the main beneficiaries of the permitting of offshore aquaculture and can immediately affect the system; 2) interface or indirect primary stakeholders do not directly benefit from the project by will be affected by the project, they are also outside of the main organization but can impact it; 3) external or secondary stakeholders are those affected by the process or project.

3) Investigate the interests and characteristics of the stakeholders

To learn more about each stakeholders' interests, the results from the question Q1 literature review, literature analysis, and information from semi-structured interviews and Aquaculture America 2020 were gathered. The results from this were compiled into a table with the results from Step 5.

4) Identify interaction patterns between stakeholders

Interaction patterns were identified by the stakeholders that were interviewed or by the stakeholders that presented at Aquaculture America 2020 and organized in a figure. The figure is organized into three levels based on their categorization. The internal or direct primary stakeholders are placed at the top with the interface or indirect primary stakeholders in the middle, and the external or secondary stakeholders at the bottom. Arrows are drawn connecting stakeholders that engage with each other, and the arrows are color-coded based on the type of interaction that is identified. If the type of engagement/information flow is one-sided, an arrow with a circle at the end is selected to illustrate it. A two-sided arrow is selected for engagement/information flow that is shared between the two stakeholder groups.

5) Assess the power and potential roles of stakeholders

To assess the power and potential role of stakeholders involved in the offshore aquaculture permitting process, their key interests, importance to the process, influence on the process, and their participation in it was determined. Using a chart included in the tool, the relevant information was organized. Then the stakeholders were classified, low to high, based on their relative influence and importance to the process. A stakeholder with low influence is one that does not have the power to impact the offshore aquaculture permitting process/industry. A stakeholder with medium influence is one that actively participates in the permitting process and whose feedback has the power to impact the permitting process/industry but cannot decide whether a farm can or cannot be established. A stakeholder with high influence is one who has the power to distribute permits and whose feedback/consultation determines whether a farm can be established. A stakeholder with low importance is one who does not have a role in the permitting process. A stakeholder with medium importance is one that is involved is the permitting process but only through giving feedback, attending workshops, and lawsuits. A stakeholder with high importance is one who engages many stakeholders, issues public notices, helps with the site selection.

The stakeholders are placed onto a graph provided by the tool to classify them according to their relative influence and importance. This graph was used to identify possible areas of improvement.

6) Use findings to make progress and assess options

The results found were used to support and create the recommendations to improve stakeholder engagement in offshore aquaculture.

The Sustainability framework was applied to the results from the Stakeholder Power Analysis framework. This was done to determine how stakeholders are impacted by the permitting process through understanding what management perspectives are being used to engage them. Based on the given descriptions for the perspectives, the results from the literature analysis were used to look for the aligning engagement perspectives.

5 Results

5.1 Q1: What Is the Current Regulatory Regime and Permitting Process in The United States?

As a result of the literature analysis, a History of U.S. Offshore Aquaculture Legislation from 1970-2020 (5.1.1) has been produced. This section illustrates what the current regulatory regime is and how it came to be the way it is, answering the first portion of question Q1.

The results for the second portion of question Q1 regarding what the current permitting process is can be found in the following sections: 5.1.2 Gulf of Mexico Lawsuit (2014-2020), 5.1.3 Introduction to Offshore Aquaculture Companies, 5.1.4 Permitting Process, and 5.1.5 Regional Comparison. A summary of the results can be found in Section 5.1.6.

As a result of the preliminary interviews with NOAA Aquaculture Regional Coordinators, the West Coast Region was identified as having the only commercial offshore farm in U.S. federal waters; and, the Southeast Region was identified as having significant efforts by the U.S. federal government to establish commercial offshore farms. These two regions were then selected to be the U.S. case studies. They were compared to look for potential differences in their permitting processes. Details about the Gulf of Mexico MOU are included in this section.

5.1.1 History of U.S. Offshore Aquaculture Legislation *(History from 1970-2020)*

The United States government has been interested in aquaculture for over a century. This interest was supported and expanded under several federal agencies beginning in the 1800s. For over a century, much of the focus was on both recreational and commercial fisheries enhancement to create new fisheries and to supplement existing populations through the National Fish Hatcheries System (Nash, 1979; USFWS, 2013). A national interest in commercial offshore aquaculture did not begin to appear until the 1960s and 1970s. This is when there was a significant focus on food

production and security, along with growing concerns about the sustainability of wild fish catches (Novotny, 1969). Aquaculture had been framed by practitioners, researchers, and government actors as an exciting new technology. However, it was and continues to be held back by political and social barriers (Fairbanks, 2015; Stickney, 1996). As early as 1978, the regulatory regime was described as inappropriate; and, the reasons for lack of its development is not due to scientific and technological limitations, but rather administrative and political issues (National Research Council, 1978). While interest has further increased in recent years, offshore aquaculture continues to be "governed through a piecemeal and complicated set of laws" (Fairbanks, 2018). Documentation of the policy formulation process over the past 5 decades clearly clarifies why the sector's growth has been inhibited.

Countless attempts at the national level have been made since 1975 to pass legislation regarding the development and management of offshore aquaculture. Between 1975 and 2020, only one law had passed after three failed attempts followed by eight other attempts since (see Figure 6). A common disagreement regarding the proposed policies was over who should be the "lead agency to direct and finance aquaculture activities in the country" (Nash, 1979). An overwhelming number of the proposed legislative bills designated the Department of Commerce (DOC) as the lead federal agency to permit and coordinate aquaculture activities. In addition, territorial conflicts emerged from agencies trying to gain power in the management of aquaculture (Fairbanks, 2015). There was also a lack of uniformity in regard to how aquaculture was being defined. As a result, it impacted whether a proposed policy recommended the DOC or the Department of Agriculture (USDA) as the lead agency (see Figure 5).

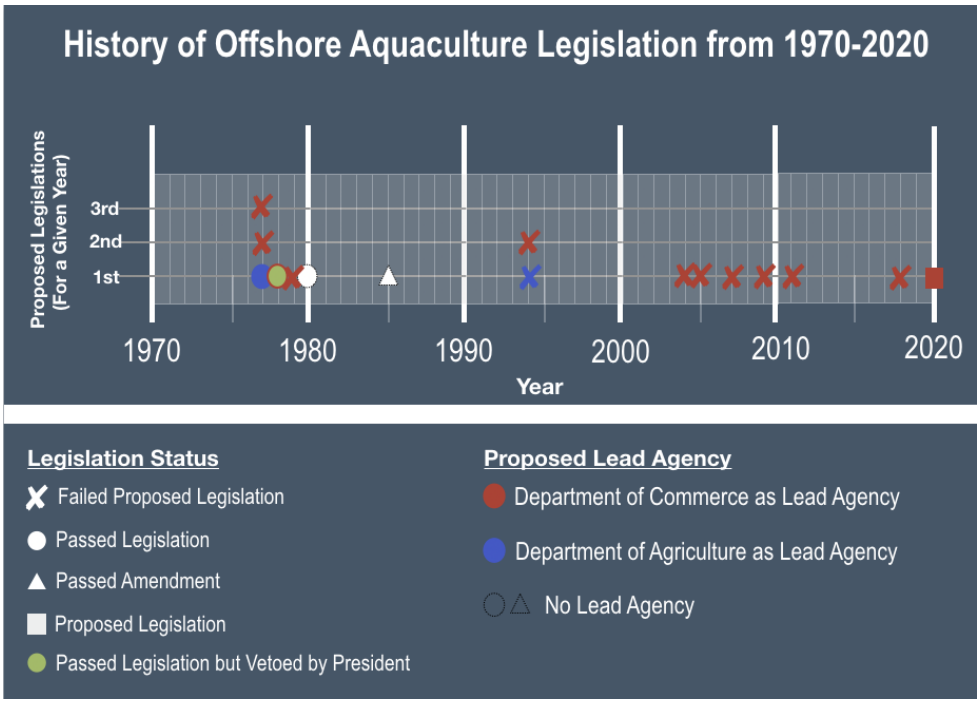

Figure 5 History of Offshore Aquaculture Legislation from 1970-2020

In the 1970s, several environmental laws were passed including the Marine Mammal Protection Act (MMPA), the Clean Water Act (CWA) in 1972, and the Endangered Species Act (ESA) in 1973 (Nash, 1979). Concerns about maximizing the yield of wild fish and foreign fishing vessels off the coasts of the U.S. brought the ocean into focus of the national government (Morton, 2015). This led to the passage of The Magnuson-Stevens Fishery Conservation and Management Act (MSA) in 1976, giving the National Marine Fishery Service (NMFS) the authority to manage marine fish stocks in addition to its authority given through the MMPA and ESA (the NMFS resides within the DOC). It also governs foreign fishing in the EEZ (3-200nm) and until 1991, issued permits to foreign vessels (16 U.S.C. §§1801-1891d). While, at the time, these acts didn't specifically mention aquaculture, they would later influence the efforts toward the expansion of aquaculture in federal waters.

Beginning in 1977, the Aquaculture Organic Act and the Aquaculture Policy Act were introduced in Congress and would have made the Secretary of Commerce the lead authority in coordinating and organizing aquaculture activities in federal waters but did not pass. The Aquaculture Policy Act of 1977 was re-introduced the following year and was approved by the

House of Representatives and the Senate after it included provisions to protect commercial fishermen who were worried about competition between offshore fishing and aquaculture. At the end of the 95th Congressional Session, the bill was vetoed by President Carter due to its high fiscal demands (Nash, 1979). The bill included Government subsidies such as insurance programs and loan guarantees but "a clear need for them" had not been established (Bergland, 1979). This veto was supported by the freshwater aquaculture farmers who were worried about potential competition with coastal and offshore aquaculture farmers (Nash, 1979).

Also, in 1977, the USDA became engaged in aquaculture by writing the Food and Agriculture Act. This piece of legislation was significant because it designated the USDA as the lead federal agency in food and agricultural science research. Notably, it included aquaculture to be "among the basic functions of the Department of Agriculture," and in the definition of food and agriculture sciences (GovTrack.us, 2019b). It also defined aquaculture as an 'agricultural pursuit', thus creating a territorial conflict with the DOC (Fairbanks, 2015). While it does not specifically state that it is the *lead* aquaculture agency, it does appear to indirectly indicate this. While there was some opposition by those worried that the USDA would be more focused on freshwater farming, and that it would detract from the potential of marine and coastal farming, it was widely approved by Congress (Nash, 1979).

The following year, the National Aquaculture Act of 1980 (NAA) was passed and remains the only federal aquaculture-focused bill to date. This bill states that it is in the national interest to encourage the development of aquaculture in the US. The NAA did not nominate a lead agency but rather it assigned responsibilities to the Departments of Commerce, Interior, and Agriculture, and it created the Joint Sub-Committee on Aquaculture (JSA). The JSA, now known as the Subcommittee on Aquaculture (SCA), required each department to take turns leading and coordinating activities to lessen intra-agency conflicts. However, while this occurred, no overarching policy framework was created. This led to "little tangible support for industry growth in terms of either regulatory clarity or financial security," (Fairbanks, 2015).

A study conducted in 1981 commissioned by the JSA (conducted by Aspen Corporation) found that as many as 11 federal agencies were directly involved in aquaculture; and, as well as

50 federal statutes and 120 federal statutory programs that directly impacted the industry. Although this study produced these findings, it did not lead to any significant efforts toward improving the regulatory regime. (DeVoe, 2000)

In 1985, the National Aquaculture Improvement Act (PL 99-198) was introduced and passed. It amended the National Aquaculture Act of 1980, and it specifically established the Department of Agriculture as the lead federal agency to coordinate and disseminate national aquaculture information; it designated the Secretary of Agriculture as the permanent chair of JSA; and, it established the National Aquaculture Information Center in the USDA. This further legitimized the USDA's claim over aquaculture (Cicin-Sain et al., 2004; Fairbanks, 2015; Fairbanks, 2018).

In 1988, the American Norwegian Fish Farm Inc. (ANFF) proposed to build a 47 square mile salmon facility in offshore waters off the coast of Massachusetts. It was the first company to apply for permits for a project of this scale. The permit was issued in 1990 after finding that the operation would not significantly impact the environment. However, the proposed location was relocated farther offshore to avoid conflicts with the fishing industry (Cicin-Sain et al., 2004). But, just nine months later, the permit was withdrawn due to possible environmental, spatial, and regulatory conflicts and concerns. Notably, the public had minimal opportunities to give input (Cicin-Sain et al., 2004; Fairbanks, 2018). It appeared that government agencies and project planners were not ready to address the range of concerns brought up by the project; and, importantly, it forced the agencies to reassess their power and responsibilities (Cicin-Sain et al., 2004). NMFS reassessed its authority over offshore aquaculture and released its findings in an internal DOC policy memo in 1993. The memo determined that under the Magnuson-Stevens Fishery Conservation and Management Act's definition of fishing, which is defined as the "catching, taking, or harvesting of fish", that aquaculture should be included (Fairbanks, 2014).

In 1994, the USDA attempted to pass legislation (National Aquaculture Development Research and Promotion Act) that would make it the lead aquaculture permitting authority. This act sought to amend the National Aquaculture Act of 1980 to allow the USDA to recognize private aquaculture as agriculture, but the legislation was never passed (GovTrack.us., 2019a).

In 2004 the US Commission on Ocean Policy was mandated to submit recommendations as to how to coordinate and create a comprehensive national ocean policy to the President and Congress. It resulted in them calling on the President and Congress to take immediate action to halt the steady decline of U.S. oceans and coasts conditions and also stated that there is a lack of clear regulation for offshore aquaculture (U.S. Commission on Ocean Policy, 2004). President Bush responded with an Ocean Action Plan that proposed an act to give the DOC clear authority to regulate offshore aquaculture and to reduce the regulatory and legal obstacles (Bush Administration, 2004).

In 2005, the National Offshore Aquaculture Act was introduced in the Senate and would have authorized the Secretary of Commerce to implement and establish a regulatory system of offshore aquaculture. It also would have required the Secretary of Commerce to work with other federal agencies to implement a streamlined and coordinated permitting process (S.1195, 2005). This act was never passed, and it failed again when it was reintroduced in the House in 2007 (H.R.2010, 2007). Similar legislation, the National Sustainable Offshore Aquaculture Act, was introduced in 2009 and reintroduced in 2011 would have given the Secretary of Commerce permission to establish an Office of Sustainable Offshore Aquaculture within NMFS and to issue permits (H.R.4363, 2009; H.R.2373, 2011). It failed to pass.

In 2018, the AQUAA Act (Advancing the Quality and Understanding of American Aquaculture Act) was introduced in the House and Senate and looked to establish a regulatory system in the EEZ for marine aquaculture. It would have assigned NOAA to coordinate the regulatory issues (S.3138, 2018; H.R.6966, 2018). This bill was never passed. But, in March 2020, the AQUAA Act was reintroduced in the House of Representatives and was referred to the Subcommittee on Water, Oceans, and Wildlife (H.R.6191, 2020).

