

Cape Cod's Seafood Supply Chain: Process, Challenges, and Opportunities

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Executive Summary

The local seafood supply chain on Cape Cod is structured in a way that disempowers local fishermen from catching fish based on demand from local consumers or local restaurant owners, and instead caters to the demand of the few established buyers in the marketplace who typically sell fish off-Cape, even internationally. Additionally, fishermen don't have much leverage in the early stages of the supply chain to negotiate for higher prices based on factors like quality, or to encourage buyers or consumers to try species that are highly abundant, albeit lesser known.

The process for permitting is likewise both complicated and cost prohibitive for many fishermen, although the state agencies are working with the Cape Cod Commercial Fisherman's Alliance and local fishermen to create permitting options that are more reflective of fishermen's actual needs.

There are several key areas for intervention in the supply chain that will likely help empower fishermen, restaurant owners, and consumers: (1) Create more straightforward and feasible permit types that are streamlined between town and state agencies, (2) Develop an innovative business model for the mid-tier (processing, storage/aggregation, and distribution) supply chain that brings ownership and agency into the hands of fishermen, (3) Create a directory (an app or web platform) that connects buyers, sellers, and consumers of local seafood, and (4) Run seafood cooking and tasting programs to get seafood consumers eating a broader variety of seafood and consumers eating more seafood.

Overall, the fishing industry on Cape Cod is America's oldest industry- the nation's first blue economy. It still makes up a significant portion of Cape Cod's economy and identity, but it needs restructuring to bring leverage back into the hands of small-boat family fishermen and to encourage a seafood industry that is representative of our changing ocean conditions and supports this important industry for years to come.

Introduction

Cape Cod's seafood supply chain is a complex system with many challenges that make it difficult for fish caught locally to end up on local dinner plates. This report explores the current supply chain, providing a comprehensive explanation to answer the question "why can't I find local seafood?" Beyond identifying the challenges, we also provide a discussion about key areas for intervention and some examples of opportunities that could be explored in future projects.

It is important to remember that fishing (and the blue economy that accompanies it) is arguably the United States' first industry. As Barton Seaver describes, the fishing industry historically existed on the fringes of society, seen as an industry that is dirty and not an

aspirational career choice. With strange hours and high risks, it was not the first choice for people looking for upward mobility¹.

However, the abundance of fish off Cape Cod provided an employment opportunity unlike anything else in its era; the old saying goes “you could walk across Cape Cod Bay on the backs of codfish”. In the early 1900s, fish like halibut and codfish were highly abundant and you could scarcely imagine a day where these fish would not be so plentiful. However, that day came in 1900s when the codfishery collapsed along with many other popular fish. Primarily, there was a lack of governance for natural resources off the coast. As fishing technology and maritime infrastructure improved after WWII, vessels (both foreign and domestic) could fish farther off shore, more efficiently than ever before. The large foreign fleets are the most commonly referenced culprit as to why fisheries experienced such a dramatic collapse in the mid 1900s. With the nearly simultaneous passage of the United Nations Convention on the Law of the Sea (UNCLOS: an international treaty), the United States began managing it’s natural resources out to 200 nautical miles from shore.

The national law we see this reflected in for fisheries management is the Magnuson-Stevens Act, originally passed in 1976. When the law took effect, foreign vessels were no longer authorized to fish in U.S. waters. The domestic fleet industrialized, doubling in numbers and increasing their capacity to harvest. However, it was not long before the very first scientific assessments revealed a highly depleted fishery, causing management measures stepped in somewhat abruptly. Although the results were different for every fishery, many fisheries, like groundfish, went through a trial and error period of management and science. Over time, regulations employed a combination of gear restrictions, trip limits, days-at-sea restrictions, fishing area closures, and other rules. As combined measures failed to rein in overfishing, the number of days fishermen were allowed to fish dropped each succeeding year until they were a fraction of what they had been. By 2009, most fishermen had 40 or fewer days of fishing per year. While some stocks of highly desirable species in particular were overfished, others were severely under fished. This radically changed the face of fishing businesses: many were already in jeopardy by the time the new management systems called catch shares was implemented in 2010. Essentially, catch shares (more commonly referred to as sector management for the groundfishery) created a privatized version of the fishery by bringing proprietorship into the hands of fishermen. The idea was that if fishermen controlled their allocation of stocks and had a vested interest in their long-term health, they would be more apt to protect the resource. In some fisheries, industry investment and involvement in the management and scientific structure has been very successful, like the Atlantic sea scallop fishery, which boasts some of the highest value in the country. The sea scallop fishery does not operate under a sector system but is limited in access with controlled annual allocations of the resource to fishermen, who also are able to benefit through a set-aside of the stock for research. They participate in scientific research and assessments in exchange for pounds of quota, which they are able to harvest and profit from. Other fisheries, like the once mighty groundfishery (which include stocks like cod,

¹ Seaver, B. (2017). *American Seafood: Heritage, Culture & Cookery from Sea to Shining Sea*. P.6.

haddock, flatfish, etc.) have struggled to overcome challenges with science, market value, and management.

While new, seemingly restrictive management came into place only a few decades following the passage of the Magnusson-Stevens Act, consumer demand for these now overfished species continued. The void left by a lack of domestic product in the wake of depleted fisheries was quickly filled by international and farmed supply, which stepped in to meet consumer demand. With increased technology in terms of freezing and shipping, fish like cod or salmon, overfished in the Northwest Atlantic, became available in ample supply at low cost from foreign or non-local American suppliers. Suddenly, you could get codfish from Iceland, salmon from Alaska or Norway, bluefin tuna from the Mediterranean, or shrimp from India to meet consumer demand for specific species that were no longer available to catch locally, despite the abundance of other, lesser known species directly off Cape Cod's shores.

This dynamic overrode local fishermen's capacity to meet consumer demand through local albeit different, lesser-known fish available to catch in abundance off Cape Cod's shores. Although fish like striped bass, codfish, and tuna were caught to their limits, other, lesser-known fish was left in the water with uncaught quota. Fish like scup, pollock, haddock, may have had artificially high limits due to a lack of good scientific data, but were still significantly under-valued, meaning fishermen could not fish and sell them profitably. Other abundant local fish is caught and simply exported directly to markets in Asia and Europe, such as skate and dogfish.

Today (with a few exceptions), most locally abundant fish is either exported or simply not caught, while high-value local fish is caught at its maximum sustainable limit, and unmet consumer demand for familiar species is met by a supply of imported fish.

This report explores this supply chain dynamic deeply, specifically from a permitting and market based perspective.

Overall, the key challenges in the local seafood supply chain on Cape Cod are:

1. By necessity, fishermen are inherently price-takers with a [typically] substitutable product that is perishable. They do not have leverage to negotiate for a better price when there are few buyers in the marketplace and their product cannot "hold" for long.
2. Ecological realities, zoning regulations, seasonal workforce, and seasonal fishing actualities all challenge the likely success of a full-size processing plant on Cape Cod.
3. Permitting in Massachusetts is particularly complicated when compared to other New England states; as a commonwealth, each town can add health laws that supersede state laws (the state sets the minimum requirement). This is a phenomenon referred to as "home rule".
4. Permitting for direct sales to consumers or restaurants is confusing, complicated, and arduous.

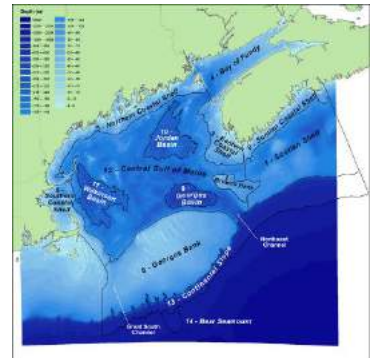
5. Requirements for refrigeration and processing are extremely complicated and expensive, consequently limiting direct sales opportunities.
6. Fishermen, already busy managing a full-time business, are not necessarily aware of the potential business opportunities in innovative sales models because they have built their business within the reality of existing models. Fishermen also don't necessarily want to run a consumer-facing business.
7. Restaurant owners and chefs are frustrated by the lack of local seafood available, and are actively seeking more avenues to provide it to their customers.

That said, there are substantial opportunities to improve fishermen's agency in the supply chain by developing innovative mechanisms to bypass existing supply chain processes and build consumer demand and awareness around seafood. These innovations may work in a "chicken-or-egg" type scenario whereby one innovation depends on the other, but overall change has to start somewhere.

Glossary of terms

Dealer: Seafood dealers who purchase federally or state managed species from vessels require a permit to purchase the following species: Atlantic mackerel, squid, butterfish, Atlantic sea scallop, Northeast multispecies, monkfish (goosefish), summer flounder (fluke), scup, black sea bass, Atlantic bluefish, Atlantic herring, spiny dogfish, Atlantic deep-sea red crab, Atlantic bluefin tuna, other Atlantic tunas (yellowfin, bigeye, skipjack, albacore); NE skate, American lobster, Atlantic hagfish, surf clam and ocean quahog processors or dealers; Atlantic herring processors or dealers; and/or Atlantic mackerel at-sea processors [50 CFR 648.6 and 50 CFR 697.6].

George's Bank- A large elevated area of the sea floor between Cape Cod and Sable Island. It separates the Gulf of Maine from the Atlantic Ocean.



Gulf of Maine: A large gulf in the western Atlantic ocean on the east coast of North America. It spans from Cape Cod Bay in the South to Sable Island in the North.



Harvester: The individual(s) who physically extract fisheries resources from state and federal waters. Used interchangeably with fishermen, shellfishermen, aquaculturist, etc. Harvesters are subject to state and federal fisheries permits and regulations.

Highly Migratory Species: Refers to fish species or stocks that have extensive migrations and can occur in both EEZs and high seas. This term is usually used to denote tuna and tuna-like species: marlins and swordfish. HMS are not managed by regional councils, but by NOAA fisheries (and its appropriate advisory panels) and by other countries' representative fisheries management bodies.

Landings: Catches of marine fish landed in foreign or domestic ports. Marine capture fisheries landings are subject to changes in market demand and prices, as well as changes in total allowable catch to accommodate the need to rebuild stocks to maximum sustainable yield levels in order to achieve long-term sustainable use of marine resources.

Maximum Sustainable Yield: Is the largest average catch that can be captured from a stock under existing environmental conditions. MSY aims at a balance between too much and too little harvest to keep the population at some intermediate abundance with a maximum replacement rate.

Magnuson Stevens Act (MSA): The primary law governing marine fisheries management in U.S. federal waters. First passed in 1976, the MSA fosters long-term biological and economic sustainability of our nation's fisheries.

Processor: Typically refers to a large scale fish processing plant, but sometimes can refer to smaller scale entities like cutting rooms. Much of the fish caught of Cape Cod goes to large scale processors in New Bedford due to the sheer quantity landed and complexity of fileting or if the fish will be frozen or value-added.

Quota: Limits placed on the amount of fish, shellfish, or crustacean that can be harvested from the ocean. Based of the concept of maximum sustainable yield, this is the amount of fish that can be harvested by fishermen without long-term harm to the resource. When setting a quota amount, considerations like natural mortality, scientific uncertainty, life-span and reproductive rates, are all factored in to determine how much can be sustainably harvested. Quotas are most often set in three year increments and updated annually as new information about a stock becomes available.

Regional Fishery Management Council: The United States has eight of these councils and each one provides regulatory recommendations to NOAA on federal fishery management activity in their respective region. Councils are comprised by designees of states and/or tribes, as well as appointed members representing interests in their respective regions for discrete term limits.

Stock: the living resources in the community or population from which catches are taken in a fishery. Use of the term **fish stock** usually implies that the particular population is more or less isolated from other stocks of the same species and hence self-sustaining. In a particular fishery, the fish stock may be one or several species of fish but here it is also intended to include commercial invertebrates and plants.

Stock Assessment: NOAA Fisheries' stock assessments are key to marine resource management. They provide high-quality scientific information to managers to answer important questions such as:

- What is the current status of a stock relative to established targets? (e.g. Is the stock experiencing over fishing or is it over fished? Is a marine mammal stock depleted?)
- How much catch is sustainable while maintaining a healthy stock?
- If a stock becomes depleted, what steps are required to rebuild it to healthy abundance levels?

