

**PROSPECTS FOR MASSACHUSETTS COMMUNITY
SUPPORTED FISHERIES**

Honors Thesis

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ABSTRACT

Marine fisheries across the globe are challenged by unsustainable industrial fishing practices resulting in the depletion of fish populations. Fish become global commodities, traded and shipped all over the world, accumulating thousands of food miles and benefiting companies and food processor many miles from the fishery itself. Community Supported Fisheries (CSF) were created in the last ten years as a solution to unsustainable, industrial fisheries practices that undermine marine environmental health and local fishing jobs, communities and cultures. Closely related to the land-based Community Supported Agriculture (CSA) model, CSF seek to minimize the distance between producers and consumers, offering fresh and local fish to consumers and allowing for greater profits remain in local fishing communities. CSF are smaller in scale and support more environmentally sustainable fishing practices. This model has spread throughout the United States over the last decade with no two CSF being identical. Through personal interviews with two local Massachusetts CSF, I document the evolution of these CSF. I assess the implementation of sustainable fishing practices and consider whether the CSF model promotes the sustainability of people and planet. I examine barriers and threats to CSF success; information that will be relevant to those interested in starting their own CSF. Finally, I examine CSF marketing strategies and consider how they employ localisms (local identities, branding) to market themselves to the nearby communities based on their local surroundings and demographics.

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Introduction:

Planet Earth is under attack, and we are the only ones who can protect it. According to Joyce Msuya of the United Nations, the health of humanity is tied to the state of our environment (NationalGeographic.com 2019). Due to industrialization and global capitalism, the planet is at a loss; experiencing a loss of biodiversity; degradation land, air and water pollution; and many more environmental impacts (NationalGeographic.com 2019). But while the Earth deteriorates there is still hope for its resurgence and survival. People can make a difference in their day to day lives to help heal the planet. Through the implementation of sustainable practices, there is hope to turn things around and maintain a healthy planet for all.

Sustainability is crucial when assessing the future state of the planet. According to Margaret Robertson (2014), sustainability “refers to systems and processes that are able to operate and persist on their own over long periods of time,” (Robertson 2014, 3). These systems are also looked at through three different lenses known as the “triple bottom line” or the “three E’s”. The “E’s” are environment, economics, and equity. These three qualities define sustainability and act as goals for communities. They provide parameters to educate individuals on what it takes to foster communities that are healthy and safe, allow economic growth and opportunities for everyone, as well as maintain healthy ecosystems.

The first E, environment, refers to maintaining and improving upon the health of the biophysical environment, such as terrestrial and aquatic ecosystems, as well as those who live within it, such as animals. The environmental lens of sustainability focuses on the life-supporting systems found within nature, such as oxygen production or

decomposition of waste products. Critical to environmental sustainability is an understanding of natural systems that sustain our planet as well as all of the life on it. Having this critical, scientific knowledge allows us to carry on our lives knowing what is necessary to keep Earth's natural systems viable for all living beings.

The second E relates to economics. Sustainable economics is defined by the ability of an economy to sustain itself and generate profit so that one is able to meet their own basic human needs. Economic sustainability does not focus solely on short term economic growth at the expense of the planet or people. Economic sustainability involves improving the quality of life for all, by monitoring our impacts on the Earth so that all may live healthy and happy lives, rather than those who simply can afford it. This is not always the easiest step in moving towards sustainability because global capitalism, with its focus on short term profit-making, leads to unsustainable choices. What is required is a shift in thinking toward emphasizing long term economic productivity rather than short term monetary gain for the few and privileged.

The third E, equity, represents and seeks equality for all. This includes, "freedom from unhealthy living conditions and equal access to food, water, employment, education, and healthcare...not just [for] a privileged few," (Robertson 2014, 6). Equality for all in the present may seem understandable, but there are also intergenerational impacts that need to be taken into consideration; making sure that the people of the future will have the same opportunities that are available today. Sustainability can often be confused with "being green." While choosing to minimize our impacts on the planet is important, sustainability is not about looking at immediacy, but rather towards the future; what will make the planet healthy for everyone for a long time.

There are many aspects of our day to day lives that can allow us to live more equitably, including changing the way we organize our food systems. One of the areas of the food system that is becoming unsustainable is the fishing industry. Fishermen, scholars, and policymakers are striving to make commercial fishing more sustainable. The focus of this thesis is to explore the origins, development or characteristics and prospects for one such sustainable solution to our fisheries problems: Community Supported Fisheries (CSF). My goal in this thesis is to provide context for the emergence and development of CSF, helping the reader understand how and why CSF may help to eliminate the crisis of global, U.S. and New England fisheries.

The Social and Economic Organization of Fisheries:

Since the 1980s, the fishing industry has seen a steady decline in the number of fish being brought to the shores (Snyder & Martin 2015). Overfishing has been a leading “concern, with 20-30% of federally monitored fish species considered overfished” (Campbell et al. 2014, 91). Fish are commonly caught using trawlers by local or small fleet fishermen or fisheries. The fish caught by these fishermen are then sold to a wholesaler for a trace, monetary value, only to be sold at auction for higher values. The profit goes to the wholesaler, while the fishermen are left with a smaller revenue from the initial sale of the fish. Along with lower profit margins, smaller fisheries are “threatened by ... the rationalization of production capacity, consolidation of ownership and corporatization of social relations,” (Snyder & Martin 2015, 28). Larger fisheries are able to take a large quantity of fish and bring in more revenue for their businesses and, of course. Consolidation and corporatization reinforce the belief that the past was full of rich fishing opportunities and communities, only to be replaced by big business (Snyder &

Martin 2015). The loss of community and privatization has caused fishermen to use more extreme and expensive methods, such as large nets used to capture entire schools of fish, or fish aggregating devices (FAD) which are buoy-like machines used to attract species of fish, in order to keep up with market demand, (Hays 2008). Fisheries are forced to fish the population of desirable aquatic species to exhaustion in order to make a livable wage. The results of overfishing are lower fish stocks and degradation of fish habitats. Unfortunately, these unsustainable and unfair practices are leading to a loss in biodiversity within oceans as well as a loss of a fishing way of life. These impacts will leave a lasting impression and will impact generations to come on their ability to make a living as a fisherman and limit who is able to afford fish.

