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Conflict and Change:
Livelihood Transitions in New England and Pacific Groundfishing Communities

By
James C. LaChance

A dissertation submitted in partial satisfaction of the
requirements for the degree of
Doctor of Philosophy
in
Environmental Science, Policy, and Management
in the
Graduate Division
of the
University of California, Berkeley

Committee in charge:
Professor Kathryn De Master, Chair
Professor Stephanie Carlson
Professor Youjin Chung

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Abstract

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Doctor of Philosophy in Environmental Science, Policy, and Management

University of California, Berkeley

Professor Kathryn De Master, Chair

Groundfisheries in the New England and Pacific regions face enormous environmental and social transformations that threaten the livelihoods of fishermen and the long-term viability of their communities. Federal declarations of economic fishing disasters, climate change impacts, and “the greying of the fleet,” a demographic transition of aging fishermen and fewer recruits entering the industry, together converge upon working waterfronts in coastal communities experiencing gentrification and a loss of shoreside infrastructure for the fishing industry. Concomitant with these shifts, a decade-old transition in fisheries management to “catch shares” effectively privatizes fishing resources, catalyzing new forms of financial investment and triggering a wave of change and conflict.

Employing a qualitative comparative case study approach, this research examines the challenges fishing communities confront as a result of the implementation of catch shares. Within this evolving context of environmental and social change, catch shares effectively enables a novel type of enclosure and accumulation through values-based investments and erects new barriers to fishing rights access, which in turn intensifies the impact of gentrification and the loss of shoreside infrastructure. As powerful actors invest in fisheries, fishermen and community members contest the scientific knowledge and trends of professionalization underpinning management decisions.

This dissertation presents these findings and describes opportunities to democratize fisheries science by embracing aspects of expert and practitioner-based knowledge that, combined, may enhance management outcomes, build trust, improve agency, and increase accountability. This approach offers potential to bolster the livelihoods of fishermen as they navigate ongoing changes both in the ocean and in their social environment.

To Nancy and Carmen

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Chapter 1: An Introduction to Conflict and Change in Groundfishing

1.1 Introduction

Social and Environmental Change

I grew up in an area known for its commercial fishing heritage. Cape Ann, a rocky corner of Massachusetts jutting into the northwest Atlantic, shelters several coastal communities with ties to the fishing industry. Groundfish,¹ tuna, swordfish, lobster, scallops, and much more are all landed² here. At the heart of Cape Ann sits Gloucester, Massachusetts – the oldest fishing port in the country, established in 1623. If you leave Gloucester Harbor by boat and head north around the perimeter of Cape Ann—past the twin lighthouses of Thatcher Island and around Halibut Point—you eventually reach Essex, Massachusetts. Across the Annisquam River from Gloucester, and therefore off “the island” as the locals refer to it, Essex historically launched the many wooden fishing vessels it built for the local fleet. To this day, the town sustains a historic boatbuilder and museum at its pier, though the supply of commercial fishing boats to Gloucester has long since ended. In many parts of the country, similar communities have originally depended on a natural resource-based economy like fishing but now face conflicting uses. This dissertation focuses on how these places continue to evolve in the context of social and environmental drivers, such as management shifts and changing fish stocks, to both understand what these communities experience today and how experiences could shift in the future.

This case study research compares two regions and fisheries: the Northeast multispecies groundfish complex in New England, and the Pacific Coast groundfish fishery on the West Coast. In this research I refer to these regions and their fisheries by the names of their respective regional fishery management councils: New England and the Pacific.³ I conducted this comparative study because the regions have undergone similar changes to their respective groundfishing fisheries, or groundfisheries, since 2000, and I wanted to better understand their experiences navigating these changes. As I explain in detail in Chapter 2, each region’s groundfishery recently received a fisheries disaster declaration, a U.S. Department of Commerce designation that makes funds available to assist the industry in its recovery from

¹ The term “groundfish” describes a variety of demersal species of fish that spend the majority of their lives at or near the bottom of the ocean. Historically groundfish have been caught in high volume year-round, cementing their importance to portside infrastructure. Several interviewees described groundfish as “the glue” that keeps a port vibrant and viable (Author Interview, 2019). Chapter 2 details groundfish species and commercial groundfish harvesting practices.

² Landings are the fish that are harvested, brought to port, and sold.

³ The official names of their respective regional fishery management councils, which are the entities that establish the fishery management plans for each fishery studied here, are the New England Fishery Management Council (NEFMC) and the Pacific Fishery Management Council (PFMC). The NEFMC regulates commercial fishing for the states of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut. The PFMC manages fisheries for California, Oregon, and Washington (and should not be confused with the North Pacific Fishery Management Council, which manages the fisheries of Alaska).

said disaster.⁴ In 2010, each fishery also shifted in its management paradigm from effort based management approaches (e.g. days-at-sea, where fishermen are allocated actual days of fishing effort they may use in a given time period) to an approach commonly known as “catch shares” fishery policy (which focuses instead on rights to an amount of fish). This was informed by the reauthorization of the Magnuson-Stevens Fisheries Conservation and Management Act in 2006 (hereafter Magnuson Stevens Act, or MSA), which has been used to manage U.S. fisheries since 1976.⁵ The catch shares approach effectively privatizes fishery access in part through shares, or quotas, that confine fishery landings to a certain amount of fish during the fishing year. Fishery participants buy, sell, and trade shares of the collective quota as if in a “stock market” for fish (Author Interview, 2019). The New England and Pacific fisheries mirror catch share ambitions, but they diverge in certain features and practices that this study will describe in the comparative research approach described in the Research Methods section of this chapter, and in Chapter 2.

Through this research, I identify a range of factors that inform social and environmental changes in these fisheries. I analyze how demographic shifts in the fishing industry converge with changes in management and regulations, and I describe how the gentrification of fishing communities further complicates and compounds these changes. I examine ways that financial actors—from hedge funds to environmental nongovernmental organizations—make values-based investments into fishing communities, and I explore how these practices inform a broader pattern of neoliberalization, or the ideology of market-oriented solutions to various social problems. I also analyze how values-based investors deploy natural resource conservation as a novel type of accumulation and enclosure of the fisheries. This research also exposes how knowledge to inform fisheries management is being constructed differently by fishermen and fisheries scientists, though they share an empirical foundation. I contend that these types of knowledge could more effectively complement each other to achieve shared management goals.

Further complicating the impacts of catch shares implementation for the livelihoods of fishermen and their surroundings, all of these social changes I describe occur in the midst of significant environmental challenges and cultural responses to those challenges. There exist imperatives to rebuild overfished stocks, while also navigating warming of waters, shifts in regional species habitats, potential impacts of offshore wind energy development, and the ongoing threat to endangered marine mammals from fishing gear entanglement.⁶ As I chronicle in this dissertation, commercial groundfisheries navigate increasingly challenging, and increasingly crowded, waters.

⁴ The Pacific disaster, approved January 19, 2000, included approximately \$5 million in funding for a natural disaster of unknown causes and sustained decline in recruitment. The New England disaster was declared September 13, 2012, with approximately \$33 million offered for a natural disaster of unknown causes. More detail follows in Chapter 2.

⁵ The Magnuson Stevens Act is administered by the Office of Fisheries in the U.S. Department of Commerce’s National Oceanographic and Atmospheric Administration.

⁶ This is an especially important issue for the lobster industry in New England and the Dungeness crab industry on the West Coast, but did arise in conversations with groundfishermen.

Why “fishermen”

Academic studies and certain fishery organizations sometimes use non-gendered nouns to describe people who fish: fisher/fishers, fish harvester, fisherpeople, fisherfolk, and similar iterations. Occasionally one may see or hear terms like fisherwoman or fisherwomen to describe specific individuals doing the fishing. However, in this writing and research, I choose the gendered nouns “fisherman” or “fishermen” to describe those who fish, to reflect how those I interviewed identify themselves. Though my interview sample of women who fish was small (n=3), each referred to herself as a fisherman; two even pointedly insisted on describing themselves as fishermen. This aligns with other experiences I have had in fishing communities in similar research conducted in the wild harvest and aquaculture shellfish sector, as well as with the approach of other fisheries researchers who have described similar reasoning for continuing use of the gendered noun (e.g., Hilborn, 2011; Brewer, 2017).

Motivations for this word choice may change with time, and it is important to note that gendered diction may exclude and impede a diversity of new entrants to commercial fishing. As one seafood non-profit manager pointed out, recruitment is already challenging enough, only to be further complicated by gendered terminology:

We started trying to use fish harvester, but it was tough because a lot of women, like, they don’t want [to be referred to as] anything other than fisherman, because they feel that if they’re asking to be called [something else] then they’re asking for a special privilege (Author Interview, 2019).

To respect such concerns, I use throughout this dissertation the collective noun fishermen to describe those who fish. I do not intend to exclude the identity of anyone who fishes.

1.2 Guiding Research Questions

The central research question I raise with this research is: what are some of the challenges and opportunities fishermen and their associated communities are experiencing after approximately ten years under a catch shares management approach in the New England and Pacific regional groundfish fisheries? To interrogate and better understand these challenges and opportunities, I examine three key themes that emerged from my extended case study research: (1) demographic shifts among fishermen and fishing community gentrification; (2) values-based investing in groundfish fisheries; and, (3) knowledge contestation and professionalization of the fishery. These three themes each comprise a distinct chapter in this dissertation.

In *Chapter 3: Groundfishery Greying and Gentrification*, I ask how the greying of the fleet—in which the increasing age of fishermen converges with a decrease in new entrants—impacts regional groundfishing communities. Are working waterfronts being lost, and if so, how will this impact recruitment of new fishermen? I analyze the impact of greying and gentrification on the resilience of fishing communities in each region, and investigate particular ways in which the recent shift to a catch shares approach helps or hinders such resilience.

In *Chapter 4: Values-Based Investing in Groundfisheries*, I ask how new forms of values-based investing change the nature of fisheries management and impact fishing livelihoods. I explore how these practices fit within broader patterns of neoliberalization, and what this research may suggest about new forms of accumulation and enclosures.

In *Chapter 5: Knowledge Contestation and Professionalization*, I ask how efforts to professionalize a fishery, or to encourage the trappings of more refined business practices, could be problematic and/or beneficial. I consider what ways of knowing professionalized scientific approaches exclude, and what key tools of knowledge production this science privileges. I ask if catch shares amplify existing issues of knowledge contestation in each region, and I identify potential opportunities to democratize fisheries science in these areas.

1.3 Theoretical Framing

Researchers have capably identified the challenges and impacts of privatizing (e.g. Carothers and Chambers, 2012), commodifying (e.g. Peluso, 2012), and financializing (e.g. Fairbairn, 2020) individual natural resources. This research will investigate the impact and implications of such privatization of a natural resource a full decade following its implementation in these two groundfish fisheries. Through a focus on the related impacts of values-based investing and knowledge contestation, this study unveils previously unrecognized convergences of political ecology, rural sociology, anthropology, fisheries science and management, and economics in research on aging producers and gentrification of natural resource-based communities, values-based investing and its community implications, knowledge contestation, and the democratization of knowledge.

Groundfishery Greying and Gentrification

My research on the implications of an aging groundfish fishing population builds upon similar research done in the U.S. To this point, existing research has focused upon Pacific Ocean fisheries in Alaska, Oregon, and California (e.g., Donkersloot & Carothers, 2016; Cramer et al., 2018; Russell, Sparks, Arias-Arthur et al., 2014). Researchers attribute this greying of the fleet in part to the shift from effort-based management regulation (e.g. days at sea) to catch shares, which, as this dissertation argues, erects barriers to entry and limits upward mobility for all fishermen, both new entry and established (Bradshaw, 2004; Bromley, 2009; Copes, 2002; Copes & Charles, 2004; Criddle & Macinko, 2000; Donkersloot & Carothers, 2016; Grafton, 1994; Macinko, 2014; McCay, 1995; Pinkerton, 2017). This research applies the understandings of the greying of the fleet to the little-explored New England context. My work also builds upon work examining similar trends in other natural resource-based sectors, such as agriculture and forestry (H. F. Gale, 1993; USDA ERS, n.d.; He et al., 2021).

In agriculture, the aging of the farming workforce and the expectation that younger farmers are more likely to lease land than to own (USDA ERS, n.d.) gives rise to questions about what land and livelihood access will look like in the future. My focus here on similar changes taking place

in the groundfishing industry draws, in part, from existing research in agriculture. I describe how the trend of increased leasing of agricultural land resembles a similar phenomenon in fisheries. Changes to shoreside infrastructure and loss of land-based resources for the fishing industry further complicate such challenges; even if new fishermen are recruited, the supporting resources the industry requires may no longer be available in port.

This greying of the fleet closely conspires with the gentrification of fishing towns to threaten the industry's future. Historically, beginning fishermen relied on training from elders and frequently joined the fishery due to close family connections (Miller & Van Maanen, 1982). In recent years, however, this trend has tapered off (Andreatta & Parlier, 2010) and placed generational fishing families on a decline (Russel et al., 2014; Messick, 2015). Fishing rights ownership has shifted toward urban-based actors (Carothers, 2010). National Oceanic and Atmospheric Administration (NOAA) research on the East Coast highlights this gentrifying shift in both rural and urban ports, citing increased dependence on tourism and recreation in many locations along the Eastern seaboard.⁷

I situate my research of groundfishery greying and gentrification within broader questions of what the next generation of fishing livelihoods and communities may experience as they adapt to these rapidly accelerating changes. I ask what constitutes a resilient fishing community, and how succession plans for fishing families might improve and turn the tide away from fishing rights consolidation.

Values-Based Investing

The shift from effort-based controls to catch shares heightened the role of capital in the two groundfish fisheries studied here. This change in fisheries management diminished the ability of fishermen to negotiate their livelihoods on their own terms; to better understand this shift in agency and access, I draw on theories of power, drawn primarily from political ecology. Using David Harvey's theory of accumulation by dispossession as a lens (Harvey, 2003), this research considers the impact of changes required by the shift to catch shares. I identify how certain actions both dispossess fishermen of access to fishing rights and separate them from means of production. This dispossession exacerbates existing power imbalances while enabling conservation goals to be met and secures—in a relatively new way—fishing rights within rural fishing communities. I augment Harvey's accumulation by dispossession with Alice Kelly's view of conservation as primitive accumulation (Kelly, 2013). Kelly's research focuses on how the creation of national parks fosters patterns of enclosure and dispossession. My work similarly examines how values-based investments shape groundfisheries by privatizing the access to fish, creating new enclosures that separate fishermen from their means of production and fostering a process of ongoing accumulation and dispossession.

⁷ Jimenez, R. (2021, May 3). Social Indicators of Gentrification Pressure. Retrieved on April 30, 2022 from https://storymaps.arcgis.com/stories/56781eb366f1485e8ffd7c96b16f133f?utm_medium=email&utm_source=go_vdelivery.

The theories of Harvey and Kelly, as well as Bonnie McCay (1985a; 1989) and Elinor Ostrom (1990), together inform how I think about enclosure and common pool resources. Enclosure, or restricting access to the commons, frequently attends acts of dispossession (Harvey, 2003), and has distributional impacts to resource appropriation (McCay 1985a). Harvey (2003) sees enclosure and dispossession regularly in acts of privatization and financialization, and McCay (1995a) emphasizes the need to retain cultural values that rely on access to the commons.