Answers to these questions help managers make the best decisions to ensure sustainable fisheries, healthy ecosystems, and productive coastal communities. NOAA Fisheries' scientists work with other scientists, fishermen, resource managers and others from around the country and world to ensure NOAA stock assessments represent the best science information available. For more information about stock assessments, visit NOAA's stock assessment page (<https://www.st.nmfs.noaa.gov/stock-assessment/stock-assessment-101>).

Total Allowable Catch (TAC): A TAC is a catch limit set for a specific fishery, a subset of the overall quota. Whereas quota can include things like bycatch in other fisheries, a TAC is unique to one. A good example of this is the skate fishery, which has annual TAC's, but some of the quota is also allocated in other fisheries (such as the sea scallop fishery) that may catch them while targeting another species.

Auction House: An auction is the process of buying and selling a resource. Most commonly, a harvester sells their resource to the auction house in the morning after landing on the dock for a pre-arranged price. The auction house lists the landings of the multiple harvesters for a higher sale amount, and transactions are completed with buyers throughout the day. After being bought, the fish may go on for further processing before reaching it's destination. Buyers from an auction house range from high-end food establishments and processors, to national grocers or other retail establishments.

Wholesale: Refers to permits that allow business-to-business sales. The term wholesale or wholesaler can refer to processors, dealers, distributors, and retailers. Oftentimes these businesses are vertically integrated and fishermen can have wholesale permits.

Retail: Refers to permits that allow business-to-consumer sales. The term retail or retailer is the consumer-facing seafood business whether a fish market, farmers market, restaurant, etc. When fishermen sell via direct sale models, they typically need both a wholesale and a retail permit (in some cases they just need a retail permit).

Department of Public Health (DPH): Public health departments oversee the science and prevention of disease, prolonging life, and promoting human health through organized efforts and informed choices of society, organizations (public and private), communities and individuals. DPH operates at the state level and works closely with DMF. They set the minimum requirement that the towns must adhere to, although towns in Massachusetts can set more strict requirements.

MA Division of Marine Fisheries (DMF): The state of Massachusetts' agency that manages the state's commercial and recreational saltwater fisheries and oversees other services that support the marine environment and fishing communities (refer to www.mass.gov/division-of-marine-fisheries for more info).

NOAA Fisheries: Also referred to as the National Marine Fisheries Service (NMFS). This is the federal agency responsible for the stewardship of the U.S. living marine resources and their habitat out to 200 nautical miles. It is a division of the National Oceanic and Atmospheric Administration, which falls under the Department of Commerce.

Food and Drug Administration (FDA): The FDA is an agency within the U.S. Department of Health and Human Services that oversees manufacturing and distribution of food, pharmaceuticals, medical devices, tobacco and other consumer products and veterinary medicine.

Primary Buyer: The state refers to the first business-to-business sale from a commercial fishing permit to a wholesale dealer permit as the “primary buyer”. A fisherman can be both the fisherman and the primary buyer, if she or he holds both permits.

CAPE COD SEAFOOD SUPPLY CHAIN



Supply Chain Process

As shown above, the Cape Cod Seafood Supply Chain has nine distinct phases, all of which play a key role in determining what types of seafood are available on local menus. These nine steps also are key intervention points for innovations in the supply chain. This report aims to break down the supply chain by step, describing the supply chain's current functionality, discussing relevant permit types to encourage local sales, providing a brief overview of potential opportunities to catalyze local sales and dissolve supply chain blockages, and finally providing a useful case study of supply chain disaggregated by species.

Previous supply chain and seafood promotion work conducted by the Fishermen's Alliance led us to understand that consumer demand exists for local seafood, but due to inherent supply chain complexities within the current system, it's still really difficult for restaurants and consumers to access local seafood. Consequently, we uncovered the complexities of the supply chain and document our findings throughout this project.

The nine different "steps" of the supply chain are described below (please refer to the graphic above for a visual display of this process):

1. Harvesters

Fishermen and shellfish aquaculturists harvest seafood from public waters. Harvesters depend on a healthy marine environment to sustain their businesses. Fishermen, particularly small-boat family fishermen with an eye on the next generation, are arguably the biggest advocates of sustainable harvests. They depend on effective, science based monitoring and management of species to understand how much can be taken out of the water to ensure the health of the stock in the future while maintaining their current business model.

Likewise, they also depend on "local ecological knowledge" or information passed down from older fishermen about trends and changes that happen long-term. Ideally, this knowledge is not just considered anecdotal, but is valued scientifically and integrated into fishery management practices.

Fishermen also depend on things like adequate and safe port infrastructure for landings, permitting that enables the model of sales they are interested in, and responsive town, state and federal entities that manage this process. They also need crew that is trained to be effective and safe on-the-water and permits to fish and when applicable, access to quota.

In other words, fishermen depend on a lot more than just being on a boat, on the water. From permits to infrastructure to quota, many factors have to come together in this first stage of the supply chain for fish in the ocean to make it to shore.

2. Seafood Dealers

The first point of sale in the wholesale process is from the fisherman to a dealer, or an entity with a dealer permit (this step is often referred to as the “primary buyer”. This, and the processing and retail/distribution stages are somewhat complicated as businesses are sometimes vertically integrated and one business can control multiple stages of the supply chain. In some cases, fishermen also have dealer permits. There are both state and federal dealer permits, and to conduct a sale the permit must match the type of permit the fish was caught on; for example, a fish caught on a federal commercial fishing permit cannot be sold to a dealer with only a state dealer permit, but *can* be sold to a dealer with a federal dealer permit (federal can be sold to federal, state can be sold to state). It is important to note that all seafood dealers in Massachusetts need a state permit.

Regardless, the fisherman who harvested the fish sells or transfers it onto the dealer permit, the first of many “business-to-business” wholesale transactions along this process. A dealer can look like many things: a fisherman with his own dealer permit, a fish market with its own dealer permit, an auction house, a processor that also has a dealer permit, or just a middle man that is transporting the fish to the next step in the supply chain.

Where the fish goes next typically depends on how much processing it needs, what its shelf-life is, where it is destined to end up, whether it needs packaging/freezing, how much immediate local demand there is, whether it is an easy fish to fillet, and who the dealer is.

For example, groundfish caught on a federal permit intended for a local market might go directly to a local fish market with a federal dealer permit. The fisherman is not permitted to process or fillet the fish (besides gutting and/or icing it), but the fish market could fillet it with a small cutting room in the back before offering the fish up for sale in their market or selling it on to a local restaurant. However, some groundfish might be intended for a value-added product like fish sticks at a university dining hall, in which case it would likely be driven to an auction facility or directly to a processor with a dealer permit. The fish would then be processed at scale, value-added as needed, frozen and packaged for distribution, ultimately ending up somewhere like a university dining hall or in a grocery store frozen food aisle.

3. Processers

As discussed above, the processing step of the supply chain is dependent on the species or the intended use of the product. Often times, this is directly related to the scale and value of the fish. Lower value fish with high volume (like skate and dogfish) are typically processed at scale², frozen, and sold to an export market. However, certain types of groundfish and other mid-value products are also processed at scale and made into value-added or frozen products.

Typically, a processor refers to a large company that processes fish at scale, however in terms of permitting it can also refer to a cutting room in a fish market or the back of a

² “At scale” refers to a large volume. Typically dogfish and skate processors in New Bedford need 120,000 pounds of fish to operate.

restaurant. Again, sometimes dealers, processors, and retail/distribution can be vertically integrated, which can make these wholesale steps somewhat confusing.

For direct sale models, this is typically the hardest point to overcome as there are very strict requirements, such as Hazard Analysis and Critical Control Points (HACCP) and standards for everything from waste management to water usage, etc. Given that there is no centralized facility on Cape Cod for this sort of work, the best option is for fishermen interested in direct sale models with fish that needs to be filleted or frozen is to partner with existing processors or dealers (including local fish markets) that have processing capability and HACCP certification.

4. Imports

According to FishWatch, the U.S. currently imports over 80% of the seafood that American's eat – mostly salmon, shrimp, tuna, and codfish³. This distorts the supply chain by providing a massive supply of fish in the marketplace that meets consumer's demands. Typically imported fish either arrives pre-processed at the retail & distribution point or as a whole or minimally processed fish at the processing point of the supply chain.

This is a distinct challenge to overcome as imported fish are oftentimes much cheaper than their local alternative and as “familiar” species, they meet consumer demand for domestic species that were historically overfished or are more expensive in the U.S.

Interestingly, fish imported nowadays may not even be frozen – Icelandic cod can reach dinner tables in the U.S. the same day they are harvested, fresh, and oftentimes quicker than fish caught locally⁴.

5. Exports

On the flipside of importing seafood, the U.S., particularly Cape Cod, exports an exorbitant amount of the fish it catches. In 2017, Cape Cod fishermen landed over 12 million pounds of dogfish and just under that of skate; over 90% of both species were exported to Europe and Asia.

Dogfish typically goes to the United Kingdom for fish and chips or to Asia as shark fin soup or a whole fish holiday meal, although historically the belly flaps were a bar snack in Germany called “Schillerlocken”. Skate is considered a delicacy in France and a street food snack in Singapore.

The import and export dynamic is further complicated by the fact that some species are caught in the U.S. and exported for cheaper processing and then re-imported as “American caught” products, with country of origin listed as wherever they were processed.

³ NOAA. (N.d.) *Global Wild Fisheries*. Retrieved on May 9, 2019. <https://www.fishwatch.gov/sustainable-seafood/the-global-picture>.

⁴ Schulman, Michael. (January 7 2019). *When your Dinner Comes with a “Sea to Pan” Journey*. Retrieved on May 9, 2019. <https://www.newyorker.com/magazine/2019/01/14/when-your-dinner-comes-with-a-sea-to-pan-journey>

6. Retail & Distribution

The retail & distribution step of the process refers to fish leaving the processing plant (or coming in on an airplane) and going to its final or almost final destination. This might mean the fish gets on a truck bound for restaurants in New York City, sent to a grocery store, or on a plane to a university in the Midwest.

There are some recent innovative distribution models appearing lately as well, such as Amazon's fish-order service⁵ or Real Oyster Cult⁶.

7. Restaurants & Fish Markets

Restaurants and Fish Markets are the two most common retail points on Cape Cod where people are typically able to purchase local fish (as opposed to a university dining hall or a grocery store), which is why we differentiated these from "retail" on the supply chain graphic.

Most people consume seafood, particularly new or unfamiliar types of seafood, first at restaurants before trying to cook it themselves at home⁷. Our findings from the Pier to Plate program showed that generally there were two types of restaurants on Cape Cod: (1) those who were committed to the ethos of serving and supporting local, even if it meant overcoming logistical constraints, and (2) those who needed to meet a certain price point and volume of customers and were more concerned with the logistics of the fish they were serving (thawing time, cooking ease, consistent availability, taste profile, etc.). Restaurants committed to the ethos of providing local seafood are best suited to these early stage supply chain interventions because they are willing to work with a product that might be more difficult to find, more complicated to prepare, and will require staff training to answer inevitable questions from consumers.

We also learned that although chefs and owners might be big proponents of the "Eat Local" movement, this doesn't always transition down to the wait staff. It's sometimes a challenge, particularly in an area with high seasonal staff and frequent staff turnover to adequately train wait staff to answer questions about seafood sourcing and promote local options.

Fish markets and restaurants also run into challenges with how to communicate information about local seafood availability when (1) they may have trouble consistently sourcing locally to meet demands for tangible items like menu printing and signage, (2) they may not have enough information themselves about what is actually caught locally.

The Fishermen's Alliance collaborated with Buy Fresh Buy Local Cape Cod to develop new "ice spears"⁸ to distribute to select pre-determined fish markets across the Cape to aid

⁵ Amazon Fresh Fish. <https://www.amazon.com/slp/fresh-fish/u5cfjq8n5z7b6xh>

⁶ Real Oyster Cult <https://realoystercult.com/collections/real-oyster-cult>

⁷ 2/3 of the value of seafood sold and consumed in the U.S. is in restaurants.