In the current organization of the fisheries, there is no consideration for the three elements of sustainability. According to Snyder and Martin (2015), the current trajectory of fisheries in New England is one that cripples small-scale fisheries, threatens fishing communities, and reduces economic diversity. The result of the current market structure is that fishermen are taking from the oceans, without consideration for the future. Smaller fisheries, due to fewer boats in a fleet and a limited number of fishermen, are not given equal opportunities to do right by the planet and reach quotas, therefore needing to turn away from sustainability in order to make a living. Overfishing, over a lifetime, has led to a decrease in fish as well as the number of fishing communities (Snyder & Martin 2015). New England fishing regulations such as Total Allowable Catch (TAC) and quota based fishing have only contributed to a decrease in the number of fisheries (Snyder & Martin 2015). If fisheries are unable to reach their quotas they are forced to go out of business, causing the small-scale local fisheries to close and the privatization of large-scale

fisheries to rise (Snyder & Martin 2015). What once started out as fathers handing off their businesses to their sons, now turns into a loss of a business and loss of a family's history. Fishing communities, today, are a mere shadow of what they once were due to this loss of equity. The lack of sustainability is collapsing fishing culture and community.

Given overfishing and threats to the viability of small-scale fisheries in New England and all along the coastline of the United States, fishing communities have sought alternative and more sustainable marketing strategies to ensure their survival. The fishing community of Port Clyde, Maine was the first in the U.S. to create this more sustainable approach to fishing. First, they created a coalition to plan an alternative to TAC, however, their efforts were rejected (Snyder & Martin 2015). The Port Clyde fishermen then developed an alternative method that allowed them to fish within the law, but be more sustainable. The fishermen used data collected by the National Marine Fisheries Service (NMFS) in order to expand their knowledge on fishing habitats and what times were seasonally appropriate to harvest fish (Snyder & Martin, 2015). They started selling their hauls on a local level, reaching out to consumers in the area as well as local businesses. Through this direct marketing, the desire for fresh, local fish grew, along with support for the fishermen of Port Clyde (Snyder & Martin 2015). Through innovation and restoration, as well as education, promotion, and perseverance Port Clyde has created a flourishing fishing community centralized on more sustainable fishing practices, with benefits for fishermen and their families, as well as a united community. Providing a healthier environment for all, especially for the breeding cycles of fish, improving upon the economic livelihoods of those within the community, and equity for all fishermen now and in the future.

Crisis of the Fisheries:

Fishing has been around for centuries and provides for many people all around the globe. It is a trade that has supplied a way of life as well as a community and culture. However, what was once a bountiful and promising industry, is now one facing uncertainty. It is of no surprise that fish populations everywhere are in decline. These projections have been known for decades, and are of global concern. This can be connected to a rise in global consumer demand, leading to overfishing as well as pressures on fisheries health from environmental pollution and climate change.

Since 1961 the demand for fish has grown in both developed and developing countries with fish consumption being twice as high as population growth (FAO 2018). While interests have grown in the industry, the unfortunate truth is that the number of fish available are dwindling. According to statistical data provided by the Food and Agriculture Organization of the United Nations (FAO) (2018), the amount of fish being caught or raised has decreased by roughly 2 million tons within a year. All world regions have found it more difficult to sustain a harvest at previous levels. Some locations, such as along the Northwestern Pacific have been able to increase their catch rates, mostly along Alaskan and Canadian coastline. However, these are not the circumstances for other fisheries, such as Peru and Chile, who contributed 1.1 million tons of fish to the loss. There are roughly 40.3 million jobs within the global fishing economy (United Nations 2018). With a noticeable downward trend in catch rates, it can be expected to see that the number of jobs will also be on the decline.

Job loss in fisheries is not only a personal problem but impacts entire countries greatly. During 2016, United States fishermen brought in \$212 billion in sales from their

fisheries (NOAA 2016). These numbers are decreasing as years go on with United States fish populations being cut in half from 1970 until 2012, (Doyle 2012). The high prices placed upon domestically caught fish is leading to more and more fish being imported. In a study conducted by McClenachan et al. (2014), they found that Chinese seafood was the largest quantity of seafood imported at 23%, followed by Thailand at 15%, and Canada at 12% respectively. This is especially true and economically challenging for the shrimp fishermen on the coast of Georgia. In a Brunswick News article, associate marine extension director Bryan Fluech speaks about how “[o]ver 90 percent off the shrimp we eat is imported, and ... it’s hard for [Georgia fishermen] to compete with those prices” (2018). Fish has become one of the most popularly internationally traded items with roughly 35 percent of all production being traded on a global level (United Nations 2018). Second, only to the European Union, sits the United States in receiving imported fish supplies. This has prompted many fishermen to become more resourceful in their marketing strategies. For the fishermen of Georgia, this has meant emphasizing the history and culture of Georgia caught shrimp in their gumbo.

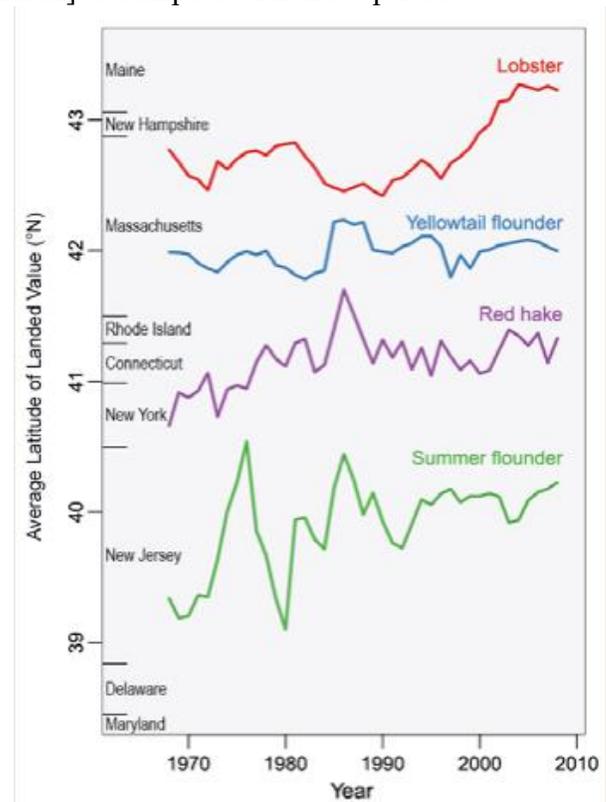


Figure 1: Common Atlantic Species moving North due to temperature changes (Doney et al., 2014)