Enclosures occur in various ways in fisheries. Ostrom (1990) demonstrated that when Canada staked a claim on its coastal waters out to 200-miles under the “Law of the Sea Convention” in 1976, this was a first step in rationalizing fisheries (a term I explain below, and in more detail in Chapter 5, that entails fisheries relying on rational economic thought), but this action also began to undercut local claims to fisheries. Some suggest that the current culmination of ocean enclosure efforts in the international agreement of a 200-mile exclusive economic zone (EEZ)⁸ is only temporary, and that eventually all of the ocean will be enclosed (Ball, 1996). Other forms of enclosure of the ocean include the creation of marine protected areas and marine national monuments (e.g. Sand, 2007), or, pertinent to this work, catch shares and the privatization and commodification of fishing rights (e.g. Pinkerton & Davis, 2015; Lowe & Carothers, 2008; Carothers & Chambers, 2012).

Building upon this thinking on enclosures, I deploy Ostrom’s community-based understanding of a common pool resource (CPR), which she describes as a “natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use” (Ostrom, 1990, p. 30). Ostrom emphasizes how common pool resources can rely on management not just from the state, but also from self-organization and self-governance by resource users (1990). All too often, those who espouse privatization aims for natural resource management conflate common pool resources with open access resources (e.g., Hardin, 1968), and I explore the tension that arises from this imprecision in Chapter 4.

Longstanding patterns of U.S. fisheries policy exhibit a “rationalizing” mindset (Mansfield, 2004), and rationalizing and professionalizing efforts in fisheries rely in some ways upon enclosure. Here I embrace Mansfield’s definition of “rationalizing” as the idea that “market rationality (i.e., profit maximization) is natural,” such that a rationalized fishery offers predictable patterns of harvest and improved sustainability (Mansfield, 2004, p. 314). The rationalization of fisheries often accompanies an effort to “professionalize” the fishery, or to introduce formalized structures and trappings of standard business practices, such as improved

⁸ The Exclusive Economic Zone (EEZ) was created by the United Nations Convention of the Law of the Sea in 1982. It acknowledges the sovereign right of a coastal nation to the resources of its coastal waters out to 200 nautical miles (or about 230 miles). More information about the U.S. EEZ is available here: NOAA Ocean Exploration. (n.d.) *What is the EEZ?* Retrieved on May 6, 2022 from <https://oceanexplorer.noaa.gov/facts/useez.html#:~:text=An%20%E2%80%9Cexclusive%20economic%20zone%2C%20%E2%80%9D,both%20living%20and%20nonliving%20resources.>

accounting and tracking of quota, for example. Implementation of a catch shares approach professionalizes a fishery (e.g., the individual fishing quota (IFQ) system with Alaskan halibut, as described in Carothers, 2013; or the introduction of an IFQ in New Zealand, as described in Mace et al., 2014).

When describing professionalization in natural resource management, I include environmental nongovernmental organizations (ENGOS) as part of that shift. ENGOS, and in this case The Nature Conservancy specifically, purchase and lease fishing quota or are partners with other organizations that do this. Through dispossession and then repossession (which, as I will explain in Chapter 4, has effectively occurred in the Pacific region through investments and divestments into fisheries by The Nature Conservancy), ENGOS occupy a tricky niche in fisheries management. ENGOS act similarly to corporations that speculate upon fishing rights under the guise of values-based investing. Like “green grabbing” activities in farmland (Fairhead et al., 2012), “blue grabbing” or “ocean grabbing” capitalizes on the newly formed privatized structures present in some fisheries (e.g., Hill, 2017; Barbesgaard, 2018; Bennett et al., 2015).

Contested Knowledge

The catch shares approach privileges the role of capital, shifting power dynamics to complicate rationalizing and professionalizing of fisheries by introducing a new ownership approach and its associated market for buying, selling, and trading quota and permits. However, rationalizing and professionalizing already face challenges because they critically rely upon accurate fisheries science and fish stock assessments. Allowable catch limits (ACLs) for a fishing season place a hard cap on how much fish can be caught, and require accurate fisheries stock assessments. These complex analyses aim to determine the sustainable levels of harvest that remain; in the New England context in particular, determining that sustainable harvest level has been a longstanding point of contention. This is most frequently evidenced by disagreements over “chock stocks” or “choke species” (Author Interviews, 2019). A choke stock is one for which there is little quota available because the scientific assessments suggest that they are scarce, but fishermen’s experience and knowledge on the water suggests otherwise. This mismatch between scientific and practitioner knowledge can choke off fishing for plentiful species that are frequently found near the choke species and is a key point of contestation.

To better understand knowledge contestation in fisheries and examples of complex scientific analyses that do not rely on professionalized scientific skills, I draw on foundational work of “post-normal science” (Functowics and Ravetz, 1992). Here I explore whether scientific efforts in groundfish fisheries could benefit from movement away from a singular view of science and toward community-based evidentiary approaches that incorporate novel methods and additional perspectives (Functowicz and Ravetz, 1992). Others have similarly proposed that experiential knowledge could complement scientific knowledge and ultimately improve conservation actions (Fazey et al., 2006).

Drawing together scientific expert knowledge and experiential practitioner knowledge offers opportunities to democratize fisheries science and improve our understanding of the fisheries natural resource. Others have described this holistic knowledge as reflexive and a new knowledge paradigm (Pimbert, 2017), emphasizing that this approach to knowledge requires participation (Carolan, 2008) and coproduction (Salomon et al. 2018). Akin to forms of local ecological knowledge such as Indigenous knowledge, this combined approach echoes efforts to integrate knowledge into management approaches that have been historically overlooked (Thrupp, 1989; Hoover, 2017; Norgaard, 2019). These ways of knowing and the privileging one type of knowledge over another articulates with my earlier discussion of how management attempts to professionalize fisheries. As I describe in Chapter 5, fishermen feel they are perceived as “backwards” (Author Interview, 2019), and some fishermen suggested that this is in part why their knowledge is frequently unrecognized and underappreciated.

1.4 Research Methods

Personal Background

While I was growing up, my family would often spend summer weekends out on our 17-foot center console boat. It was nothing fancy, as evidenced to many passersby by the old two-stroke Evinrude outboard that ensconced the boat in a cloud of blue smoke when at idle. A favorite destination was Folly Cove in Rockport, Massachusetts. This cove is home to urchins, starfish, juvenile lobsters, flounder, mussels, and more as it gradually descends to a depth of 70-plus feet at its rocky point, where a sandy bottom spans the cove before rejoining the rocky granite coast of Cape Ann. Its subsurface terrain attracts beginning divers, and, in our case, young kids donning fins and masks to snorkel. Folly Cove yields for me my oldest and clearest memories of changes in the ocean.

One summer when I was ten, I discovered a section of the granite face of the northern side of the cove covered with a sheet of green urchins. Each time we visited that year, I would eagerly check on it. When I swam out the following year, the urchins were nearly all gone, replaced by a wall of starfish. Another year, my father showed me a trick to enable seeing a lot of fish—smash up something they like to eat, then sit (or float, as it may be) and wait. I would swim out toward the middle of the cove with a few small crabs or some unsuspecting mussels and a rock, give them a smash, and let them go. Out of the inky shadows would come a dozen emboldened “schoolie” (young) striped bass to gobble them up, nearly out of my hand, and encircle me. Whenever I could convince a friend to join me who was new to snorkeling, I made sure they met my schoolie friends and learned the shared virtues of cold-water snorkeling in Folly Cove. However, when striped bass populations dwindled a year or two later, the schoolies frequently did not show.

Yet another change I observed at Folly Cove took place once I had graduated from college and held my first professional job in 2009. I had saved up funds to buy my own SCUBA gear. My dive buddy and I were out at the northern point of the cove in about 65 feet of water, and I saw a

new fish. “What the hell is that?” I remember thinking. Although much more common today, back then black seabass were infrequent visitors, and I only heard about them from friends who fished for them on the south shore of Cape Cod. Once I returned home, I confirmed the sighting in my field guide, and there I also learned that black seabass and I share a love of lobster. No wonder they are moving north.

I think that it might be because of these experiences that I have a hard time figuring out precisely when I began to conduct my dissertation research on changes in the ocean. Even when I attempt to bound this research through my enrollment in the PhD program at UC Berkeley, efforts to date the research remain complicated because I made my way into this work gradually. First, through various projects with my PhD advisor, I examined issues surrounding farmland access in the U.S. and how this access is complicated by new forms of financial investments being made in farmland by deep-pocketed actors. Then, having made some of my own connections to analogous changes taking place in fisheries, I began submitting fellowship and grant proposals that compared values-based investments in farmland and fisheries. Finally, after much discussion and initial fieldwork, I determined that this fisheries case was just too rich not to make it the entire focus of my dissertation.

I methodically began this research in 2017 when I received a fellowship to work with the Berkeley Food Institute and applied for my initial Institutional Review Board (IRB) approval from the Committee for Protection of Human Subjects at UC Berkeley (see Appendix A). Focused on community outreach, I was able to travel through the mid-Atlantic and New England regions speaking with fishermen and fish processors, as well as seafood vendors at docks, processing facilities, on vessels, and even at farmers’ markets. I also attended fishing community events, including Slow Fish San Francisco in spring of 2018 and a community lobster boil in Gloucester. I attended fishing community organization meetings as well as traditional office-based annual board meetings. This early stage of the research was largely exploratory and focused on networking in the realm of ocean and fisheries policy. As such, my initial interviews were informal and exploratory. I took extensive field notes about these unrecorded, off-the-cuff conversations and began developing a growing network of commercial fishing contacts.

Regardless of whom I spoke with, I intentionally tried to explore two things during these conversations—changes seen in the fishing community, and changes seen in the ocean. I intended to start with a broad, shared social and ecological lens, with the aim of parsing the connections between the two. From these conversations I developed my formalized research approach. Armed with an amendment to my initial IRB approval (see Appendix B) and a reasonable assemblage of research and professional funds,⁹ I began conducting formal dissertation research.

⁹ Additional research funds and support were collected throughout the research and writing process from various sources, including: the American Association of Geographers’ Geographies of Food and Agriculture Group, the UC Berkeley Loker Foundation Award, the UC Berkeley Dr. E. Ralph de Ong Student Support Fund, the UC Berkeley

Research Methodology

For my research I relied on a comparative extended case study approach that combined qualitative interviews, participant observation, and analysis of secondary literature, including fishery council documents, NOAA reports, and related fisheries policy documents. I recruited interviewees primarily through a network sampling approach, augmented by directly contacting sector leaders and experts (e.g., regional fishery council members, fishing sector managers, fishing permit bank organizations, representatives of ENGOs engaged in the fishery). Between January 2019 and January 2020, I conducted semi-structured qualitative interviews with 75 people—including fishermen and key informants (n = 24 in the Pacific region, with n=14 fishermen; and n = 51 in the New England, with n=23 fishermen). I conducted the first 30 interviews in New England before I began conducting interviews on both coasts. After interviews were completed, they were transcribed and then analyzed using NVivo qualitative data analysis software. This approach identifies and triangulates key themes shared by fishermen and other community members.

I targeted two interconnected sub-networks of interviewees: fishermen, and people otherwise connected to commercial fishing. I defined fishermen as anyone engaged in commercial fishing, and I prioritized individuals who are fishing or have fished in either the New England or Pacific groundfish fishery for their livelihood. Additionally, I interviewed fishermen who were active in the same waters and ports as groundfish fishermen but who primarily fish for other species. These fishermen were recommended as generally knowledgeable about the industry—often given their length of tenure fishing in the area—even if they were primarily engaged in other local fisheries, such as Dungeness crab, sea urchin, squid, or shrimp in the Pacific region, and scallop, lobster, monkfish, shellfish, or tuna in New England. Other community members I interviewed included representatives of the NEFMC and PFMC, federal fishery scientists, state fisheries employees, fishing sector managers, and representatives of permit banks, fishing trusts, and community quota funds. I also interviewed key representatives of ENGOs and non-profits engaged in fisheries, community-based fishing support organizations, seafood processors, as well as researchers, policy makers, local officials, seafood business/market owners, and lawyers who work with fishing industry.

Interview questions focused on changes to fisheries management approaches, reflections on the region's groundfish fishery disaster declaration, thoughts on various sector and permit bank structures, general feelings on marine conservation, knowledge and experience of values-based investments in fisheries, understanding of challenges facing the ocean and working waterfronts, and more. If the person I interviewed was a fisherman, I also asked specific questions about his or her approach to fishing, how they got their start in the industry, what fishing practices they

use, and their perception of changes on the water and working waterfront. The full interview guide is available in Appendix C.

I intentionally cast a wide net with my interview questions to ensure the interview functioned as a guide instead of a formal questionnaire. Semi-structured interviews resemble conversations, with no two interviews following the same format, although sharing a set of key subjects or topics. Through this approach, the most pertinent issues rise to the top and inevitably drive the conversation. Interviews generally lasted between 45 minutes to one hour, with some interviews extending more than two hours. Also, in some cases, particularly when on a boat fishing or setting flags for races or repairing a wooden boat, the interview might extend throughout an afternoon. In the case of interviews lasting more than two hours, I recorded portions of interviews and also kept notes on various conversations and observations made throughout the day, balancing interviewing with participant observation.

Rigorous notetaking proved especially important to participant observation. For this component of my research across the New England and Pacific regions, I attended regional fishery council meetings and subcommittee meetings, private sector meetings (when invited), and reviewed materials and plans from offshore wind energy interests that had been shared with some fishing organizations. I also attended multiple annual/board meetings of a handful of commercial fishing support organizations. I took a seat at state and city-level fisheries commission meetings, spent time on the decks of fishing vessels (both to fish and observe gear, fish holds, charts, and photos), assisted with preparations for the St. Peter's Day Fiesta (the annual blessing of the fleet) in Gloucester, attended Slow Fish San Francisco, attended a community-based fishing organization's annual lobster boil, visited processing facilities and permit bank headquarters, and more. Fieldwork in New England fortuitously overlapped with a series of community listening sessions commissioned by the NEFMC and hosted by the Gulf of Maine Research Institute, so I attended these listening sessions (run like focus groups, but with a community-wide invitation in each location) on Cape Cod, the South Shore of Boston, and Gloucester.

Finally, after I had completed my interviews and the bulk of my fieldwork, I had the good fortune to be selected as a NOAA Sea Grant Knauss Fellow. This fellowship placed me in the Washington, D.C. office of U.S. Senator Ed Markey of Massachusetts, where I worked as part of his energy and environment team from February 2020 through November 2020. This fellowship offered me an opportunity to engage in participant observation in the policy arena. My portfolio featured topics related to the work of the U.S. Senate Committee on Commerce, Science, and Transportation, on which Senator Markey serves. After just six weeks on Capitol Hill, the pandemic struck. Communicating with the fishing industry, which has been inordinately impacted by the pandemic because of its heavy reliance on the restaurant industry (people like to go out for seafood more often than cook it at home), became a significant focus of my day-to-day efforts. Work on behalf of the Senator to support the fishing industry in Massachusetts entailed interacting with members of the groundfishing community and other fishing sectors in

Massachusetts and New England, as well as communicating with Congressional staffers in offices from around the country with heavy ties to the fishing industry. The experience of speaking with constituents, drafting oversight letters for executive branch agencies, compiling briefings for Senator Markey, attending key fisheries and Commerce Department hearings, consulting with the Congressional Research Service, and drafting legislative language continued to inform my understandings of ocean policy, fisheries regulation, and the connections of both to the fate of fishing communities.