Jahns, L, et al. (22 December 2014). *Intake of Seafood in the US Varies by Age, Income, and Education Level but not by Race-Ethnicity*. Nutrients. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4277015/>

⁸ An "ice spear" is a laminated label with a little spear on the end of it that gets stuck into ice of fish display trays.

consumers in identifying local species and providing more consistent branding across different fish markets. This labeling follows Buy Fresh Buy Local's national structure and is not enforceable labeling, and therefore requires truthfulness and trust between the fish market staff, managers, and customers. We are supportive of this endeavor but given the complexity of actually getting local fish in local fish markets, we believe it will have limited success.

8. CSAs & Farmers Markets

Community Supported Agriculture (CSAs), otherwise known as Community Supported Fishery (CSF) and Farmers Markets are another retail point in the supply chain. These innovative direct sale models exist in a very limited capacity on Cape Cod. There have been three CSFs throughout the years; only one is still partially functional. The main issue with the CSF model locally is that fishermen typically catch a large quantity of one or a few types of fish– they don't catch a large variety of species each trip. Subsequently, people end up with a lot of the same species. Also, as mentioned above in the processing section, most of the fish must be provided whole or not processed (unless the fisherman partners with an existing processor). Consumers are typically not used to working directly with a whole fish. Further complicating the matter, dealers do not like it when fishermen set aside part of their catch for other buyers. We have heard of dealers refusing to buy the rest of the day's catch if the fishermen splits the catch and sells the highest quality portion of the catch elsewhere.

To date, the farmers market model has only been moderately successful with lobsters due to their low health risk and relatively simple refrigeration requirements, and with whole finfish (striped bass and black sea bass) sold off a commercial fishing boat that holds a Retail Boat dealer permit at a farmers market close to the marina (i.e.: people were directed to go down to the dock to purchase the fish directly off the boat). However, this is not possible in all harbors because of town restrictions. Prior to 2019 there were otherwise no examples of direct sales of finfish on a retail permit at a Farmers Market. During the summer of 2019, the first local fisherman has been permitted to sell scallop and finfish at farmers markets.

The Division of Marine Fisheries (DMF) and Department of Public Health (DPH) are currently working with fishermen on an individual basis for local sale models. They are also in the process of developing a Farmers Market Retail Permit that will streamline and ideally simplify the process for local sales at farmers markets.

Direct sale models are an interesting option for fishermen to reach clients directly and “cut out the middle man”, but particularly with finfish this process requires extensive commitment, both financial and time, to meet the permitting requirements from the town and state.

A key mistake often made during this step is that fishermen assume that getting the product to market is enough, while in reality the key to success for a fisherman interested in a direct sale model is the fisherman's interest and understanding that marketing, promotions, and customer relations is key to a successful direct-sale business model. Innovative sale models

at farmers markets like those used by New England Fish Mongers are experiencing some success because they utilize social networks (social media, in this case) to make sales and inform people of the catch before it arrives, effectively selling out before even reaching the market.

There is a growing trend and awareness towards eating local. On Cape Cod, farmers markets are the most logical sale point in the existing local food system, but this model that requires harvesters to wear many different “hats” and potentially miss weather windows or tides for fishing might not be the best fit for farmers and/or fishermen. Importantly, most farmers markets on Cape are not in existence year round, which means that traditional sale points and relationships still need to be maintained for a successful year round business. An innovative brick and mortar model that is more responsive to industry demands might be a better fit as a long term solution to the challenges on Cape Cod. We explore this further in the opportunities section.

9. Local Consumer

The final point along the process of local seafood supply chain is the consumer. Pier to Plate and subsequent seafood promotion and outreach work has proven that demand for local, sustainable seafood is strong and has sustained for at least two years for species like skate and dogfish.

The Fishermen’s Alliance conducted a seafood consumer survey from June – September 2018 at farmers markets, fish markets, and other community events to gauge consumer awareness and interest in local seafood. With a total of 234 participants, key findings included that people’s main reasons for buying local are purchasing a fresher product, supporting local fishermen, and being more environmentally friendly (lower carbon footprint). Other findings included that people’s main obstacles to buying local seafood are the availability of species and the price point. If a single person in the seafood purchaser’s family doesn’t like fish or certain species, this will deter the family from purchasing local. People’s knowledge of local, abundant seafood was low; when asked what species they think is most abundant on Cape Cod, the majority of people said cod, striped bass, and then dogfish, likely highlighting the success of our Pier to Plate program and consumer education around dogfish. Some even listed salmon and shrimp as abundant local species. Of consumers surveyed, 81% were willing to experiment with new fish, 28% were “maybe” willing to experiment with new fish, and 7% were not willing. Of the 7% who are not willing to experiment with new fish, the majority of responses were because of picky eaters in the family or a lack of knowledge about the fish, including information about sustainability, preparation, and human health impacts. Overall, we identified the need for more targeted education to get the public eating seafood and seafood eaters eating underutilized seafood.

A particularly notable and interesting trend is that seafood consumers’ misperception of the health and quality differences between fresh and frozen seafood, particularly when frozen seafood is often actually local species while fresh might be imported from somewhere like Iceland (or previously frozen, although this should be labeled at the retail point). A lot of people are eating seafood in restaurants that is previously frozen, although they most likely

are unaware of this. There is a prevailing assumption that frozen seafood is a lower quality than fresh and therefore should be avoided, based on outdated freezing technology. In reality, today's frozen seafood, particularly flash frozen or IQF (Individually Quick Frozen) products actually maintain quality extremely well, providing the consumer with a higher quality product than a fresh fillet. Frozen fish are often frozen within a day of landing (or even at sea!), while fresh fish has to be processed, transported to the retail point, and may sit a refrigerated case for a few days before being sold. The technology for freezing or cooling fish rapidly has drastically improved in recent years but consumer knowledge and acceptance of frozen fish has not followed suit.

The "ideal" local consumer is aware about local seafood availability, has addressed concerns of health and/or sustainability of the fishery, is confident in their ability to cook the product, can afford the product, and can access the product at restaurants or markets that are open at reasonable hours and with adequate transportation. They should also have the ability to store and cook the product in the best way possible.

In other words, just getting the fish into the storefront or at the farmers market isn't enough: we need to ensure consumers are confident and knowledgeable about their fish choices and empowered to cook them to the best of their ability. We explore this further in the opportunities section below.

Overview of Permitting

This section provides an overview of the permitting process as it relates to different species in Massachusetts. However, as a Commonwealth, individual town health departments can override state requirements, so fishermen interested in innovative sale models should contact their town health departments as well as the state's Division of Marine Fisheries (DMF) and Department of Public Health (DPH).

This section provides an overview of the options and process for permitting local seafood sales. It should serve as a guide and is not guaranteed to be correct or up-to-date; it is understood that these processes are constantly evolving and updating - fishermen should check with the state and town departments for clarification.

Fishermen interested in direct or innovative sale models should refer to the Gulf of Maine Research Institute (GMRI)'s reports from the 2018 USDA Local Food Promotion Program grant on *The Barriers Preventing New England's Finfish from Entering the Market and How to Overcome Them*, of which a significant portion of this permitting section is based on. Contact Kyle Foley at kfoley@gmri.org for more information. Fishermen should also contact the Division of Marine Fisheries (DMF) Permitting Department and the Department of Public Health (DPH).

Overview

- The two main permit types relevant for local seafood sales are retail seafood permits, which refer to sales from business to consumers and wholesale seafood permits, which refer to sales from business to another business.
- Fish caught on federal commercial fishing permits must be sold to a dealer with state and federal dealer licenses, whereas fish caught on a state commercial fishing permit can be sold to a dealer with a state wholesale license.
 - In some cases, fishermen can act as a “primary buyer” both fisherman and wholesale dealer (and retail for situations like farmers markets). Even though it's the same person (fisherman) involved in each step, the fish technically is “sold” and changes hand through the different permits and fishermen are required to submit dealer reports if they are also the “primary buyer”.
- State departments (DMF and DPH) set the minimum standard required for town health departments, however town health departments can set further requirements for local sales.
- Most regulations for direct sale models currently exist in somewhat rudimentary form for finfish and live crustaceans. Regulations for direct sales of live shellfish and filleted or processed finfish is new territory for Massachusetts permitting.
- Currently there are no seafood specific direct-to-consumer permitting options at the state level with the exception of the Retail Boat model, however DMF and DPH are

working on creating new permits that will help simplify the process for fishermen and local health departments. For now, they will work with fishermen on a case-by-case basis.

Permitting options are divided by the scenario and by species (note, finfish includes scallop).

Fisherman wants to sell finfish directly to a restaurant

- Fish caught on state permits can be sold to restaurants with a state dealer (wholesale) license
- Fish caught on federal permits can be sold to restaurants with a federal dealer (wholesale) license
- Either the fisherman or the restaurant can have the wholesale dealer permit, but they must also comply with DPH regulations.
- Typically, fish must be sold without processing but sometimes “light processing” is allowed. Contact DPH to determine processing prohibitions and options.

Fisherman wants to sell shellfish to a restaurant

- Right now, this process is only possible if the fisherman also has a wholesale dealer permit endorsed for shellfish and all of the requisite refrigeration and safe handling requirements determined by DPH.

Fisherman wants to sell crustaceans to a restaurant

- Commercial lobster permits allow fishermen to deliver directly to restaurants, provided they also hold a Retail Boat seafood dealer permit.

Fisherman wants to sell finfish to consumers at a farmers market (or another direct-sale model)

- Fisherman needs a state and/or federal wholesale dealer permit, depending on whether the fish they want to sell was caught on a state or a federal commercial fishing permit.
- Fisherman needs a town retail food permit from the town health department
- Fisherman needs a state retail seafood dealer permit from DMF/DPH. Currently there is no Farmers Market Retail permit and DMF and DPH are addressing these applications on an individual basis.
 - Note: DMF/DPH will not issue a state retail permit until the town has issued a retail permit or inspection report (the town is essentially a “blessing” for the state)
- Finfish must be processed at a HACCP facility and must meet all other DPH requirements (refrigerated truck, etc.).

Fisherman wants to sell crustaceans at a farmers market (or another direct sale model)

- Fisherman needs retail food permit from the town health department
- Fishermen need a state retail seafood dealer permit from DMF/DPH. Currently there is no Farmers Market Retail permit and DMF and DPH are addressing these applications on an individual basis.
 - Note: DMF/DPH will not issue a state retail permit until the town has issued a retail permit or inspection report.

Fisherman wants to sell shellfish at a farmers market (or another direct sale model)

- There is currently not a model in place for shellfish to be sold directly at a farmers market, unless the fisherman/harvester has a wholesale dealer permit. The best way

to sell shellfish directly to consumers currently is to sell them shucked for on-site-consumption. Contact your town health department for more information.

Opportunities for key interventions

Cape Cod is marked by an extreme seasonality of its residents, and therefore, a shortage of a limited full time labor pool. The fishing industry (harvesters) are among a small portion of the year round employment. Even so, fishing activity is limited in the winter (primarily due to unsafe weather conditions), meaning less labor is needed to process or transport catch. Due to short and sporadic weather windows for fishing, the supply is intermittent.

For many industries, this seasonality, coupled with a rising cost of housing that is beyond the reach of much of the labor force, make the Cape a difficult place to establish a new, year round business, particularly one whose operation requires economies of scale to be profitable. For this reason, fish processors are drawn to areas like Gloucester or New Bedford that have larger operations and infrastructure already in existence with guaranteed year round employment and affordable housing.

In addition to this, the standards for wastewater quality and disposal are very strict throughout the peninsula. Cape Cod's naturally high water table, limited real estate, and high seasonal population result in strict requirements for sanitation and wastewater management. This is something worth further research to better understand what is within the realm of possibility in terms of processing and sanitation or wastewater. Large plots of land to set up a large facility that could operate year round and adhere to the water regulations are extraordinarily expensive and hard to come by. Most small business owners with knowledge of the industry would not have the capital or ability to access capital that would overcome this barrier.