While some regions are making the best

out of tough situations, this does not change the fact that overfishing is still a major issue within the industry. Statistics show that the percent of sustainably caught fish, or fishing

methods that consider impacts on the environment, fish spawning sites, and threatened species, is on the decline moving from 90 percent sustainable in 1974 to 66.9 percent in 2015 (United Nations 2018). Historically, people have seen the oceans as open and free and would take as much as they liked as often as they wanted. Fishing out of season and using smaller knit fishing nets are unsustainable as people are overfishing popular breeds, such as Atlantic Cod and Haddock. Overfishing does not allow fish populations to remain stable because fish are caught before they are able to reproduce and have offspring mature. Fishing regions such as the Mediterranean and the Black Sea, Southeast Pacific and Southwest Atlantic have the highest percentages of depleted fish stock, whereas Eastern Central Pacific, Northeast Pacific, Northwest Pacific, Western Central Pacific, and Southwest Pacific had the lowest (United Nations 2018). This tragedy of the commons explains the depletion of our oceans and emphasizes the work that must be done in order to bring life back into them.

Bringing fish back into the fishing industry has more challenges ahead than declines due to overfishing. Climate change is an additional factor affecting today's fisheries, one that needs creative solutions in order to combat. Scientists, as well as fishermen, are well aware of the impacts climate change has on the fishing industry. Many species are moving towards the poles and/or out to deeper waters in order to adjust to warming ocean temperatures (United Nations 2018). While this will lead to an increase in supply and diversity along the northernmost and southernmost parts of the globe, tropical areas will lose diversity. These impacts are forcing fish species, which are able to relocate, out of their normal habitats in order to survive. This migration leads to new worries in regards to species interaction as well as issues regarding space (United Nations

2018). Climate change is making fishermen have to work harder. Along with changes in water temperature there are changing currents, changes in storm frequencies and intensities, and an increase in carbon dioxide levels in water (Seggel De Young and Soto 2016). Fishermen are forced to adapt to these changes in order to make a living. Many fisheries have closed their docks due to this, and many more may follow this same fate due to climate change.

Climate change is a serious issue that fishermen everywhere will face. There are several new plans for the future to mitigate the impacts on the fish supply as well as on fisheries. These policies are supposed to benefit all fisheries, but this is not always the case. Due to their sheer size, larger fisheries tend to have more input in policymaking. Practices on sustainability can be slim to find since many large fisheries tend to focus on profitability within their business (Crilly 2013). In order to mitigate these impacts, there have been discussions to implement access criteria into fisheries (Crilly 2013). Criteria access is looking into ways for fisheries to be more environmentally conscious by using alternative fishing nets along with having designated areas for fishing. After these stipulations are planned, fishing fleets are then allowed to go and fish (Crilly 2013). However, these efforts are not standards heavily implemented in the fishing world. Future policies will be pushing fishing towards criteria access practices.

Community Supported Fisheries:

The fishing industry is at a critical point in history. This is now a time where fisheries will sink or swim in more ways than one. With large fishery policies, climate change, the continual reliance on foreign fish supplies, and an overall decline in fish populations it has never been tougher to be a fisherman. Policies and actions made by

individual fisheries such as the fishing community in Port Clyde, Maine, will be crucial to the future of fisheries.

What Port Clyde created was an alternative fishery marketing arrangement known as Community Supported Fishery (CSF). This model “call[s] us to be stewards of the environment, to be committed to one another’s well-being, and to reimagine the direction of our local economies and environments,” (Snyder & Martin 2015, 27). CSF are modeled after the Community Supported Agriculture (CSA) model (Salladarré et al. 2018; Bolton et al. 2016; Campbell et al. 2014; McClenachan et al. 2014). Unlike conventional markets with multiple middlemen, CSA are a countermovement against traditional commercial food markets and seek to bring community and stewardship back into direct relationship with the farm (Campbell et al. 2014). Both CSA and CSF have shareholders who pay upfront for a portion of a harvest and give up the power of decision-making to the producer in what they will be receiving (Salladarré et al. 2018). Shareholders pay a higher price for a fresh, locally produced food while also sharing the risk of production with the fisherman or farmer (Salladarré et al. 2018; Witter & Stoll 2017; McClenachan et al. 2014). Unlike CSA, however, CSF struggles to supply a diverse selection of fish, as they sell what they catch and do not simply pick and choose their haul (Stoll, Dubik, & Campbell 2015). CSF also struggle directly connecting consumers with their fishing procedures as there are many liabilities involved with taking people onto trawlers whereas, in the CSA model, the shareholder can have direct access to the farm and thus have direct knowledge of how their food is being grown (Campbell et al. 2014).

Despite these struggles, CSF make great effort to promote community (Campbell et al. 2014). Through face-to-face interactions, at community events such as “Seafood Throwdowns”- a cooking competition between professional chefs used to promote the underutilized species commonly sold through catch-shares- CSF bring the community together and promote awareness about sustainable fishing (Brinson, Lee, & Rountree 2011). A key environmental benefit of direct marketing and local distribution is that the CSF carbon footprint is two magnitudes smaller compared with industrial seafood (McClenachan et al. 2014).

CSF are expanding along the coasts of the United States (Fig 2) and increasing in frequency (Fig 3).