In addition to interviews and extensive participant observation, I triangulated my field data with a careful review of key fishery management documents and data, including federal disaster declaration statements, regional fishery council amendments pertinent to groundfish and broader management shifts, regional fishery council presentations and public comments, fishery management plans and stock assessment updates, fishing industry documentaries shared by interviewees. Finally, I conducted an archival review of newspaper articles and photographs at the Cape Ann Museum in Massachusetts in 2019.

My methodology emphasized a qualitative approach, as through my studies and research experience I have learned that these methods will often uncover nuanced, surprising, or complex findings that evade quantitative inquiry. This engaged, participatory research method embodies what is known as a “reflexive” approach to science (Burawoy, 1998, p. 4), an approach that dovetails well with the complexity of groundfisheries. This methodological approach values the embedded knowledge and experiences of those whose livelihoods depend on groundfisheries and have a stake in maintaining thriving coastal communities; moreover, it gives these industry actors full voice while illuminating accurate, nuanced, and relevant findings.

1.5 Overview of Chapters

Following this introduction, this dissertation proceeds through five more chapters.

Chapter 2: History and Context

This chapter elucidates some of the key terms, actors, and species landed in each fishery, as well as identifies regional specifics of note. First, I describe in detail the types of fish species and the respective stocks managed in each groundfish fishery. Here I describe basics of their life history, identify key species and considerations of management, and key fishing practices. I then proceed to describe the very basic oceanographic differences between each region, as well as the history and broader context of the seafood industry in each region. Key contextual factors like the scale of the industry, the scope of landings, identification of key ports and species situate the reader in these respective New England and Pacific Coast seascapes.

Importantly, Chapter 2 includes detail on each region’s groundfishery, outlining the details and complexities of each. In New England, the groundfishery includes 13 species of fish managed in 20 distinct stocks, while the Pacific groundfishery includes over 90 species and over 100 stocks,

and as such there are many nuances to each. There are also many shared factors, as these groundfish species share aspects of their ecology and life history, including spending time on or near the ocean floor. Further, in each region, these fish are generally caught in high volume. This predominance informs how more than one person I interviewed described groundfish as the *glue* that keeps a port economically viable. Groundfisheries keep fish houses cutting fish, trucks moving fish, and ice houses running large quantities of ice, and they do this year-round, so that other smaller-volume and seasonal fisheries also important to maintaining a vibrant fishing community have the resources of a working waterfront at their disposal.

Chapter 2 also provides further detail on the fisheries disaster declarations on each coast, and outlines the role of the Magnuson-Stevens Fisheries Conservation and Management Act (Magnuson Stevens Act, or MSA) in managing our nation's fishery resources, and its role in informing the actions of the eight regional fishery councils (including New England and the Pacific, the entities key to this study). Not an analytical chapter, Chapter 2 serves to ground the reading in the broader context of New England and Pacific regional groundfish fisheries and fishing communities.

Chapter 3: Groundfishery Greying and Gentrification

This chapter turns to the findings of my research. I present four key findings that connect an aging fleet and gentrification of fishing communities to the shift toward catch shares management:

- Groundfish fishermen and, in some cases, vessels are aging.
- Beginning fishermen face new and emerging challenges in entering the industry.
- Working waterfront infrastructure is declining in availability and quality.
- Gentrification afflicts fishing ports, with commercial fishing frequently replaced by tourism, and these changes threaten community resilience.

Introducing first the greying of the fleet—a trend of increased median age of fishermen and a decrease in new entrants to fishing as a career—and gentrification of fishing communities naturally builds upon the broader context I describe in Chapter 2. The chapter paints a picture of each region's key ports and species landed, and describes relevant policies, to underpin these four key findings. Multiple natural resource dependent industries, including fisheries, farming, and forestry, share this trend of increasingly aging producer populations, which invites the analysis that follows in Chapters 4 and 5.

Chapter 4: Values-Based Investing in Groundfishery

This chapter identifies a relatively recent trend in these two fisheries, in which various actors are making values-based investments into fishing access rights in the form of permits and quota. My research interviews included several questions about purchases of fishing rights via permits and quota, the two methods for gaining fishing access in the commercial fisheries,

beyond fishing experience and a vessel. I also included questions about entities designed to keep fishing rights based in local communities. These entities have been described by a NOAA memorandum as community sustainability cooperatives (CSCs) (Mamula & Kosaka, 2019); these entities are more commonly known locally or regionally as permit banks, fishing trusts, and community quota funds. In my interviews I queried participants' knowledge of, and opinions on, who buys permits, quota, and other fishing resources (such as vessels) in the region, and which main actors purchase and/or manage these permits and quota.

Several key themes arose:

- In each region, fishermen and fishing community members describe a range of opportunities and vulnerabilities associated with CSCs in their communities.
 - A key positive opportunity that emerged as a theme from my research was that CSCs retain an option for local fishing rights access, and some offer this access at a below-market cost.
 - A key negative vulnerability that emerged as a theme from my research was that CSCs potentially exacerbate the perception and experiences of winners and losers created by catch shares implementation, particularly by intensifying insider-outsider dynamics.
- Those I interviewed may distinguish between ENGOs and financial actors (namely Blue Harvest¹⁰ in New England, and Pacific Seafood¹¹ in the Pacific region), but also group them together as similar actors that capitalize on privatization and corporatize the fishery.

These key findings illustrate how the shift in fisheries management to effectively privatize fishing rights through the catch shares management approach has impacted and continues to shape fishing livelihoods. The creation of what are, essentially, landlords who govern fishing rights illustrates a neoliberalization of fisheries and novel methods of accumulation within these fisheries. Though this emerging form of accumulation arises from within both of these two distinct and seemingly oppositional values-based investment actors, the people I interviewed describe financiers and ENGOS as the same.¹²

Chapter 5: Knowledge Contestation and Professionalization

This chapter compares and contrasts patterns of knowledge contestation and professionalization across the two regions. While professionalization—or the introduction of formalized structures and the trappings of standard business practices—took similar form and was frequently described similarly on each coast by fishermen and industry experts, in the New England fishery there was substantial disagreement over the science underpinning certain

¹⁰ Blue Harvest is a Delaware-incorporated fishing company that bases its fishing vessels and processing operations in Massachusetts and Virginia.

¹¹ Pacific Seafood started in Portland, Oregon and is one of the largest fishing businesses in North America.

¹² Several interviewed fishermen and community members used this term “corporatization” to describe how a large entity backed by significant capital holds an outsized influence over the fishery.

groundfish stock assessments. In the Pacific fishery, the formal science underpinning stock assessments generated less controversy and disagreement. Some fishermen and community members suggested a key difference between the two stock assessments was that in the Pacific region they contract with industry vessels for part of the assessment. Several key themes across these two issues emerge in this chapter.

- Fishermen from each region express feeling perceived as “backward” or uneducated. This description often arose within discussion of professionalization permeating the fishery, which some credit to the catch shares approach.
- Key informants and fishermen on each coast recognize the differences between the stock assessment approaches in the Pacific region and New England, and many identify longstanding challenges within trawl survey science conducted by the NEFSC.
- New England fishermen express conflicted feelings on a key amendment to the NE fishery management plan (Amendment 23), which aims to improve accountability by increasing monitoring, as well as on monitoring, itself. Electronic monitoring may dramatically cut monitoring costs for fishermen, but some express concern about privacy and/or the logistics of deploying this technology on certain types of vessels.
- Fishermen hold significant experiential, local ecological knowledge that stands apart from scientific knowledge, and some fishermen conduct their own research.
- Multiple interviewees in New England describe a mismatch of scientific versus experiential knowledge and share the perception that federal stock assessment functions poorly and could improve.
- In interviews and participant observation, fishermen repeatedly expressed and illustrated an interest in fisheries science, indicating opportunities for collaborative, empirical work to pull fishermen into research, combine expert and experiential knowledge, and improve management assessments and practice.

In New England, the feelings of backwardness that fishermen describe exacerbate mistrust and the conflicts between scientific and experiential knowledge constructs. This chapter describes an increasingly problematic knowledge conflict, and questions how recent initiatives to increase fisheries monitoring in the New England region provides challenges, such as potentially increasing observer costs, and opportunities, such as improving accountability. I conclude Chapter 5 by arguing for an approach that would democratize fisheries science by combining components of expert scientific knowledge with practitioners’ experiential knowledge, in order to improve both fisheries management and fishing livelihood outcomes.

Chapter 6: Groundfishery Future

The concluding chapter describes how the findings and conflicts identified by this research occur in increasingly crowded waters. In the overwhelming majority of interviews in each region, both fishermen and fishing community members expressed concern over large scale changes from climate change, investment in offshore wind power development, and recent offshore aquaculture regulations and siting. While investment in several programs that aim to recruit and train beginning commercial fishermen show promise for the fishing community, these environmental and commercial challenges persist. I argue that through efforts to

democratize fisheries science and embracing ways of knowing beyond an expert-practitioner binary model, fishing livelihoods and communities stand a stronger chance of enduring the challenges they face.

1.6 Describing Participant Observation

Division wracks commercial fishing. Lines divide state and federal waters, dayboats and trip boats, trawlers and hook-fishermen. When conducting interviews, I quickly learned that these divisions were most often embraced; no one appeared particularly shy about sharing an opinion, however unpopular it may be with someone else. Arguments and disagreements from 10, 20, or even 30 years past remained fresh, and hard feelings were often described less as grudges and more as active dislikes. Few considered a perceived “outsider”—to the region or the profession—trustworthy. Part of my job in conducting qualitative social science research, as I spoke with people, joined fishermen on boats, and attended community/state/federal-level meetings, while also taking recordings, photos and notes, entailed navigating these divisions. I sought to better understand what themes might unite—or at least be shared by—the constituencies I was studying. Despite divisions, these communities and the fish they chase must, after all, depend upon a natural resource both fluid and vast: one world ocean that covers the majority of our planet.

Admittedly, these divisions proved difficult to navigate. For example, even within the modest scope of my home state of Massachusetts, I quickly learned that when in Gloucester, it was a great benefit that I grew up down the road in Beverly—not technically a part of Cape Ann (“over the bridge”)—but close enough. However, when out on the *other* cape—Cape Cod (which I concede is more well-known)—I emphasized my connection to Beverly, as it helped me to avoid association with the Cape versus Gloucester tensions. While in Gloucester, I would hear how the hook-fishermen working with “the Hook” (now the Cape Cod Commercial Fishermen’s Alliance) on “the Cape” had “gamed the system,” and how they had received extra quota they should not have by participating in a pilot study during the years when groundfishing was transitioning to the catch share system (Author Interview, 2019). A day or two later, I would be out on Cape Cod, hearing how “draggers” (also known as trawlers, vessels that drag or trawl nets to capture fish) from Gloucester could not be trusted with the future of the fishery. “Well the Gloucester Preservation Trust, the word conservation does not exist in their lexicon, okay. I don’t think, [well] certainly it’s not in practice,” said one ENGO representative I met at a coffee shop (Author Interview, 2019). A misstep or mis-allegiance could be costly to my reputation and research, and I had to guard my opinions and expressions carefully when bouncing around the state, and back and forth from coast to coast. Being circumspect and projecting openness and a lack of judgement fostered trust among my interlocutors; I was and am grateful to those I spoke with that they openly shared their unvarnished, forthright opinions.

The following chapters showcase the main findings from my research and capture the experiences of New England and Pacific groundfishermen and other members of the fishing community. To better illustrate divisions, contestations, and (sometimes) intense situations, I begin each chapter with an anecdote or reflection from my research. The stories relate to the findings of the chapter and begin to showcase some of the tensions in these communities, but hopefully also demonstrate the knowledge and care that everyone I interviewed exhibits.

One fisherman I interviewed summarized his love of fishing succinctly: “I love fish more than people” (Author Interview, 2019). The majority of those I interviewed exhibited a similar level of gratitude for the ocean and for fishing. I expect that for many of the people I interviewed a similar statement one longtime industry advocate made would profoundly resonate: “To be a fisherman,” she declared, “you have to have it in your soul.” (Author Interview, 2019).

Chapter 2: History and Context

2.1 Introduction: Free—Moral Compass, for Parts Only

In the summer, the drive to Chatham on Cape Cod from the north shore of Boston can last all day if you leave too late. With several interviews lined up in the vicinity, I started driving at 4 a.m., hoping to miss the traffic. This is where my preparation for my first interviews on the Cape ended. At just the second interview of the trip, I pulled into a driveway that was typical for many of the fishermen I interviewed. There was an old skiff in the driveway, misused but not discarded, and a rusty truck with lines and gear in the bed that was not too old, but was already worn out from its familiarity with salt water. The home was a warm, functional, modestly-sized single-story ranch. For this stop, I had arranged an interview with a groundfish fisherman, but I quickly realized that the passion for talking about challenges facing him and his community would include the rest of his family – his wife, child, and maybe even their old dog. We ate stew and began to speak while seated at the table. Before long the fisherman was up, pacing.

“When I was a kid, the boat and gear and knowledge were worth the money.” He continued, “My ancestors had [a] King’s grant, we’ve been fishing here for generations. I was captain of an 80-foot boat when I was 18. And now, it ends with me. My kids will not fish – I forbid it.” Much of his frustration lay in the almost decade-old shift in management to catch shares, a new approach that essentially privatizes the right to fish by creating a “stock exchange” (Author Interview, 2019) for shares of fish to be bought, sold, leased, and traded. This fisherman was particularly upset with how he perceived his initial allocation of quota shares as too small, and each year he found it increasingly difficult to keep his business afloat. Several fishermen I spoke with on Cape Cod had similar feelings, and it is well known that this transition was difficult for many fishermen. I would hear more about this after this first Cape Cod interview.

The fisherman continued. “I was supposed to have first refusal on a permit, but [The Nature Conservancy] bought all the big permits in town and outbid anyone who tried to compete,” he said. As we continued speaking, he started going through a stack of mail, and held up a letter. It was from a fishing organization in Maine with an unsolicited offer to buy his permit—which gains him access to the fishery—and the quota—which is what establishes his share of fish and allows him to land them. He was frustrated about how often he received letters like this, and I could tell the divisions between him and the organizations bidding against him were significant.

Later that evening while conducting another interview, I was made aware of just how fresh these divisions remained on Cape Cod. This later fisherman remarked, “Well, I imagine you saw the moral compass ad?” This was the first I’d heard of it (see Figure 2.1).