Over the course of the past 15 years, there have also been several bills introduced that looked to limit or halt the permitting power of current federal agencies for offshore aquaculture facilities. The National Oceans Protection Act (S.1124, 2005), the Natural Stock Conservation Act (S.796, 2005), and the Keep Finfish Free Act (HR.2467, 2019) looked to prohibit federal agencies from issuing permits to finfish aquaculture until Congress passes a law authorizing

them, until all federal agencies are required to consult with all governors located within a 200nm radius, or until a national standard and regulations are implemented.

5.1.2 Gulf of Mexico MOU Lawsuit (2014-2020)

In 2014, in an effort to stimulate offshore commercial aquaculture, the USDA's SCA was tasked by the Gulf of Mexico Fishery Management Council (under NOAA, see Figure 6) to develop "an effective and efficient federal permitting and regulatory process... and increase the coordination, consistency, transparency, and predictability in making permit decisions," (BOEM et al., 2016). The result was the Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico. Subsequently, in order to coordinate activities between the permitting authorities, an agreement was needed.

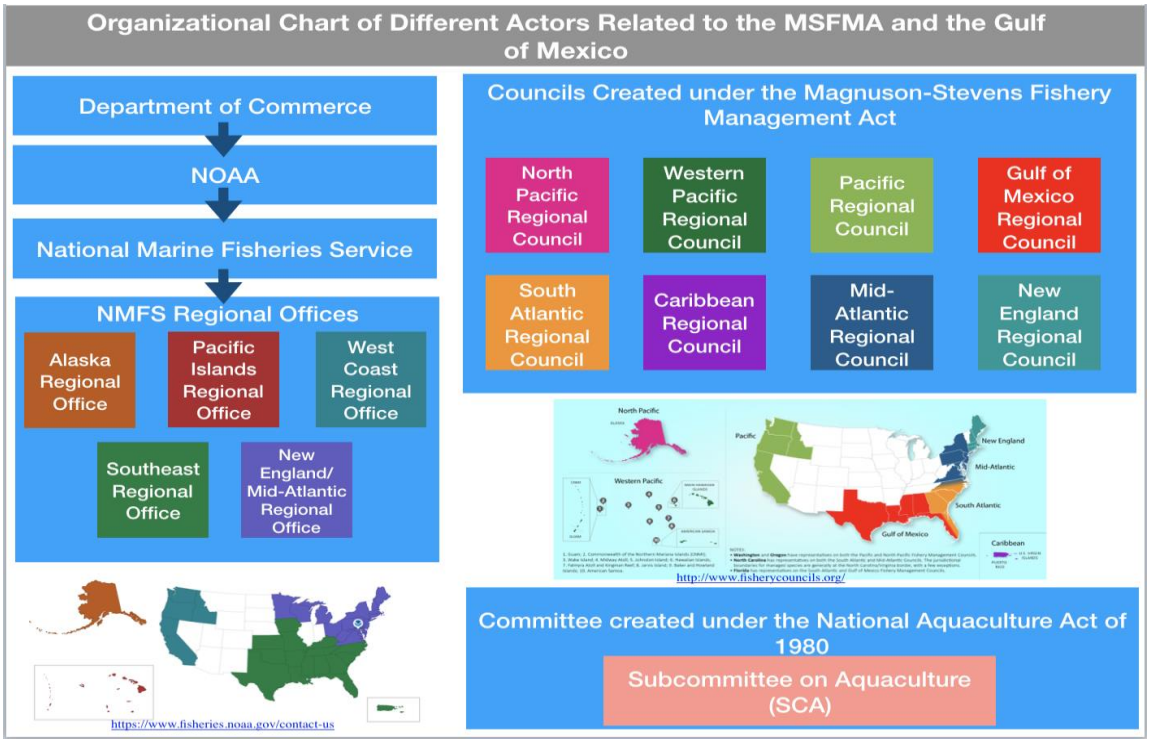

Figure 6 Organization of the agencies, councils, offices, and a committee under the Department of Commerce. These actors are involved in the Magnuson-Stevens Fishery Management Act and in the Gulf of Mexico.

As a result, in 2016, a memorandum of understanding (MOU) for permitting offshore aquaculture in federal waters of the Gulf of Mexico was signed by several federal Agencies. The following signed onto the MOU: the Bureau of Ocean Energy Management (BOEM), the United

States Coast Guard (USCG), the National Marine Fisheries Service (NMFS), the Bureau of Safety and Environmental Enforcement (BSEE), the United States Environmental Protection Agency (EPA), the United States Army Corps of Engineers (USACE), and the United States Fish and Wildlife Service (USFWS). Under this MOU, the NMFS was added as a third permitting authority. The authority for permitting by the USACE and the EPA are explained below.

The purpose of the MOU was to create an appropriate regulatory regime by improving coordination between permitting authorities in order to streamline the permitting process. This would be achieved through the following objectives:

1) Work cooperatively with interested stakeholders, and with each other, to increase awareness of the current regulatory requirements; and, share information which can be informative in their decision-making process.

2) Coordinate and participate in the pre-application and application processes to minimize impacts on protected areas and species.

3) Coordinate public hearings, comment periods, and facility inspections.

The reasons each of the three identified agencies had or asserted permitting authority included:

- The National Marine Fisheries Service had authority to permit aquaculture operations in federal waters in agreement with the Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico which was developed under the authority of the Magnuson-Stevens Fishery and Management Act (16 U.S.C § 1801). This authority, however, was quickly revoked. This is detailed below.

- The U.S. Army Corps of Engineers regulates aquaculture facilities that are located on the seabed to the Outer Continental Shelf. They have this authority under the Section 10 of the Rivers and Harbors Act of 1899, 33 U.S.C. § 403.

- The U.S. Environmental Protection Agency permits discharges of offshore aquaculture activities under the Clean Water Act Sections 301, 318, 402, and 403, (33 U.S.C § 1251 - 1387).

In addition, the USFWS, USCG, BOEM, and BSEE are required to review and provide approvals for the offshore aquaculture operations related to protecting marine navigation, marine life, and the regulation of activities in federal waters. (BOEM, 2016)

In 2016, in parallel to the MOU activity, the NMFS finalized regulations authorizing offshore aquaculture permitting in the Gulf of Mexico. This allowed the NMFS to approve the permitting of up to 20 facilities to collectively grow 64 million pounds of fish. However, a lawsuit was filed shortly after by a lobbying group made up of more than a dozen seafood companies and fishermen. The lawsuit argued that NMFS does not have authority under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). They claimed that the act was intended only for the harvesting of the traditional fishing of wild fish, and that Congress would not have defined it to include fish farming. The lobbyists won the lawsuit in September 2018, which meant that NMFS could not distribute any permits for the Gulf of Mexico (Huffman, 2018). This also meant that the MOU that was signed in 2016 to have NMFS as the lead agency to streamline permitting, increase transparency and cooperation, and to coordinate public hearings needed to be reviewed and revised. Similar MOUs have not been signed in other regions allowing for potential differences in the permitting process and stakeholder engagement.

While NMFS is no longer able to distribute permits, USACE and the EPA are still allowed to grant offshore aquaculture permits. Once corporations receive all required permits from these agencies, they will be allowed to establish offshore farms. In June 2019, NMFS appealed the ruling and are hoping to have a decision made in 2020 (J. Beck, personal communication, October 8, 2019).

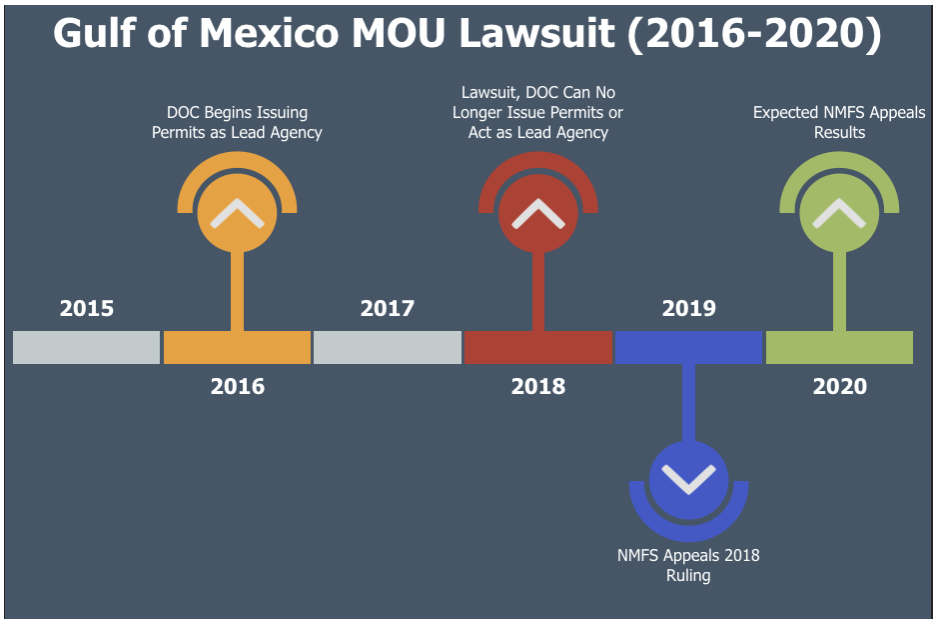

Figure 7 Gulf of Mexico MOU Lawsuit Timeline, 2016-2020

5.1.3 Introduction to Offshore Aquaculture Companies

There have been several attempts to establish offshore farms in federal waters. The first permit was given in 1990 to the American Norwegian Fish Farm, Inc. (ANFF). The permit was withdrawn later that year due to concerns regarding regulations, the environment, and conflicting uses of the ocean space. It was noted that stakeholders, including the public and other federal agencies, had few chances to give input allowing for several concerns to remain unanswered. (Cicin-Sain et al., 2004; Fairbanks, 2018) ANFF was not included in this analysis because of the lack of information that could be gathered (the company is no longer in business). There are also a few other companies, such as Ventura Shellfish Enterprises, working towards permitting a farm in federal waters (Peters, 2020); however, their experiences are not included because they are in the planning stages.

Three notable companies that have gone through, or are currently going through, the process of navigating the U.S. permitting process: Catalina Sea Ranch, Ocean Era, and Rose Canyon Fisheries. They have each had unique experiences with the permitting process. This is due to regional differences such as the implementation of a Memorandum of Understanding (MOU) in the Gulf of Mexico, but also due to different stocks being grown and the size of the farms. The key findings are summarized in the table below and more information about the

companies can be found in Appendix A. A point of clarification – the table references several stakeholders that have not been mentioned up to this point. Their involvement and the details that fed into the construction of this table are documented in the following subsections.

Catalina Sea Ranch successfully navigated the permitting process and was the "first and only permitted offshore aquaculture facility in U.S. federal waters," (Notice of Asset Sale, 2020). The farm is not currently operational as it entered bankruptcy in early 2020 following the filing of a $10-million wrongful-death claim in December 2019 (Mayer, 2020).

Table 1 United States Permitting Process and Offshore Aquaculture Companies

	Catalina Sea Ranch	Ocean Era, LLC	Rose Canyon Fisheries
Region	West Coast	Southeast	West Coast
Facility Location	100-acre farm located 6 nautical miles off the coast of California	45 nautical miles off the south-west coast of Florida	4 nautical miles off the coast of California
Crops	Mediterranean mussel	Almaco jack (Kampachi)	White Sea bass & yellowtail jack
Section 10 Permit	• Standard Permit public notice March 26,2012 • Provisional permit issued July 17, 2012 • Permit issued January 2014	• Application submitted December 13, 2017 • Application withdrawn March 23, 2018 • 2nd application submitted November 2018 • LOP pending January 2020	• Permit first submitted October 2014 • NOI issued in March 2015 • Permit denied in June 2016 following US Navy comments
NEPA	• USACE determined that EA was not necessary	• EPA agrees to act as lead Federal agency • NEPA review is not required because the proposed facility is not considered to be a "new source" but EA is still performed	• EPA agrees to act as lead Federal agency • EPA published NOI, November 2015 • Spring 2016, EPA cancels agreement to lead NEPA • NOAA offers to lead NEPA in May 2017
NPDES	• NPDES permit not required	• NPDES permit submitted in 2018 • EPA public notice issued August 20, 2019 • Public hearing determined to be necessary and scheduled for January 28, 2020	• RCF did not make it to this stage
Facility Approved?	• Yes (First application 2012, approved in 2014) • CSR entered bankruptcy in 2020	In progress	Permits withdrawn June 2017
Permitting Length	3 Years	November 2018-Current (March 2020)	October 2014-June 2017

5.1.4 Permitting Process

The following section goes into detail about the federal agencies involved in the permitting process, the agencies that give consultations, as well as the permits that are necessary. The experiences of CSR, Ocean Era, and RCF as they applied for the permits can be found in Appendix A.

Permitting Agencies

The Army Corps of Engineers and the Environmental Protection Agency are the only two federal agencies that can distribute permits for offshore aquaculture. While other federal agencies cannot distribute permits, an authorization may be required for the proposed project. BOEM and BSEE must review and approve a facility if it is located within the outer continental shelf. Federal agencies are also consulted to ensure that proposed facilities do not conflict with laws that fall under their jurisdiction. NMFS is greatly involved during the process, giving consultations on the Endangered Species Act, Essential Fish Habitat, National Historic Preservation Act, Fish and Wildlife Coordination Act, National Marine Sanctuary Resources Act, and the Marine Mammal Protection Act. Once the permits are obtained from the EPA and USACE, the applicant must receive authorization from USCG to place buoys and markers, also known as Private Aids to Navigation (PATON), at their facility location (EPA, 2019).

Section 10 Rivers and Harbors Act

The Rivers and Harbors Appropriation Act of 1899 was created to consolidate several pre-existing laws regarding federal oversight of the United States' navigable waters. It established the federal government's authority over the regulation of activities in almost all U.S. waters (Rivers and Harbors Appropriation Act of 1899). Section 10 of the act prohibits the creation of any obstruction to navigable waters that has not been approved by Congress, unless it has been recommended by the Chief of Engineers (EPA, 2019). While this section applies specifically to "ocean and coastal waters within three nautical miles from shore," the Outer Continental Shelf Lands Act (OCSLA) extends the laws and regulatory power of the U.S. over the outer continental shelf. The OCSLA gives authority to the Secretary of the Army to ensure that navigation is not obstructed by devices that are attached to the seabed. Any offshore aquaculture facility in the outer continental shelf (OCS) that is considered an "installation or other device" and is also

attached to the seabed will require a section 10 permit. This section allows the Army Corps of Engineers to regulate the placement of aquaculture facilities in U.S. waters (USACE, n.d.a).

USACE gives authorization to offshore activities subject to Section 10 through two forms of individual review and three types of general permits. The two forms of individual review include Individual Permits and Letters of Permission. These permitting decisions also take into consideration the public interest which is determined by balancing the benefits of the facility against the detriments of the facility. (USACE, n.d.a)

The Standard Permits (Individual Permit) are issued when projects are projected to be more impactful to the surrounding environment and when it does not meet the criteria for a General Permit. It includes an evaluation using additional environmental measures as well as a more extensive and thorough public review. It usually has a 21-day comment period although it can also be between 15-30 days. It can take between 60-120 days to process the permit with larger or controversial projects taking longer. This permit is issued by a Corps District Engineer after the pre-application consultation, the public notice and comment period, and the completion of the environmental impact assessment. (USACE, n.d.a)

A Letter of Permission (LOP) is a type of individual permit that is issued through an "abbreviated processing procedure," (USACE, n.d.b). It is used when the district engineer determines that the proposed facility would have minor impacts on the environment and should not have substantial opposition. A LOP does not include an individual public notice which means that it does not accept public feedback. LOPs and General permits are not expected to be applied to offshore aquaculture facilities "because these authorizations are used for activities that are expected to pose minor impacts," (Environmental Law Institute, 2015).