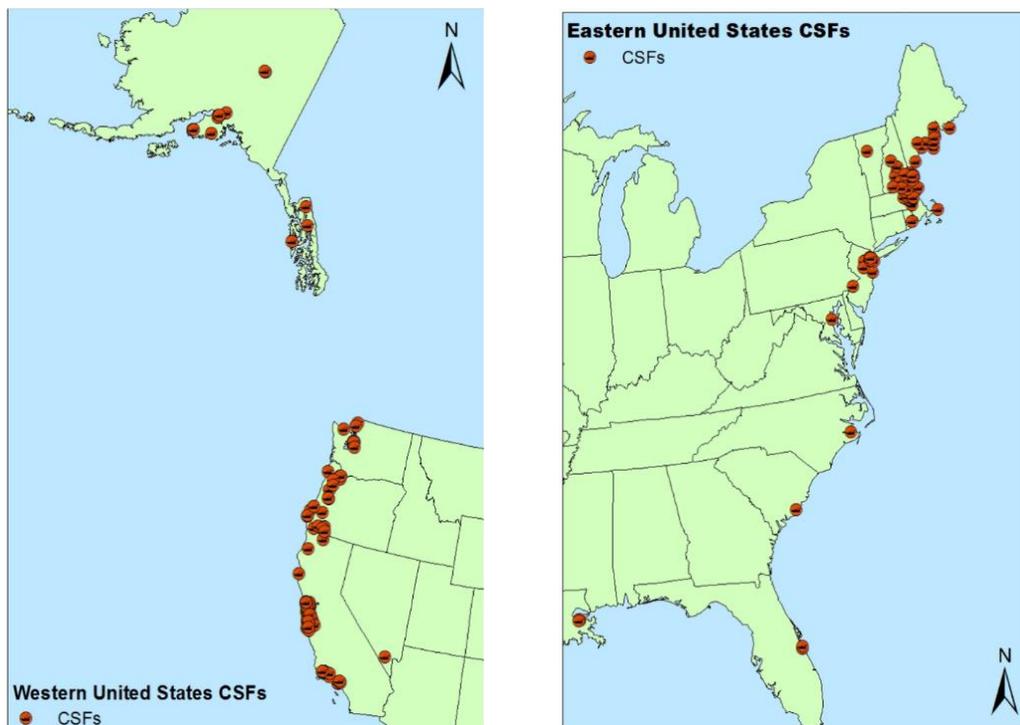


Figure 2: Map of distribution sites for CSF, (Data collected from LocalCatch.org 2019).

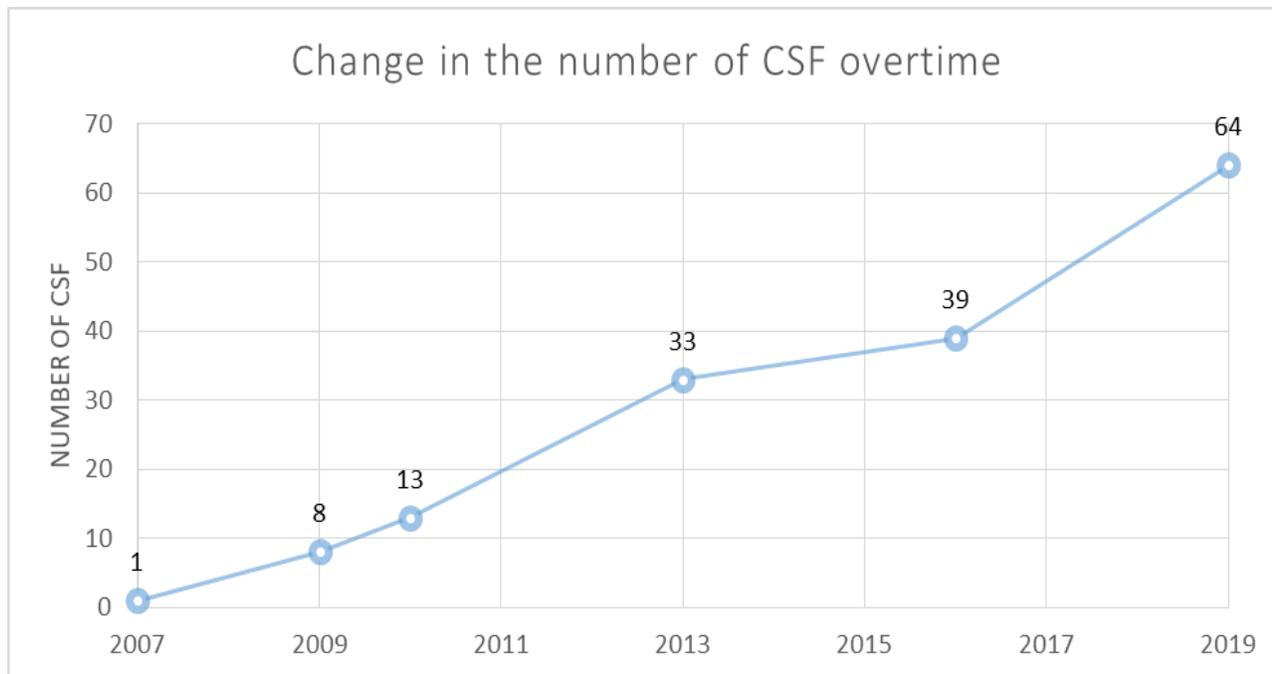


Figure 3: The growth of the CSF (LocalCatch 2019; Bolton et al. 2016; Silvern & Silveri 2013; Brinson et al. 2011)

CSF across the United States have similar core values of shortened supply chains, and traceable, local seafood, yet distinct differences on an individual level (Table 1).

Table 1

Characteristics of Community Supported Fisheries*

Unifying Characteristics	Divergent Characteristics
<ul style="list-style-type: none"> • Shortened supply chains • Traceable chain of custody • Domestically sourced seafood • Effort to provide information to consumers about their seafood • Voluntary adoption of CSF designation 	<ul style="list-style-type: none"> • Legal organization • Goals of CSF program • Types and importance of other product outlets • Consumer commitment • Seafood species included in CSF box • Seafood sourcing practices • Frequency and method of CSF box distribution • Challenges associated with selling seafood through CSF program

Bolton et al. 2016*

But not all CSF are the same. Each CSF has its own business practice ideas about community building, economic benefits, and impacts on the environment. There are

currently three types of CSF focus: Harvester, Consumer, and Species (Bolton et al. 2016). A Harvester focused CSF uses a direct marketing structure with the goals concentrated on improving the economy and resilience of fishing communities (Bolton et al. 2016). Consumer-focused CSF use intermediary marketing, such as distributors and retailers and are oriented towards community education and connection to the seafood system (Bolton et al. 2016). Species-focused CSF connect fishers and consumers interested in high-value aquatic species, such as Salmon or Cod. Species-focused CSF use direct marketing or intermediary marketing, however, it is distinct in that species are traveling greater distances in comparison to the two other focuses (Bolton et al. 2016).