However, there are small facilities that currently exist in small fishing villages on the West Coast like the Seafood Producers Cooperative⁹, and a local business model that we explore under the Bluefin tuna portion of this report. A well-informed and properly permitted individual could acquire the necessary permits and small facilities to operate a year round local business on a small scale. We believe small scale businesses are where opportunity exists to shake-up the supply chain and keep local fish available locally. By having one entity acquire the appropriate dealer, facility and retail permits in an innovative ownership model, the many different steps can be consolidated into one in an ownership model that brings power back into fishermen's hands. Therefore, a fish or shellfish could go from harvester to processor to plate in an expedited manner, changing hands less frequently, travelling less, and keeping seafood local to where it was caught. Challenges to the method are building relationships and trust needed to keep this operation profitable year round. Barriers to this are often the price and zoning requirements as mentioned above. A business supporting local harvesters would have to provide a better price to the harvester than they would earn from providing it to their traditional dealer or wholesaler.

⁹ Seafood Producers Cooperative <https://www.spcsales.com/who-we-are-2/our-fishermens-co-op/>

Key Leverage Points for Intervention

The local seafood supply chain is a series of nine steps with distinct challenges and opportunities in most steps, and overall in the system. Donella Meadows' "Leverage Points: Places to Intervene in a System"¹⁰ is a useful lens from which to look at interventions. Of the nine steps in the seafood supply there are several key leverage points for interventions: within the steps, the steps themselves, and the system in which the steps exist in. Typical interventions focus on leverage points such as rules within the steps such as Total Allowable Catch (TAC) limits for specific fisheries or uncertainty buffers when managers impose a lower TAC to protect against limited information about the species at hand. A key issue in developing effective interventions in fisheries is the delays relative to the state of systems change and the lack of strong negative feedback loops that balance out a system. For example, when a species is overfished or fished to a maximum sustainable limit and there is no substitutable product locally, supply decreases and price increases (in general); instead of the high price dis-incentivizing the fisherman from catching the fish, it actually incentivizes him to catch it for a premium ex-vessel price (i.e. tuna, swordfish, certain salmon and groupers), when there are plenty of other underutilized fish in the ocean with stocks that are plentiful. Or similar fish from other parts of the world (farmed or wild) or domestic farmed fish are imported to meet the demand at a low price, not accounting for negative externalities like the carbon footprint and management implications where that fish was caught; this overrides local capacity to catch an abundance of protein of different types. A stronger negative feedback loop would adjust the demand accordingly by leveraging other underutilized species to replace the demand for the overfished species.

The structure of information flows within the supply chain is functionally limiting on both ends of the supply chain, for harvesters and consumers or restaurant owners/chefs. Businesses of different sizes have identified the best way to make money in the current system is to vertically integrate and to reduce competition. The majority of successful seafood businesses locally are dealers, processors, and retailers – integrated into one consolidated business. Some are even also harvesters, with their own permits. This vertical integration isn't necessarily a bad thing, but when there are only a few buyers in the marketplace, it inherently gives power not to the harvester or the consumer, but to the buyers in what could be considered an oligopoly.

Therefore in the current system, fishermen are inherently price-takers because they have a highly perishable product and a limited number of buyers in the marketplace: they depend on someone wanting to buy their product at a certain time, and the buyers know that. In high-volume, low-value fisheries like skate or dogfish, demand is elastic as there is ample supply and many fishermen in the fishery, which benefits the buyers and reduces leverage for the fishermen.

¹⁰ Meadows, D. (1999). *Leverage Points: Places to Intervene in a System*. The Sustainability Institute. <http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/>

In other words, interventions within the system for uncertainty buffers and ensuring that species are not overfished via monitoring systems are all admirable approaches to introducing parameters to the system but they will not change the behavior of actors within the system nor will they change the goals of the system, the structure of the system, the power to reorganize the system, or the overall mindset of the paradigm we are operating within. These interventions simply try to mitigate behavior that might exploit fisheries, but they don't incentivize behavior (on the buyers or the fishermen's perspective) that is adaptable to changing ocean conditions and consumer demand. They punish overfishing but do not address continued demand for species that are overfished or imported.

Therefore, the key interventions to improve the local small-scale seafood supply chain involve reorganizing the system to empower harvesters and consumers or restaurant owners/chefs through interventions such as:

- (1) Create alternative wholesale models, perhaps community owned or non-profit owned cutting rooms, distribution centers, and freezer/refrigeration space¹¹.
- (2) Create a digital platform that circumvents existing supply chains and connects harvesters directly with market opportunities, including end consumers.
- (3) Run consumer-facing workshops and awareness campaigns directly addressing consumers concerns about different types of seafood and increasing their comfort level working with whole fish, partially circumventing the need for processing.
- (4) Work with non-seafood industry to create a new retail space that is adaptable to changes in supply and relieves the current direct-sale burden requiring fishermen to be consumer facing.
- (5) Develop permits that allow for innovative sale models responsive to modern realities of refrigeration and monitoring requirements – help fishermen innovate safely and move the industry forward.
- (6) Run trainings such as industry specific Hazard Analysis Critical Control Point (HACCP) certification programs and serve safe classes to comply with health requirements.
- (7) Increase consumer awareness of supply chain dynamics and empower consumers to become advocates for local seafood and aware of the negative externalities of purchasing imported codfish, farmed tilapia, imported tuna, farmed salmon, etc.
- (8) Reduce town-by-town autonomy in local food regulations in Massachusetts. Use MA DMF/DPH health and permitting standards across all towns and reduce the ability of towns to create their own rules, which make local sales more expensive and complicated for fishermen.

The assumptions of this supply chain include the transition towards an effective and responsive fisheries management system ensuring that there are wild fish in the sea to be caught as well as efforts to increase effective climate change mitigation and resilience both ecologically and in fishermen's' business models.

¹¹ This could also provide fishermen with a non-residential address for permitting, which is necessary for some of the retail and wholesale DMF permits.

These interventions are theoretically aligned with leverage points in the supply chain; certain interventions will have a bigger impact on the system than others. Certain interventions depend on others to be successful – for example, a digital connecting platform will not be effective if fishermen are not selling fish to local restaurants or fish markets and consumers won't be able to exercise their power if there is no local fish to buy or to learn how to cook in cooking classes.

That said, interventions have to start somewhere and oftentimes supply chains are a chicken-or-egg situation that requires jumping in and adjusting as we go along, adapting our approach to the changing system, with clear attention to the goal of the system we promote.

Case Studies of Potential Solutions

Innovative retail space: Dory Fishing Fleet and Market, Newport Beach California

The Dory Fishing Fleet and Market is a fishing cooperative in Newport Beach, CA founded in 1891 on what is now the Newport Pier. Consumers can purchase fish directly from fishermen at the dock and it can be processed (filleted) upon request and stored, all depending on each individual fisherman's availability.

The Dory model is unique as each fisherman remains relatively autonomous in his or her business model but they are all housed at the Dory Fishing Fleet and Market, which acts essentially as a platform for them to sell their product.

Fish availability depends on seasonality and fishery closures, but lines are typically separated into fish and crab, due to the incredibly high demand and availability of crab species. It's not unusual for fish to be sold out by 8 AM.

Innovative wholesale space: Regional cold storage facility, Northern California.

**This project is still in the planning phase

The Eureka Cold Storage facility is an interesting model in Northern California that would respond to the fishing industry's need for a seasonally adaptive, relatively small-scale, potentially membership owned processing and freezing space for seafood.

Greenway Partners produced a comprehensive report for the town of Eureka assessing the needs of the fishing fleet, scale of operation, geographic considerations, health requirements, ownership models, cost structure, and more for the Eureka Cold Storage Facility.

App: Locavore

Locavore is an app that connects consumers with local produce around them and information about seasonally available food. The app has a map feature that connects consumers with farmers markets or farms selling local food along with recipes, seasonality charts, reviews, and more. Locavore is run under LocalDirt, which is closing operations on May 31, 2019 after being sold several years ago to a company that decided not to use it. The key challenge the founder of Locavore ran into was that it was particularly difficult to

maintain up-to-date data and records of the farmers. She suggested that a successful, similar model could simply be a website directory with varying entry points for fishermen, consumers, and wholesalers.

Supply Chain by Fishery

The following section explores the supply chain of some of the main fisheries here on Cape Cod. Each profile will include an overview of (1) The status of the fishery and current management in place, (2) Typical supply chain process, (3) Permitting, (4) Key opportunities, and (5) A case study of an existing supply chain process for this species.

Please note that the permitting section of each fishery is intentionally vague, as regulations are consistently changing. As mentioned below in the permitting section of this report, the permits to buy and sell seafood are determined by both the buyer and seller, what type of permit the fish is caught on, and the infrastructure available.

Specific questions on permitting should be directed to the permitting department of the Massachusetts Division of Marine Fisheries. Another great resource is the Gulf of Maine Research Institute's recent paper on *The Barriers Preventing New England's Finfish from Entering the Market and How to Overcome Them*. Contact Kyle Foley at kfoley@gmri.org for more information.



Figure 1 Captain Kurt Martin. Photo Credit Fishy Pictures www.fishypictures.com

Black Sea Bass

Fishery Information and Management

Although always present seasonally in New England waters, Black Sea Bass has recently increased in abundance as its population moves North along the Eastern Seaboard following warmer water conditions. Black Sea Bass has above target management population levels in the mid-Atlantic and below target population levels in the South Atlantic: in other words, in the North Atlantic (where we are) you can feel good about eating Black Sea Bass. Overall, its fishing status is at recommended levels, although the biology of the species is not well known and lacks data, causing the stock assessments to have a high degree of uncertainty¹².

NOAA Fisheries, the Mid-Atlantic Fisheries Management Council, and the Atlantic States Marine Fisheries Commission all jointly manage the fishery north of Cape Hatteras, North Carolina. It is managed under the Summer Flounder, Scup & Black Sea Bass

Fishery Management Plan with an Annual Catch Limit (ACL) divided between commercial and recreational harvest. The commercial limit is divided among states based on historical fishing rates, and includes size limits, minimum mesh for trawls, a moratorium on entry to the fishery, and closed seasons. Adjustments to state allocations are approved through the council process on an annual basis¹³.

Caught primarily with fish pots, lobster traps, otter trawls and hook & line, there are both commercial and recreational fisheries for Black Sea Bass on Cape Cod, although the

¹² NOAA. (N.d.) Black Sea Bass. <https://www.fisheries.noaa.gov/species/black-sea-bass>

¹³ ASMFC. (N.d.) Black Sea Bass. <http://www.asmfc.org/species/black-sea-bass>

commercial fishery is currently small as few fishermen are landing Black Sea Bass. In Massachusetts, the minimum size limits for the commercial fishery are less than the recreational industry; in other comparable fisheries like Striped Bass, the opposite is true.

Permitting

Black Sea Bass must be caught on federal or state commercial fishing permits and therefore must be sold to a wholesaler with a federal or state wholesale license.

Supply Chain

Black Sea Bass is mostly distributed to New York or Boston's high-end markets or restaurants, although local restaurants and fish markets are beginning to carry it more frequently as consumer demand increases.

Ample opportunity exists for direct sales to consumers as the fish is easy to fillet at home and prepare. Black Sea Bass is a favorite household fish amongst those who have tried it, with a very mild flavor and versatility of culinary options from fish tacos to grilled whole fish.

Case Study

One example of a Black Sea Bass direct sale scheme exists whereby a fisherman sells whole Black Sea Bass alongside Striped Bass at a local farmers market that is in close proximity to a harbor. The marina's proximity to the farmers market is key because the fisherman is actually able to sell off his retail boat permit and does not need a retail truck permit in this case. Typically, a direct sale model for Black Sea Bass would require both a state retail truck permit and a town retail food permit. The specific health requirements vary by town, but typically the fish cannot be processed (filleted), must be sold whole, and has certain refrigeration requirements.

If you are interested in direct sales models for Black Sea Bass, please contact both the MA Division of Marine Fisheries permitting department and the local town health department.

Dogfish



Figure 2 Captain John Tuttle.
Photo Credit: David Hills,
www.fishypictures.com

Fishery Information and Management By pound, dogfish is the most abundant fish landed on Cape Cod, primarily caught by gillnets or longline. The dogfish fishery is open access with a federal agency letter of authorization, which is slightly different than a permit, as person can request an LOA to dogfish. The state of Massachusetts also has an endorsement for spiny dogfishing, although applications for endorsement remain open as of this date. Population health is considered near target population levels – overfishing is not occurring. The dogfish fishery suffered from overfishing in the late 1990s and its health today is considered a success of fisheries management¹⁴.