General permits are issued for projects that will have minimal negative effects to the environment. They are issued on a larger scale basis such as nationally, regionally, or statewide in order to expedite the authorization process and to reduce the duplication of effort between different agencies involved. (USACE, n.d.a)

National Environmental Policy Act

The National Environmental Policy Act (NEPA) is an environmental law that was enacted by the President's Council on Environmental Quality in 1970. Its purpose is to ensure that all federally assisted, licensed, and agency actions are evaluated for the effect of their actions on the environment to limit harm. NEPA is applied to any project that involves permits that are issued by federal agencies unless it is "categorically excluded" from a detailed environmental assessment. This occurs when a federal action does not "individually or cumulatively have a significant effect on the human environment" (40 CFR 1508.4; EPA, 2017). A requirement made by NEPA is that federal agencies must prepare environmental assessments (EA) and environmental impact statements (EIS). A beginning step of this process is that a Notice of Intent (NOI) is published by the federal agency to the Federal Register. This NOI "informs the public of the upcoming environmental analysis and describes how the public can become involved in the EIS preparation" (EPA, 2017). This marks the beginning of the scoping process where the public and the agency work together to determine possible issues and alternatives that can be addressed in the EIS. When the draft EIS is published, the public has a minimum of 45 days to review and give comments. When the comment period closes, the agency considers the substantive comments and determines whether further analyses are needed. Responses to the substantive comments are included in the final EIS publication which also begins the wait period for a minimum of 30 days for agencies to take before making a decision. At the end of the EIS process, a Record of Issuance (ROI), which contains an explanation of the agency's decision and the alternatives that were considered, is issued (EPA, 2017).

Section 402 Permit (NPDES)

The Federal Water Pollution Control Act was enacted in 1948 to regulate the discharge of pollutants into U.S. waters. The act was reorganized and expanded upon in 1972 and became what is now known as the Clean Water Act (CWA). The CWA set national standards, programs, and recommendations for industry wastewater and surface water pollution. Under the act, it is unlawful to "discharge any pollutant from a point source into navigable waters, unless a permit was obtained," (EPA, 2019, March 11). A range of substances are included under the broad definition of "pollutant" such as agricultural waste, chemical waste, sewage, and biological

materials. For aquaculture, pollution can include decaying net pens, antibiotics, hormones, effluent, and excess feed. Escaped cultivated organisms may also be considered "pollutants" under the definition of biological materials (Harvard Law School Emmett Environmental Law & Policy Clinic, Environmental Law Institute, and The Ocean Foundation, 2012; USPIRG v. Atlantic Salmon of Maine, 2005). There is only one permitting regime under the CWA that applies to offshore aquaculture: Section 402 permits, also known as the National Pollution Discharge Elimination System permit (NPDES) (Copeland, 2013).

In 1972, the Clean Water Act also created the NPDES permit program to help regulate the discharge of pollutants into U.S. water from point sources. An NPDES permit is required when a facility is going to discharge a "specified amount of a pollutant into a receiving water under certain conditions," (EPA, 2016, November 29). The EPA regulates the direct discharge of pollutants in navigable waters which applies to interstate waters, lakes, and federal waters. A rule was enacted that states that "concentrated aquatic animal production facilities" or CAAPs must comply with effluent discharges up to 12 miles offshore and require an NPDES permit. Numerous scholars have determined that the CWA also applies to the EEZ. An offshore farm is considered to be a CAAP facility if it does any of the following: 1) produces more than 20,000 lbs of fish per month in a cold-water facility or 2) produces at least 100,000 lbs of fish per year in a warm water facility. **(**EPA 2018).

There are two levels of control focusing on technology and water quality-based limits. If the technology-based limits are not adequate to provide protection to the body of water, the water quality-based limits are instituted. The CWA gives authorization to the state to issue permits under the NPDES program. (EPA, 2016)

5.1.5 Regional Comparison

Based on the information presented above about Catalina Sea Ranch and Rose Canyon Fisheries which were going through the permitting process in the West Coast Region and Ocean Era which is going through the permitting process in the Southeast Region, notable differences and some similarities can be seen.

For both regions, there has not been a clear roadmap as to how to begin site selection or the permitting process. RCF originally reached out to the Navy's Regional Office for help with site selection, but under a new corporate structure they are working with NOAA's National Centers for Coastal Ocean Science (NCCOS) to determine the best location (Kent, 2020). Ocean Era also used NCCOS to identify potential sites (Peters, 2020). Another company who plans on putting in 18 cages 20 miles off the U.S. coast is working with NOAA for site selection (J. Beck, personal communication, October 8, 2019).

As described in the Gulf of Mexico MOU, the agency with "more extensive and expertise concerning the activities" will take the lead for consultations and evaluations "in order to minimize delays and reduce potential duplication and conflict," (BOEM et al., 2016). In the Gulf of Mexico, following the lawsuit, the EPA took the role of lead agency for the Velella Epsilon project. According to contacts in Region 4 of the EPA and USACE, it is likely to maintain the lead agency for future projects (J. Beck, personal communication, October 8, 2019; M. Wahlstrom, personal communication, October 22, 2019). The MOU is also currently undergoing revisions and the Department of Defense has shown interest in signing onto it. NOAA is still heavily involved in the permitting process through consultations on Essential Fish Habitat and ESA (M. Wahlstrom, personal communication, October 22, 2019).

Unlike the South East Region which has the Gulf of Mexico MOU for guidance, the West Coast Region does not have a permanent MOU. This means that for each project that is proposed, they create a new MOU. This could lead to issues with consistency, predictability, and transparency in the permitting process depending on who signs onto it and who takes the lead to conduct the NEPA review. For Don Kent's proposed company, NOAA was used to help with the site selection (D. Kent, personal communication, October 10, 2019).

The level of stakeholder engagement can vary due to the size or crop of the proposed farm, based on the company, and based on the state's interest or concerns over the facility. And some parts of the permitting process which could increase stakeholder engagement is left to Best Professional Judgement.

For facilities near, at, or above the CAAP threshold an NPDES permit is required which has an opportunity for a public comment period unless the crop is not believed to negatively impact water quality. As for companies engaging stakeholders, it's completely optional although it's believed to be critical (D. Kent, personal communication October 10, 2019; K. Tyler, personal communication, October 22, 2019). Under the Coastal Zone Management Act (CZMA), the state has the right to request or perform a consistency review from NOAA (Office for Coastal Management, n.d.). In the case of CSR, the California Coastal Commission conducted their own consistency review and state-led comment period which ended up receiving more feedback than from USACE's comment period. For the Velella Epsilon (V.E.) project in the Gulf of Mexico, the state of Florida did not conduct their own consistency review. Also, for the V.E. project, USACE determined that a LOP should be issued instead of a standard permit because of the small size of the facility and that it's unnecessary to receive public feedback (K. Damico, personal communication, October 23, 2019). But this conflicts with the EPA's decision to extend the comment period and hold a public hearing.

5.1.6 Summary

In the United States, the most recent offshore aquaculture related bill was passed in 1980 and amended in 1985. It did not establish a lead permitting agency but there are at least nine federal agencies involved in the permitting process. The lack of a lead agency has lengthened the permitting process and created an environment that lacks transparency. While NOAA has attempted to become the lead permitting agency, they were brought to court under the belief that they do not have the authority to distribute permits under the MSA. NOAA has appealed the ruling and are hoping for results in 2020.

Recently, interested companies have been approaching several federal agencies to help with site selection, a clear starting spot has not been established as to whom they should reach out to first (D. Kent, personal communication, October 10, 2019). Although it is recommended by employees from NOAA and offshore aquaculture CEOs that NOAA and NCCOS should be approached first when beginning the pre-permitting process. Then, the permits are submitted to the EPA and USACE and followed by public notices. If a NEPA review is triggered, either the EPA or USACE must conduct it. The Agency that conducts it could be based on a pre-established

MOU which could state that the same agency always conducts it, the agencies could sign an MOU just for that proposed facility, or the agencies could choose not to sign an MOU and they could each conduct their own reviews. Even though NOAA cannot distribute permits in the Gulf of Mexico, they are still heavily involved in the permitting process through required consultations with the agencies, hosting workshops for stakeholders, and consulting with offshore aquaculture companies. The MOU is still being used by the other federal agencies that signed it. This still helps improve the permitting process. But the West Coast does not have an overarching MOU in place which leads to permitting discrepancies between the two regions and a continued lack of transparency in the region.

It is known that there is not a clear length of time that the permitting process takes. For some it took a couple years and for others it was onwards of 3 years without a permit in sight. Currently there is not a set or strict amount of time that an agency is allowed to take for each step of the permitting process. This allows for an expensive process but also one that continues to scare off investors (D. Kent, personal communication, October 10, 2019; B. O'Hanlon, personal communication, March 4, 2020).

If the farm is proposing a stock that is not believed to impact water quality and if the facility will be small, there is a chance that there won't be opportunities for stakeholder engagement by the government. But the companies might choose to have engagement opportunities.

5.2 Q2: How Does the United States' Regulatory Regime and Permitting Process Compare to Regimes of Countries That Have Established Offshore Farms?

Norway and Panama were selected as comparative case studies because they had the two largest offshore farms in the world. Their regulatory regimes and permitting processes are documented in this section to allow for a country comparison with the United States to be done. The results of this comparison are presented in Section 5.2.3. A summary of the results is presented in 5.2.4.

5.2.1 Norway

Commercial aquaculture development began in the 1970s and has since grown to represent over 60% of exports of Norwegian seafood (Tiller, 2017). In 2018, Norway produced 1.4 million tons of finfish from coastal and marine aquaculture (Statistisk sentralbyrå, 2018). But as coastal farming has continued to expand, the marine space has become crowded and allows for sea lice to easily spread (Hersoug, 2015**).** To date, there is only one offshore farm in Norway with four others in development. Norway's Ministry of Trade and Industry have expressed interest in expanding and streamlining the offshore aquaculture permitting process. They tasked the Directorate of Fisheries to identify and map areas that are suitable for offshore facilities (Fiskeridirektoratet, 2019, December 17). In Norway, the Directorate grants both coastal and offshore permits. (A. Brønsten Osland, personal communication, September 4, 2019; FAO, 2007, May 3).

As part of this case study, I travelled to Bergen, Norway and met with Anne Brønsten Osland who is the Senior Advisor for processing aquaculture development permit applications at the Directorate of Fisheries. While she seemed hesitant to respond to questions, her answers were valuable. She told me about current and future operations, the process to apply for permits, as well as the length of time it usually takes to receive a permit. Also, during my time in Norway, I visited a seafood innovation cluster. It was a building filled with aquaculture startups and spaces for bouncing ideas off of each other. I easily saw why Bergen is known as a hub for innovation in aquaculture (Aquaculture Magazine, 2019). I also presented my research at the Faculty of Law at the University of Bergen (Appendix B).

Regulatory Regime

Aquaculture, both offshore and coastal, are regulated under two main pieces of legislation: 1) The Aquaculture Act of 2005; 2) The Food Safety Act of 2003. These Acts are both regulated by The Ministry of Fisheries and Coastal Affairs (the Ministry). The Ministry is responsible for the regulation and administration of the acts. Under the Ministry is the Directorate of Fisheries (the Directorate), who is in charge of coordinating and surveilling the aquaculture sector. The Ministry delegated powers to the Directorate to grant licenses. (FAO, 2007, May 3)

1) The Aquaculture Act of 2005 was created “to promote the profitability and competitiveness of the aquaculture industry within the framework of a sustainable development and contribute to the creation of value on the coast," (Norwegian Ministry of Fisheries and Coastal Affairs, 2005). The development and management of all aquaculture, which includes inland and marine waters in Norway, is regulated by the 2005 Act. It established a licensing system and covers issues such as registration, the transfer of licenses, and control and enforcement. This act also established environmental standards and requirements for environmental impact assessments. Pursuant to this act, a license may be granted if it is deemed to be environmentally responsible and if conservation and coastal zone plans have been met. Also required are any applicable licenses regarding food safety and production (Act of 19 December 2003 no. 124), pollution and waste protection (Act of 13 March 1981 no. 6), harbors and boat traffic (Act of 8 June 1984 no. 51), and river systems and groundwater management (Act no. 82, November 2000). This act says that all authorities involved in licensing a project are obligated to be efficient and to coordinate the permitting process. It also says that all persons engaged in the proposed facility have a professional background in aquaculture. A knowledge in how to prevent and limit fish escapees is also required, and the proposed facility should be staffed with “persons capable of ensuring the welfare of the fish,” (FAO, 2007, May 3) which is done through a training session that is repeated every 5 years.

2) The Food Safety Act of 2003 regulates food quality and safety as well as animal health. It also addresses aquaculture production, fish processing, and distribution. The Norwegian Food Safety Authority is in charge of enforcing this act and given management powers. (FAO, 2007, May 3)

Permitting Process

In Norway, waters up to 5 nautical miles from shore are divided and managed on a regional level. The Directorate has offices located in each region and applicants file their aquaculture license with the appropriate regional office. For proposed facilities outside of regional jurisdiction, the application can be filed at the Directorate headquarters located in Bergen. The Directorate will then forward the application to the applicable authorities which includes the National Coastal Administration and the Water Resources and Energy Directorate, the Food and Safety Authority,

and the County Governor in order to obtain the required licenses. (A. Brønsten Osland, personal communication, September 4, 2019)

The application is then made public to the municipality where the aquaculture facility is pursuing approval and the application is also published in several newspapers (FAO, 2007, May 3). There are several municipal hearings that are held and are considered "rigorous" and "arguably favor stakeholders." Stakeholders have four weeks to submit comments (Tiller et al., 2017). For proposed facilities outside of regional jurisdiction, hearings will be held for the general public (A. Brønsten Osland, personal communication, September 4, 2019). During the entire length of the permitting process, there are three separate comment periods for stakeholders to give feedback (Tiller et al., 2017). A summarized version of this can be seen in Figure 8.