Massachusetts CSF:

Massachusetts has some of the oldest and most prosperous fishing communities in the United States (NOAA 2019). The state has a long tradition of fishing beginning with Native American tribes, to the European settlers, American whalers, and 20th-century commercial fishing. Fishing is a part of the state's identity, with tourists visiting the state for its fresh lobster, cod, sea scallops and other seafood (NOAA 2019). Like many prosperous resources, Massachusetts waterways have historically been exploited and seen a decline in fish stock and the amount of seafood brought in. The fishing industry changed from wooden boats with sails to steam and diesel-powered metal trawlers; and with these new technologies, the ability to catch large quantities of fish increased causing a decline in the population to unsustainable levels (Robinson & Pederson 2005). In the 1980s the effects of overfishing became apparent as the price for fish rose and newspapers publicized the plight of fishermen no longer able to make a living from the sea (Robinson & Pederson 2005). Throughout the 1980s until today 59% of Northeast

aquatic species, such as Cod or Haddock, were deemed as “low abundance” and this would spur change within the fishing industry (Robinson & Pederson 2005; NOAA 1998). At the same time, the fishing industry was experiencing global competition and consumers were becoming interested in local food and understanding the social and environmental impacts of their food choices (Bolton et al. 2016). This set the stage for the recent creation of community supported fisheries in Massachusetts, along the Port Clyde Model as an alternative to modern, industrial unsustainable fishing practices (Fig 4).

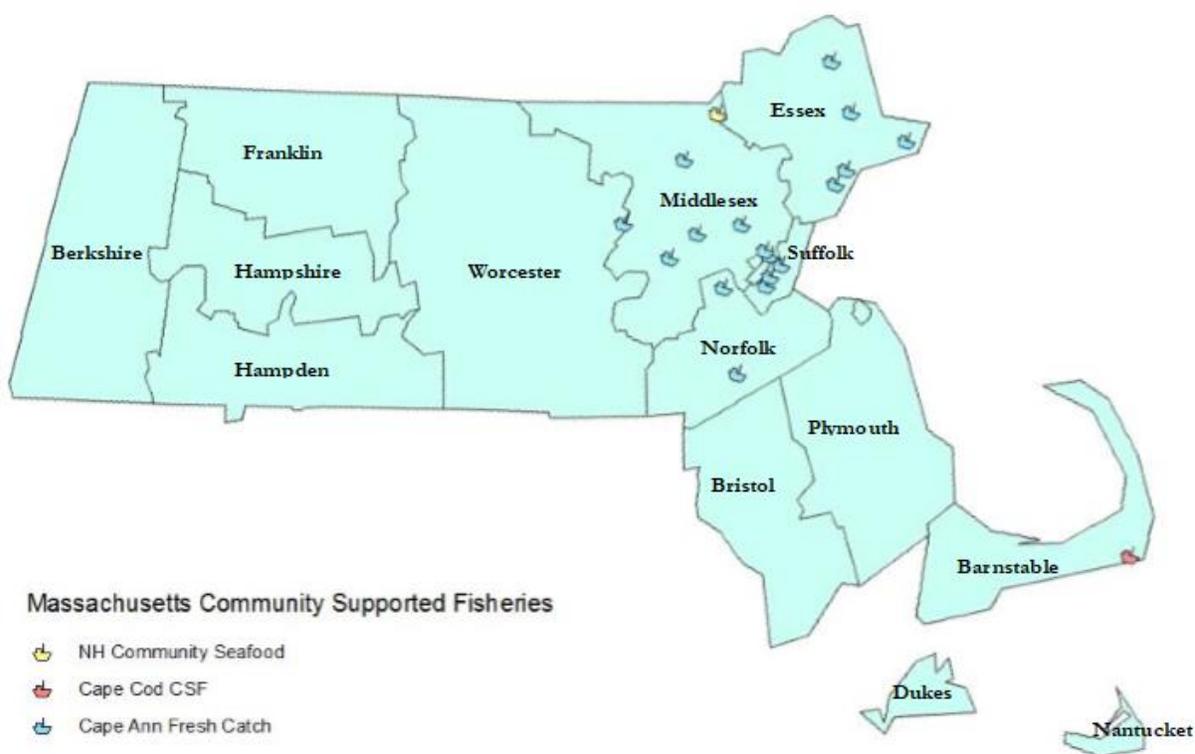


Figure 4: Current CSF located in MA, including drop-off locations (Data collected from LocalCatch.org)

The first CSF in Massachusetts is Cape Ann Fresh Catch (CAFC) located in Gloucester, MA. CAFC began in 2008 and started their delivery service to shareholders

in June of 2009. The CSF was formed with the support of the Gloucester Fishermen's Wives Association (GFWA) and additional support from an MIT SeaGrant and the Northwest Atlantic Marine Alliance (NAMA) (Dipalo 2009; GFWA.org 2009). Described by the GFWA as a collaborative effort "between shore-side residents, businesses, and the local fishing community" this CSF started with eight drop-off locations outside of Boston (Amy 2009). CAFC now has 17 distribution locations found primarily in the eastern part of the state (LocalCatch.org 2019). Their number of shareholders fluctuates depending on the season. Last available data indicates that they had 700 shareholders (Silvern & Silveri 2013).