Dogfish is jointly managed by the Mid-Atlantic Fisheries Management Council and the New England Fisheries Management Council under a single Fisheries Management Plan (FMP). The management plan is flexible to adapt to changes in the fishery

¹⁴ ASMFC. (N.d.) *Spiny Dogfish*. <http://www.asmfc.org/species/spiny-dogfish>

between amendments to the FMP. For example, the fishing year 2019 Annual Catch Limits (ACL) were reduced in reaction to updated biological information about stock abundance, which can vary significantly in relatively short periods of time. Quotas for the current year are more closely reflective of the actual landings of spiny dogfish, whereas there was a large discrepancy in the numbers in 2018. Quotas are set every three years and reviewed based on revised population estimates. Two quota periods divide up the fishing year and trip limits set the maximum amount fishermen can harvest during single trips¹⁵.

Supply chain

The majority of dogfish landed on Cape Cod is purchased by a wholesale dealer and brought to New Bedford for processing. Some fishermen with wholesale dealer truck permits bring the fish themselves to New Bedford. As a shark species, Dogfish is relatively difficult to fillet and is well-suited to filleting at scale in a processing plant where it is filleted and frozen before being exported primarily to European and Asian markets. Additionally, as a member of the shark family, the waste byproduct from filleting has to be specially disposed of to only a handful of authorized companies. A small amount of dogfish remains in domestic markets where institutional buyers use it in breaded or fried fish products like Shark Bites, but most of the fish is exported.

In the UK, dogfish is used as fish & chips, in Asia it is used in shark fin soup or sometimes as a center-plate delicacy (whole fish), in Germany it is used as “Schillerlocken” – a bar snack similar to beef jerky that is preferred by older generations. The skin is used as fertilizer however there have been some reports that dogfish skins are hazardous material, however the implications for waste management remain unclear.

Fishermen currently receive historically low ex-vessel prices for dogfish and do not have any financial incentive to bring home a better product or try new techniques onboard such as gutting, brining, and icing onboard. Pilot programs on improved quality of dogfish have not yielded improvements in ex-vessel prices because wholesale buyers are not willing to pay more for an improved product on a pilot program. This is a key challenge for supply chain interventions and is somewhat of a “chicken or egg” scenario where fishermen may need to take a price cut for long-term improvements in price for quality once the quality is maintained over time. However, this is understandably frustrating for fishermen.

Local consumer demand for dogfish is low-to-moderate despite many years of effort to promote it, given the time and process required to adequately thaw the product, its neutral flavor, and soft texture. Unless frozen, dogfish also has a relatively short shelf life, and does not keep well in the average consumer’s fridge after being purchased. As dogfish has similar mercury levels to Albacore Tuna, it is not an ideal substitution for other frequently consumed breaded or fried products that traditionally use low mercury fish such as pollock or haddock.

Permitting

Given the processing requirements and amount of dogfish landed by fishermen, there are no innovative sale models by local fishermen. Fishermen interested in direct sale models should contact both the MA Division of Marine Fisheries permitting department and the local town health department.

¹⁵ NOAA. (N.d.) Atlantic Spiny Dogfish. <https://www.fisheries.noaa.gov/species/atlantic-spiny-dogfish>

Case Study

In 2017, the Fishermen's Alliance ran a program called Pier to Plate, funded by an earlier section of this Saltonstall Kennedy grant which provided dogfish and skate free of charge to local restaurants throughout the summer, intending to enable chefs to experiment with unique underutilized fish without a financial risk. This program utilized existing supply chain pathways: fish caught by local fishermen was processed and frozen by Marder Trawling before being transported to frozen storage at Chatham Fish & Lobster before being distributed to local restaurants.

In total over 4,000 pounds of dogfish and 6,000 pounds of skate were distributed to local food establishments throughout summer 2017. A key finding from the program is that consumers readily chose dogfish when they did not have options to purchase other similar species. For example, if a dogfish fish sandwich was available as well as a hake fish sandwich, consumers were less likely to choose dogfish and expressed hesitation. However, when dogfish was the only type of fish sandwich, they readily order it. Consumer surveys found that consumer demand for local underutilized fish exists however realities of supply chain complexity (thawing, taste, etc.) inhibit local restaurants and to some extent fish markets' ability to source local fish.

Groundfish



Figure 3 Captain Eric Hesse. Photo Credit: David Hills, www.fishypictures.com

Fishery Information and Management

The New England Fishery Multispecies Complex includes eighteen different species of groundfish, all managed with a single fishery management plan. Federal waters groundfish are a quota managed species that allows fishermen to choose one of two management options:

1. Select a sector to join and receive a community allocation based on personal landings history; this is a type of catch share program that allows leasing among sectors. There are no trip limits for species that have quota allocations. The majority of fishermen chose this option.
2. Select to join the common pool, which uses days-at-sea, trip limits, and quarterly fishery catch limits to control how many fish are caught.

Fishing in federal waters requires a federal limited access Northeast (NE) multispecies permit. A state limited entry groundfish endorsement is required to fish for groundfish in state waters. The state of MA regulations for trip limits mirror those of the federal regulations in many cases. Federal groundfishermen who belong to an authorized sector are not subject to specific trip limits (because they are managed through quota allocations), however, those fishermen that belong to the common pool are.¹⁶

The federal multispecies permit includes American plaice, Atlantic cod, Atlantic halibut, Atlantic pollock, Atlantic wolffish (prohibited), haddock, ocean pout (prohibited), redfish,

¹⁶ Greater Atlantic Regional Fisheries Office. (2018, April 30). Northeast Multispecies (Groundfish); Fishing Year 2018 Regulations :: Greater Atlantic Regional Fisheries Office. Retrieved March 15, 2019, from <https://www.greateratlantic.fisheries.noaa.gov/nr/2018/April/18multifw572018recrulephi.html>

white hake, windowpane flounder (prohibited), winter flounder, witch flounder, yellowtail Flounder. Groundfish are primarily caught with trawl, gillnet, & hook (jig and benthic longline) gear.¹⁷

There is a historic lack of accountability, trust, and data in the groundfish fishery going back to the hay-day of the Cod fishery before its collapse in the 1990s. Groundfish is a very important part of Massachusetts and particularly Cape Cod's history. Beyond its namesake, the "Sacred Cod" hangs in our State House, and old timers say you could "walk across Cape Cod bay on the backs of Cod fish". Despite this heritage, the fishery was fished to a point of collapse in the 1990s forcing reactionary management plans with inadequate success, creating a chasm between fishermen who saw immense numbers of Cod in the waters and scientists declaring the stock overfished. Documented instances of flawed science informing policy making, such as Trawl Gate,¹⁸ further increasing the distrust between fishermen and scientists that is still evident today.

Permitting

Fishermen catch groundfish on federal or state fishing permits and can sell directly to markets or restaurants that also have federal wholesale dealer permits. MA has a variety of dealer permits related to fisheries activities (see permitting chapter of this document), including a wholesale seafood broker permit and a wholesale seafood dealer permit. Seafood dealers who purchase federally managed species from vessels require a permit to purchase the following species: Atlantic mackerel, squid, butterfish, Atlantic sea scallop, Northeast multispecies, monkfish (goosefish), summer flounder (fluke), scup, black sea bass, Atlantic bluefish, Atlantic herring, spiny dogfish, Atlantic deep-sea red crab, Atlantic bluefin tuna, other Atlantic tunas (yellowfin, bigeye, skipjack, albacore); NE skate, American lobster, Atlantic hagfish, surfclam and ocean quahog processors or dealers; Atlantic herring processors or dealers; and/or Atlantic mackerel at-sea processors.¹⁹ Small amounts can be filleted in-house by chefs at restaurants or staff at fish markets, but the rest is sent to processors via wholesalers or by-way of the auction. Some groundfish such as Pollock or haddock is often processed and frozen into products like fish sticks and fish sandwiches. Wholesalers either distribute back to local retailers or send product nationally or internationally, mainly to Spain, Canada, and Japan²⁰.

¹⁷ NOAA Fisheries. *Northeast Multispecies*. Retrieved on May 9, 2019.

<https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/multispecies/>

¹⁸ TrawlGate was a situation in the early 2000's where fishermen observing NOAA's survey equipment noticed a very big problem with the tow's wire setup. The wires were uneven, meaning that underwater, the net would not expand into a proper u-shape needed to catch fish, thus making the surveys themselves grossly inaccurate. After fishermen on the research vessel observed and noted the problem as well as several other key indicators that the gear was not functioning properly, the agency was slow to respond to or acknowledge its errors. When this situation became known to the media and fishing fleet, it caused a significantly divide and distrust between the industry, scientist and regulators.

Benjamin, Molly. (22 November 2002). *The Real Story Behind TrawlGate*. Cape Cod Times.

<https://www.capecodtimes.com/article/20021124/news01/311249991>

¹⁹ Greater Atlantic Regional Fisheries Office. (2014, October 31). Dealer Permits. Retrieved March 15, 2019, from <https://www.greateratlantic.fisheries.noaa.gov/aps/permits/dealer/index.html>

²⁰ Dawicki, Shelley. (June 20, 2017). *Following the Fish: Where New England's Catch Goes and Why it Matters*. NOAA. https://www.nefsc.noaa.gov/press_release/pr2017/features/fish-flow/

Fishermen interested in direct sale models should contact both the MA Division of Marine Fisheries permitting department and the local town health department.

Supply Chain

Given the high demand for groundfish, particularly cod, unique supply chain models exist in this fishery with specific high end grocers/wholesalers who implement high degrees of traceability for local consumer demand. These models are relatively new and are promising for fishermen as they often provide price floors for fishermen, but fishermen must meet certain size and quality parameters set by buyers that may not be realistic or representative of the fishery.

There is a substantial lack of consumer awareness about local availability versus imported product, especially of cod. Consumers often assume that all cod served on Cape Cod is local, whereas much of it is imported from Iceland, Alaska, or Norway²¹. There is high consumer demand for groundfish and key opportunities in promoting groundfish species besides cod. An abundance of lesser known groundfish like pollock, redfish, and haddock provide an exciting opportunity to align buyers looking for simple, mild, sustainably sourced local fish. This is a substantial knowledge gap between fishermen and buyers.

Case Study

For groundfish, Whole Foods purchases codfish, haddock, and other species caught by jiggers and hook and line fishermen. Once again, this style of fishing produces smaller harvests but very high quality fish, caught individually, brought on deck alive, handled with industry best practices. Several Cape Cod boats focusing on haddock have shifted operations and land at the Whole Foods facility at Pigeon Cove in Gloucester,* guaranteeing the shortest possible time between landing and delivery to consumers. Whole Foods guarantees a set price which allows these fishermen to maintain highest quality and anticipate a steady market and cash flow. A challenge with this model is that the buyer still sets the price for fishermen and demands certain quality requirements that may be impossible to meet given realities of fishing – such as additional size requirements for fish (over the legal minimum).

*location change pending as of June 2019

Monkfish



Figure 4 Photo Credit:
David Hills,
www.fishypictures.com

Fishery Management and Information

Monkfish, fondly known as the “poor man’s lobster” is abundant on Cape Cod, particularly in the winter. The stock is divided between the Northern Gulf of Maine/Northeast George’s Bank and Southern George’s Bank – overfishing is not occurring in either. Monkfish is jointly management by the Mid-Atlantic Fisheries Management Council and the New England Fishery Management Council. The National Marine Fisheries Service implements rules and regulations. The Monkfish fishery is managed under

²¹ Gotbaum, Rachel. (January 2 2014). *Why the Cod on Cape Cod Now Comes from Iceland*. NPR.
<https://www.npr.org/sections/thesalt/2014/01/02/255547215/why-the-cod-on-cape-cod-now-comes-from-iceland>

“days at sea” program with corresponding trip limits.²²

Monkfish tails are mostly landed, although occasionally fishermen will land whole monkfish.

Permitting

As far as our research shows, there are no innovative or direct sale models for Monkfish. Fishermen interested in direct sale models should contact both the MA Division of Marine Fisheries permitting department and the local town health department.

Supply Chain

The majority is bought by wholesalers, processed at scale and sent to national and foreign markets in Asia and Europe. Monkfish is increasingly available locally but is not a mainstream product yet²³.