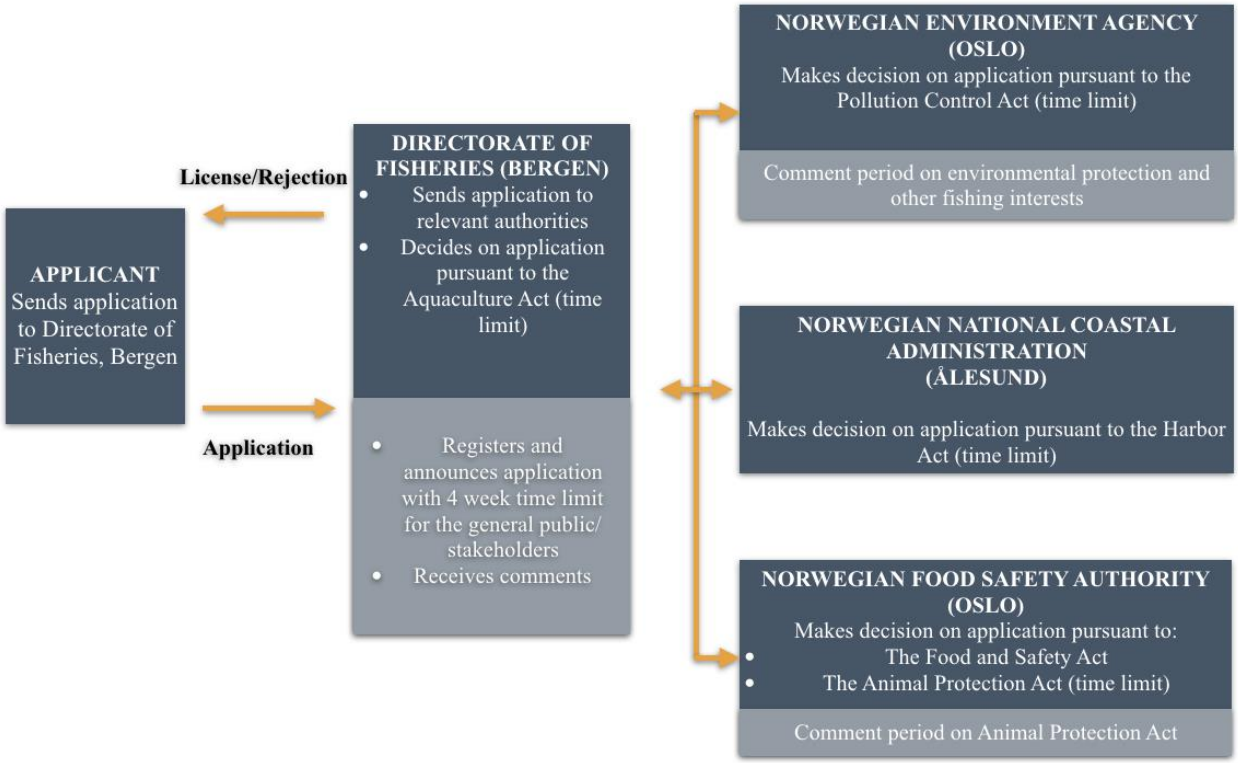

Figure 8 The permitting process for offshore aquaculture in Norwegian National waters (5-200 nm)

Before a license from the Food Safety Authority is granted, a risk assessment is performed to determine what the possibility is of disease spread within the proposed facility and to the

surrounding environment. Production volume, species type, and distance between facilities are also considered during the assessment (FAO, 2007, May 3). Licensing fees for each facility depends on what type of fish is used and what its use will be. Biomass limitations are also set based on the aforementioned variables. Application processing fees for an aquaculture license are set at $1,987 (NOK 12,000) and the fee is returned if the license was not granted (FAO, 2007, May 3). Development licenses, in addition to commercial licenses, can be issued. Norway created this license to promote technological development and innovation in hopes to solve spatial and environmental challenges within the aquaculture industry. This license is temporary and requires the recipient to share the developed technology with the industry to facilitate improvements (A. Brønsten Osland, personal communication, September 4, 2019; EY, 2017; SalMar, n.d.).

In 2017, SalMar, a Norwegian aquaculture company and one of the world's largest producers of salmon, installed the country's first offshore farm. Located 3 miles from the Norwegian coast is Ocean Farm 1 (Figure 9), a 220-foot-tall facility capable of holding more than 1.5 million salmon (Popescu, 2018). This full-scale pilot facility was the first to be granted a development license and began operations in September 2017 (Saue, 2018) and wrapped up its pilot production phase in January 2019 (Ramsden, 2019).

In late 2018, SalMar received up to 8 development licenses for the country's first farm outside of regional jurisdiction. This offshore farm, currently named Smart Fish Farm, was designed to raise fish in deep waters 20-30 nautical miles from the Norwegian coast (Ramsden, 2019, February 14). The licenses can last up to 15 years and the company can apply to convert the license into a commercial license (A. Brønsten Osland, personal communication, September 4, 2019). The farm is designed to hold more than 3 million salmon, equivalent to a maximum estimate of 12480t, and is just under the length of 1.5 football fields at an impressive 525 feet (Undercurrent News, 2018).

Figure 9 Ocean Farm 1 https://www.cbinsights.com/research/autonomous-fish-farms/

5.2.2 Panama

The aquaculture industry in Panama began in the 1970s with the hopes that it could help meet its residents' nutritional needs, food security, and job creation (FAO, n.d.). Until Norway's Ocean Farm 1, Panama boasted the largest open ocean farm in the world. The country strives to be competitive while developing the industry sustainably (PanamaTramita, n.d.). In Panama, the Ministry of the Environment distributes both coastal and offshore aquaculture permits.

Regulatory Regime

In 1972, the Ministry of Agriculture and Husbandry Development was established as the agency in charge of aquaculture development and growth. The Ministry then created the National Aquaculture Directorate who then took on the aforementioned duties. (FAO, n.d.)

In 1995, Panama published the National Aquaculture Development Plan to provide optimal conditions to promote and expand the industry. This was done to work towards environmental and economic sustainability for the benefit of the country and industry. The plan states that it was to better understand issues related to aquaculture and to establish appropriate regulations that will increase aquaculture production. To carry out this plan, stakeholders knew that the public and private sector had to work together, and that research, institutional

development, fisheries regulations, and training needed to be implemented. (FAO, n.d.; Bolanos, 2012)

In 1995, under Law 58, aquaculture was defined as an agricultural pursuit which allowed producers to receive the same financial incentives as their land farming counterparts. In hopes to streamline the permitting process, the law requires only one application need be submitted per aquaculture project. Environmental Impact Assessments for new aquaculture projects are also required by this law. Following this was rapid growth. The Ministry of Agriculture and Husbandry Development was established as the agency in charge of aquaculture development and growth. The Ministry of Agriculture and Husbandry Development then created the National Aquaculture Directorate who then took on the aforementioned duties. A consultative body, the National Aquaculture Commission, worked to develop regulations and resolve aquaculture related conflicts. (FAO, n.d.; Bolanos, 2012)

In the past 22 years, Panama has experienced 3 major structural changes within its government in relation to marine resources and aquaculture. These institutional rearrangements have left stakeholders and government officials confused (Bolanos, 2012). The most significant change occurred in 2006, when Law 44 was passed and created the Aquatic Resources Authority of Panama (Autoridad Nacional de los Recursos Acuáticos- ARAP). All coastal and marine management entities were unified under ARAP. Distributing aquaculture permits and performing Environmental Impact Assessments became duties of ARAP as well as monitoring and funding. Law 44 also moved the industry from an agricultural practice to "one that involves coastal resources and its effects on the environment," (Bolanos, 2012).

In 2015, House Bill No. 25 was passed and created the Ministry of the Environment (Ministerio de Ambiente) and now encompasses ARAP (CentralAmericaData.com, 2015, February 20). The Ministry of the Environment took over ARAPs duties for coastal management, permitting and EAs but left it to continue to oversee fisheries and aquaculture (OpenBlue, 2016; Spalding et al., 2015). ARAP works to promote coordination, enforcement, and consults with the public and private sectors. It also works to ensure that policies and federal agencies do not overlap in duties and purpose, in hopes to increase permitting efficiency (Dirección de Inspección, Vigilancia y Control, n.d.).

Permitting Process

In Panama, the National Government has authority over the entirety of their marine space (D. Suman, personal communication, January 28, 2020). This means that the Ministry of the Environment manages both coastal and offshore aquaculture and is the lead permitting authority. They conduct the environmental assessment and forward the relevant information and parts of the application to the Ministry of Health and ARAP (OpenBlue, 2016).

To establish a farm in Panama's offshore waters, the interested company must secure 3-4 permits as well as ~20 "secondary" permits which includes consultations, waivers, and meetings with planning boards. A company can get temporary permits to begin operations while working towards the official ones. An EIS is conducted during the permitting process and has a stakeholder engagement component. A third-party consultant visits different communities and conducts interviews to record how they believe they might be impacted by the proposed offshore facility (B. O'Hanlon, personal communication, March 4, 2020).

Snapperfarm Inc., one of the world's first open ocean farms, grew cobia in waters off of Puerto Rico for six years. They began the pre-permitting process in 1998 and secured demonstration/research permits in 2002. The farm produced only 50 tons of cobia annually meaning that they weren't operating commercially, and it allowed them to operate without an NPDES permit. They wanted to expand their production size up to 750 tons annually and tried for six years to secure permits (B. O'Hanlon, personal communication, March 4, 2020; Thurston, 2009; McCarthy, 2007). Frustrated with the length of the permitting process, the company began to evaluate ~10 countries in the area for offshore aquaculture potential in 2006-2007. The company soon realized Panama's potential and were enticed by the idea of a more transparent permitting process. They began site evaluations and applied for permits in 2007 and ceased production in Puerto Rico in 2008 (Caribbean Update, Inc, 2009, June1; Stone, 2014, April 30).

At the time that Snapperfarm Inc. moved to Panama, ARAP had just become the lead permitting authority and all documents could be submitted to them. During the permitting process, the company identified key stakeholders at the community level as well as in the government and worked to communicate their intentions and educate them on offshore aquaculture. After two years, in 2009, they received temporary permits from the Ministry of the

Environment and began operations. The company also acquired Pristine Oceans, which was another offshore aquaculture company located in Panama waters, which allowed them to begin harvesting sooner (B. O'Hanlon, personal communication, March 4, 2020). They began selling their offshore grown cobia in 2010 (B. O'Hanlon, personal communication, March 4, 2020; OpenBlue, 2016).

It took the company a total of 6 years to secure the official permits but because of the transparency of the process, it was manageable for the company. They are now operating under the name Open Blue Sea Farms and have 22 cages 8 miles off the Panama coast (Richardson, 2009, November 16; Stone, 2014, April 30; Welch et al., 2019). Two of these submersible cages can be seen in Figure 10. The company continues to engage stakeholder engagement efforts through a permanent community affairs position.

Figure 10 Open Blue Cobia Pen https://www.openblue.com/about-us/

5.2.3 Comparative Analysis

To determine ways to improve the current permitting process and industry, a comparative analysis was conducted between the United States, Norway, and Panama. Important factors such as the current state of offshore aquaculture in each country and the current regulatory regime and permitting processes are analyzed. The key takeaways are summarized in Table 2.

Table 2 Summarized comparison of U.S., Norway, and Panama's regulatory regime and permitting process.

	United States	Norway	Panama
Nationally Managed Waters	3-200 nm	5-200 nm	0-200 nm
Offshore Farms	Catalina Sea Ranch (6 nm - *entered bankruptcy*)	Ocean Farm 1 (3nm), Smart Fish Farm (20-30nm - *not yet installed)*	Open Blue Farms (8nm)
Regulatory Regime	National Aquaculture Act of 1980 (*ammended in 1985)*	• The Aquaculture Act of 2005 • The Food Safety Act of 2003	House Bill No. 25, 2015
Stakeholder Engagement	At least 1	3 opportunities	At least 1
Streamlined?	No lead permitting agency	Directorate of Fisheries is lead agency	Ministry of the Environment is lead agency
Permitting Time	2 Years Minimum	2-3 Years	~2 Years for Temporary ~6 Years for Official

While there are not differences in the number of farms between the three countries, there are significant differences in the sizes. To date, the United States has had only one commercial farm in federal waters, but the company entered bankruptcy in 2020 and was available for purchase (Notice of Asset Sale, 2020). While Norway and Panama also currently only have one offshore farm each, they are considered to either be the largest farm or to have the most offshore pens. Up until Norway's Ocean Farm 1, Open Blue Farms in Panama was the largest offshore farm in the world with 22 cages and produced 1700t in 2017. Norway has the largest offshore farm/cage in the world with the capacity to hold up to 10000t of salmon (Fletcher, 2018). The country is working to permit a pen that is even larger (Undercurrent News, 2018).

There are differences in each country's control of their marine space. In the United States, the states manage waters up to 3nm with the exceptions of Florida's west coast and Texas who manage waters up to 9nm. From 3-200nm is considered offshore and is managed by the federal government. Norway is divided regionally, and the regions manage waters up to 5nm from their

coastline. From 5-200nm is managed by the National Government although 3 miles is still considered offshore in the country. Comparatively, Panama's National Government has control over all of the country's marine space (0-200nm). It is unclear where the country considers offshore waters to begin, but it is known that Open Blue Farms is considered offshore at 8nm.

In the past 15 years, Norway and Panama have updated their regulatory regimes in order to match their interest in promoting the growth of the offshore aquaculture industry. In Norway, the Aquaculture Act of 2005 establishes a licensing system and grants the Ministry the right to allocate licenses. In Panama they passed House Bill No. 25 in 2015 which created the Ministry of Environment and amended Law 44 of 2006 so that the Ministry is in charge of permitting and that ARAP is in charge of aquaculture oversight. Comparatively, the United States' main law in their regulatory regime is the National Aquaculture Act of 1980. This law wanted to promote the industry but gave little tangible support. It also did not establish a lead permitting agency or licensing system.

In Panama and Norway, their most recent policies consider the environment and sustainability as an important factor in the development and management of the offshore aquaculture industry. Panama's Law 44 works to consider the environmental impacts of the industry on the environment and moved the focus of the industry away from being agriculturally focused. Norway's Aquaculture Act discusses the country's focus on sustainable development and its need for a comprehensive environmental system. Comparatively, the United States' 1980 National Aquaculture Act does not contain any mention of sustainability or the environment. Also, Panama and Norway's offshore aquaculture industries also function under a national agency specific to marine and environmental resources. An attempt was made by NOAA in the Gulf of Mexico to control the sustainable growth of the industry but as mentioned earlier, it failed.

When it comes to an efficient permitting process, the United States differs from Norway and Panama. Because the National Aquaculture Act of 1980 did not establish a lead agency, the agency to lead the permitting process depends on the region and type of offshore farm. In the Gulf of Mexico, the EPA is likely to become and remain the lead agency with the help of the current MOU whereas the lead agency in the West Coast region is nominated on a case by case

basis. In Norway, the Directorate of Fisheries is the lead permitting and coordinating agency. In Panama, the Ministry of the Environment is the lead permitting and coordinating agency. The differences in permitting processes are reflected in the recorded times it takes to receive the necessary permits. In the United States, it has taken a minimum of two years to receive the necessary permits and that was for a farm that did not require an EA. For a process that included an EA, the process took more than three years. In Norway, the permitting process takes a maximum of two-three years. In Panama, the process took two years to receive temporary permits and six years to receive the full/official ones (B. O'Hanlon, personal communication, March 4, 2020).