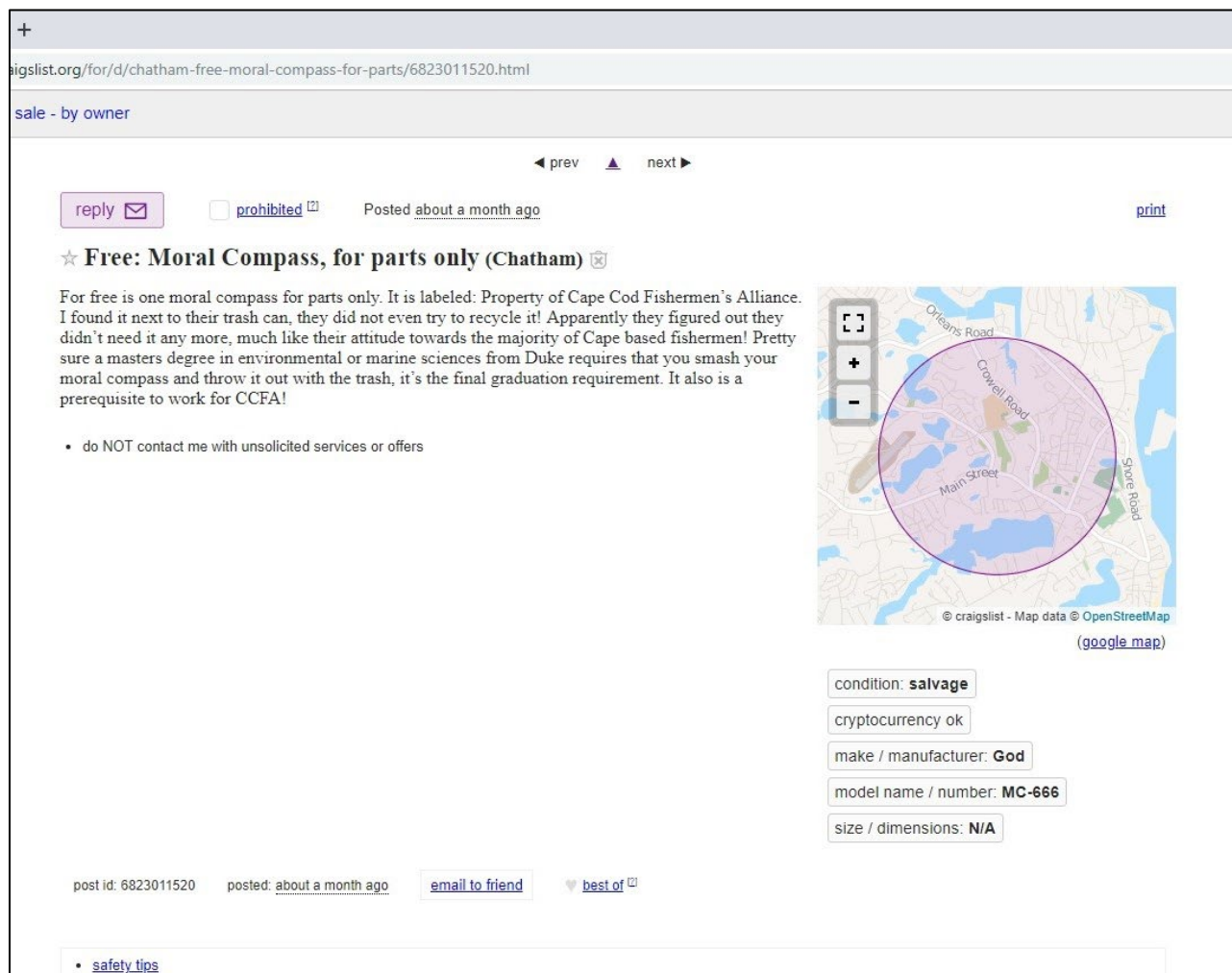


Figure 2.1 A screenshot of the moral compass ad. It captures the tension and division between certain fishermen and some fisheries organizations who, often with the assistance of environmental nongovernmental organizations (ENGOS), have invested in fishing rights. In this case, the ire of the creator of this ad is directed at the Cape Cod Commercial Fishermen's Alliance (CCCFA).

My first day on Cape Cod was productive—I had met passionate individuals and learned how some find the opportunity for powerful actors to invest in local fishing rights to be immoral. But the tensions and divisions in groundfishing communities would be further emphasized soon, once I returned to California.

I flew to the Bay Area and started conducting my Pacific fishery interviews. In the Pacific region, fewer groundfishermen than in New England actively fish, but familiar tensions bind fishermen and managers. For my first interview, I headed to a quintessential California coffee shop perched high up on a cliff with an expansive view of the Pacific. I met with an older fisherman who was incredibly knowledgeable about regional history and fishing regulations up and down the coast and in Alaska. (It was not uncommon that someone fishing in the Pacific region also had some level of experience fishing in Alaska.) He acknowledged some of the challenges of the transition to catch shares in descriptions consistent with what I had learned in New England. However, the Pacific region's groundfish fishery is nearly fully recovered in terms of the status of fish stocks, and he attributed much of this to the higher level of accountability—inherent in the Pacific region's utilization of 100% rates of fisheries observer coverage¹³—that came with the transition to catch shares. In his opinion, the 100% fishing observer coverage (a type of monitoring of fishermen's actions to ensure accountability), bycatch limits (to support conservation goals), and other associated changes led to a much healthier fishery with increasingly greater number of rebuilt stocks. All of this caught my attention. But what really stuck with me from this interview was what I immediately noticed on his wrist, as soon as he sat down at our coffee table: until that day, I had never before seen a Rolex.

One fisherman declares that fishing is no longer viable and his children will never fish, and another accessorizes with a Rolex—this dichotomy reflects the conflict and change I describe throughout this dissertation.

2.2 What Are Groundfish and How Are They Caught?

To people who do not often think about fisheries management, the word groundfish sounds like a bit of a misnomer.

However, once explained, most people will realize they are actually quite familiar with groundfish. And for anyone who generally eats fish, more often than not—whether in New England, the Pacific region, or in Alaska—at some point in their life they have almost certainly consumed groundfish. Cod, pollock, haddock, and flounder are some of the most commonly found white-fleshed fish in the U.S., and fisheries managers describe them all as species of groundfish. Pollock leads the way in terms of its ubiquity, due largely to the immense Alaskan pollock fishery that dominates institutional and commercial restaurant purchasing in the U.S.

¹³ Fishery observers are individuals contracted by NOAA to monitor commercial fishing on-board vessels and/or at shore. They track and monitor many important commercial fishing metrics.

(Look no further than the “filet-o-fish” sandwich from McDonalds, or the frozen fish sticks in your freezer; you are likely to be looking at Alaskan pollock.)

The term groundfish refers to species that share similar life history traits and, as a result, are more easily managed together as a complex of species. As the name implies, and as is typical for demersal¹⁴ species, groundfish spend at least some portion of their life near the ocean floor. Despite these general similarities, in the Pacific and New England regions, each groundfish fishery contains a range of unique groundfish species.

If you are from Massachusetts and have ever visited the state capitol in Boston, then you are familiar with how central certain groundfish species can be to a place and its inhabitants. The iconic Atlantic cod (*Gadus morhua*), known in the Massachusetts State House as the “Sacred Cod,” hangs from the rafters as an ever-present reminder of the pivotal role it played in sustaining the Pilgrims after they were taught how to fish for it by Native Americans. While in Massachusetts the Atlantic cod might often steal the spotlight—whether for its historic sustaining role or its current plight of management—fisheries managers classify around 100 different species in the two groundfish fisheries examined by this research.

This research focuses on the respective groundfish fisheries and fishing communities in the following two of the eight regional councils established by the Magnuson-Stevens Fishery Conservation and Management Act in 1976:

- (1) The Pacific Fishery Management Council (Washington, Oregon, and California), and
- (2) The New England Fishery Management Council (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut)

New England Groundfish

The New England Fishery Management Council (NEFMC) manages the groundfish in federal waters from three to 200 miles offshore of the five coastal states in this region. The Northeast Multispecies (Groundfish) Complex, which is the exact name of the groundfish fishery managed by the NEFMC, consists of thirteen unique fish species represented by 20 distinct management stocks. These are summarized in Table 2.2.

¹⁴ Demersal is a term that describes fish that live on or near the ocean (or lake) bottom.

Table 2.2 New England Groundfish Species and Their Fish Stock Names

Groundfish common name (species)	Stock(s) name
Acadian redfish (<i>Sebastes fasciatus</i>)	Acadian redfish
American plaice (<i>Hippoglossoides platessoides</i>)	American plaice
Atlantic cod (<i>Gadus morhua</i>)	Gulf of Maine cod Georges Bank cod
Atlantic halibut (<i>Hippoglossus hippoglossus</i>)	Atlantic halibut
Atlantic wolffish (<i>Anarhichas lupus</i>)	Atlantic wolffish
Haddock (<i>Melanogrammus aeglefinus</i>)	Gulf of Maine haddock Georges Bank haddock
Ocean pout (<i>Macrozoarces americanus</i>)	Ocean pout
Pollock (<i>Pollachius virens</i>)	Pollock
White hake (<i>Urophycis tenuis</i>)	White hake
Windowpane flounder (<i>Scophthalmus aquosus</i>)	Northern windowpane flounder Southern windowpane flounder
Winter flounder (<i>Pseudopleuronectes americanus</i>)	Georges Bank winter flounder Gulf of Maine winter flounder Southern New England/Mid-Atlantic winter flounder
Witch flounder (<i>Glyptocephalus cynoglossus</i>)	Witch flounder
Yellowtail flounder (<i>Limanda ferruginea</i>)	Georges Bank yellowtail flounder Southern New England/Mid-Atlantic yellowtail flounder Cape Cod/Gulf of Maine yellowtail flounder

The majority of these species begin to reproduce at a relatively young age (two to three years), and lifespans within the New England fishery complex range from 10+ years (e.g., haddock) to 50+ years (e.g., Acadian redfish and halibut), with most species falling somewhere in the middle of that range. Interestingly, Acadian redfish reproduce via live young, while the other species lay eggs. Most of these species are caught on or near the bottom of the ocean through a variety of fishing gears/practices (described below), although otter trawls, gillnets, and hook-and-line are the most common and the practices used do vary on each coast:

- Otter trawls – a long conical net dragged behind a fishing vessel commonly known as a dragger or trawler.
- Gillnets – long nets that sink and are set vertically in the water to soak for a period of time and passively capture unsuspecting fish by the gills. The nets are later retrieved and fish are harvested.
- Hook gear – these include rod and reel, handlines, and tub trawls (bottom longlines, or a main line with smaller lines off of it that have baited hooks).
- Fish pots/traps – a fixed-gear cage that allows fish to swim in before becoming trapped. This is common in the sablefish pot fishery of the Pacific region.
- Fish weirs – a stationary collection of poles and nets that, through various designs, trap fish for harvest. These are less common but do exist in some areas of New England.

On the east coast, groundfish are found anywhere from roughly North Carolina to Canada, but the majority of the groundfish landed in the Northeast Multispecies (Groundfish) Complex are harvested in the Gulf of Maine and Georges Bank.¹⁵ Seventeen of these stocks are managed by the NEFMC, while three stocks (the Georges Bank stocks of cod, haddock, and yellowtail flounder) cross boundaries and therefore are co-managed with Canada. The groundfish fishery begins May 1st and runs through April 30th, and, as described above, commercial fishing vessels need to have either an open access permit (which allows a permit holder access to the common pool and comes with more restrictions on harvest) or a limited access permit (which means they are enrolled in a sector and are not beholden to certain limitations, like trip limits, since they have their share of the fish). There are various categories of each of these permit types, but the most common arrangement is for a vessel with a limited access permit to enroll in a sector. Once enrolled in a sector, the individual with a limited access permit will bring with them to the sector their potential sector contribution (PSC)—their allocation of fish quota—that is then calculated through the species-specific annual catch limit (ACL) to determine what they add to their sectors annual catch entitlement (ACE). In most cases, a sector manager is in charge of intra- and inter-sector transactions and keeping track of what percentage of ACE remains in a fishing year for each fish stock.

¹⁵ NOAA Fisheries has an overview of the species and general fisheries management approach used for Northeast Multispecies Complex available here: NOAA Fisheries. (n.d.). *Northeast Multispecies (Groundfish)*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/species/northeast-multispecies-groundfish>.

Roughly a decade old, fishing sectors can be thought of as harvest cooperatives, in which fishermen in the same sector have signed agreements that link them together in various ways and provide the fishermen with certain benefits over simply fishing in the common pool fishery (non-sector participants). Fishermen in the common pool fishery do not have signed cooperative agreements, and once the common pool quota for a species is caught—regardless of who catches the quota—the fishermen in this pool must stop fishing for the season. A sector effectively consists of a group of fishermen who, to some extent, cooperate. Joining a sector is a voluntary process that groups fishing vessels that bring their fishing quotas with them to the cooperative and its shared ACE (measured by weight). Annual catch entitlement often describes a sector’s quota, with each individual fisherman having their own shares of quota; as such, I will generally refer to it as quota throughout this dissertation.

One of the goals of sectors is for the fishermen to have more flexibility in how they fish their harvest share of the sector’s ACE, and as such also includes opportunities to “carry over,” or retain some portion of unused quota for the following year’s fishing season. If annual catch entitlements are traded (i.e., bought, sold, leased), the members of the sector which holds the ACE have the right of first refusal before other sectors can bid any quota that is offered for sale or lease. At the time I was conducting research interviews, which roughly aligned with fishing year 2019-2020, there were 16 approved sectors in the New England groundfish fishery.¹⁶ Trading of fishing quota can take place between sectors, is facilitated by sector managers, and is tracked and publicly available on the Greater Atlantic Regional Fisheries Office (GARFO) website.¹⁷ The amount of quota transactions varies greatly by species and sector, and depends on a variety of variables such as initial allocation of quota for each of its members, enrollment and attrition in membership, gear type used, and other variables. An example using data from fishing year 2021 for Gulf of Maine Cod (GOM cod) stock trades shows that Gloucester-based Northeast Fishing Sector (NEFS) 2 had an initial ACE allocation of 161,483.1 pounds, transferred in 94,835 pounds (approximately 58.7% of their initial allocation), and transferred out 20,910 pounds (approximately 12.9% of their initial allocation). These numbers are different for each sector in each year, and though prices are not listed on the GARFO portal, the details do include the parties making individual transactions and the size of each transaction (GARFO, n.d.). It should be noted, however, that the amount that each sector is actively fishing varies substantially, and the number of vessels and gear types used by each sector vary as well. This is all to say: not all sectors have an equal ACE allocation, fishing effort, or similar fishing practices.

¹⁶ NOAA Fisheries retains operation plans for approved sectors in each fishing year since their inception in 2010, and they are available here: NOAA Fisheries. (n.d.) *Previously Approved Northeast Sector Operation Plans*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/new-england-mid-atlantic/commercial-fishing/previously-approved-northeast-sector-operation-plans>.

¹⁷ Information on sector quota transfers is available here: Greater Atlantic Regional Fisheries Office (GARFO). (n.d.). *Sector ACE Transfer Summary*. Retrieved on April 14, 2022 from <https://www.greateratlantic.fisheries.noaa.gov/acetransfer/>.

Pacific Region Groundfish

In the Pacific region, the Pacific Fishery Management Council (PFMC) manages groundfish stocks in federal waters. The Pacific groundfish fishery includes shores off the coasts of Washington, Oregon, and California, and stocks include over 90 different species of fish. These species fall into five categories based on a combination of taxonomy and morphology, which include: (1.) over 50 species of rockfish (e.g., canary rockfish, *Sebastes pinniger*; yelloweye rockfish, *Sebastes ruberrimus*, and many others), (2.) a dozen species of flatfish (e.g., arrowtooth flounder, *Atheresthes stomias*; Dover sole, *Microstomus pacificus*, and more), (3.) roundfish (e.g., lingcod, *Ophiodon elongatus*; sablefish, *Anoplopoma fimbria*), (4.) sharks and skates (e.g., spiny dogfish, *Squalus suckleyi*), and (5.) other miscellaneous species (e.g., spotted ratfish, *Hydrolagus colliei*).^{18,19} Not surprisingly, this large number of species features a relatively large range in life history traits. Many of the rockfish species, for example, do not begin to reproduce until they are five to 20 years old, and some have lifespans of well over 100 years. Other species like lingcod will begin to reproduce earlier, at roughly two to three years, and can live for approximately 20 years. Still other species, such as sablefish, will begin to reproduce around five to seven years of age and can live for 90 years. This fishery circumscribes a wider range of life histories than its New England counterpart, as is expected, since the Pacific fishery encompasses both a much larger number of species and categories of fish.