CAFC operates year-round. Customers of CAFC pick-up Massachusetts fish such as Cod, Hake, Salmon, Scallops and Pollack on a weekly basis, caught by fishermen working out of Gloucester. Customers are given the opportunity to choose their pickup site as well as the type of package they wish to buy, whether that be one pound, two pounds, or only shellfish. Local restaurants also feature CAFC seafood. There was even experimentation with subsidized seafood in the Lowell area, however, this was found to be unsuccessful (Silvern & Silveri 2013). They claim to offer a fresh, never old or frozen, product that is caught through "sustainable stewardship" (GFWA.org). According to MIT SeaGrant worker Sarah Olivo, "fishermen are taking all groundfish, cutting down on by-catch, they stay closer to shore, use less gas and overall, the environmental impact makes a difference" (Amy, 2009).

CAFC provides consumers with information on the type of fish, the vessel that caught the fish, as well as a suggested recipe (CapeAnnFreshCatch.org 2019). The fishery is known for working with the community, having creative collaborations, fair

access and price, as well as a very transparent supply chain. Consumers want to know where their seafood is caught, and whether it is caught sustainably. Local seafood from the CSF is interpreted as being a fresher, higher quality product than store-bought seafood (Witkin et al. 2015). Advertised through NAMA (2011), this fishery hosts fileting, cooking, and tasting demonstrations for the public. Through these interactions and events, consumers are able to learn about CSF, meet the community of fishers, and learn about the sometimes uncommon species (such as dogfish) they could be receiving through their shares. Reactions to the CSF have been positive as one promoter stated, “People were very afraid before doing this; now people are empowered by it” (Amy 2009).



Figure 5: CAFC Pick-up Location in Beverly, MA (Sulick 2019)

A second CSF in Massachusetts is Cape Cod Community Supported Fishery. This CSF serves consumers in the Southeastern part of the state, focusing on Cape Cod and primarily during the summer season (Silvern & Silveri 2013). Also based on the CSA model, shareholders negotiate share prices on a variety of fish delivered on a weekly basis. They are known for supplying Squid, Mackerel, Black sea bass, and Scallops. Like Cape Ann, Port Clyde and other CSF, they seek to,

“establish a transparent chain-of-custody from boat to fork; increase access to premium, locally caught seafood; ensure fishers receive a fair price for their catch...;engage fishers and community members in more...local food systems; [and] provide a framework through which fishers and customers can creatively steward our marine resources,”(CapeCodCSF.wordpress.com).

This CSF is run by the Eldredge family and has been using a method known as weir trapping since the 1960s. This method involves imbedding long sticks with attached netting into soft bottom ocean floors, traditionally in a heart shape with an opening. Fish enter through the mouth of the weir and as the tides get lower, fish are trapped and later caught to be brought ashore (Gulf of Maine Research Institute). The Cape Cod CSF then looks over the size of the fish and only collects fish large enough for sale, all others are safely returned back into the ocean (CapeCodCSF). A portion of catch proceeds goes towards solving the challenges of overfishing, poor water quality, and predation in the Cape Cod area so that the viability of the fishery and the health of the ecosystem is maintained (CapeCodCSF). Cape Cod CSF sells its product to a variety of consumers; local restaurants, seafood distributors, seafood markets, and individuals who may not be shareholders (Silvern & Silveri 2013).

At one time, there were two other CSF in Massachusetts: Cape Cod Fish Share and South Shore Seafood Exchange Inc. Both have since closed for economic reasons. Cape Cod Fish Share was located in Brewster, MA and operated bi-monthly with close to 30 distribution sites (Silvern and Silveri 2013). The fishery offered allotted shares of seafood, pre-gutted or shelled, which many CSF do not do (Silvern & Silveri 2013). They accepted food stamps and allowed community members to volunteer for a share of their product (Silvern & Silveri 2013). What appeared to be a very successful CSF came to a sudden halt. According to former CSF member Andrea Thorrold, the company was well enjoyed and respected by the community and the company was amazing in their

communication skills until one day it all stopped (Fraser 2014). It appears that with ailing parents, the couple running the business needed to take some time off, however, owner David Henchy was never able to start up the business again (Fraser 2014). Shareholders lost \$600 a share, not to mention larger shareholders such as restaurants losing upward of \$66,000 in product (Fraser 2014).



Figure 6: The pick-up location of Cape Cod Fish Share, before they closed (Silvern 2012).

South Shore Seafood Exchange (SOSSEXI), located in Scituate, MA was a well-loved CSF (WickedLocal.com, 2014). They operated year round out of the company headquarters (Silvern & Silveri 2013). Shareholders, received one to two pounds of fish a week, for a ten-week season specializing in filleted fish (Silvern & Silveri 2013). There is no published explanation for the closing of this CSF. All that can be found are a website that is no longer available, and a Facebook page that's most recent post is from 2017. However, it can be hypothesized that changes in quota and price of fish led to the closing of SOSSEXI. According to an article on WickedLocal.com (2014), the number of boats in Scituate Harbor, starting in 2012, had declined from 23 boats to eight. Due to the shrinking of catch quotas and the decline in the price of fish, fishermen are losing money

when they undock their ships and head out to sea (WickedLocal.com 2014). According to Frank Mirarchi, a fisherman of 51 years, “quotas...are now a quarter of what [is needed] to break even, and the market is saturated [by] imported fish,” sourced from all over the world (WickedLocal.com 2014).

CSF shareholders share specific demographics and similar belief systems.

According to Salladarré et al. (2018), CSF shareholders tend to be middle-aged, well educated, medium to upper incomes, and women. Salladarré et al. (2018), investigated a CSF on Yeu Island in France and found that “70% liked receiving unknown fish species, 86% were satisfied with their monthly

delivery, and 80% say that

membership improved their

knowledge on seafood products” (p.