When considering stakeholder engagement, there are some differences between the United States and Norway. In the United States, stakeholder engagement is not guaranteed by the government based on the size of the project. For example, if the proposed farm was deemed small by USACE and a LOP was used and if the proposed stock was known not to impact the surrounding environment (e.g. mussels). If the farm triggers a NEPA review, an NPDES permit, and is determined to be large enough for a Section 10 Standard Permit, there are at least three opportunities for public comment. Another opportunity could arise if a state agency pursuant to the CZMA requests to conduct an independent review and a state-led comment period. The companies that are interested in establishing a farm have been known to engage stakeholders before and during the permitting process. They take it upon themselves to reach out to stakeholders for education and site selection. In Norway, there are a guaranteed three times for stakeholders to be engaged by the government. For Panama, stakeholders are engaged during the EIS process by a third party and the companies can reach out to stakeholders during and after the process for educational and transparency purposes.

5.2.4 Summary

Panama and Norway were selected as case studies due to them both having the world's largest offshore facilities. Norway currently boasts Ocean Farm 1, a cage which is 3 miles from the coast and can hold up to 1.5 million salmon. Panama is home to Ocean Blue Farms where there are 22 cages 8 miles from the coast. Both countries have lead permitting agencies which receive the necessary permits and distribute it to the other agencies involved. In Norway, the Directorate of

Fisheries communicates with the other agencies and has the power to grant licenses. In Panama, the Ministry of the Environment grants the necessary permits. The United States had one commercial offshore facility, Catalina Sea Ranch, growing mussels. The country does not have a lead agency but has two permitting agencies (EPA and USACE) and coordinating efforts is optional.

Both Norway and Panama have legislation that was passed in the past 2 decades. These pieces of legislation also mention the environment and sustainability as priorities to promote the industry's growth. The United States' most recent offshore aquaculture legislation was passed in 1980 and amended in 1985. It also does not mention sustainability or the environment.

In regard to the length of the permitting process and stakeholder engagement, there are clear differences between each country. In Norway, the permitting process is not expected to last longer than 24-36 months and has three opportunities for stakeholders to be engaged by the government. In Panama, it can take 24 months to receive temporary permits and up to 72 months to receive all official permits. The country has at least one opportunity for stakeholder engagement. The United States' can last at least two years and, in some circumstances, (growing stock with minimal impact to the water and a small cage/facility) there may be limited to no stakeholder engagement from the federal agencies. If a facility is growing finfish and has a larger scale/cage, there are at least two opportunities for stakeholder engagement.

5.3 Q3: What Are United States' Stakeholders' Roles, And How Are They Impacted by The Current Permitting Process?

The results from the Stakeholder Engagement framework by Mayers, 2005 and the Sustainability framework by Mathur et al., 2008 are presented in the section below. The results are summarized in Section 5.3.3.

5.3.1 Stakeholder Engagement Framework

The results from the 6-Step Process are documented below.

2) The key stakeholders were identified by NOAA, EPA, USACE, and from presentations made at the Aquaculture America 2020 conference are as follows: the general public; coastal recreational and tourism users and groups; recreational and commercial fishing industry; wholesale and retail seafood processors; offshore marine aquaculture industry; offshore oil and gas industry; U.S. Military installations and leadership; local, state, and federal politicians and public servants; local, state, and federal agencies and policy makers; non-profit and non-governmental organizations. The aforementioned stakeholders were then categorized into three groups: internal/direct primary, interface/indirect primary, and external/secondary. This categorization can be found in Table 3.

Table 3 Categorization of Stakeholders in the U.S. Offshore Aquaculture Permitting Process

Internal/ Direct Primary	Interface/Indirect Primary	External/Secondary
Offshore Marine Aquaculture Industry -Ocean Era -CSR -RCF	Federal Agencies -NOAA -EPA -USACE	General Public
	State Agencies involved in CZMA	Non-Profit and Non-Governmental Organizations
	U.S. Military	Local, State, Federal Politicians and a public servants
		Wholesale and Retail Seafood Processors
		Recreational and Commercial Fishing Industry
		Coastal Recreational and Tourism Users and Groups
		Local and State Agencies and Policy Makers
		Offshore Oil and Gas Industry

3) Stakeholder interests and characteristics are summarized in Table 4.

4) In recent years, stakeholders have been cited as a focus of the industry due to their lack of support (D. Kent, Personal Communication, October 10, 2019; Peters, 2020). Companies such as Rose Canyon Fisheries and Ocean Era as well as NOAA work to engage stakeholders to educate them on what offshore aquaculture is and to understand their concerns. It was noted by Ocean Era at their Stakeholder Outreach Workshop in June 2019 that there was a lack of attendees from the commercial fisheries sector. There are four main types of stakeholder engagement that have been be found during the permitting process: communication/consultations when working on permits, workshops, lawsuit/protests, and the public notices and hearings. These interactions are summarized in Figure 11. Currently, the external/secondary stakeholders that are engaging with the offshore marine aquaculture companies appear to be one-sided. As mentioned earlier, the companies are spending some of their time educating the stakeholders about the science behind offshore aquaculture to teach them that it won't negatively impact the environment. Until these stakeholder's environmental fears are quelled, it's unlikely that the company will be able to take their advice into consideration.

It was mentioned by Peters in 2020 that stakeholders from the commercial and recreational fishing industry did not participate in a workshop held. This meant that the group missed an opportunity to have their voices heard. Both the government and offshore aquaculture companies should look for engagement methods that appeal more to stakeholder groups that have not participated to ensure that their voices and feedback are heard. (Peters, 2020)

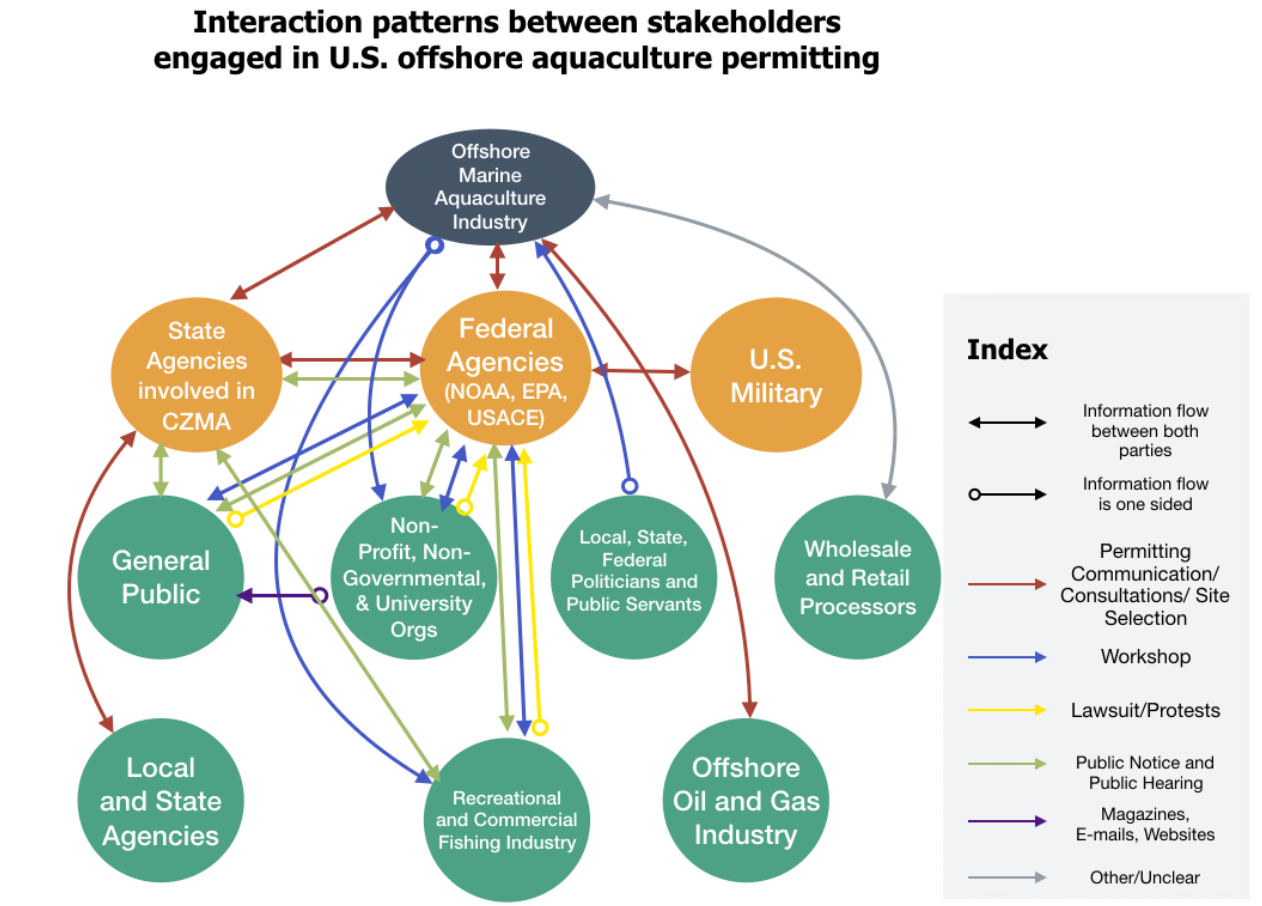

Figure 11 Interaction patterns between stakeholders engaged in U.S. offshore aquaculture permitting

5) The role of stakeholders involved in the offshore aquaculture permitting process, their key interests, importance to the process, influence on the process, and their participation is documented and organized in Table 4. Stakeholder classification based on their relative influence and importance to the process can be found in Figure 12.

Table 4 Summary of stakeholder's interests, importance, influence, and participation in U.S. offshore aquaculture permitting

Stakeholder	Key Interests	Importance to Project	Influence on Project	Participation
Offshore Marine Aquaculture Industry	• Establish Farm • Lower Deficit • $$$ • Protect water quality	High	Medium-High	• Responsible for project implementation • Engages and educates stakeholders
EPA	• Clean Water Act	High	High	• Distributes permits • Issues public notices • Holds public hearings • Conducts NEPA
USACE	• Rivers and Harbors Act	High	High	• Distributes permit • Issues public notices
NOAA	• EFH • NHPS • ESA • NMSRA • FWCA • MMPA • Sustainable industry growth		High	• Conducts workshops • Consultations/Site Selection
U.S. Military	• Ensuring limited navigation and spatial conflicts	Medium-High	High	• Gives feedback and consults with companies
State Agencies involved in CZMA	• Ensuring farm and permits are consistent with state law	Medium-High	Medium-High	• Conducts consistency review • Conducts state-led public comment period
General Public	• Protecting water quality/the environment	Low	Low	• Protests • Gives feedback
Non-Profit, Non-Governmental, University Organizations	• Protecting water quality • Protecting wild populations • Research	Medium	Medium	• Protests • Gives feedback • Lawsuit • Workshop attendance
Local, State, Federal Politicians	• Industry growth • Reduce deficit	Low	Low	• Introducing offshore aquaculture bills
Wholesale & Retail Processors	• Processing and selling fish	Low	Low	• Workshop attendance
Recreational & Commercial Fishing Industry	• Jobs • Sustainable wild populations	Medium	Medium	• Gives feedback • Did not participate in workshop • Lawsuit
Offshore Oil and Gas	• Lowering oil rig decommissioning costs	Low	Low	• Meetings with company to help with site selection

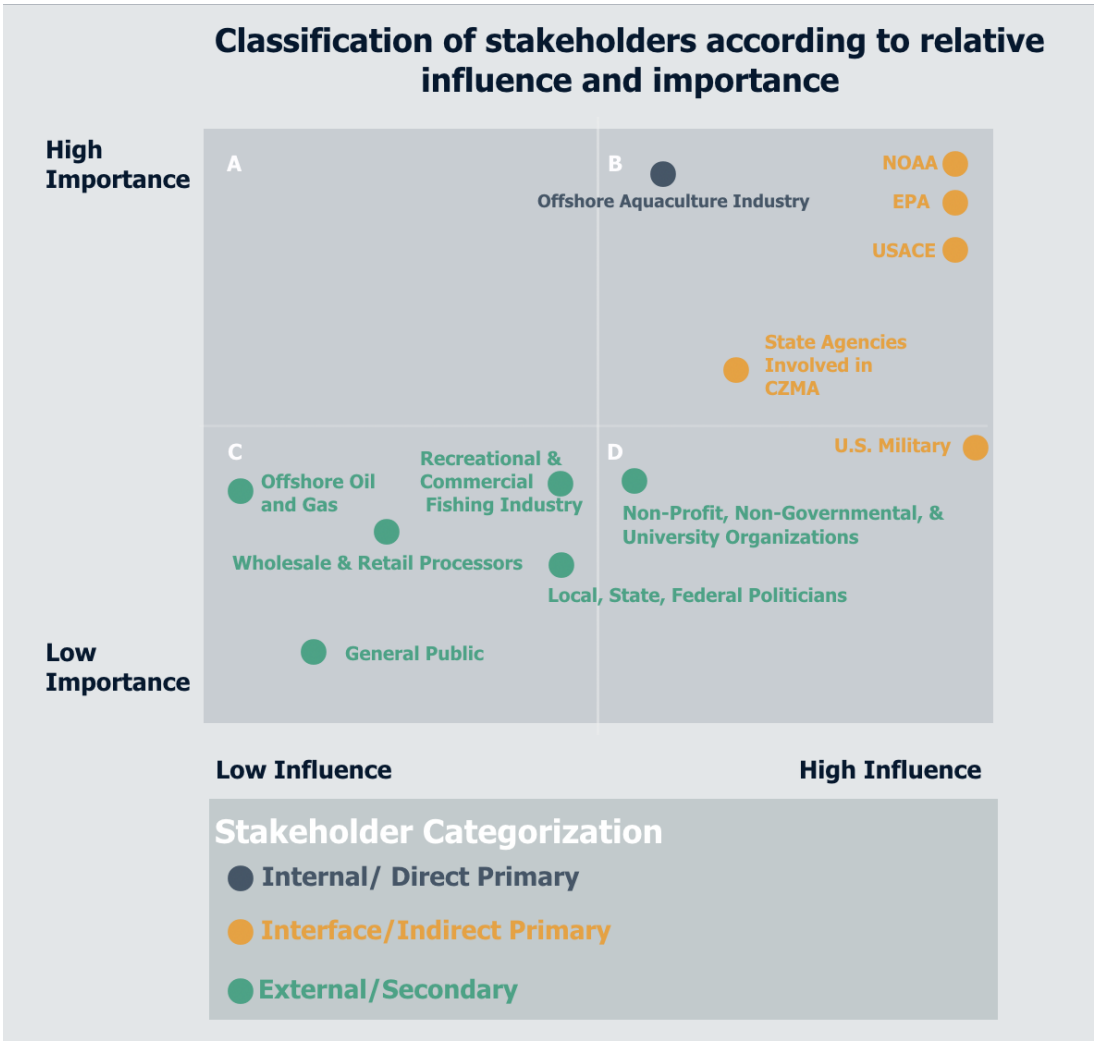

Figure 12 Classifying stakeholders according to their relative influence and importance

Box A is empty meaning that there are no identifiable stakeholders contributing to or substantially altering the permitting process/projects. Identified in Box B is the offshore aquaculture industry and all of the interface/indirect primary stakeholders. This means that these groups have "a high degree of influence and importance to the success of the [permitting process]/project," (Mayers, 2005). NOAA was identified as having the highest amount of influence and importance due to the fact that their approval is necessary for several federal acts and because other stakeholders have recommended them as the agency to be the lead permitting authority. Following NOAA are the other federal agencies whose permits are required to install the proposed farm. They also issue public notices and organize public hearings which engages many stakeholders. The EPA is listed above USACE because it conducts the NEPA review. The

offshore aquaculture industry is also found in Box B and has high influence and importance to the project and permitting process but is ranked lower than the federal agencies because in the end, the agencies determine whether a farm can be established. In the case of RCF, it didn't matter how much time and money the company spent on the permitting process. Lastly, state agencies that help conduct CZMA consistency reviews are highly influential and important to the permitting process. In the case of RCF, the CCC's state-led comment period received a wider variety of comments than USACE did. Also, their approval is needed to establish a farm and they often give necessary guidelines for the company to meet (Environment Law Institute, 2015). The companies are also engaging a wide variety of stakeholders through telephone interviews, workshops, conference attendance, attending Fisheries Management Council meetings, and private meetings (Peters, 2020).