The Pacific region entails a few sub-categories within the groundfish fishery—the groundfish trawl catch share program, the fixed gear trip limit fisheries, the sablefish primary fishery, the Pacific whiting fishery, and the Pacific halibut fishery. In this dissertation, I focus primarily on the groundfish trawl catch shares program in the Pacific region because it compares well with the New England groundfish fishery, particularly in terms of its catch shares management approach and the shared predominant fishing practice of trawling. The Pacific groundfish trawl catch shares program shifted to the quota-based catch share approach for the trawl fishery at about the same time as in New England (~2010), and is based largely on the same principles, although without the harvest cooperatives or “sector” approach used in New England. Instead, in the Pacific region, quota is primarily managed and traded at the level of individuals; although, it should be noted that through permit banks and other community quota funds (which have been collectively identified by some as Community Sustainability Cooperatives, or CSCs), there are certain organizing structures that exist in the fishery, and those will be covered in further detail in Chapter 4.

¹⁸ NOAA Fisheries identifies these categories here: NOAA Fisheries. (n.d.). *West Coast Groundfish*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/species/west-coast-groundfish#overview>.

¹⁹ The Pacific Fishery Management Council has stock assessment documents on their website that provides further detail on the species harvested in this fishery: Pacific Fishery Management Council (PFMC). (n.d.). *Groundfish*. Retrieved on April 14, 2022 from https://www.pcouncil.org/managed_fishery/groundfish/.

2.3 Coastal Oceanography

Oceanographically, the New England and Pacific regions differ. The New England ocean floor topography includes a continental shelf that extends much farther with various ledges and shelves that provide groundfish habitat; the Pacific oceanography features a narrower shelf that drops to more extreme depths closer to shore. The shelf in the Gulf of Maine and the broader New England shelf includes numerous banks and shoals, with their ridges and basins having a maximum depth of approximately 1,500 feet below the surface, although many areas are much shallower. Along the East Coast as a whole, the continental shelf extends from 0.6 miles offshore in Florida to more than 260 miles offshore in Maine, with an average of approximately 84 miles.²⁰ Conversely, the continental shelf in the Pacific region is often much narrower, with it being only a few miles wide on the coast of Northern California. As a result, in the Pacific region, fish are regularly harvested from much deeper waters, on the open ocean, and groundfish will venture into waters as deep as approximately 10,000 feet.²¹

2.4 History and Broader Regional Seafood Industry Economic Context

New England

Fishermen and community members on both coasts observe that while commercial fishing endured for centuries off New England, in the Pacific region it is a much younger industry. Although Native Americans fished the waters off of what is now Massachusetts for centuries, catching eel, alewife, lobster, cod, and shellfish (DeMaster et al. 2019; Cronon, 1983), Gloucester, Massachusetts is often described as the country's oldest commercial fishing port, established in 1623 by colonists from Dorchester, England. The area around Dartmouth, Massachusetts has been an important fishing port since shortly after the arrival of the Pilgrims in Plymouth, Massachusetts in 1620, just a few miles to the north. The nearby Port of New Bedford, Massachusetts, established in 1787, was a leading whaling port as of the early 1700s, before transitioning to non-whaling commercial fishing in the 19th century.²² Currently, New Bedford has been the nation's most lucrative fishing port for 20-years running (1999-2019), landing \$451 million worth of seafood in 2019, thanks almost entirely to the wealth of the Atlantic sea scallop fishery (NOAA FUS, 2021). Likewise to the north, Maine has a rich fishing heritage going back centuries and, although groundfish landings have decreased, Maine leads the country in lobster landings, the second most valuable species and 10th highest volume of

²⁰ The shallow shelf of much of the waters off New England produces an environment that is rich with sea life, and the shallow nature can also create unpredictable seas, particularly during storms. More information on the shelf is available here: Emery, K.O. (1966). Atlantic Continental Shelf and Slope of the United States. Retrieved on April 14, 2022 from <https://pubs.usgs.gov/pp/0529a/report.pdf>.

²¹ More information on the Pacific region is available here: NOAA Fisheries. (n.d.). *West Coast Groundfish*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/species/west-coast-groundfish>.

²² An informative timeline of the history of New Bedford and its environs is found on the website of the New Bedford Whaling Museum: New Bedford Whaling Museum. (n.d.). *Timeline 1602 to Present*. Retrieved on April 14, 2022 from <https://www.whalingmuseum.org/learn/research-topics/regional-history/timeline-1602-to-present/>.

any species landed in the country (NOAA FUS, 2021). Because of this high value and the key role lobster plays in the local Maine economy, the industry also carries political clout.

Beyond Gloucester and New Bedford, key fishing ports (by state) in New England include: Stonington, Rockland, Portland, Friendship, Vinalhaven, Beals Island in Maine; in New Hampshire, Newington; in Massachusetts, Boston and Provincetown-Chatham; and North Kingstown and Point Judith in Rhode Island. These cities all land in the top-50 ports by volume and/or value in the most recent edition of the National Oceanographic and Atmospheric Administration's Fisheries of the U.S. (NOAA FUS, 2021). Traditional groundfish ports include Stonington (although now lobster is more common), Portland, Gloucester, Boston, Plymouth, Chatham, and New Bedford (although scallops are highest value here). Finally, as a result of the historic role of fishing in the region, many of the people I interviewed in New England belonged to multi-generational fishing families.

Pacific Region

In the Pacific region, the groundfish fishery takes place off California, Oregon, and Washington, generally from Morro Bay, California to the Canadian border, with a concentration of vessels and landings based in Oregon and Washington. While this industry developed after that in New England, significant landings and traditions stand here, as well, with Newport and Astoria in Oregon being key ports, as well as Eureka, Fort Bragg, San Francisco, Monterey, and Morro Bay in California, and others in Puget Sound, Washington. The Pacific region's groundfish industry has greater variation in gear types; in addition to trawls, fixed gear (limited entry sablefish and non-sablefish, as well as open access and state fisheries), midwater hake trawl and at-sea hake processing vessels, and other smaller fishery types work the waters. While some of the groundfish fishermen I interviewed in the Pacific region were from multigenerational fishing families, and the most recent report from the PFMC highlights the frequency of multi-generational fishing families in the fishery (PFMC & NMFS, 2017), in my own personal research I encountered a mix of multigenerational and first of second generation fishermen.

Landings from Each Region

The following figure shows the breakdown, by state, of all commercial fishing (including non-groundfish) landings by both volume and value. Excluding the numbers from Alaska, the Pacific region lands about half the value of seafood as New England, but about twice the weight in metric tons.

Table 2.3 Weight and value of seafood landings from the New England and Pacific regions in 2017 and 2018 (data from NOAA FUS, 2021).

Regions & States	2017			2018		
	Thousand pounds	Metric tons	Thousand dollars	Thousand pounds	Metric tons	Thousand dollars
New England	555,661	252,046	1,266,061	571,709	259,326	1,394,365
Maine	208,677	94,655	511,315	228,365	103,586	587,381
New Hampshire	10,621	4,818	35,011	9,844	4,465	38,431
Massachusetts	242,137	109,832	605,250	241,276	109,442	647,179
Rhode Island	84,108	38,151	100,768	81,089	36,782	105,149
Connecticut	10,118	4,590	13,717	11,135	5,051	16,225
Pacific	7,181,926	3,257,700	2,435,113	6,487,258	2,942,601	2,500,309
Alaska	6,004,883	2,723,796	1,764,462	5,403,751	2,451,125	1,781,999
Washington*	665,895	302,048	313,747	590,396	267,802	346,440
Oregon	296,485	134,484	147,058	308,958	140,142	174,287
California	214,663	97,371	209,846	184,153	83,531	197,583
*Including at-sea processors; note slight error in total numbers due to rounding						

While these numbers reflect all commercial fisheries, a closer look at groundfish data finds similar revenue and volume of landings in the Pacific and New England regional groundfish fisheries. For New England, approximately 200 vessels are actively fishing, with two species groups from the groundfish fishery in the top 10 for both revenues and landings in the region: (1) cod and haddock and (2) flounder account for \$41,711,000 million of the \$46,252,583 million in landings revenue from 2017 (the most recent year available) (NOAA Fisheries of the US, 2021; NOAA NEFSC, 2021) (See Appendix D, Tables 2A and 2B, for more detail).

Various types of permits (with different gear types) and the higher number of groundfish species complicate numbers in the Pacific region; however, a review of the data shows similarities to New England. For example, while the overall seafood industry has landings revenue of approximately half of those in New England (see Appendix D, Table 2C) when the four groundfish species/species groups in the top 10 for the region are considered (see Appendix D, Table 2D), the combination of flatfish, Pacific hake (whiting), rockfish, and sablefish adds up to \$126,227,000. While this seems like a much larger number, if at-sea processors of whiting are removed from the calculations (since they are not the direct focus of this research) and if fixed-gear fishermen targeting only sablefish are excluded (since they are also not the direct focus of this research), then the total revenue is closer to \$35.5 million for the individual fishing quota for the shoreside groundfish fishery.²³ With annual variability, this is on-par with the \$46 million revenue of the New England fishery.

²³ It is difficult to get an exact comparison between the two groundfish fisheries because of the way that their respective permits and fishing gear types imperfectly align, plus the high-volume low-value Pacific hake (whiting)

2.5 Fisheries Disasters Declared on Each Coast

The New England and West Coast groundfish fisheries have each navigated rough patches tied to environmental and regulatory change over the past two decades. As a result, both fisheries have received federal disaster declarations and payouts within the time frame of the period examined in this study: from 2000 to 2022. But why do these fisheries have this in common? Why were they each declared a disaster?

A fishery disaster is determined by the Secretary of the U.S. Department of Commerce and, if funds are appropriated by Congress, then it is up to Commerce to also dole out disaster relief funds. Generally, eligible events for a disaster declaration include natural (e.g., a drop in fish stock biomass) or man-made (e.g., oil spill) calamities, although Commerce also allows for regulatory or judicial actions designed to protect human health and environment but may cause significant economic harm.²⁴ Generally, a state governor or regional governors will write letters to the Secretary of Commerce and highlight economic injury (e.g., a decline in landings, revenues, participants, or access to the resource) to the fishing industry in their area. If the Secretary so declares, it falls to Congress to appropriate the funds; once a disaster determination is approved by Commerce, it may take years for the funds to materialize in bank accounts as they percolate through NOAA. Unfortunately, it is well known that disaster declaration payouts in particular can take a long time for NOAA to process, as was clear during the pandemic when COVID assistance funds for the seafood industry were funneled through NOAA.²⁵ Once Congress appropriates disaster funding, any commercial fisherman, charter fisherman, processor, or other shoreside infrastructure provider who can show documentation

fishery data complicate tidy comparisons. However, through a comparison of data from Fisheries Economics of the US (2017), a 2018 NMFS review of the Pacific Coast groundfish management (National Marine Fisheries Service, West Coast Region. (2018, May). Pacific Coast Groundfish Fishery 2019-2020 Harvest Specifications and Management Measures. Retrieved on April 14, 2022 from <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=161280&inline.>), and the NOAA Performance Measures calculator for New England (NOAA Fisheries. (n.d.). *NE Multispecies – Large Mesh*. Retrieved on April 14, 2022 from <https://apps-nefsc.fisheries.noaa.gov/socialsci/pm/index.php/programs/6.>), a reasonably accurate estimate of revenue can be made for each groundfish fishery, that ends up with 2017 total revenues in the \$36-46 million range for each.

²⁴ NOAA has an FAQ for fishery disaster declarations available here: NOAA Fisheries. (n.d.). Frequent Questions: Fishery Disaster Assistance. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/national/resources-fishing/frequent-questions-fishery-disaster-assistance>.

²⁵ The notorious lag in the fishery disaster payment process informed oversight letters from Senators to NOAA after NOAA was tasked with managing the CARES Act fishing industry relief funds at the beginning of the COVID-19 pandemic. An example of this is seen here: US Senate. (2020, April 4). Senators Markey and Warren Urge Department of Commerce, NOAA to Act Swiftly, Equitably, and Transparently in Allocating \$300 Million in Fisheries Disaster Assistance. Retrieved on April 14, 2022 from <https://www.markey.senate.gov/news/press-releases/senators-markey-and-warren-urge-department-of-commerce-noaa-to-act-swiftly-equitably-and-transparently-in-allocating-300-million-in-fisheries-disaster-assistance>.

of injury of at least 35% in revenue may apply for funds. In some cases, subsistence and recreational users may even be eligible.²⁶

For the New England multispecies fishery, the most recent disaster declaration was made on September 13, 2012, at an economic assessment of \$32,847,955. This was not the first disaster declaration for the fishery; one each had been approved in 1994 (\$30m) and 1995 (\$25m), and denied in 2007 (New England), 2008 (New Hampshire), and 2009 (Maine). For the Pacific groundfish fishery, the only disaster declaration applied for was approved on January 19, 2000, for \$5,000,000.²⁷

Prior to each fishery's approved groundfish disaster, fish abundances decreased quickly and significantly, such that harvest levels decreased, which in turn caused economic harm and motivated ensuing declarations of disaster. In a 2019 Congressional Research Service (CRS) report, conditions beyond the control of fishery managers were blamed in each fishery failure.²⁸ The New England fishery's declaration qualified as a "natural disaster of unknown causes" in 2012, and the Pacific region's groundfish declaration qualified as a "natural disaster of unknown causes; sustained decline in recruitment" in 2000. The New England groundfish disaster received \$32,847,955,²⁹ while the Pacific region groundfish disaster received \$5 million.

2.6 Magnuson Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary piece of legislation that guides the management of our nation's fisheries. Originally enacted in 1976 to drive out foreign fishing vessels from federal waters, the MSA declared a 200-mile protected zone (predating the creation of the exclusive economic zone (EEZ), which was later created in the 1982 United Nations Convention of the Law of the Sea). It established the eight regional federal fisheries management councils – that are responsible for crafting fishery management plans (FMPs) and any amendments to these plans – and the MSA outlined 10 national standards to guide fishery conservation and management. The 10 national standards are all technically created equal, but the first national standard is often emphasized: "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the

²⁶ There is an informative Congressional Research Service report on fishery disaster assistance available here: Congressional Research Service. (2019, September 11). *Fishery Disaster Assistance*. Retrieved on April 14, 2022 from <https://sgp.fas.org/crs/misc/RL34209.pdf>.

²⁷ The disaster declaration information for the Pacific regional groundfish fishery is here: NOAA Fisheries. (n.d.) *Fishery Disaster Determinations*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/national/funding-and-financial-services/fishery-disaster-determinations>.

²⁸ Congressional Research Service. (2019, September 11). *Fishery Disaster Assistance*. Retrieved on April 14, 2022 from <https://sgp.fas.org/crs/misc/RL34209.pdf>.

²⁹ The disaster declaration information for New England is available here: NOAA Fisheries. (n.d.) *Fishery Disaster Determinations*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/national/funding-and-financial-services/fishery-disaster-determinations>.

optimum yield from each fishery for the United States fishing industry.”³⁰ The 1976 legislation was enacted to protect our federal waters (or those waters with three to 200 miles of shore) from foreign fleets and to sustain fish populations, while also incentivizing large investments to be made in the U.S. fleet. With the international fleet gone due to the EEZ, many domestic vessels were eager to fill the void.