175). Massachusetts shareholders

shared similar characteristics with

48% having a household income of

over \$100,000, and 73% having

children (Witkin et al. 2015). Unique to

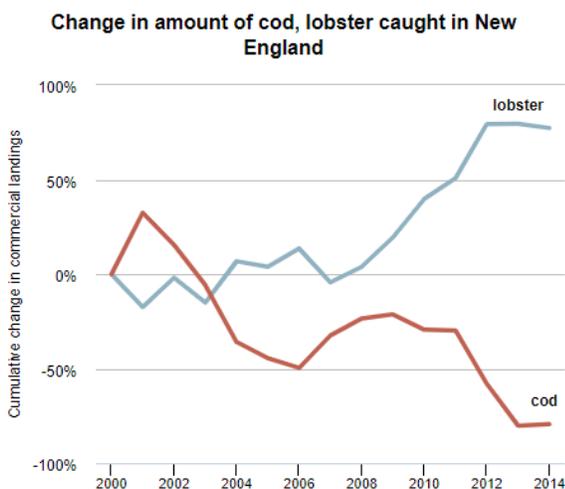
Massachusetts, 53% of CSF participants live within 50km of the coast and 61% tend to

purchase at least one locally abundant species on a regular basis (Witkin et al. 2015).

External Threats:

Climate Change:

Climate change, as previously stated, is impacting the fishing world. The rise in global temperatures are not just a threat to species on land, but also to species within our



Source: NOAA

Figure 7: The change in catch for Lobster and Cod in New England (Doney et al. 2014)

oceans. Oceans absorb much of the infrared radiation sent to earth by the sun. While this causes issues for humans, sea temperature change impacts the lives of aquatic species. Marine species are moving to cooler waters as ocean temperatures get warmer (Fig 1). It is believed that oceans along the Northeastern United States are warming substantially quicker than other bodies of water. The fishing communities of the Northeast are thus faced with an overwhelming threat to their culture, history, and tradition.

While some fished species, such as Atlantic Cod, are doing poorly with increased ocean temperatures, others are doing better under these new conditions (Fig.7). Lobster populations are on the rise with an increase in ocean temperatures. Although they are thriving under these new conditions, Lobsters are still moving poleward and could migrate out of United States waters into Canada if ocean temperatures continue to increase.

Along with absorbing infrared radiation, oceans also absorb large quantities of CO₂, making oceans more acidic. Ocean acidification wears down the calcium carbonate shells of many shellfish such as clams, oysters, and mussels (Doney et al. 2014). This kills these species and/or inhibits them from growing to catchable sizes. Areas along the coast are vital spawning sites for groundfish, the main haul for Massachusetts fishermen. The lethal combination of sea temperature rise and ocean acidification, threatens these spawning. Fish eggs may be unable to produce viable offspring, and thus population numbers will continue to decline (Doney et al. 2014). With less fish and shellfish in the oceans, as well as the steady move towards the poles, New England fisheries may become less economically viable and have to close.

Competitive Co-option:

Some of the appeal to many consumers for participating in a CSF program include the quality and freshness of the product as well as the direct marketing done by the CSF. Through direct marketing, customers bypass middlemen and receive fish caught the same day as opposed to waiting for their fish to be processed and delivered to stores. Consumers also want to promote the local economy and jobs (Stoll et al. 2018; Witter & Stoll 2017; Brinson et al. 2011). Other businesses have seen the success of CSF marketing practices and have implemented them into their business model.

Ocean's Table, sourced from Gloucester Harbor, is a New England fishery that uses the direct marketing and fresh fish model similar to CSF. Ocean's Table offers fish "fresh from the ocean to your table" giving information on who is catching the fish, and offering fileted fish opposed to whole fish options (OceansTable.com 2019). They offer underutilized and popular species to their customers through four varied packages: Captain's Select, Mariner's Mix, Fisherman's Choice, and Tasting Sampler (OceansTable.com 2019). Similar to a CSF they use direct marketing, meaning there is no middleman in their production line. They catch the fish, bring them to their facility where it is gutted and sold directly from their business. Their prices are similar to CSF with lower bundles costing \$8 and more expensive bundles being \$15 (Join.OceansTable.com 2019).

Ocean's Table is not a CSF, with no mention of sustainability or community on their website. Ocean's Table utilizes the aspects of CSF that have proven to be desirable

to consumers -- fresh product from the ocean -- while ignoring sustainable fishing practices and fair prices towards fishermen (Witkin et al. 2015).

Although businesses such as Ocean's Table are certainly a competitive threat to the CSF model, CSF also struggle to compete with delivery based food services offering such as Stop and Shop and Amazon that offer their customers grocery items delivered to their door. This convenience allows companies to service large numbers of customers who might be more willing to take the "Gloucester Caught" fish from Stop and Shop than to go to a CSF pick-up location. CSF have recently started to mimic this idea from its competitors, with CSF such as CAFC offering home delivery services in hopes of bringing in more shareholders (CAFC.com 2019).

Internal Strategies and Challenges:

Expanded Engagement with the Local and Food Justice Movement:

Local food movements have been growing in popularity, as consumers are demanding more local food products for their believed freshness, environmental sustainability, and benefits to the local economy (Witkin et al. 2015). The desire for local food has expanded beyond the land-based "Farm-to-Plate" locavore food system to include the "Pier-to-Plate" CSF movement. This expansion of localization of the food system is not only being directed towards wealthier consumers but CSF are also involved in a community-wide effort to make seafood equitable, increasing access to the fishery for people of lower incomes. CSF in Massachusetts, such as CAFC and SOSSEXI, participated in SNAP, the federal government supplemental nutrition assistance program. The SNAP program is a subsidized food program offering healthier food choices for lower-income families, (Silvern & Silveri 2013). CAFC served lower-income

communities, such as Lowell, by donating to food banks and ethnic neighborhoods. By reaching out to economically poorer areas, the fishing community is strengthened through the promotion of the local economy and by making seafood accessible, regardless of financial status. These individuals, in turn, advocate for CSF members to have higher wages and better working conditions within their processing plants.

Another important way in which CSF make connections with their communities is through “Seafood Throwdowns” (Brinson et al. 2011). NAMA helps to promote many of these events as they, “have proven to be fun, educational and community-driven events to promote public awareness of what it really means to have sustainable seafood” (NAMANet.org 2019). The “throwdowns” involve chefs battling to see who can prepare a locally abundant fish in the most delicious way. While the battle is certainly entertaining, interested viewers are also able to learn about threats to our oceans and fisheries as well as how they can participate in solutions to the problem (NAMANet.org 2019). Along with “Seafood Throwdowns” NAMA has helped to bring CSF into local food festivals further helping the promotion of the CSF and sustainability by broadcasting to a wider network of people (NAMANet.org 2019).