Julia Childs famously launched monkfish into the national public domain on her show in the 1980s. Today, there is moderate consumer demand for monkfish as a unique local fish that has high substitutability for lobster.

Skate



Figure 5 Photo Credit Fishy Pictures
www.fishypictures.com

Fishery Management and Information

Skate is managed federally by the New England Fishery Management Council in a complex of seven species: Winter Skate, Barndoor Skate, Little Skate, Thorny Skate (landings prohibited), Clearnose Skate, Rosette Skate, & Smooth Skate. All species except Thorny Skate are commercially landed and overfishing is not occurring. Winter Skate is the most abundant type of skate caught locally on Cape Cod, and proportionate landings of Barndoor Skate were recently approved in 2018 as a result of a successful fisheries rebuilding

plan. The fishery is divided into bait and wing²⁴.

Typically fishermen on Cape Cod land skate wings and leave racks (everything besides the wing) at sea, but sometimes they land cheeks and use the racks for bait for other species such as lobster. Skates are primarily caught in gillnets for most of the year. A much larger bait fishery exists out of the ports of Rhode Island that is prevalent in the fall and winter months.

Permitting

Similarly to dogfish, there are currently no innovative sale models for skate due to the complexity of processing it and the sheer amount of skate being landed. Fishermen interested in direct sale models should contact both the MA Division of Marine Fisheries permitting department and the local town health department.

²² NOAA. (N.d.) Monkfish. <https://www.fisheries.noaa.gov/species/monkfish>

²³ Dawicki, Shelley. (June 20, 2017). *Following the Fish: Where New England's Catch Goes and Why it Matters*. NOAA. https://www.nefsc.noaa.gov/press_release/pr2017/features/fish-flow/

²⁴ NOAA. (N.d.) Northeast Skate Complex. <https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/skate/>

Supply Chain

Skate are mostly purchased by wholesalers who bring the fish to processing plants in New Bedford, although occasionally fishermen with wholesale dealer truck permits will drive the fish to the processor themselves. As a type of ray, skate are notoriously difficult to fillet and consequently is mostly processed at scale off-Cape. The majority of the fish is then frozen and exported to Europe and Asia, although increasingly there is domestic demand for skate. Like dogfish, the skin requires particular disposal methods. Most often, the skin is primarily used for fertilizer.

Minimal amounts of skate stay local although there is strong interest from local restaurants and consumers. The main blockage is the local markets carrying the fish and/or distributors delivering fish in (smaller) quantities restaurants need. Foreign demand particularly in France is very high as skate is considered a delicacy, often served with the skin on. In Singapore, skate is grilled and eaten like mozzarella cheese, peeled off with chopsticks. There is ample opportunity for skate as a local, sustainable, healthy, and delicious choice for local consumers. In general, it keeps longer and has a better shelf-life than dogfish.

Striped Bass

Fishery Management and Information

Striped Bass is a unique fishery on Cape Cod as Massachusetts has the only commercial striped bass fishery in the country. With population levels below target levels, the current fishing rate promotes population growth and is strictly managed. From Maine to North Carolina, striped bass is managed by the Atlantic States Marine Fisheries Commission, the Atlantic Striped Bass Conservation Act, and the Atlantic Coastal Fisheries Cooperative Management Act. There are substantial commercial, recreation and charter interests in this fishery. Fishermen catch striped bass by hook & line on the designated fishing days up to their daily catch limit²⁵.

Permitting

Striped bass is similar to bluefish in that commercial fishermen can deliver fish directly to fish markets that have a state wholesale dealer permit. There are currently no examples of direct-to-consumer sales, but striped bass is a great candidate for pilot projects in direct sales. Fishermen interested in direct sale models should contact both the MA Division of Marine Fisheries permitting department and the local town health department.

Supply Chain

Fishermen can either bring their catch directly to wholesale retailers (state permit only required) or can sell to wholesale distributors for regional distribution. Most fish is processed (filleted) in the restaurants or fish markets. Some fish is distributed to regional markets like New York and Boston.

Striped Bass is very high in demand in commercial and recreational fishermen and consumers. There is significant knowledge of the local fishery and consumers have relative confidence in handling and cooking it. There are ample lessons learned here to apply to

²⁵ ASMFC. (N.d.) *Atlantic Striped Bass*. <http://www.asmfc.org/species/atlantic-striped-bass>

other fish when marketing to local consumers, particularly in terms of confidence of preparation and branding of local product.

In Massachusetts, there has been a recent concentration of enforcement on recreational fishermen who seek to sell striped bass to fish markets. Like all recreationally landed species, this is illegal, and devalues the commercial fishery. However, many fishermen that do fish the species use it to augment their catch in the summer months: a fun-to-catch game fish that provides a boost in revenue and is popular with consumers.

American Lobster



Figure 6 American Lobster. Photo Credit: GARFO.

Fishery Management and Information American lobsters are crustaceans with large, shrimp-like bodies and 10 legs, two of which are long strong claws used for pulverizing shells and tearing soft flesh. Live lobsters tend to be olive or brownish green, with other colors appearing on appendages. They only turn red once cooked due to a pigment that reacts to heat in their shells. Lobsters are not sedentary, migrating large distances throughout the year.²⁶

Lobsters have a long lifespan, but are difficult to age due to the periodic shedding of their shells. Scientists believe that they may live up to 100 years old, and they can weigh up to 44 pounds. Larger females bear more eggs, which they can carry internally for up to a year after fertilization, and for 9-

11 months externally. Fishermen are prohibited from landing these “berried” females, and have mandatory or voluntary v-notching requirements in most areas. If a v-notched lobster is caught, even without berries, a fishermen must return the individual to the water in most areas. There are seven American lobster management areas as shown on figure 2.²⁷

The lobster fishery is managed by the Atlantic States Marine Fisheries Commission, a federal entity, under the Atlantic Coastal Fisheries Cooperative Management Act. It is a limited entry fishery managed through trap allocations and trap limits versus a more common quota system. The amount of traps on a permit can change based on the overall health of the fishery in a respective area.²⁸ For example: although the overall population of lobster is not experiencing overfishing, it known that the Southern New England stock of American Lobster has experienced significant declines due to changing ocean conditions and the amount of traps allocated in their known locations has been significantly reduced over the past several years. It is estimated that more than 97% of landings come from the

²⁶ NOAA Fisheries. (n.d.). American Lobster. Retrieved February 15, 2019, from <https://www.fisheries.noaa.gov/species/american-lobster>

²⁷ NOAA Fisheries. (2014, February 12). American Lobster Information Sheet. Retrieved February 20, 2019, from https://www.greateratlantic.fisheries.noaa.gov/nr/2014/February/american_lobster_info_sheet_2.12.14.pdf

²⁸ NOAA Fisheries. (n.d.). American Lobster. Retrieved February 15, 2019, from <https://www.fisheries.noaa.gov/species/american-lobster>

George's Bank/Gulf of Maine stock, which is why the overall quota and stock status remains in good condition.²⁹

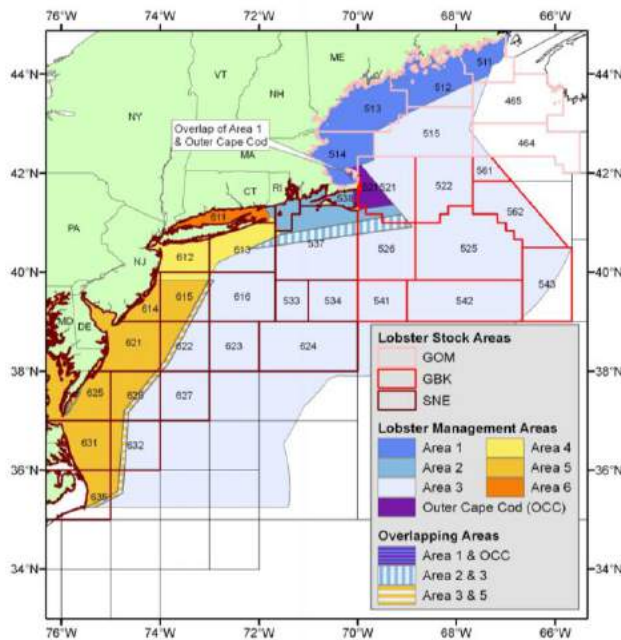


Figure 7 Lobster management areas. Photo credit: GARFO.

More detailed regulations on time/area closures and gear regulations can be found through the Greater Atlantic Regional Fisheries Office Website and FAQ sheets, or through individual states marine fisheries programs.

Supply Chain

Like most seafood species, the supply chain for American Lobster begins with the harvester, who captures the species with a trap and brings the undifferentiated product back to shore. After landing, the fishermen can sell his or her catch to a dealer on the wharf that sorts and qualifies the lobsters.³⁰ These buying stations pay a “boat price” and

then mark up the price before selling it to the wholesaler. These places typically have fuel and other gear that make for a quick stop before the fisherman heads home.³¹ It is then quickly transferred from them to a processor (who process the lobster, generally by freezing) and they store the product in order to meet later market demands. Examples of processors in Massachusetts include Seatrade (New Bedford), Gloucester Seafood Processing, etc. The dealer may also take the lobster directly to market for live distribution both nationally and internationally.

Permitting

Fishermen operating on their commercial permit and a Retail Boat dealer permit can deliver lobsters directly to fish markets and fishermen with a retail truck permit and corresponding town retail permits can sell directly to consumers. If a fisherman wants to sell at the dock, he likely only needs a retail boat permit, but if he plans on going to a farmers market or another point of sale, he needs a retail truck permit. From there it is transferred to a customer, either for retail or to a restaurant. This is typically where most of the value added for the species, and where the lobster finally reaches the plate of the consumer.³² There is a lot of exchange of lobsters between wholesalers. For example, a smaller wholesaler, focused

²⁹ Atlantic States Marine Fisheries Commission. (n.d.). Retrieved February 21, 2019, from <http://www.asmfc.org/species/american-lobster>

³⁰ <https://taatrain.cffm.umn.edu/publications/LobsterMrktOverview.pdf>

³¹ <https://escholarship.org/uc/item/5m78k80p>

³² <https://taatrain.cffm.umn.edu/publications/LobsterMrktOverview.pdf>

on local distribution, might sell to local restaurants and fish markets as well as to a larger wholesaler, who will then distribute the lobsters across the country or even over to other wholesalers in Asia. Who wholesalers sell to depends on the size and scope of their business and what orders they need to fill.³³

In lieu of selling to a traditional buying station (dealer), some fishermen have opted to form cooperatives. Coops are nonprofits owned by lobstermen who share in expenses and profit. They sell to the coop for a previously determined price and a manager will market the lobster to different buyers. This helps to vertically integrate the fishermen into the supply chain, and allows them to have more control over where (and for how much) their lobster is sold. Coops pool resources together, which can allow for transactions with larger dealers. Because Coops have a net zero profit, any leftover money is split between the members at the end of the year.

Supply Chain Complexity

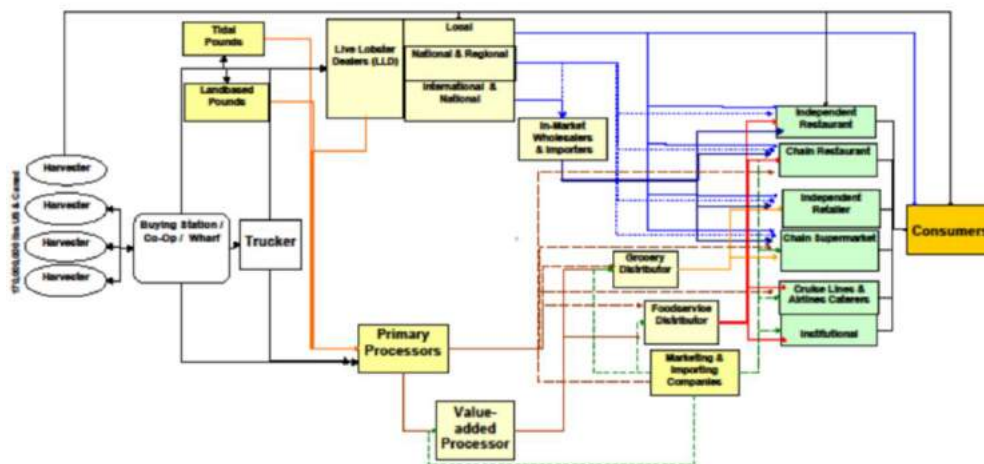


Figure 7: Supply Chain Complexity. Source: USDA.