The two most recent Congressional re-authorizations of the MSA have had several significant impacts. First, in the 1996 reauthorization³¹, there was a shift away from resource stewardship and development, and toward resource conservation. The reauthorization included the concept of maximum sustainable yield – “the largest long-term average catch that can be taken from a fish stock.”³² Second, although legislation has been introduced to reauthorize the MSA in the 117th Congress,³³ the most recent reauthorization occurred in 2006.³⁴ The 2006 version of the MSA introduced two important, connected provisions relevant to this research: first, annual catch limits (ACLs) (the catch level where overfishing will not occur), and second, limited access privileges (LAPs) (programs that limit access through federal permits and rely on established ACLs). Together these provisions describe the basic tenets of a catch shares fishery and encourage this management paradigm’s use in U.S. fisheries management.

Annual catch limits are set by the regional fisheries management council, in consultation with each council’s respective science and statistical committee (SSC), to ensure that overfishing does not occur by strict adherence to a stock catch limit that is deemed sustainable.³⁵ The LAP allocates a particular percentage of the ACL to a fishing participant, and it goes by several names and forms, including individual transferrable quotas (ITQ) or quotas, but is often simply referred to as “catch shares.”³⁶ The ACL establishes the size of the pie that is then sliced up and

³⁰ The 10 national standards also outline the importance of utilizing the best science available, equitable allocations, efficient resource utilization, to minimize adverse impacts to fishing resource dependent communities, and more. The full list of 10 can be found here: NOAA Fisheries. (n.d.). *National Standard Guidelines*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/national/laws-and-policies/national-standard-guidelines>.

³¹ The full text of the 2006 reauthorization of the MSA is available here: Public Law 104-297. (1996, October 11). *Magnuson Fishery Conservation and Management Act*. Retrieved on April 14, 2022 from <https://www.congress.gov/104/plaws/publ297/PLAW-104publ297.pdf>.

³² NOAA’s definition of maximum sustainable yield is available here: NOAA Fisheries. (n.d.). *Understanding Fisheries Management in the United States*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/insight/understanding-fisheries-management-united-states>.

³³ Representative Huffman (D-CA) introduced this legislation in July 2021 and a summary can be found here: 117th Congress. (2021, July 26). *H.R. 4690 – Sustaining America’s Fisheries for the Future Act of 2021*. Retrieved on April 14, 2022 from <https://www.congress.gov/bill/117th-congress/house-bill/4690?q=%7B%22search%22%3A%5B%22magnuson%22%2C%22magnuson%22%5D%7D&s=1&r=4>.

³⁴ The full text of the 2006 reauthorization can be found here: Public Law 109-479. (2007, January 12). *Magnuson-Stevens Fishery Conservation and Management Act*. Retrieved on April 14, 2022 from <https://www.congress.gov/109/plaws/publ479/PLAW-109publ479.pdf>.

³⁵ The steps of setting an annual catch limit are outlined by NOAA here: NOAA Fisheries. (n.d.). *Setting an Annual Catch Limit*. Retrieved on April 14, 2022 from <https://www.fisheries.noaa.gov/insight/setting-annual-catch-limit>.

³⁶ NOAA’s Catch Share Policy document from the Obama administration can be found here: NOAA. (n.d.). *NOAA Catch Share Policy*. Retrieved on April 14 2022 from

allocated to fishermen as an LAP or quota, determining their access and potential harvest. Catch shares programs have been used in many federally managed fisheries since introduction in 1990 to the surf clam and ocean quahog fisheries in the Mid-Atlantic.³⁷ Implementation of catch shares has often been contentious, and a moratorium on their creation was held from 1996 to 2002.³⁸ While often polarizing, and the subject of continued research—especially since the 2006 MSA reauthorization—the use of catch shares continues within both of the fisheries studied here.

2.7 What Else is There to Know About Groundfish?

Further specific regulatory activities pertain to each of these groundfish fisheries and will be described in this dissertation. For example, in setting allowable catch limits and limiting access through their fishery management plans (FMPs), regional fishery management councils also amend these plans. The amendment process impacts each of the fisheries studied here differently, as amendments are unique to each and conducted by their respective councils. In Chapters 4 and 5 I will discuss several recent amendments regarding ownership caps and monitoring of fisheries, changes that came up often in interviews and through participant observation at council meetings.

Other specific challenges relevant to both of these fisheries include the development of offshore wind energy development and offshore aquaculture in the U.S. Both of these industries have been on the horizon for some time, but the regulatory process for each has gained momentum and actual development of these industries on the water is expected in the coming decade. NOAA has identified Southern California as a likely site for one of two initial aquaculture opportunity areas (AOAs), designations intended to stimulate investment into offshore development of aquaculture in the region. Legislation known as the AQUAA (for Advancing the Quality and Understanding of American Aquaculture) Act has been introduced in Congress several times and intends to create a regulatory framework, not unlike the MSA, specific to aquaculture management. In offshore energy development, New England is home to the oft-discussed but still yet-to-break-ground Vineyard Wind project. Will Vineyard Wind get a turbine up this year, and will this accelerate offshore wind development elsewhere? Regardless

https://static1.squarespace.com/static/56c65ea3f2b77e3a78d3441e/t/56ccf69762cd94e237371f32/1456273047389/Tab+08b_Attach+1_NOAACatchSharePolicy.pdf.

³⁷ A recent (2019) review of the ITQ for the surf clam and ocean quahog fisheries can be found here: Mid-Atlantic Fishery Management Council. (2019, March). Review of the Atlantic Surfclam and Ocean Quahog Individual Transferable Quota Program. Retrieved on April 14, 2022 from https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/5cc08f3e652dea786e2b95a3/1556123487916/1_SCOQ+ITQ+Program+Review+Final+20190321.pdf.

³⁸ An interesting review of the legal and policy implications of catch shares is available here: Fina, M. and Kade, T. (2012). Legal and Policy Implications of the Perception of Property Rights in Catch Shares. Retrieved on April 14, 2022 from https://www.vnf.com/files/6594_Legal%20and%20Policy%20Implications%20of%20the%20Perception%20of%20Property%20Rights%20in%20Catch%20Shares.pdf.

of these unanswered questions, other wind power and aquaculture developments are evolving fast, and there is concern that their respective impacts to fisheries are not well understood.

Beyond new industries, commercial fisheries also compete with habitat and species protection strategies. New marine protected areas (MPAs) are described as an option for conservation by the federal government, and national monuments on the ocean are created (and dismantled, and then re-created) through executive order. Though the Pacific region is about two times larger in terms of square miles of water, the two regions actually have similar percentages of their waters in MPAs, with New England at 5.1% MPA coverage, and the Pacific region at 5.2% MPA coverage.³⁹ Commercial fishing shares increasingly crowded waters with these and other conservation vessels.

Finally, how will each of these fisheries be impacted by climate change? Each fishery faces significant disruptions, both in terms of changes to the ecosystems and fish stocks, as well as in terms of difficulties this poses to management and regulations based on quota ownership. As the impacts of changing climate unfold – and in some places like the Gulf of Maine, continues to accelerate faster than 99% of the world’s waters (Pershing et al., 2015) – unforeseen challenges will undoubtedly surface. For example, if species shift poleward with climate change (Pinsky, Selden, & Kitchel, 2020), will their associated quota also shift from one management council to another? What will happen to shoreside infrastructure in the ports that shifting species leave behind? Will climate change leave in its wake fishing ghost towns, and is tourism going to fill the commercial and economic void of such impacts? Or can these ports pivot in some new way to maintain their working waterfront? This dissertation seeks to offer insight into the challenges and opportunities being discussed and explored in each region.

³⁹ NOAA Marine Protected Areas Center. (2020). *Marine Protected Areas 2020*. Retrieved on May 10, 2022 from <https://marineprotectedareas.noaa.gov/aboutmpas/marine-protected-areas-2020.html>.

Chapter 3: Groundfishery Greying and Gentrification

3.1 Introduction: “I’m just hanging on ‘til the disaster payment comes through”

In 2016, a large hotel was constructed on the waterfront in Gloucester, Massachusetts, one of the main sites of my research. An industrial property formerly occupied by the Clarence Birdseye flash-freezing facility was re-zoned to facilitate the construction of a waterfront luxury hotel (see figures 3.1-3.3 below).⁴⁰ The neighborhood known as “The Fort”—with a lobster buyer, a fish market, and an icehouse—now included a type of neighbor which, presumably, would prefer the neighborhood does not smell like fish. While the development was billed as an economic revitalization effort and brings much-needed tourist revenue to the area, it also represents a type of gentrification that is increasingly common in coastal communities and formerly working waterfronts. Most fishermen and community members I interviewed in Gloucester who mentioned this development did so in a positive way, which shows the importance of understanding local perspectives and the nuance of gentrifying waterfront property. In some cases, locals might even welcome the displacement of certain fishing-related businesses.

⁴⁰ The Clarence Birdseye flash freezing facility had been closed since 2003. For an article that outlines some of the historical significance of the original Birdseye building, see: Kuhlmann, A. (2016, June 22). *Beauport Hotel opens doors to Birdseye, Frozen Food Pioneer*. The Gloucester Clam. Retrieved April 9, 2022, from <http://www.gloucesterclam.com/2016/06/22/beauport-hotel-opens-doors-to-birdseye-frozen-food-pioneer/>. Another article with more background on the re-zoning efforts entailed in development is available here: Carlock, C. (2016, June 20). *From flash-freezing warehouse to luxury hotel: Beauport Hotel opens in Gloucester*. Boston Business Journal. Retrieved April 9, 2022, from https://www.bizjournals.com/boston/real_estate/2016/06/from-flash-freezing-warehouse-to-luxury-hotel.html.



Figure 3.1 A photo of Pavilion Beach and the Birdseye facility. This was taken before its demolition and redevelopment of the property as the Beauport Hotel. Photo credit: Kuhlmann, A. (2016, June 22). *Beauport Hotel opens doors to Birdseye, Frozen Food Pioneer*. The Gloucester Clam. Retrieved April 9, 2022, from <http://www.gloucesterclam.com/2016/06/22/beauport-hotel-opens-doors-to-birdseye-frozen-food-pioneer/>.



Figure 3.2 View of the completed Beauport Hotel. Photo credit: Kuhlmann, A. (2016, June 22). *Beauport Hotel opens doors to Birdseye, Frozen Food Pioneer*. The Gloucester Clam. Retrieved April 9, 2022, from <http://www.gloucesterclam.com/2016/06/22/beauport-hotel-opens-doors-to-birdseye-frozen-food-pioneer/>.



Figure 3.3 An aerial view of the Beauport Hotel site. This photo provides a view of part of downtown Gloucester's mix of fishing industry, tourism, and residential homes. Photo credit: Carlock, C. (2016, June 20). *From flash-freezing warehouse to luxury hotel: Beauport Hotel opens in Gloucester*. Boston Business Journal. Retrieved April 9, 2022, from https://www.bizjournals.com/boston/real_estate/2016/06/from-flash-freezing-warehouse-to-luxury-hotel.html.

Two years after the completion of this development in Gloucester, I had begun my graduate research, and while enrolled in a scientific SCUBA diving course, I drove to Monterey, California for a weekend of skills and safety training. Having read *Cannery Row* and as an avid consumer of sardines, I was excited to see what a historic sardine fishing town looked like (see Figures 3.4 and 3.5). I was not entirely up-to-date on my history. After the collapse of the sardine fishery in the mid-20th century, the town reinvented itself with an economic base more focused on restaurants and tourism. I could not help but wonder if this was the destiny for most fishing towns. How would other towns fare without huge investments being made in a world-class aquarium, like the Monterey Bay Aquarium? Cannery Row was still in the heart of town, with the old conveyor bridges spanning the main thoroughfare, but now transporting people instead of fish. The scene looked much less like a fishing town and more like an outdoor shopping mall and a ski-resort. Everything a visitor could want was there and for sale, including a room with a beautiful view. From the four-star hotel and various nearby spas, to the cannery-themed outlets and chains like Bubba Gump Shrimp and a Thomas Kinkadee gallery, it was hard to imagine that street ever exuded the familiar odor of fish being landed and processed. Though this particular fishing industry in Monterey collapsed mid-20th century, it is interesting to consider what alternative futures might exist for other fishing towns. How are different fishing communities changing over time—how common is gentrification, and what are some of the drivers of these changes?



Figure 3.4 A view of sardine canneries in Monterey, circa 1940. Photo credit: Craig Lovell Alamy, cited in Nuwer, R. (2020, October 1). *Old Seaweed Reveals Secret of Monterey Sardine History*. Scientific American. Retrieved April 9, 2022, from <https://www.scientificamerican.com/article/old-seaweed-reveals-secret-of-monterey-sardine-history/>.

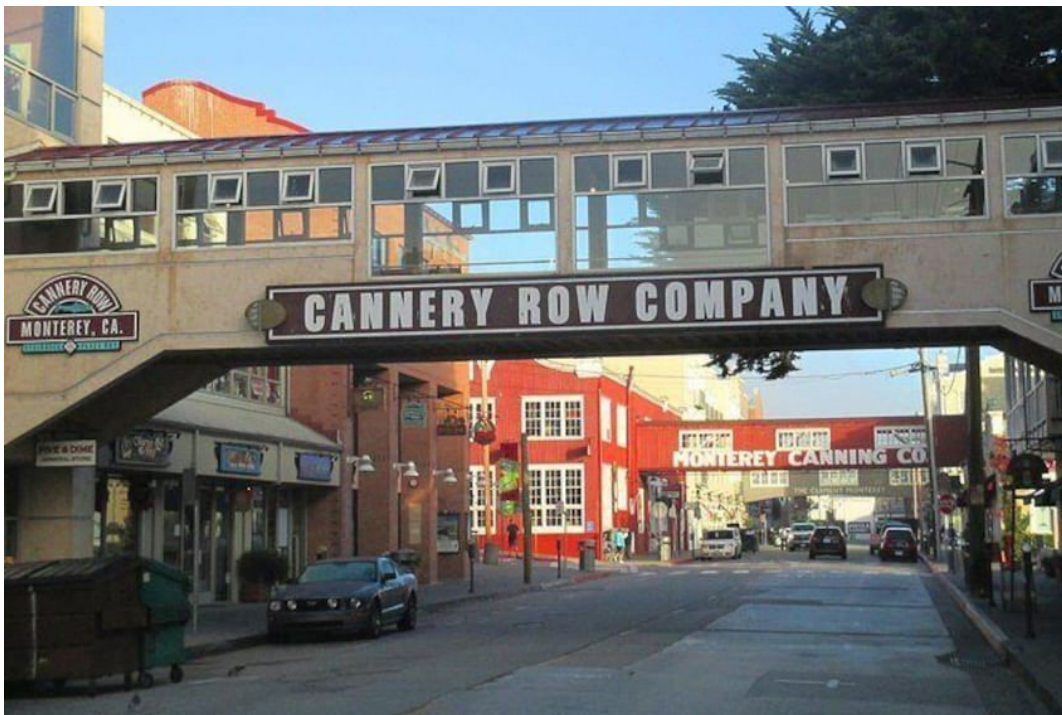


Figure 3.5 A more recent view of Monterey and Cannery Row. Old conveyors are converted to walkways across the street, with hotels, retail, and restaurants on either side and the Monterey Bay Aquarium in the distance at the bend in the road. Photo credit: Expedia.com Historic John Steinbeck Cannery Row walking tour.