Figure 8: Images for the 2017 Seafood Throwdown in Rockport, MA run by NAMA (NAMA 2017).

Ownership/ Business Model Issues:

CSF are usually a smaller cohort of fisheries that seek to provide a fresh and local product to consumers. Due to their small size, CSF tend to be family owned and operated. Smaller fisheries carry the tradition of keeping the business within the family, and within the community. However, family-run businesses can have their downfalls. In times of family emergencies operations within the fisheries is forced to come to a halt or a pause. This was the case with Cape Cod Fish Share. As previously stated the husband and wife duo faced family illness which caused them to pause their business. This resulted in large debts owed to customers who had already purchased shares, including larger consumers such as local restaurants. Cape Cod Fish Share was unable to recover after the spiral of difficulties that came with family obligations while running a successful, small business.

Conclusions:

Technological developments, global climate change and the expansion of global markets for fish have led to the decline of fish stocks, degradation of marine ecosystems and challenges to the sustainability of fishing communities around the world. In this thesis I have charted the recent growth of an innovative and locally-based initiative to create a more sustainable fishery in the face of these global economic and environmental challenges. As I have demonstrated in this thesis, Community Supported Fisheries (CSF) are a key local initiative, diffusing around the U.S. and other parts of the world, that will contribute to the social, economic and environmental sustainability of fisheries. CSF are expanding in number, size and are having a significant impact on fishing communities and are likely to continue to expand in numbers, size and further innovate their social organization and marketing strategies into the future.

But, while their recent pattern of growth is encouraging, there are still many challenges and difficulties that may slow down further CSF expansion. For example, Federal fishing regulations are a challenge as quota-based catches decline, leaving fishermen and their communities with limited fishing opportunities and thus future income to maintain their boats and businesses. Climate change is clearly one of the largest challenges to both marine and land-based food systems. Rising ocean temperatures are causing species to migrate to cooler water and away from existing fisheries. This will inhibit CSF sustainability as well as commercial fishing companies. Unless action against climate change is taken soon, all fishing industries will suffer and decline.

Economically, competition from global and large-scale corporations such as Amazon represent an existential threat to small-scale food system enterprises such as CSF. Amazon, Stop and Shop and other large-scale corporations are able to use economies of scale and massive food distribution networks to deliver food directly to consumers and at a cheap price, thus undercutting the CSF and similar local food operations. With the click of the mouse, customers are able to choose from a globally sourced assortment of foods, including fish, while in the comfort of their own home. While CSF, such as CAFC, have started implementing delivery services, they have limited ability to compete with Amazon. As Amazon and other corporations enter into the local food markets they will put pressure on local food producers to continue to innovate, expand their marketing strategies and perhaps collaborate by scaling up or forming cooperatives; the future is uncertain and challenging, but local food producers have tools, expertise and community support and should remain hopeful.

CSF have successfully connected families and communities to the rich fishing history of Massachusetts. Through their direct marketing and local community outreach, the CSF message regarding sustainability has and will continue to spread to concerned and energized local community members. If the CSF model was not attracting shareholders and even copy-cat businesses such as Ocean's Table, we would not be seeing the growth in numbers and geographical diffusion that I have documented in this thesis. CSF as a success story is indicated by my map of CSF across the United States and as well as scholarship that demonstrated the spread of CSF across the globe. Salladarré et al. (2018) recent study on Yeu Island in France show how the Port Clyde CSF model has finally made it across the Atlantic and it is perhaps only a matter of time before we see CSF in other regions of the globe as well.

CSF's have great potential to also promote equity and social sustainability in the local food movement by increasing the participation of low-income communities, recent immigrants and people of color. While scholars have examined food injustice in the land-based food movement (i.e. who participates in CSA and persistence of food deserts), there is little data on how CSF and fisheries in general are contributing to food security for low-income communities and providing opportunities for such communities to participate in the local food movement. This thesis found that local CSF are actively engaged (through NAMA) and reaching out to such communities, seeking to build bridges and promote social and economic sustainability for both consumers living in food deserts and the producers – the fisherman – living and working in coastal communities such as Gloucester and Port Clyde.

There is still much to be learned about the success and future prospects of CSF in Massachusetts. Throughout this research contact with CSF and their owners was limited; as running a CSF takes constant effort and attention. While numerous attempts were made with the Massachusetts CSF and requests made for interviews for filling out surveys, they refused to collaborate. CSF are being constantly bombarded with questions from university researchers and other fisheries as indicated by the recent emergence of a CSF literature over the past five years. There also were issues contacting Cape Cod CSF as it is only open during summer months. When reaching out to CAFC a brief phone interview was conducted discussing how much effort is put into the CSF and how much work the job entails.

Besides the need for basic social and economic data on CSF, further research is needed into the role of existing state and federal fishing policies and how they impact CSF. How do such policies impede or assist in sustaining small and local food enterprises such as CSF? Marketing to consumers is critical to the success and sustainability of the local food movement on both land and sea. Research is needed into how Massachusetts agencies (Massachusetts Division of Marine Fisheries) and local-food marketing agencies such as Northeast Harvest, are assisting with such marketing efforts and what future regulations and policies are needed to enable CSF to be sustainable in the face of the numerous threats identified in this thesis. Finally, perhaps the one critical facet of the local food and CSF movement that has received little attention is the consumer. Research on the characteristics of current and potential CSF shareholders and consumers is critical if CSF will succeed in the future.

CSF hold great potential to promote economic, social and environmental sustainability. In this thesis, I have sought to identify their basic characteristics, strengths and the prospects for their future viability and success. If anything, CSF serve as a model and a reminder of how communities are striving to be active agents in charting their own destiny in the face of local, regional and global challenges: forces that disempower those with the least amount of social, political and economic power. Sustainability is a goal and process that is becoming increasingly important as we move toward the second decade of the twenty-first century. CSF, like other parts of the local food movement, hold great promise and potential to realize the goal of living more sustainably and harmoniously with planet earth.

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