Value: Why is lobster so expensive?

This has more than one answer.

At each step in the supply chain, the cost of the lobster is increased incrementally to cover things like transportation, storage, marketing, etc. to ensure that each respective step is making a profit. So although the harvester may get a certain price per pound, it moves up the more times it changes hands. Another reason for increase is due to promotion, marketing and branding.

³³ <https://escholarship.org/uc/item/5m78k80p>

- Promotion – Industry invest in generic promotions and building interest and awareness of the brand and products
 - \$.05 per pound anticipated return of 5-8% increase in boat price
 - \$.10 per pound, anticipated return of 12-18% increase in boat price
- Marketing and branding – Private companies invest in marketing and branding individual products and bring the products to market³⁴
- Simply, it was labeled as a delicacy, and people like eating expensive food.

There are no commercial farms to provide a lot of lobsters, so supply is limited to wild caught fisheries. Lobsters grow slowly, and they are challenging to keep alive through shipping, meaning those costs are much higher than with fillets of fish. Live lobsters are preferred by the consumer because of their texture when cooked.

Whether cooked or frozen, processing lobsters is a labor intensive process, often needing done by hand to ensure shell and waste materials are not served with the meat. Additionally, Americans perceive cheap lobster as suspicious or a scam³⁵

Case study

Selling seafood directly to the consumer has many challenges. A Cape Cod fishermen embarked upon a pursuit of selling his lobster at a local farmers market. His challenges began in having to coordinate different regulatory requirements at the federal, state, and local level. Federally, he had to obtain a dealer permit, which allowed transfer from him (the harvester) to the himself (the dealer) in order to sell them to another person. Next, he had to work with the state to ensure that once the lobsters were landed, he was able to transfer/move them according the proper refrigeration and storage requirements. Finally, as he would be selling the lobsters in the commonwealth of Massachusetts, he had to comply with the local town health department regulations. Ultimately, he chose to only sell at one towns' farmers market during the summer, instead of having to apply for multiple permits in different towns, which would have meant repeating the already cumbersome application process.

Getting permits and approvals was not the easiest process. “It’s time-consuming,” said the captain. “Just figuring out what I needed to do and all that.”

“The challenge in Massachusetts is that as a Commonwealth our towns have individual health policies. In states like Maine and New Hampshire they have a state law only,” Leaning said. “This makes it difficult when the state and town might not work together or know what the other is requiring.”

³⁴ <https://taatrain.cffm.umn.edu/publications/LobsterMrktOverview.pdf>

³⁵ Sullivan, C. (2015, July 17). Science explains why lobster is so expensive. Retrieved February 22, 2019, from <https://www.businessinsider.com/why-is-lobster-super-expensive-2015-7>

As a result of this process, the fishing organization that helped the captain navigate the process is now working with the state to approve a uniform permit that would allow others to sell direct, rather than spend countless hours and dollars navigating the currently complex process.

“I don’t believe that all fishermen want to sell direct or should sell direct,” she said. “It all depends on what’s happening in the fishery and what the individual wants out of his or her business model. I just think they should have the option. [This captain] is an example of exactly the type of family I think we should support here on Cape Cod – a young, independent entrepreneur who is trying to think outside the box in terms of his business model and is generating employment for other young people to stay on Cape Cod.”

So far it seems a lot of people agree, or at least love lobster. On a Sunday morning in early July, The captain had sold almost all of the 150 pounds he brought. He and [his wife] say they have regulars that come right when they open at 9 a.m.³⁶

Additional challenges in selling lobsters directly to consumers arose in this case study. Namely, the fishermen wasn’t interested in marketing and promoting his product so the sales were limited to customers via word-of-mouth, previous interactions, or PR from other sources about lobsters at the farmers market. On the consumer end, lobsters are considered a delicacy but most farmers market customers either were hesitant to buy lobster at the farmers market because they were headed to the beach or out for the day, were planning on eating it out, or were apprehensive to cook it. Local customers supported lobster but only as a specialty purchase; they weren’t interested in purchasing lobster every week and were hoping for more variety in seafood options.

Atlantic Sea Scallop



Figure 8: Atlantic Sea Scallop. Photo Credit NOAA FishWatch.

Fishery Management and Information Atlantic Sea Scallops are harvested year-round from Maine to North Carolina. Scallops are bivalves, much like clams and oysters. Their shells are held together by an abductor mussel, which is what Americans typically eat. They have a saucer shaped shell with scalloped or fluted edges (thus the name). Scallops can live up to 20 years and grow relatively quickly in the first years of their lives. After spawning in late summer/early fall, the scallop larvae stay in the water column for 4-6 weeks before settling on the ocean floor. Scallop larvae are a valuable food source for other pelagic fish and invertebrates. Scallops eat through filter feeding, and possess the ability to propel themselves through water to escape predators by snapping their shells closed. Other bivalves do not have this capability.

³⁶Leggett, D. (2018, August 15). Local Farmers' Market Brings on the Lobster. Retrieved February 22, 2019, from <https://www.capecodchamber.org/articles/local-farmers-market-brings-lobster>

Scallops are managed by the New England Fishery Management Council and NOAA Fisheries. The regulations divide the scallop fleet into two components: a small “dayboat” individual fishing quota (IFQ) fishery who adhere to individual quotas and 600 pound daily trip limits, and a larger “limited access” component who are subject to 18,000 pound overall trip limits (a trip could be a week or more). Both are required to adhere to strict area closure requirements and must use vessel monitoring system (VMS) while harvesting scallops. Measures are in place that reduce bycatch through gear modifications and seasonal area closures.

Value of Landings

Rank	Species	Thousand Dollars
1	Salmon	687,770
2	Crabs	610,377
3	Lobsters	593,874
4	Shrimp	530,977
5	Scallops	511,945
6	Pollock (Alaska)	413,273
7	Flatfish	267,013
8	Oysters	236,418
9	Clams	210,755
10	Cod	160,815

Figure 9 Value of species by thousand of dollars. Source: FUS2017

In 2016, the scallop fishery of the Atlantic was valued at more \$496 million with landings of approximately 41.6 million pounds.³⁷ The 2017 Fisheries of the U.S. Economic report ranks scallops fifth by value in the entire country, at approximately \$511,945,000, which falls approximately \$170 million behind the number one valued species, salmon.³⁸

Supply Chain

The supply chain for the scallop fishery begins at sea. Fishermen on both Limited Access and General Category vessels process (shuck) their product at sea, removing the abductor mussels from the shells. Live scallops require an addition permit from the state to land.

After a fishermen completes a trip, they have several options on whom to sell:

Many vessels choose to sell their product directly to the auction. Here, wholesale bidders can purchase and bid on a lot. Prices for a lot generally increase throughout the day, as does quality. Auction prices are generally more consistent, which can make it easier for a fishermen to plan their business for the season year, although the trend is that auction prices are slightly lower in the summer when supply is high. Prices increase in the winter when conditions prevent regular fishing, and meat yields are lower (supply decreases). Recently, fishermen saw prices from \$9-11/lb ex-vessel during the summer of 2018, and prices around \$13-15/lb as holidays increased demand. Market value remains fairly consistent throughout the year around \$25/lb for sea scallops. Like other fisheries, as the product moves through the supply chain, the price increases incrementally until it reaches the consumer.

Permitting

There are currently no examples of innovative local sale models of scallops on Cape Cod, however there is ample opportunity for this high value and highly sought after species.

³⁷ NOAA Fisheries. (n.d.). Atlantic Sea Scallop. Retrieved February 21, 2019, from <https://www.fishwatch.gov/profiles/atlantic-sea-scallop>

³⁸ National Marine Fisheries Service (2018) Fisheries of the United States, 2017. U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2017 Available at: <https://www.fisheries.noaa.gov/feature-story/fisheries-united-states-2017>

Fishermen interested in direct sale models should contact both the MA Division of Marine Fisheries permitting department and the local town health department.

Case Study

The Cape Cod Fisheries Trust has been working closely with Cape Cod fishermen and the Whole Foods Supermarket chain to deliver locally sourced scallops and groundfish to the Northeast region of the supermarket chain, which totals roughly 70 stores.

For scallops, three captains sell product directly to Whole Foods, shipping to a processing facility in Gloucester. These boats are part of the “general category” fleet, meaning each boat is allowed to land only 600 pounds of shucked scallops per trip. These scallops are the highest quality, freshest product on the market. Recognizing that, Whole Foods buys from these captains at a price that is consistently higher than prices quoted on the general seafood auction in New Bedford.

For groundfish, Whole Foods purchases codfish, haddock, and other species caught by jiggers and hook and line fishermen. Once again, this style of fishing produces smaller harvests but very high quality fish, caught individually, brought on deck alive, handled with industry best practices. Several Cape Cod boats focusing on haddock have shifted operations and land at the Whole Foods facility at Pigeon Cove in Gloucester, guaranteeing the shortest possible time between landing and delivery to consumers. Whole Foods guarantees a set price which allows these fishermen to maintain highest quality and anticipate a steady market and cash flow. A challenge with this model is that the buyer still sets the price for fishermen and demands certain quality requirements that may be impossible to meet given realities of fishing – such as additional size requirements for fish (over the legal minimum).

Bluefin Tuna

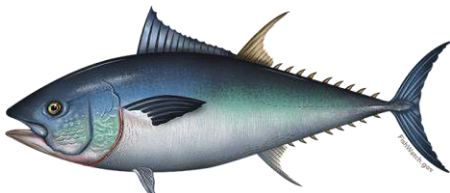


Figure 10 Atlantic Bluefin Tuna. Photo Credit: NOAA FishWatch

Fishery Information and Management

Atlantic bluefin tuna caught in U.S. waters are found in the western Atlantic from Newfoundland to the Gulf of Mexico. Bluefin are a highly migratory species. They are extremely evolved top predators and can migrate thousands of miles across the ocean, which makes their management more challenging, as it qualifies them for international management measures. They typically live near the surface, but will dive to depths of 500 to 1,000 meters. They spawn in the same areas of the Gulf of Mexico (April to June) each year, where they are prohibited from being caught. Bluefin tuna are the largest of all tuna species,

they grow more slowly than all others. They can live up to 20 years, and typically begin spawning around age 8, which is slightly higher than their Pacific counterparts.³⁹

The International Commission for the Conservation of Atlantic Tunas (ICCAT) scientific committee assessed the abundance of bluefin stocks in 2017. It determined that western Atlantic Bluefin Tuna (those caught in the U.S.) are not subject to overfishing. However, due to overfishing in previous years, the stock is still in a rebuilding plan.⁴⁰ The current catch limits set by the 2017 stock assessment authorize a 17% increase in the amount of fishing allowed for the species. Although this was less than the stock assessment suggested could be fished, scientists gave a buffer from the top end of the range to account for uncertainties. For example, scientists continue to study the impacts of the 2010 Deepwater Horizon spill on the species. The spill coincided with the spawning season, which may have impacted an entire generation of young fish.⁴¹

Atlantic Bluefin Tuna are managed through NOAA Fisheries Highly Migratory Species Division, who make recommendations to ICCAT consistent with applicable U.S. laws.³

Supply Chain

Very generally, the supply chain for Atlantic (western) bluefin tuna can be described by the following process:

Fishermen harvest and land a whole tuna and tag it. Harvesting can be accomplished through purse seining, harpooning, rod and reel, long-line or trap, although the latter is the least significant gear type. The whole fish is brought to a dealer who has the appropriate federal and state permits.