In Box D are the U.S. Military and the non-profit, non-governmental, and University organizations. The U.S. Military is highly influential for the siting of the possible farm location. In the case of RCF as well as CSR, the U.S. Military (Navy) greatly impacted the possible locations where the farm can be established. They are moderately important to the permitting process because their approval is essential and they also suggest possible/alternative site locations. Non-profit organizations etc. are included in this box due to their involvement in the workshops, their access and ability to communicate with other stakeholders, and their involvement in the NMFS lawsuit. This lawsuit impacted NOAA's involvement, the Gulf of Mexico MOU, and Ocean Era's permitting process. While not extremely important to the permitting process, they are valued by the offshore aquaculture companies and by the State and federal agencies.

Included in Box C are the least important and influential stakeholders. The remaining stakeholders are from the external/secondary category. The general public was determined to be the least important and least influential due to their lack of knowledge on offshore aquaculture. Currently, the offshore aquaculture companies are designating many resources towards educating them on the science and permitting process and so they are unable to provide valuable feedback. The recreational and commercial fishing industry, while having been involved in the NMFS lawsuit and invited to workshops, their involvement has been noted as being minimal in the

workshops. The permitting process is likely to move forward without their consent, but they are important to engage to ensure that there are no usage conflicts of the selected sites. Underneath the fishing industry are the Local, State, and Federal politicians who are placed there due to their lack of proposed policies and efforts towards improving the industry in recent years. The wholesale and retail processors and the offshore and gas industry are also placed in this box due to their limited involvement in the permitting process.

6) As can be determined from the information gathered and from the analysis, the fishing industry is limiting their involvement by not attending the available workshops. But this could also be seen as a poor method of stakeholder engagement by the offshore aquaculture company and they should choose a different method going forward to better engage the fishing industry. Further recommendations can be found in Section 5.3.3 and Section 8.

5.3.2 Sustainability Framework

The offshore marine aquaculture industry does engage stakeholders from the strategic management perspective and from the ethical perspective but is still lacking in the social learning perspective. The companies have identified the stakeholders and have several methods to engage them. They also appear to believe that the stakeholders have a democratic right to participate and they also work to be transparent in their goals when working to permit their farms. Due to the widespread fears of aquaculture among the American public and other stakeholders, the social learning perspective is currently limited. A main pillar in this perspective are constructive conditions and a space for mutual learning. But because there are concerns among the public related to negative environmental impacts not shared by the offshore aquaculture industry, a level of education and scientific understanding must be reached first. It is unlikely that mutual learning is occurring at this time and that their input is not useful enough to include in the project. But as they continue to educate these external stakeholders trust, relationships, and innovative strategies will begin and will lead to other developments like changes in perceptions, new norms, new discourses, and coevolution (Mathur et al., 2008).

According to these results, the system at this time is not yet sustainable. It is said that to correct this a sustainability assessment should be conducted at the same time as the EA and integrated with it.

Stakeholders are impacted by the current permitting process because it has failed to educate on a larger scale. The current permitting process has limited the growth of the industry and therefore has limited the knowledge of the industry and science for other stakeholders (ex: general public). This has caused the social learning perspective to be limited and because of this, is it contributing to the industry being identified as unsustainable.

5.3.3 Summary

Stakeholders were identified through semi-structured interviews and presentations made at Aquaculture America 2020. Based on information gathered from the Literature Analysis, stakeholder interests, participation, importance, and influence were recorded. The results were classified and placed into Table 4. It was concluded that NOAA is the most important and influential stakeholder in the offshore aquaculture permitting process. They consult on six federal laws and they help with site selection. The EPA is also highly important and influential due to their current role in distributing permits and conducting NEPA reviews. Following them is USACE due to their more limited role in the permitting process, but for still distributing a permit. The offshore marine aquaculture industry is considered very important but less influential in the permitting process. As was seen with RCF, it didn't matter how much money they invested, they still didn't receive the necessary permits. State agencies involved in the CZMA are also important and influential to the process because the federal agencies need their permission before distributing permits. The U.S. Military was considered to be very influential to the permitting process because their maritime areas are prioritized by the U.S. Government, but they are less important to the permitting process because they do not engage with other stakeholders or help with permitting decisions. Non-profits, non-governmental, and university groups were also considered somewhat influential and somewhat important due to their impact on the permitting process with their involvement in the NMFS Gulf of Mexico lawsuit as well as their continued participation in workshops, public hearings, and protests. The least influential and important stakeholders are as follows: the general public, the commercial and recreational fishing

industries, wholesale and retail processors, offshore oil and gas, and local, state, and federal politicians.

The application of the sustainability framework highlights that the current permitting process is unsustainable because it does not engage stakeholders fully from the social learning perspective. This means that stakeholders do not yet have a space for mutual learning. This was likely due to the long history of failed attempts to grow the offshore aquaculture industry and therefore has limited the spread of knowledge about it. Currently, workshops are spent educating stakeholders, but it appears to be one sided. Noted by Peters, 2020 and Kent, 2020 was that a lot of the workshops and the public hearing were spent educating the attendees on the science rather than ways to improve the industry. The industry and federal agencies are likely not able to receive useful feedback to create an environment where the learning is “mutual”. To help move the industry forward, the general public must hear about the science.

6 Discussion

6.1 Methodology

6.1.1 Limitations and Challenges

Throughout the duration of this research, there were a few limitations that had notable impacts.

An issue that was quickly identified was that the term “offshore” has either several different meanings or is used liberally. Some of the semi-structured interviews originally identified several “offshore” farms but during the literature review, and using the definition of offshore aquaculture, these farms did not meet the qualifications to be considered offshore.

An issue that persisted into question Q2 was that the terms “offshore” and “mariculture” have been used to describe farms that are under 3 miles from the coast. This made it difficult to identify which countries actually had offshore farms. Also, several companies called themselves the “first offshore farm in the world” or the “largest offshore farm in the world” which led to some confusion.

Another notable issue was a language barrier which impacted the results for question Q2. During the literature analysis for Panama, no documents specifically related to the offshore aquaculture permitting process and regulatory regime were found. An understanding of who governs the coastal waters needed to be determined. This was important because if the National government governs coastal waters, the permitting process and agencies will be similar to that of the offshore process. There was no information in English found related to this, so I emailed a professor at the University of Miami who had previously published a paper Panama’s marine policy. They said that the National Government does have authority over all of Panama’s marine space (D. Suman, personal communication, January 28, 2020). While this was a step forward, the most recent document specifically related to the current coastal aquaculture regulatory regime (in English) was likely last updated in 2005 (FAO, n.d.). I used Google Translate to help find

documents and information from Panama's government website, but the results were not comprehendible. Panama's permitting process was patched together through information found on Open Blue's website and heavily supplemented from an interview with Brian O'Hanlon, the former CEO of the company.

It is open to opinion whether different groups are more important to the process/industry. The results shown in the graph, figure, and table are likely to be influenced based on what year the analysis is conducted and potential personal biases. Also, due to the limited number of semi-structured interviews and only with stakeholders from federal agencies and the offshore aquaculture industry, it is likely that a picture of what is currently happening was not fully portrayed in the results.

6.1.2 Strengths

I did not have any issues obtaining U.S. information through online sources and interviews. The additional time spent on this research improved the results because more information was able to be collected. As I was likely seen as a stakeholder by the interviewees, they were extremely quick to respond to my emails and more than willing to answer questions. This allowed for good insights into the industry to be made.

The semi-structured interviews strongly supplemented the literature analysis due to the issues discussed in Section 6.1.1. While this enabled me to receive very contemporary information that had not yet been documented in English, it was based upon personal recollections of the interviewee.

The stakeholder engagement framework worked well to highlight areas of engagement that can be improved. This was useful to create recommendations on how to improve stakeholder engagement in the industry and during the permitting process.

6.1.3 Results

Q1: What is the current regulatory regime and permitting process in the United States?

An appropriate regulatory regime is one that is effective at achieving its goals and is simple and efficient (Basedow and Kauffmann, 2016). These results support the arguments first made in 1978, and also by Fairbanks (2015), and Stickney (1996), saying that the current regulatory regime is inappropriate. Based on the attempts made to pass legislation over the course of 40 years with only having one offshore aquaculture related bill be passed, it is unlikely that another one will be passed any time soon. This means that the regulatory regime will continue to be inappropriate.

NOAA was and still is taking steps to work around this and it is unclear whether or not they will win their appeal. If they do manage to win their appeal, this will improve the efforts in the Gulf of Mexico and will hopefully inspire the other regions to follow suit. Companies are trying to navigate through the current permitting process. Don Kent and Neil Sims, at Aquaculture America 2020, discussed their hope for the industry once they've successfully figured out an efficient way to receive the necessary permits. They are willing to accept that NOAA won't be the lead authority and they just want to find a way through the permitting process. It was a popular idea before and remains a common recommendation from current stakeholders that NOAA becomes the lead permitting authority.

The permitting process and regulatory regime had last been documented up through 2017. This thesis has documented the changes in the system and industry through March 2020, which had not yet been written about. The literature analysis documented the current state of offshore aquaculture in regard to the permitting process and regulatory regime. It did this through documenting the 2018 lawsuit and the appeal, as well as documenting the experiences of three offshore aquaculture companies. It further documents how the offshore aquaculture industry is progressing without a lead permitting agency and appropriate regulatory regime.

Q2: How does the United States' regulatory regime and permitting process compare to regimes of countries that have established offshore farms?

Panama and Norway have two of the largest offshore aquaculture facilities in the world. It was also determined that their regulatory regimes are appropriate because they have been able to support the growth of the industry. These countries have lead permitting agencies but it was found that having a lead permitting agency can increase transparency but does not necessarily decrease the permitting time.

This thesis is also the first (known) document to discuss stakeholder engagement and the permitting process for offshore aquaculture (in English) for both Panama and Norway.

Q3: What are stakeholders' roles, and how are they impacted by the current permitting process?

When I first began sending out emails and conducting the semi-structured interviews, I was surprised that everyone I had reached out to was so helpful and willing to answer questions. It was not until Aquaculture America 2020, and one of the presentations I attended on stakeholder engagement in offshore aquaculture, that I realized that they likely viewed their involvement in my research as a form of stakeholder engagement.

As a result of my conference attendance and semi-structured interviews, I believe that stakeholder engagement is a focus of both the industry and the federal agencies. Both of these groups have invested a lot of effort to answer questions and hold workshops. Although this has happened, the way that these groups engage with specific stakeholders needs to be changed and tailored more towards their needs. While companies are not legally required to engage stakeholders, they do so to help educate the stakeholders in the hopes that the permitting process can run smoother.

It also appears that the agencies (NOAA, EPA, and USACE) are not currently coordinating their stakeholder engagement despite it saying that they would in the Gulf of Mexico MOU. USACE has not yet held a workshop to better educate the other stakeholders on offshore aquaculture.

7 Conclusions

Over the course of this research I conducted seven semi-structured interviews with stakeholders from NOAA, USACE, EPA, as well as two influential stakeholders from the offshore aquaculture industry. This included travels to Oahu, Hawaii for the Aquaculture America 2020 conference, and to Norway for an in-person interview with a Directorate of Fisheries official. I reviewed over 100 sources, including news articles, published papers, and government documents. My research was also the first to document the offshore aquaculture regulatory regimes and permitting processes for Norway and Panama in English.

This thesis focused on answering three key questions:

Question *Q1* focused on documenting the United States' offshore aquaculture regulatory regime and the current permitting process, including the changes it has faced in the past 4 years. For this question, I concluded that the current permitting process and regulatory regime has caused interested offshore aquaculture companies to face a lengthened, expensive, and uncertain process. The United States has been trying to promote the growth of the offshore aquaculture industry for almost 50 years. It was first noted in 1978 by the National Research Council that the regulatory regime was inappropriate. This thesis supports that claim. The United States' most recent offshore aquaculture-specific bill was passed in 1980 and amended in 1985. With at least nine federal agencies involved and two permits required, there are procedural inconsistencies both within agencies as well as on a regional level. In 2014, NOAA made its first steps towards streamlining the permitting process through the implementation of an MOU, but they were unable to do this due to a lawsuit having been filed against them. NOAA appealed this and is waiting for the outcome expected in 2020. The MOU is still in use in the Gulf of Mexico, but this allows for regional differences to occur, furthering the confusion of the permitting process. To date, the permitting process has taken a minimum of two years – and that is only for farms that are avoiding finfish. If the regulatory regime and permitting process remains the same, it will continue to take years to issue permits, more resources will be required, and the seafood trade deficit will continue to increase.

Contributing to this deficit, Catalina Sea Ranch, which was the only active offshore farm, recently closed down and entered bankruptcy in early 2020. This means that there are currently no commercial offshore farms in U.S. federal waters.

Question *Q2* focused on comparing the United States' regulatory regime to that of two countries that have established offshore farms. I identified Norway and Panama as two countries with offshore aquaculture activity of interest. After semi-structured interviews and a literature analysis, I determined that both countries have appropriate regulatory regimes with established lead permitting agencies that coordinate the permitting process. The outcomes for Norway and Panama are processes that are transparent and efficient. There are both similarities and differences between the U.S., Norway, and Panama including how their marine space is managed, permitting lengths, and the regulatory regimes themselves. In the U.S., the Federal Government controls the marine space from 3-200 nm compared to 5-200 nm in Norway and 0-200 nm in Panama. For finfish permitting, Norway takes two to three years to issue permits, and Panama takes about two years for temporary permits to be issued, and about six years for the official ones. In comparison, no companies have been issued permits in the U.S. (for finfish), so the permitting length is unknown. So, although Panama and Norway have lead permitting agencies, it does not mean that the permitting time is faster. Lastly, Norway's Aquaculture Act of 2005 and Panama's Law 44 of 2006 were passed to help meet the needs of a growing industry as well as prioritize sustainability and the environment by establishing lead permitting authorities. The United States does not have similar legislation.