These two snapshots of changes in Gloucester and Monterey showcase one type of transition that a fishing community can experience—a shift from a food producing hub and natural resource dependent community, to one reliant on retail, entertainment, and tourism. I ask in this chapter: is this transition—in which historic fishing towns evolve into ice cream shops, national restaurant chains, and sardine-themed tchotchke—inevitable?

To better understand these changes in their broader context, in this chapter I focus on gentrification, an aging population of fishermen, and the related complications that occur with the implementation of catch shares in the Pacific and New England groundfish fisheries.

Gentrification

Much of what I have described in this chapter encompasses gentrification—or the displacement of local inhabitants and businesses by a new, wealthier demographic—of the waterfront. But gentrification is only one type of transition driving change in coastal fishing communities. The fishermen in many coastal ports are an increasingly older population with few beginning fishermen; further, much of the infrastructure they rely on—from piers and docks to their vessels—requires updates that are difficult to afford while navigating the past decade of adjustment to a new management regime. For some, this new regime—known generally as catch shares and, as mentioned in Chapter 2, implemented slightly differently in the two fisheries studied here—has made margins thinner, introduced leasing and trading into the fishing rights required to fish, and profits have dwindled.

The Greying of the Fleet

Fisheries managers often meet to discuss age classes and recruitment, but usually as they relate to the population dynamics of fish and how to maintain harvests at the maximum sustainable yield (MSY). Recent research, however, suggests that similar analyses are sorely needed for the fishermen themselves (e.g. Donkersloot & Carothers, 2016; Russell, et al., 2014). In fishing communities, the combined trend of aging fishermen and a lack of new fishing recruits entering the sector is known as the “greying of the fleet” (Cramer et al., 2018; Donkersloot & Carothers, 2016). While the significance of the greying fleet is gaining recognition in the scientific and policy realm regarding how best to manage and adapt to its implications, more work is certainly needed to understand variation across specific localities and fisheries. Recent research has focused on Alaska and the Pacific region, but this trend has also been noted in New England, and journalists and legislators have called attention to this issue on local and national scales.⁴¹

⁴¹ In addition to the scientific studies discussed in this chapter, there have been journalistic and legislative efforts aimed at bringing attention to and beginning to manage the greying of the fleet. Articles like this one from NPR received notable national interest and capture some of the difficulties that face new entrants to commercial fishing: Moon, J. (2018, January 24). *Facing a Dying Industry, Two Young New Hampshire Fishermen Head Out Anyway*. New Hampshire Public Radio. Retrieved April 9, 2022 from <https://www.nhpr.org/post/facing-dying-industry-two-young-new-hampshire-fishermen-head-out-anyway>. Further, in the legislative realm, the Young Fishermen’s Development Act (YFDA) passed on December 2, 2020 and aims to provide opportunities for more younger and beginning fishers to enter the industry: S.496 - 116th Congress (2019-2020): Young Fishermen's Development Act. (2020, December 3). <https://www.congress.gov/bill/116th-congress/senate-bill/496>. The YFDA shares similar goals to the USDA’s Beginning Farmer and Rancher Development Program, which began in 2009. Other opportunities for beginning fishers that I encountered in my research include the Marine Resource

A loss of fishing access and culture can arise from an aging fishing fleet, particularly when coupled with a lack of new entrants, trends of increased absentee ownership, and an influx of outsiders into a fishing community (Donkersloot & Carothers, 2016). Consolidation, loss of access to the natural resource, and decline in participation of younger generations converge with concomitant losses in ancillary support businesses⁴².

Changes in Fisheries Management

Recent changes in fisheries management—including the shift to catch shares in the two fisheries studied here—have accelerated research of the greying of the fleet. A loss of fishing access and culture can arise from the combination of an aging fishing fleet with implementation of catch shares, as new entrants decrease and trends of absentee ownership (through catch shares) increase (Donkersloot & Carothers, 2016). The shift to catch shares as a fisheries management paradigm has occurred in 17 US fisheries and was first used in the US in 1990 in the surf clam fishery.⁴³ Catch shares can be implemented in different ways, but the central tenets include a reliance on annual catch limits, limited-access permits, and allowing individual fishermen to harvest a percentage or share of the annual limit (often referred to as quota).⁴⁴ The approach effectively privatizes the right to fish, establishes new norms of ownership, and creates a market for trading access (including creating a rentier class and leasing market).

What comes next?

The snapshots that I describe in the introduction to this chapter focus on Gloucester, Massachusetts and Monterey, California, but similar changes are underway across ports from each region studied here. These particular examples make it difficult when, as a researcher, I hear the owner of a fish processing business say, “I’m just holding on until the disaster payment comes through” (Author Interview, 2019). This particular business-owner described how the seafood industry in his hometown had been slowly eroding until he finally decided it was no longer economically viable for him to be a part of it. He was pleased that a disaster had been declared (not in groundfish, but another, smaller fishery that he also relied on had recently

Education Program (MREP), administered by the Gulf of Maine Research Institute in both of my research regions (as well as the Southeast and Caribbean). This two-part workshop series teaches beginning and experienced fishermen the basics of fisheries science, management, and how to engage effectively in the federal fisheries management and science process: Retrieved April 9, 2022 from <https://www.gmri.org/projects/marine-resource-education-program-mrep/>.

⁴² This concern is not unique to groundfish fisheries; an aging population of producers is shared across many natural resource-dependent livelihoods. Farmers, ranchers, loggers and fishers alike are all experiencing similar demographic transitions. In each of these sectors, research is beginning to elucidate the challenges and threats these industries face as a result of the aging of these producers.

⁴³ NOAA Fisheries describes the general “catch share” term in greater detail here: *Catch Shares*. NOAA Fisheries - Sustainable Fisheries. Retrieved December 21, 2021 from <https://www.fisheries.noaa.gov/insight/catch-shares>.

⁴⁴ The specifics of a Fishery Management Plan (FMP) are determined by the region’s Fishery Management Council, as directed by the Magnuson Stevens Fishery Conservation and Management Act (MSA). The 2006 reauthorization of the MSA encouraged its use in other fisheries. When a catch share approach is implemented in a fishery, the initial allocation of quota a fisherman receives is generally based on a combination of their catch history and other connected characteristics. Quota in a catch share fishery can be bought, sold, leased, or traded.

been declared an economic disaster).⁴⁵ To him, this declaration meant a payout, some relief, and a smoother transition to selling his business and retiring. While he had seen a few fishermen recently reinvent themselves to focus on direct-to-consumer sales and other similar endeavors, he was older, had weathered decreases in groundfish landings from consolidation and concentration associated with catch shares implementation, and was resigned to cashing out. He would sell to one of the developers who had been slowly gaining approval to re-zone waterfront lots to accommodate restaurants. The decision was a purely economic one for him and captures the complexity of the situation. It also illustrates the scale of challenges that face those who try to remain—without a processor, or without processing options in a port, who will be able to fish?

3.2 Guiding Research Questions

This chapter examines the confluence of three key changes in fishing communities—an aging demographic engaged in commercial fishing, the gentrification of working waterfronts that fishing communities depend upon, and the implementation of a new fisheries management scheme that effectively privatizes fishing access. I situate these trends in relation to barriers to entry, out-migration from rural and/or natural-resource dependent areas, and the erosion of a diverse economic base in working waterfronts (with fleeting fishing support industries and ancillary businesses). Additionally, I consider the broader shift toward tourism-based economies in these communities, and conversations about generational fishing families and their future. By exploring the perspectives of fishermen and other members of fishing communities, I draw connections between the demographic shifts occurring in other natural resource dependent communities and examine the implications of these shifts on fishing livelihoods and community resilience.

With this framing, I consider: How does the greying fleet impact Pacific and New England groundfish communities? As fisherman age and the working waterfronts they depend on are developed for other uses, how will this impact the already-stymied recruitment of new fishermen? What are the implications of the greying of the fleet and gentrification for the resilience of fishing livelihoods in the Pacific and New England communities, and how does the shift to catch shares influence these trends?

3.3 Literature Review

Catch Shares

The Pacific and New England groundfish fisheries studied here embrace catch share management practices but implement them differently. In the Pacific region, individual fishermen receive allocations of fish they are permitted to catch, while in New England

⁴⁵ To date, 115 fishery disaster declarations have been applied for since 1985, though not all have been approved. A full list of fishery disaster requests and determinations, with related materials, are available online here: *Fishery Disaster Determinations*. NOAA Fisheries Funding and Financial Services. Retrieved April 9, 2022, <https://www.fisheries.noaa.gov/national/funding-and-financial-services/fishery-disaster-determinations#90.-california-pacific-sardine-fishery,-2017-2019>.

allocations are managed within harvest cooperatives known as “sectors” to encourage collective action from fishermen.

Catch shares have received both positive evaluations as well as incisive critiques. Some fisheries professionals—fishermen, industry experts, environmental organizations, and scientists—have identified potential benefits. These include increased economic efficiency (through increased revenue per vessel), improved safety at sea (by disincentivizing the “race to fish” through pre-determined allocations), and a reduction in fishing capacity and overcapitalization (through consolidation and associated vessel and permit buybacks). Other positive evaluations include perceived improvements in conservation through the establishment of output controls (i.e., rather than limit the amount of fishing effort that can occur in a given fishing year, catch shares define an annual catch limit) (Brinson and Thunberg, 2013; Carothers, 2013; Costello et al., 2008; Grafton et al., 2011; Hilborn et al., 2005; National Research Council, 1999). Critics of catch shares management schemes emphasize the ways that the approach can negatively impact fishing community heritage and culture, specifically by facilitating absentee ownership and leasing of fishing rights (through quota markets). Critics also contend that the catch shares management approach encourages the consolidation of ownership and concentration of fishing access, through the combination of decreasing catch limits and increasing the role of capital in fishing rights access. Further, this approach can incentivize fishing for history (or increased fishing effort in a fishery in anticipation that a catch share program could be created in the future). Moreover, some studies question whether catch shares and conferred rights actually encourage conservation, given that it can sometimes lead to “high grading” (the practice of harvesting the larger, more valuable species and discarding those less valuable). Finally, and pertinent to this chapter, research suggests that catch shares can contribute to the greying of the fleet, since this approach may create barriers to entry and limit upward mobility (i.e. the opportunity to progress from deckhand to Captain throughout your fishing career) (Bradshaw, 2004; Bromley, 2009; Copes, 2002; Copes & Charles, 2004; Criddle & Macinko, 2000; Donkersloot & Carothers, 2016; Grafton, 1994; Macinko, 2014; McCay, 1995; Pinkerton, 2017; Bromley and Macinko, 2007).

The shift toward an approach that effectively privatizes the right to fish has fostered investing in these rights. This is similar to what is seen in other natural resource dependent industries, like agriculture. The potential change in ownership structure—through the creation of rentier class—has broader implications. Study of both investment actors and what farmland they are investing in have increasingly improved understandings of the implications of these types of investments (Ashwood et al., 2020; Fairbairn et al., 2020; Fairbairn, 2014, 2020). With this improved understanding of the role of financial actors in farmland has come a growing interest in how communities may resist the financialization of farmland (Fairbairn et al., 2020). Financialization in fisheries is not as well studied as in agriculture.

Greying Fleet

To date, much of the existing research on greying fleets has evaluated Alaska and the Pacific (Caracciolo, 2017; Cramer et al., 2018; Donkersloot & Carothers, 2016), with some work also focusing on New England (Colburn & Clay, 2012). In Alaska, where natural resource-dependent livelihoods are common and the state’s fisheries produce both the top value and volume of the

country's seafood harvests⁴⁶, the trend received early attention. Work in this region focused in part on the transition to limited-access, privatized fishery management systems, not unlike those of the Pacific and New England groundfish fisheries. Scholars have linked these types of policies to consolidation and aging demographics (Carothers, 2010, 2011; Koslow, 1982). Recent research highlights the consolidation that can come with this shift in management approach as central to the increased average age of fishers; privatized access may consolidate fleets, concentrate wealth, and encourage absentee ownership (and inform rural to urban access migration) and leasing arrangements (Donkersloot & Carothers, 2016).

Research has shown that from 1980 to 2014, the average age of a fishing permit holder in Alaska increased from 40 to 50 years of age, and that in that same timeframe the percentage of residents under 40 holding permits decreased from 38 percent to 17 percent (Donkersloot & Carothers, 2016). Related research suggests that a decrease in entry-level commercial fishing opportunities in Alaska, and curtailed access following fisheries privatization through catch shares implementation (Carothers, 2015). Some of this work has suggested connections between privatization and an increase in social problems related to drug and alcohol abuse and outmigration of permit holders (Donkersloot & Carothers, 2016). In some cases, the lack of stable careers in coastal Alaska has led young people to leave the area for education and careers not available at home (Lowe, 2015).

Farther south, research conducted in two of Oregon's communities, where fishing is a key part of the local culture, has identified an increase in the average age of fishermen, but suggests a need for further investigation (Cramer et al., 2018). Interestingly, in this research, while fishermen perceive and express concern for a greying of the entire local fleet, community leaders do not see it as worrisome (Cramer et al., 2018).

Other work on the Pacific includes the Pacific Fishery Management Council's (PFMC's) five-year review of the groundfish catch share program, which points to the aging workforce as a threat to the future of the industry (PFMC & NMFS, 2017). The PFMC report emphasizes the greying fleet issue and analyzes interview and social survey data. In an analogous catch share program review recently completed by the New England Fishery Management Council (NEFMC, 2020, 2021), the greying of the fleet is identified as possibly occurring, but is not explored in similar detail.

⁴⁶ In 2019, the most recent year of data, Alaska landed 5.6 billion pounds of seafood worth approximately \$1.7 billion dollars. This is six times the volume and more than twice the value of the second leading states, as described by NOAA Fisheries: NOAA Fisheries (2021, May). *Fisheries of the United States, 2019 - Fact Sheet*. Retrieved on April 9, 2022 from <https://media.fisheries.noaa.gov/2021-05/fus-2019-fact-sheet-v4.2-webready.pdf?null>.

Agriculture

A trend of aging producers has been particularly well studied in agriculture.^{47,48} USDA data and related research has identified that farmers as a population are aging and that farmland will increasingly change hands. The average age of farmers has been rising for decades and new entrants to farming declined from 1978 to 1997 (H. F. Gale, 1993); more recent research suggests that these younger farm operators are more likely to be renting, rather than owning, farmland (USDA ERS, n.d.). With approximately 10 percent of the farmland in the US expected to have changed hands over the past five years, (USDA ERS, n.d.), this means that roughly 93 million acres are more likely to be put in the hands of non-operator landlords, in turn increasing the percentage of farmland that will likely be rented (USDA ERS, n.d.).

Perhaps anticipating these changes, the USDA initially awarded \$19 million through grant competitions under the Beginning Farmer and Rancher Development Program (BFRDP) in 2009 (Niewolny & Lillard, 2010), and has continued to fund the program for training and education of beginning or prospective farmers and ranchers (USDA NIFA, n.d.). This funding extends several decades of USDA support programming for prospective and beginning farmers, including the Agricultural Credit Improvement Act of 1992, which financed federal/state partnerships with beginning farmers and ranchers, and the Farm Security and Rural Infrastructure Act of 2002, which provided payments to beginning farmers for certain conservation practices (Ahearn & Newton, 2009). Before creating the BFRDP, the USDA also expanded loan support to beginning farmers and ranchers through its Food, Conservation, and Energy Act of 2008 (Ahearn & Newton, 2009). Similar policy and funding efforts are expanding in fisheries, but, as described earlier in this chapter, programs like the Young Fishermen's Development Act are not yet as well established.