Federal dealer permits are required to purchase, trade, or barter any highly migratory species (HMS) from a U.S. fishing vessel, even if the HMS product is landed in a foreign port. HMS product that was caught and retained by a U.S. fishing vessel is generally considered a domestic product and is not considered an import, even when the product is landed in a foreign port and crosses the U.S. border after landing.⁴²

Importers, exporters and re-exporters of Atlantic bluefin tuna, Southern bluefin tuna, Pacific bluefin tuna, frozen bigeye tuna, swordfish, and shark fins must obtain an International Fisheries Trade Permit (IFTP).⁴²

³⁹ NOAA Fisheries. (2018, December 4). Western Atlantic Bluefin Tuna. Retrieved March 1, 2019, from <https://www.fishwatch.gov/profiles/western-atlantic-bluefin-tuna>

⁴⁰ REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS). (2017, October 6). Retrieved March 1, 2019, from https://www.iccat.int/Documents/Meetings/Docs/2017_SCRS_REP_ENG.pdf

⁴¹ NOAA Fisheries. (2018, December 4). Western Atlantic Bluefin Tuna. Retrieved March 1, 2019, from <https://www.fishwatch.gov/profiles/western-atlantic-bluefin-tuna>

⁴² NOAA. (2017, August 23). Atlantic HMS Dealer Compliance Guide. Retrieved March 1, 2019, from <https://www.fisheries.noaa.gov/resource/outreach-and-education/atlantic-hms-dealer-compliance-guide> The IFTP must be applied for online at : https://fisheriespermits.noaa.gov/npspub/pub_cmn_login/index_live.jsp.

Recent regulatory changes require both the fishermen and the dealer to report the tag number and associated information to the federal government within 24 hours. Each fish has a unique tag, and at times of busy fishing, this process can be extremely cumbersome, as many fishermen will have to reach out to the dealer after the sale to verify correct information.

In some instances, the dealer will also process the fish, however, most sell to a specific processor such as Stavis Seafoods (Boston) who are able to handle large quantities of fish. Very occasionally, a fishermen will sell his catch to the auction, if there is no pre-existing agreement with a dealer. However, there is less guarantee of a good price, so most choose not to go this route. One example of fishermen that might sell to the auction are groundfishermen who are participating in an electronic monitoring exempted fishing permit (EFP) that allows them to harvest tuna (with appropriate gear) on a groundfish trip. This catch is not planned, but can provide additional income to the captain and crew from their trip. Fish on the auction would also go to a processor after their initial sale.



Figure 11: Captain Ray Kane with a western Atlantic Bluefin. Photo credit: Ray Kane.

After the fish is filleted, the processors sell to different cuts thousands of different customers. Processors generally get about 70% yield on the product, and their markup covers not only that reduction (to break even) but also enough to cover costs of freezing, shipping, and labor. For example, a processor may buy a tuna for \$8/pound, get a 70% yield, and have to sell the fish for \$11.42/pound to break even. Most would factor in other costs per pound and sell the fish for about \$13/pound. They sell to retail clients such as fish markets, sushi restaurants, etc., who will further mark the product up by about 30%, which is reflective of the price the consumer pays for the product.⁴³

An interesting anecdote on Bluefin tuna is that the Pacific and Atlantic species are extraordinarily similar in appearance. A person reading this report might question the price value, thinking that the quality of one fish is much higher than the other. However, the reality of the “million dollar fish⁴⁴” sold at the beginning of the year (at the former Tsukiji Fish market, which closed last year and moved to the Toyosu market near Tokyo Bay) is that the cost is driven up in large part due to the marketing benefits and publicity of the event, not so much from the actual quality and taste of the fish, although it is undoubtedly a high quality product. A person could speculate that the demand for Pacific Bluefin is higher and the supply much lower (as a result of years of overfishing that have resulted historically low stock abundance), therefore the price would be driven higher.⁴⁵ However, there are more

⁴³ Personal Account, Andy Baler, Bluefin Tuna Dealer, processor, and owner of Bluefin’s Restaurant.

⁴⁴ Paris, F. (2019, January 05). Threatened Bluefin Tuna Sells For \$3 Million In Tokyo Market. Retrieved March 1, 2019, from <https://www.npr.org/2019/01/05/682526465/threatened-bluefin-tuna-sells-for-5-000-per-pound-in-tokyo-market>

⁴⁵ WWF. (2014, July). Current Situation of Bluefin Tuna and Stock Management. Retrieved March 1, 2019.

factors than that to consider, and the international market on highly migratory fish deserves its own dissertation and will not be further discussed here.

Case Study

The personal interview conducted for this supply chain information revealed that there is a unique way that the supply chain can be made more advantageous, albeit through additional work and inspections. More than one dealer on Cape Cod also possesses the ability to process fish in small facilities that have been properly constructed, permitted and inspected. The bluefin tuna is then sold at these businesses restaurants. There are no regulations that prohibit a single person or business from acquiring all these different permits, which can make getting fish directly from the ocean to a plate a quicker process, changing hands much less than would ordinarily happen. However, having all permits in one small business doesn't come without its challenges.

In the case of bluefin tuna (a highly desirable and profitable fish), the supply is limited to only a few months of the year before the species moves to different waters. This is the case with other fish in New England waters such as black sea bass, squid, bluefish, striped bass, etc. Coupled with the distinctly human seasonality of Cape Cod, it can make maintaining a consistent year round business challenging, if not impossible.

The individual's perspective on why he chooses to do more work streamlining the supply chain process is that not only to consumers want local fish, but sourcing directly from fishermen and having a single dealer is more transparent, healthier, safer, and provides a legal business that supports the community in the long run.⁴⁶

Oyster



Figure 12: Eastern Oyster. Photo Credit: NOAA Fishwatch.

Fishery Management and Information

Eastern Oysters are grown throughout the United States from Maine to the Gulf of Mexico. Oysters are an ideal product for many growers due to their sessile nature, fast growth rates and high reproductive capacity. Additionally, they are self-feeding since they take food directly from the water column.

Oysters first mature as males, then switch to female. A female oyster releases over 100 million eggs during a spawning event. Major threats to oysters are from shellfish diseases and also man-made causes such as ocean acidification, which impacts shells of (particularly young) organisms.

Public Health officials in the state are responsible for monitoring shellfish from growing areas to make sure they are safe to eat.

Apart from sedentary growth, Oysters provide other environmental benefits. They filter feed the water, removing algae, organic matter, and excess nutrients as they grow. Oysters and the gear used to grow them provide habitat for other marine organisms. Additionally, oyster beds stabilize coastal sediments and help minimize impacts from storm surges.

⁴⁶ Personal Account, Andy Baler, Bluefin Tuna Dealer, processor, and owner of Bluefin's Restaurant.

Oysters can be grown wild or through aquaculture. Aquaculture essentially entails oyster larvae being bred in hatcheries and fed a diet of algae for 2-3 weeks. Larvae will then attach to a substrate such as old oyster shells. Once attached, they are transported to grow-out sites in coastal waters. They can be grown on bottom (direct on the beach in tidal areas) or off bottom (in mesh bags, racks or cages that are attached and anchored to frames in the intertidal zone. In some cases, oysters are grown in suspended culture, where bags are attached to rafts and float in the intertidal zone. Oysters can be harvested year round, although fall is generally regarded as the best oyster season, as the oyster has spawned during the summer and spent many months feeding in ideal conditions.⁴⁷ Historically oyster consumption was limited to months with an “R” in them because of the cooler temperatures and decreased likelihood of disease.

Supply Chain

As previously noted, oysters can be grown through aquaculture or wild harvest. In MA, the locations authorized for harvest of oyster are managed through individual towns. Towns manage criteria for grant application and administration through a shellfish warden, who also enforces health standards and closures. Additionally, the state manages the water quality testing to ensure no harmful contaminants are present in waters where shellfish are being harvested. The state also mandates minimum harvest sizes for oysters. Oyster harvests can be a year round industry, although supply does diminish when water temperatures decrease, as oysters grow much more slowly in cold waters. This is fairly common on Cape Cod: not only does temperature influence the growth and supply of oysters, but there is also less demand in the winter, when populations reach their yearly low and many growers remove oysters from the water over winter.

Due to concerns of disease due to warming water conditions, harvesters or growers must adhere to extremely strict requirements. Currently, harvesters have a two hour window post-tidal exposure to get oysters down to a certain temperature and they must keep the oysters adequately shaded in between.

Oysters to be consumed in raw form generally stay fresh for 10-14 days. However, if stored properly, they can live for over 4 weeks. Oysters should be stored at 38-43 degrees in a non-airtight container. Some oysters are stored in wet (recirculated water) environments that mimic their natural conditions. If stored this way, the water must be tested weekly. Wet storage is not the same as depuration, which cleanses product from certain conditional areas for a designated period of time before they can be sold for consumption.⁴⁸

Because of their relatively short shelf-life, wholesalers or co-ops typically sell directly to consumers or restaurants for immediate consumption. Oysters can be delivered by truck or air to their final destination. A consumer may buy them whole/live and shuck them him or

⁴⁷ NOAA Fisheries. (2019, March 27). Eastern Oyster. Retrieved March 31, 2019, from <https://www.fishwatch.gov/profiles/eastern-oyster-farmed>

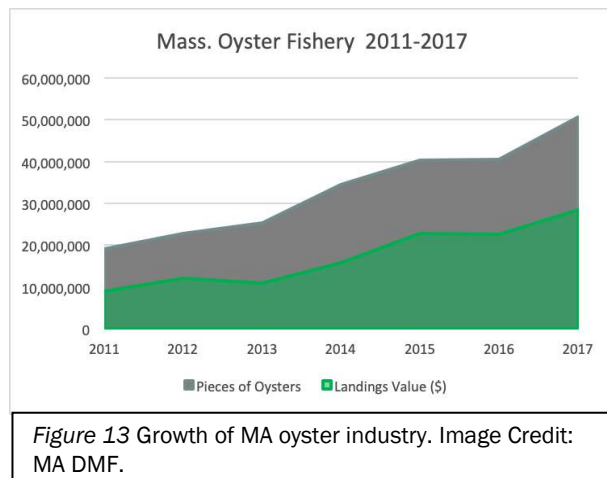
⁴⁸ Pangea Shellfish & Seafood Company, Inc. (2016). Frequently Asked Question About Oysters. Retrieved March 31, 2019, from <https://www.pangeashellfish.com/oyster-faq>

herself or may buy them for a premium at a restaurant or raw bar where they will be cleaned and served on the half shell.

Permitting

Oyster harvesters can sell directly to wholesalers or some harvesters belong to co-ops who have the appropriate permits to sell wholesale and resale directly to a consumer. Most oysters are sold as harvested in their shells, however, some are further shucked and harvested to make canned or packaged products, however the farthest north this value added product is found is Maryland currently. In Massachusetts oysters exist almost exclusively for the half shell market. Wholesalers are responsible for maintaining appropriate facilities to house raw seafood products, and must have appropriate permits (see below)⁴⁹ from the state. Wholesalers can also ship nation-wide to deliver product (for a premium price) to the consumer.

Health concerns make direct sales of oysters extremely difficult, particularly for live products. It is somewhat simpler to shuck oysters onsite at an event where consumers consume the oysters at the point of sale. Many shellfishermen are less interested in direct sales because of the health risk put into consumer's hands and the potential implications of that from a branding perspective, even if it is the consumers fault due to mishandling. Likewise, there is significant and growing interest in diversifying shellfish products to avoid disease and business concerns of monocropped aquaculture as well as promoting consumer demand to avoid the "glut" of oversupply of oysters destined for a limited half shell market.



Towns use oysters as nitrogen fixers in bodies of water that need nitrogen removed. There is ample concern among shellfishermen about what happens to these oysters and the market impacts if they are brought onto the commercial market.

The value of oysters has increased significantly over the past 8 years. In 2011, Nearly 19,000,000 pieces of oyster (aquaculture and wild) were harvested at a value just above \$9,000,000, which made the price per piece approximately \$0.47. As

of 2019, the value per piece increased to approximately \$0.56. Oysters are now the third most valuable seafood product in the State of Massachusetts.⁵⁰ If you have purchased oysters whole sale, you will notice that they are marked up at approximately \$1.00, and

⁴⁹ Massachusetts Department of Marine Fisheries. (2019). Commercial fishing permits. Retrieved April 9, 2019, from <https://www.mass.gov/service-details/commercial-fishing-permits>

⁵⁰Massachusetts Department of Marine Fisheries. (2018). Massachusetts Oyster Fishery Data.

another \$1.00-1.50 if being purchased shucked and cleaned at a restaurant by the consumer.