Question *Q3* focused on determining stakeholder roles in the permitting process, and how the stakeholders are impacted by the offshore aquaculture permitting process. After the failed attempt to streamline the permitting process in the Gulf of Mexico in 2018, it was unclear how stakeholders were being engaged and how they were impacted by the process. To date, offshore aquaculture companies and federal agencies are engaging stakeholders through the use of workshops, participation in interviews, and public hearings. These activities have been used in order to educate stakeholders (including the public) on the science supporting offshore aquaculture. However, it appears that the education is one-sided and that the federal agencies and

offshore aquaculture companies are not learning from the other stakeholders. This imbalance is causing the industry to be unsustainable. Some stakeholders are not being engaged in a meaningful or practical way, so the industry and federal agencies need to do a better job of this. Through the application of Mayers' *Stakeholder Power Analysis* (2005), I determined that NOAA is the most influential and important stakeholder in the permitting process followed by the EPA and USACE. The least influential and important stakeholders are as follows: the general public, the commercial and recreational fishing industries, wholesale and retail processors, offshore oil and gas, and local, state, and federal politicians. Mathur et al.'s *Conceptualizing Stakeholder Engagement in The Context of Sustainability and Its Assessment* (2008) was used to determine whether the current offshore aquaculture industry is sustainable. Based on this application, it was determined that the industry is not socially sustainable because it does not engage stakeholders fully from the social learning perspective. The current regulatory regime has been believed to hinder the growth of the industry but recently, the disinterest and lawsuits from stakeholders as well as the lack of mutual learning has also slowed the growth of the industry.

While the current system lacks transparency, has regional permitting differences, currently inhibits growth, is not socially sustainable, and could engage stakeholders better, there are ways to help improve these issues. The following section gives seven recommendations regarding improving stakeholder engagement and the permitting process to offshore aquaculture companies, NOAA, EPA, USACE, and other stakeholders.

8 Recommendations

In hopes to improve the offshore aquaculture permitting process and stakeholder engagement in the U.S., I am providing the following seven recommendations for the offshore aquaculture permitting authorities including NOAA, USACE, and the EPA as well as offshore aquaculture companies.

My first recommendation is to integrate stakeholders in the permitting process. It is clear, based on the results from the stakeholder engagement framework application and the presentations given at Aquaculture America 2020, that federal authorities need to find a way to uniquely engage stakeholders in a way that appeals best to them and adapt their current engagement methods. It was mentioned by Peters in 2020 that stakeholders from the commercial and recreational fishing industry did not participate in a stakeholder outreach workshop that was held by Ocean Era in 2019. This meant that the commercial and recreational fishing industry missed an opportunity to have their voices heard. Both the government and offshore aquaculture companies should look for engagement methods that appeal more or are more accessible to stakeholder groups that have not participated to ensure that their voices and feedback are heard. One way to do this is to meet with fishermen on either their boats, at a convenient location, or at a Regional Fisheries Management Council meeting, or at a NOAA Regional Office.

In relation to better stakeholder engagement, I recommend agencies to increase and expand collaboration efforts with the offshore oil and gas industry. In a presentation given at Aquaculture America 2020, Don Kent mentioned that they had been trying to collaborate with the offshore oil and gas industry to use their decommissioned rigs as a site for an offshore aquaculture facility. This could lower decommissioning costs for the oil and gas company, and it could lower the engineering/structural costs for the offshore aquaculture company. The offshore oil and gas companies could also instruct and collaborate with the offshore aquaculture companies on ways to engage with stakeholders that are against their operations.

To continue to improve stakeholder engagement, I recommended that a stakeholder power analysis be conducted each year. This will allow the person/group/agency conducting the analysis to look for improvements and to make sure that voices are not missing at workshops and public hearings.

My fourth recommendation is for federal agencies to increase transparency of the permitting process. This could be done by creating an overarching MOU in the West Coast Region, creating a step-by-step process, and creating deadlines for each step of the process. Currently, MOUs are signed on a case by case basis which has previously led to confusion and the lengthening of the permitting process for RCF. By creating an overarching MOU, similar to the one in the Gulf of Mexico, federal agencies can work towards creating a permitting process that is more consistent. Having an MOU can help identify the best step-by-step process for the pre-permitting process and who should be contacted first. But one could raise the question if MOUs are enough? In the case of RCF, they realized that they should not have originally reached out to the Navy Regional Office. A step-by-step process will show interested offshore aquaculture companies who they should reach out to first, and it could potentially reduce the amount of time and money spent during the pre-permitting and permitting process. In addition to the step-by-step process, the agencies involved should create strict deadlines for themselves to ensure that the permitting process time is reduced. It took 3 years for CSR to receive the necessary permit whereas a finfish farm's permitting process will take longer. This increased transparency could appeal more to potential investors and could support the growth of the industry.

My fifth recommendation is to educate the general public. Noted by both Peters and Kent in 2020 was that a lot of the workshops and the public hearing in 2020 were spent educating the attendees on the science rather than ways to improve the industry. To help move the industry forward, the general public must hear about the science in a way that is understandable. I recommended that an efficient way for the federal agencies and offshore aquaculture companies to educate a larger group of people is to work with reporters from 60-Minutes, a popular TV show on CBS, to discuss the current science and efforts in hopes to better educate the public.

Information regarding offshore aquaculture has been published in magazines, such as National Geographic, in the past and they should continue their efforts to maintain transparency about the goals of the industry. This will also make science more accessible to the general public.

During the pre-permitting process, ensure that all of the necessary resources are accessible. After CSR harvested their first batch of mussels, they were unsure of where to send their stock to be tested and this led to further problems. I further recommend that this problem be solved before a facility is established and to make sure that there is proper infrastructure on land for testing and processing.

My final recommendation is that NOAA should be established as the lead agency. Interviews with employees from NOAA, EPA, USACE, and Don Kent came to the conclusion that NOAA would be best as the lead agency. They have offices around the country and they already manage wild marine stocks. This recommendation is not a new one, but it remains an important one. Establishing NOAA as the lead agency will also help with the coordination of public comment periods and hearings. It was noted by the Environmental Law Institute, 2015 that when USACE conducted their public comment period, they did not receive as much feedback as the CCC. This would require a federal bill to be passed or an executive order to be signed. This has been an issue in the past but as new scientific data becomes available and as offshore aquaculture becomes better known by the general public, there might be a bigger push from Americans to support the industry.

The combined recommendations from this section could allow the following figure (Figure 13) to be possible. This figure shows NOAA as an internal/direct primary stakeholder. Similar to the permitting processes in Norway and Panama, NOAA would be the lead permitting/coordinating agency. It shows the recreational/commercial fishing industry as a more valuable and engaged stakeholder being involved in the consultation and site selection process, workshops, and giving feedback during the public notice period. The figure also shows an increase in educational efforts for the general public and non-profit, non-governmental, and university organizations. Figure 14 is shown below Figure 13 to highlight the differences.

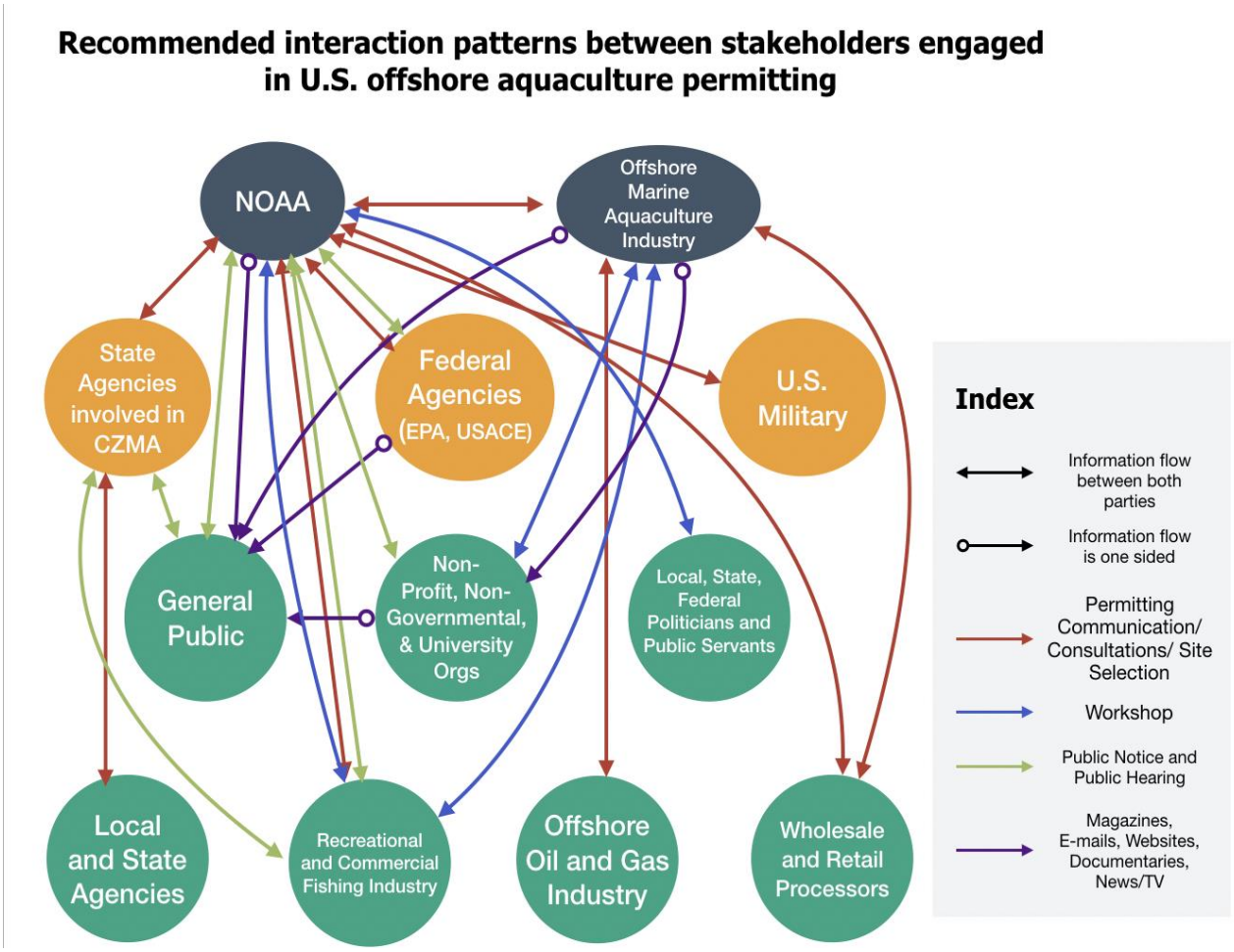

Figure 13 Recommended interaction patterns between stakeholders engaged in U.S. offshore aquaculture permitting

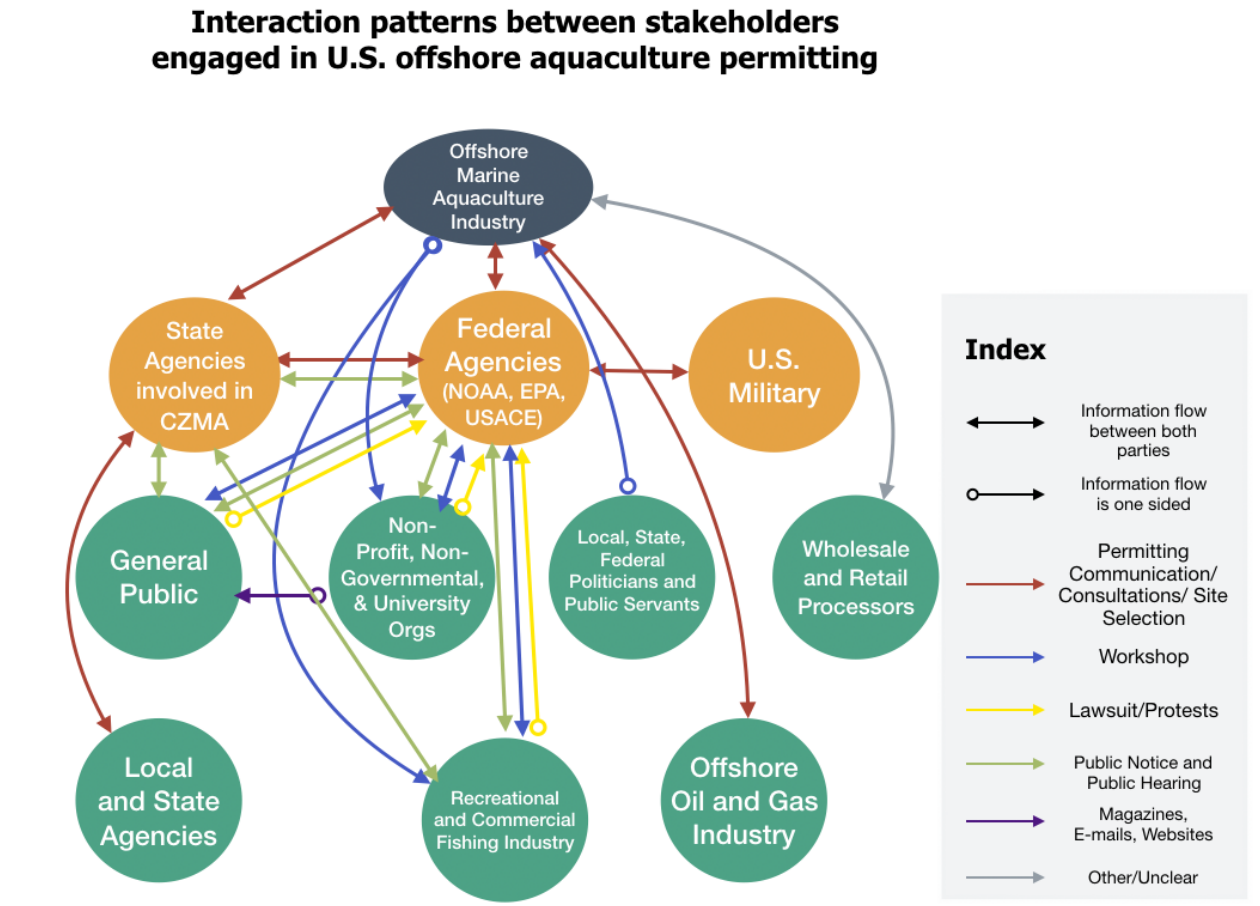

Figure 14 Interaction patterns between stakeholders engaged in U.S. offshore aquaculture permitting (same as Figure 11)

9 Further Research

In hopes to continue the work that has been completed by myself and the many scientists and researchers before me, I am providing the following ideas and recommendations for further research.

9.1 Continue to Document Offshore Aquaculture Efforts

During the time of my research, there were several new developments that occurred. This is likely to continue to happen in the coming years. When conducting my literature review on the legislative history on offshore aquaculture, I found the extensive documentation of each proposed policy to be extremely helpful. Without their work, I would have had a difficult time answering what the current regulatory regime is and how it got to be what it is today. With new and continued efforts regarding Ocean Era‘s pilot facility, Smart Fish Farm in Norway, and China‘s offshore efforts, there will be plenty of things to research and document.

9.2 Conduct the Stakeholder Power Analysis Annually

As the industry continues to change, I think it is valuable to continue to conduct Mayers’, 2005 Stakeholder Power Analysis annually. This will allow the stakeholder group or analyst conducting it to look for how stakeholders are engaged and to look for ways to improve their engagement.

10 Epilogue

On May 7th, 2020, the Trump Administration announced their Executive Order on Promoting American Seafood Competitiveness and Economic Growth. Included in the order were requests for recommendations on how to reduce domestic fishing burdens but also an overhaul of the current offshore aquaculture permitting process. Under Section 6: "Removing Barriers to Aquaculture Permitting" several changes and updates were made including: 1) designating NOAA as the lead agency for aquaculture projects in federal waters; 2) a decision that must be made in under two years for projects that require two or more agencies for permits as well as an EIS under NEPA; 3) proposing the possibility of the United States Army Corps of Engineers to develop and issue a general permit to authorize finfish, seaweed, and multi-species aquaculture in federal waters (a documentation the United States Army Corps of Engineers is included in section 5.1.2 and 5.1.4 and more information regarding general permits is included in section 5.1.4 under the Section 10 Rivers and Harbors Act heading); 4) the Secretary of Commerce in cooperation and consultation with other federal agencies shall identify at least two suitable geographic areas for commercial offshore operations and through the consideration of public comment, minimize conflicts with the military, shipping lanes, commercial and recreational fishing industry, and other industries. (Executive Order No. 13921, 2020)

One of the aims of this thesis was to document the current regulatory regime and permitting process in the U.S. The aforementioned executive order was signed after the completion of the research and had not yet impacted the industry, therefore not impacting the results. This event also highlights the importance of this research and the need to document the current state of the industry as it looks to progress forward- and had a push from the federal government to do so. There are still questions about the legality and legitimacy of NOAA being a permitting authority and there are still likely many challenges to be faced.

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Appendix A

In this appendix are the history of three U.S. offshore aquaculture companies and their experiences while navigating the permitting process.

Rose Canyon Fisheries

In 2014, Rose Canyon Fisheries (RCF) wanted to build their farm four nautical miles off the coast of San Diego in federal waters. The proposed operation would raise 5,000 tons of white sea bass and yellowtail jack each year, and it would generate 200 jobs. It would be the first fish farm in federal waters (Weiser, 2016). RCF funders had determined that they needed to become profitable by 2022. When beginning the permitting process in the West Coast Region, Don Kent, the CEO of RCF, had originally reached out to the Navy's Regional Office to help with site selection. He felt that at the time, NOAA did not have the resources needed to help pick a location (D. Kent, personal communication, October 10, 2019). Due to reasons that will be explained later, RCF submitted its permit applications to the United States Army Corps of Engineers (USACE) and to the Environmental Protection Agency (EPA) in October 2014.

During the permitting process, RCF reached out to business groups, environmental groups, as well as the recreational and commercial fishing industries. RCF gave more than 30 presentations in hopes to increase transparency about the company, and to educate the public on what offshore aquaculture is (D. Kent, personal communication, October 10, 2019). Following a long and incomplete permitting process, RCF's funders determined in June 2017 that they could not become profitable in time. They decided to no longer support the permitting process (Hubbs-SeaWorld Research Institute, 2018). The company spent $2 million dollars on graphic design and consultants and had received $20-50 million dollars in investments. In an informal interview with Don Kent, he said that he is going to try for another farm under a new corporate structure, and that NOAA is going to find a third-party consultant to help them fill out the applications (D. Kent, personal communication, October 10, 2019). In February 2020, Don Kent presented at Aquaculture America 2020 and announced that a site had been selected in Federal Waters near San Diego and an alternate site off of Long Beach, California (Kent, 2020).

Section 10 Permit in Action

In October of 2014, RCF submitted permit application to USACE and expected an environmental review to be completed within 45 days (NWI Times, 2015). After 5 months, USACE issued a notice of intent (NOI) which is an electronic document that contains basic information about the project and the company's "intent to be covered under the general permit," (EPANET, n.d.).

NEPA in Action

After USACE issued the NOI, the EPA agreed to be the lead agency responsible for the NEPA review. By November of 2015, the EPA published their NOI to lead the NEPA review which was to be guided by an MOU and to review the applications. During the same month, the US Navy submitted a comment saying that the location should be moved 2 miles north to avoid conflicts with their navigation. The following spring, the EPA cancelled their agreement to lead the NEPA review which caused the permitting process to halt. This was due to the loss of the EPA's lead stakeholder's vested interest. This meant that each agency was to conduct individual NEPA reviews. In June 2016 following the Navy's comments, the Army Corps decided they would deny the permit. This was frustrating for RCF because they felt that because they had reached out to USCG to avoid this, but they realized they should have reached out to the Navy instead. The Navy informed RCF that if they moved the farm two miles that they would not object to the project leading to RCF working with NOAA to redesign the farm. Following this effort, a joint meeting was held only to learn that USACE would deny the permit for the location even if the size of the farm was decreased. Further research into potential locations with the least interactions with commercial, recreational, and military vessels was conducted by the National Ocean Service. In May 2017, NMFS' Regulatory Branch offered to lead the NEPA review and in August, all agencies met to draft an MOU and to discuss NMFS' role as the lead agency. (D. Kent, personal communication, October 10, 2019; Hubbs-SeaWorld Research Institute, 2018).

Section 402 Permit in Action

Rose Canyon Fisheries did not make it to this stage in the permitting process.

Catalina Sea Ranch

To date, Catalina Sea Ranch (CSR) was the only existing offshore commercial farm in U.S. federal waters., CSR, a 100-acre farm located 6 miles off the coast of California, is growing Mediterranean mussel on 150-foot-long ropes submerged 20 feet below the ocean surface (Catalina Sea Ranch, n.d.). CSR began the permitting process in 2012 when they submitted a permit application to the Army Corps of Engineers. The proposed 1,076-acre farm was for a location 5 miles from the coast. Over the years of the permitting process, the location and size of the farm was changed two times before arriving at its final state. When selecting their location for the preliminary site, they consulted with the U.S. Coast Guard (USCG) to ensure that conflicts with shipping, pipelines, and oil platforms did not occur (Environmental Law Institute, 2015). They received their final permits approximately two years later (Environmental Law Institute, 2015). Over the 3-year permitting process, the company spent 1.5 million dollars on permits, preparations, lawyers, and consultants (NWI Times, 2015). While the company had their first harvest in 2017, they soon found out that they were unable to sell. For shellfish to be sold in US markets, it must be tested for biotoxins in an FDA-approved lab. Being that they were a new entity in federal waters, the FDA did not have an approved lab in California or near it. It took CSR a year to find a lab that was willing to work with their requirements as well as obtain an FDA certificate (Huffman, 2019). According to CSR's CEO, Phil Cruver, the delay cost over $100,000. In the summer of 2018, they had their first sellable harvest and are looking to expand to a size 30 times larger than its current size (Wilson, 2018). While the 2019 harvest numbers have not yet been published, it was reported that the company predicted it would harvest and sell 300,000 lbs of mussels (Huffman, 2019). However, as of March 2020, Catalina Sea Ranch explained on their website that they have entered bankruptcy and plan to liquidate their assets. They are looking for someone to buy and take over its operations (Notice of Asset Sale, 2020).

Section 10 Permit in Action

The Army Corps of Engineers issued a public notice of CSR's Standard Permit application on March 26, 2012. USACE received a number of responses to the notice from the public and from other federal agencies. NOAA was one of the respondent agencies and they gave some recommendations regarding concerns of endangered species and marine mammal

entanglement. The project was then modified and was followed by USACE reissuing a public notice (Environmental Law Institute, 2015). A provisional permit was issued by USACE on July 17, 2012 pending the completion of a review to ensure that it is consistent with California state law. NOAA's Office of Ocean and Coastal Resource Management (OCRM) granted authorization to the California Coastal Commission (CCC) after they requested to conduct a consistency review of Catalina Sea Ranch in accordance with the Coastal Zone Management Act (CZMA). The independent review included a state-led public comment period which received a wider variety of comments from stakeholders that had not participated in the Corps process such as fishing interests, the Pacific Fisheries Management Council, and environmental organizations. (Environmental Law Institute, 2015). The CCC determined that there were 13 special conditions which CSR agreed with. Catalina Sea Ranch obtained its first federal permit in January 2014 from USACE (Buck & Langan, 2017).

NEPA in Action

A preliminary review conducted by USACE determined that an environmental impact statement would not be necessary because the project would not impact water quality, cultural and coastal resources, or endangered species. (Environmental Law Institute, 2015)

Section 402 Permit in Action

A NPDES permit was not required because it was determined that the facility would not impact water quality.

Ocean Era, LLC

Ocean Era, founded in 2011 and formerly known as Kampachi Farms, successfully conducted three experimental offshore finfish projects off of the Island of Hawaii; they also operate a commercial offshore farm in Mexico's Gulf of California. They also have a fourth pilot that is in the permitting process in Florida.

The experimental pens off of Hawaii, called the Velella Delta Project, contained two trials over the span of 2 years. The Velella Beta trial (2011-2012) used a submerged net pen with a controlled drift strategy. The pen was attached to a feed vessel, but it was able to drift with local

currents. The following trial, Velella Gamma, used the same submerged pen used in the Beta trial but in contrast it used a mooring system. After the trials were completed, Ocean Era applied for permits for a third project, the Velella Delta Array (NMFS Pacific Islands Regional Office, 2016). While the permits were granted in 2016, CEO Neil Sims had decided to move his operations to Mexico, attracted by the streamlined permitting process (Watson, 2015). Due to its location outside of the U.S., that system is not documented here.

Their latest project, Velella Epsilon (V.E.), proposes the installation and operation of pilot-scale aquaculture facility raising approximately 20,000 Almaco jack (Seriola rivoliana, i.e., Kampachi) 45 miles off the southwest coast of Florida. The estimated maximum amount of feed per month is 27,268 lbs and having an estimated 88,000 lbs maximum annual harvest weight. The facility would include a single floating cage at a depth of 130 feet as well as a supporting vessel (EPA, 2019 August).

During the permitting process, the company reached out to Gulf of Mexico Fishery Management Council and the shrimp and fishing industries to conduct educational outreach and give presentations (K. Tyler, personal communication, October 22, 2019). The company held a Stakeholder Outreach Workshop in June 2019 and invited more than 175 people from several industry sectors including journalists, food services, government officials, conservationists, and both the commercial and recreational fishers. Approximately 100 people participated, and notably, the commercial fishers were absent. The company hoped to have the required permits for their pilot by May 2020, concluding the permitting process at 32 months. The company planned to begin pursuing commercial permits (Peters, 2020).

Section 10 Permit in Action

Ocean Era submitted their application to USACE on December 13, 2017. The application noted that the location and equipment for the project "was likely to change as a result of the NMFS exempted fishing permit (EFP)", (EPA, April 2019). On March 23, 2018 the application was withdrawn because these details needed to be finalized. The EFP process was terminated following the September 2018 court ruling. In November 2018, a second application was submitted. USACE determined that because of the size of the project, a Letter of Permission pursuant to Section 10 fit best. The LOP lasts for 5 years and was chosen due to the small size as

well as the short timeline of the proposed project. As of January 2020, the LOP was pending meaning that it was "federally complete" but waiting to be authorized (USACE, n.d.b).

NEPA in Action

Although NOAA cannot be a permitting authority, the EPA and USACE continued to follow with the MOU. The EPA elected to act as the lead Federal agency and is conducting the NEPA review to ensure that there is not an overlap of effort between the two agencies. A NEPA review is required when the EPA issues a NPDES permit for a "new source" under the Clean Water Act (EPA, 2019). The proposed facility does not meet the needs for a NEPA review to be conducted because it is not defined as a "new source" under the Clean Water Act. But the EPA determined that the review could be beneficial to better understand and analyze environmental impacts of the first offshore facility in the eastern gulf and because the proposed facility's maximum production is close to meeting the "new source" threshold of 100,000 lbs (EPA, 2019; EPA, 2019, April). The EPA determined from the draft EA that the proposed project would not significantly impact the environment (EPA, 2019).

Section 402 Permit in Action

Ocean Era submitted their NPDES permit in 2018 to the EPA for their new Velella Epsilon project. An NPDES permit is required based on the facility's consideration as a point source for the discharge of industrial wastewater. CAAP standards and other limitations did not automatically apply to the facility due to it producing under the 100,000 lbs/year limit but were included in the end based on the usage of best professional judgement (BPJ). For activities such as offshore aquaculture that do not have established technology-based effluent guidelines, limitations must be established with BPJ on a case-by-case basis by the EPA. (EPA, 2019 August)

When setting the BPJ limitations the EPA considered several factors: 1) the proposed 88,000 lbs is relatively close to the CAAP 100,000 lbs threshold, 2) effluent limit guidelines for CAAP facilities is very similar to the facility's operational and discharge characteristics, and 3) the facility will be the first of its kind in the eastern Gulf and that "CAAP conditions should not

be overly burdensome and should pose minimal economic hardship to the permittee," (EPA, 2019 August).

The EPA Region 4 released a public notice of a "proposed issuance of National Pollutant Discharge Elimination System permit" on August 30, 2019. Within 30 days of the notice, "persons wishing to comment upon" the NPDES permit could send comments via letter or to the designated EPA official for the region and Permitting and Grants Branch. The feedback led the EPA to determine "that significant public interest exists to conduct a public hearing," (Public Notice No. 19FL00002). Interested persons were also allowed to request a public hearing. The EPA Regional Administrator scheduled and held the public hearing on January 28, 2020 and the public comment period was extended until 7 days following the hearing. The hearing was 5 hours long and they received over 16,000 comments. There were 50 oral comments with 40 being against the permit and 10 in favor of the permit (Peters, 2020). A written transcript was made available for those unable to attend (Public Notice No. 19FL00002).

Appendix B

In this appendix is a picture of Maria Pazandak (author) presenting her research at the Faculty of Law at the University of Bergen, Norway. September 2020.

Appendix C

In this appendix is a picture of Maria Pazandak (author) at the Aquaculture America 2020 Conference in Oahu, Hawaii. February 2020.

Appendix D

Háskólasetur Vestfjarða
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Research ethics training and clearance

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This letter certifies that **Maria Pazandak** has completed the following modules of:

(X) Basic ethics in research
(X) Human subjects research
(X) Animal subjects research

Furthermore, the Masters Program Committee has determined that the proposed masters research entitled **Stakeholder Engagement in Offshore Aquaculture Permitting in the United States** meets the ethics and research integrity standards of the University Centre of the Westfjords. Throughout the course of his or her research, the student has the continued responsibility to adhere to basic ethical principles for the responsible conduct of research and discipline specific professional standards.

University Centre of the Westfjords ethics training certification and research ethics clearance is valid for one year past the date of issue unless otherwise noted.

Effective Date: 17 April 2019
Expiration Date: 17 June 2020

Prior to making substantive changes to the scope of research, research tools, or methods, the student is required to contact the Masters Program Committee to determine whether or not additional review is required.