⁴⁷ Demographic changes in commercial fisheries have a lot in common with other natural resource-dependent livelihoods in the US. Conversations about producers aging out of natural resource dependent livelihoods increasingly occur in research across industries of commercial fishing, farming, and forestry. The US forestry sector shows similar developments. Research of the US logging industry suggests that employment in the industry has been reduced and the workforce has aged over the past two decades (He et al., 2021; see Figure 3.4 in the Appendix from He et al. 2021). He et al. (2021) also showed that technical advancements and mechanization within the industry have played a role in this shift, and have been joined by a wave of logging business closures in this time period. From 1990 to 2016, the number of logging workers and logging businesses declined by approximately two percent per year, and a key challenge to the industry is to recruit new workers and business owners, while navigating logging sector consolidation (Conrad et al., 2018). The four leading states in volume harvested—Oregon, Maine, Georgia, and Michigan (Oswalt et al. 2014)—each had a decrease in logging workers from 1990 to 2016 (Conrad et al., 2018). Median age of logging business owners has increased from the 40- to 45-year range in the 1990s through the early 2000s, although it varies slightly by region, and the median age of the workforce exceeds 50 years old by the 2010s (Conrad et al. 2018; Rickenbach et al. 2015). Research in Wisconsin describes the percentage of owners 65 and older as increased from 7 percent in 2003 to 12 percent in 2010, with the median age increasing by 6 years to 52 years of age—increases described as “aging in place” (Rickenbach et al., 2015). Rather than retiring and younger generations filling their shoes, logging business owners more frequently stay on the job. But what will happen when they finally age out?

⁴⁸ The median age of farmers, fishermen, and foresters is increasing since 2011 (see Appendix D, Figure 3A). Further, annual employment in fishing in particular (NAICS Code 11411, Bureau of Labor Statistics) is decreasing (see Appendix D, Figure 3B).

A Lack of Recruitment

The lack of recruitment of new entrants to commercial fishing in general can have many underlying factors, and some of these have been addressed in the literature across a variety of fisheries and are not limited to groundfish fisheries. In the Pacific region, research has suggested that though most groundfish fishermen are approaching retirement age, many will fish longer. This increases the median age and, when coupled with a lack of new entrants, contributes to a loss of knowledge that would otherwise be passed to the next generation (Russell et al. 2014). The situation where high lease prices can create a barrier to entry is not a new phenomenon in fisheries (e.g., Squires et al. 1998); research in New Zealand has also suggested that the quota management system can create difficulties for new entrants to fishing (Deweese 2008).

Historically, many fishermen were trained by their elders and enter the career through kinship (Miller & Van Maanen, 1982). But as family recruitment to fishing decreases, analysts have seen a decline in small-scale fishing operations (Andreatta and Parlier 2010) and weakening of succession within generational fishing families (Russell et al. 2014; Messick 2015).

Some research suggests that young people look for greater job security than can be offered by fishing (Symes and Phillipson 2009), while other research focuses on the stress of commercial fishing as a livelihood. Recent research specific to the New England Groundfish Fishery emphasizes this point, as it illustrates that after repeated reductions in annual catch limits and the economic disaster declaration for the groundfish fishery, 62 percent of captains reported moderate or severe psychological distress (Scyphers, Picou, and Grabowski, 2019). This work conducted repeat surveys with this population and found that the pattern of distress remained over a five-year period, described significant distrust of managers within the fishing industry, and suggested that human well-being has lagged as a priority in management of this particular fishery (Scyphers, Picou, and Grabowski, 2019). When coupled with the profound dangers associated with groundfishing—for example, the CDC’s National Institute for Occupational Safety and Health ranks the job of New England groundfisherman as having the highest fatality rate of any US fishery, with the Pacific groundfish fleet having the fourth-highest in the US and the highest on the Pacific—it seems there are ample reasons to consider an alternative career path⁴⁹. These reasons may inform the 29 percent decrease in crew for the New England groundfish fleet from 2007 to 2015 (NEFMC, 2021).⁵⁰

⁴⁹ These data are for the period of 2005-2014 and the full report can be found here: National Institute for Occupational Safety and Health (2017, July). *Commercial Fishing Fatality Summary*. Retrieved April 9, 2022 from <https://www.cdc.gov/niosh/docs/2017-173/pdf/2017-173.pdf?id=10.26616/NIOSH-PUB2017173>.

⁵⁰ Though not a primary focus of this dissertation, the dangers of fishing were described in other ways throughout my interviews. Several interviewees pointed out that today they mostly fish without crew, with one reflecting on the inherent danger of this “single-handed” fishing if he were to have an accident or injury (Author Interview, 2019). Coupled with the fact that on many days he doesn’t even see another boat out there fishing, this interviewee feels that his profession has grown more dangerous (Author Interview, 2019). Another interviewee familiar with safety statistics described the dangers of working in the New England groundfish fishery bluntly: “The [New England groundfish] fishery is most dangerous in the nation – [fishermen are] 37 times more likely to die on the job than a police officer” (Author Interview, 2019).

Finally, as social survey research in the Pacific suggests that over half of their fishing industry survey respondents came from families with multiple generations of fishing activity (PFMC & NMFS, 2017), it would be useful for future research to track this trend on each coast. The point made by the catch share review that a loss of knowledge from the trawl fishery could be another difficulty for new entrants to overcome may also be relevant to the New England groundfishery.

While some research has described a decline in the appeal of the fishing industry over other potential careers (Pascoe et al., 2015), other research has shown statistically significant differences in commercial fishing job satisfaction based on perceived risk (Pollnac et al., 2011), as well as significant differences in job satisfaction over time across multiple New England regional ports (Point Judith, Rhode Island and New Bedford, Massachusetts) (Seara et al., 2017).

Gentrification and Tourism

The overall trend of the greying of the fleet in commercial fishing communities has played a part in another change—a shift from landing fish to landing tourists. As there are now fewer fishing vessels in some ports, and fewer ancillary fishing industries on shore, the vacuum that exists is often filled by users like recreational boaters (e.g., fishing, sailing, cruising), seaside tourists, real estate developers, and others involved in gentrifying and displacing residents from these coastal communities. This phenomenon has been recognized for some time, with gentrification long identified as displacing fishermen and fishing community members (R. P. Gale, 1991; Hall-Arber et al., 2001). Considering the impacts of gentrification, some studies identify a need to protect shoreside and other land-dependent components of the fishing industry (R. P. Gale, 1991). Today, in part enabled by catch shares, speculation on fishing rights and shifts of fishing rights ownership away from rural ports and toward urban centers continue to increase (Carothers, 2010). Rural ports increasingly experience gentrification and depend greatly on tourism in addition to recreation.⁵¹ Another important part of the challenge facing these communities is navigating the vulnerability of “amenity migration”—in this case, people relocating to better enjoy rural and coastal amenities like open space and beaches—displace local community members (Thompson et al., 2016). This research shows that fishermen have been displaced from rural fishing villages in Maine, losing access to the waterfront, sensitizing the community to future changes to other aspects of their culture, and increasing the chance of cultural conflicts, such as those that arise when outsiders with different educational backgrounds and visions for the future of a community gain increased power in a given locality (Thompson et al., 2016). Fishing communities are often place-based (Clay & Olson, 2008), originally located for proximity to a natural resource. Unlike issues of fishing rights access—which are tied to permits, vessels, and capital—amenity migrants can push fishermen farther from their place of business and the natural resources on which they depend by increasing the

⁵¹ NOAA’s Northeast Fisheries Science Center (NEFSC) produced an interesting storymap highlighting how gentrification—through urban sprawl, retiree migration, and housing disruption—is changing 29 fishing communities in the Northeast: Jimenez, R. (2021, May 3). *How Gentrification is Affecting 29 Fishing Communities in the Northeast United States*. NOAA Northeast Fisheries Science Center – Social Sciences Branch. Retrieved on April 9, 2022 from https://storymaps.arcgis.com/stories/56781eb366f1485e8ffd7c96b16f133f?utm_medium=email&utm_source=govdelivery.

local cost of living. What happens when fishermen are displaced further from the natural resource? Will they continue to fish?

Research Gaps

This dissertation begins to respond to research gaps in the literature described here on the topics of the greying fleet, gentrification, and implications of transitions to catch shares. While much research of the greying fleet has taken place in Alaska and in the Pacific region, besides identification of the trend, there has been little research of its broader impacts in the New England context. Further, this research looks at its impact on generational fishing families, as well as attempting to identify additional indicators of greying.

Regarding gentrification, this research provides detailed, qualitative findings of fishermen and fishing community member experiences of gentrification occurring in their home ports and regionally. How does gentrification connect to problems with aging infrastructure and decreases in institutional supports for the industry? And how does gentrification relate to community resilience?

Finally, though much research exists on the impacts of catch shares policy on fishing communities, this research reinforces its connection to infrastructure and community changes seen in each region.

3.4 New England and Pacific Groundfish Fishery Demographics

A requirement of the implementation of catch share programs is that these programs have a legally mandated review completed, and as such, each Regional Fishery Management Council that manages the Pacific and New England groundfish fisheries have recently completed their initial five-year reviews. These review reports by the respective regional fishery management councils include a range of finer-grain demographic data on each fishery.

Each council's 5-year review includes data from 2010 through the 2015/16 fishing year. For the Pacific region, the Pacific Fishery Management Council (PFMC) completed its initial five-year review in December 2017 (PFMC & NMFS, 2017). The review includes a discussion of the greying fleet, including the increased median age of fishers, and elucidates family ties to fishing, captures greater detail of consolidation, and highlights a decrease in job opportunities.⁵² The findings of the Pacific Coast Groundfish Fishery Social Survey (PCGFSS) included in the report provide a range of data that covers topics such as changes in the age of fishers and of shifts in the generational trends of fishing families. For example, the social survey results show that approximately 57.7 percent of all respondents (2015/16 data year) report a family connection to commercial fishing for more than 2 generations, that most respondents are more than 50 years old as of 2015/16, and that the number of respondents younger than 31 years old decreased from 10.7 percent in 2010 (the baseline year for the survey) to 5.3 percent in

⁵² PFMC. (2017, December). *West Coast Groundfish Trawl Catch Share Program Five-year Review*. Retrieved on December 28, 2021 from <https://www.pcouncil.org/documents/2017/01/rawl-catch-share-review-main-document.pdf/>.

2015/16 (PFMC and NMFS, 2017, p. 343-345). Furthermore, the greatest percentage of respondents fall into the 61 to 70 age range (24.9 percent) (PFMC and NMFS, 2017, p. 344).

Also, of interest is that for non-whiting groundfishermen in the Pacific region (which is the study population for the Pacific region in this dissertation),⁵³ in all research years the percent of fishermen older than 50 has increased, from 56.7 percent in 2010, to 65 percent in 2012, and finally 69.8 percent in 2015/16⁵⁴. The mean age of non-whiting fishery study participants increased from 52 to 57 from 2010 to 2015/16 (PFMC and NMFS, 2017, p. 348). These results show consolidation of catcher vessels (which includes whiting and non-whiting vessels) from 134 in 2009 to 97 vessels in 2015, and a decrease in job opportunities in the groundfish trawl fishery, in particular (PFMC and NFMS, 2017, pg. 27). The report describes the greying of the fleet as a concern, citing both respondents to their survey and fishing management agencies as fearful that this trend threatens groundfish fishery (PFMC and NMFS, 2017). This detailed Pacific data on greying in the Pacific groundfish fisher is not matched by similar granularity in available New England data.

For the New England region, the council recently completed its initial 5-year review in 2021 (covering the timeframe of May 1, 2010 to April 30, 2016).^{55,56} The review describes the size of the groundfish fleet steadily decreasing since the mid-1990s (well before implementation of the catch share program in 2010), and the landings of fish harvests in coastal ports likewise steadily decreasing (see Appendix D, Figures 3D and 3E, for further description of the decline of each).

The NE report notes that there are no programs established to recruit new entrants into the fishery, although there are permit bank entities (both public and private) that act to assist their respective communities in retaining fishing access (similar entities also exist on the Pacific). In the year when the sector management system was implemented,⁵⁷ between 2009 to 2010, there was a 22 percent decline in the number of vessels fishing, with a 58 percent decline in number of vessels existing from 2007 to 2015, thus illustrating the expected consolidation of effort that implementation of catch shares brings (NEFMC 2020, p. 6). With this decline in vessels, the diversity of the fleet (as measured by the Council) did not vary significantly from 2007 to 2015, and of particular interest to this research, does not show evidence of

⁵³ Whiting, also known as hake, is another type of fish in the Pacific region groundfish trawl catch share program, but it is fished for with a midwater trawl (instead of a bottom trawl) and the industry is largely distinct from those that are the focus of this dissertation. The whiting industry within the broader groundfish fishery has a large at-sea processing component (with catcherships and motherships) that makes it substantially different from the groundfish industry that is the focus of this dissertation.

⁵⁴ As described in Chapter 2 of this dissertation, the shorebased IFQ program includes both shorebased whiting and non-whiting components, and is distinct from the at-sea whiting program. The focus of this research in the Pacific region is the non-whiting shorebased IFQ component of the fishery.

⁵⁵ The executive summary is available here: NEFSC. (2020, April). *Northeast Multispecies Catch Share Review: Executive Summary*. Retrieved on December 28, 2021 from https://s3.amazonaws.com/nefmc.org/CSR-Executive-Summary_9-April-2020-FINAL.pdf.

⁵⁶ The full report is available here: NEFSC (2021, May). *Northeast Multispecies (Groundfish) Catch Share Review*. Retrieved on December 28, 2021 from https://s3.amazonaws.com/nefmc.org/Sector-Program-Review_Final-May2021.pdf.

⁵⁷ In New England the shift to catch shares used a slightly different cooperative sector structure; accordingly, the report uses this sector language in place of catch shares.

consolidation of ownership (NEFMC 2020). Although lacking some of the resolution of the Pacific Council’s analogous report, the NEFMC report notes that groundfish crew and hired captains have higher mean age than other fisheries (43 years of age in 2018, as compared to an average age of 40 in other fisheries) and acknowledge that there could be a higher rate of “graying of the fleet” in the groundfish fishery in particular (NEFMC, 2020, p. 7; NEFMC, 2021, p. vii).⁵⁸

Although there are not more specific metrics, in regard to community impacts the report describes that New Bedford, Massachusetts and Gloucester, Massachusetts as by far the ports that are the most engaged in groundfishing, with each having more than two times the level of engagement of the third highest port; further, Chatham and Gloucester are deemed most reliant on this fishery from 2012-2016 (NEFMC, 2020, p. 13).⁵⁹ Finally, Chatham, Massachusetts and Montauk, New York were found to have the highest levels of gentrification pressure (NEFMC, 2020, p. 13), which is not surprising, as they are in areas with increased tourism pressure in the summer months (Cape Cod, Massachusetts and Long Island, New York, respectively).

3.5 Key Findings

In this section, I describe the four key findings that connect the greying fleet, gentrification, and the transition to catch shares management in each region:

- Groundfish fishermen and, in some cases, vessels are aging.
- Beginning fishermen face new and emerging challenges in entering the industry.
- Working waterfront infrastructure is declining in availability and quality.
- Gentrification afflicts fishing ports, with commercial fishing frequently replaced by tourism, and these changes threaten community resilience.

Aging Groundfish Fishermen and Fishing Vessels

This research confirms the secondary data trend from commercial fisheries demographics described earlier in this chapter—the greying of the fleet is occurring in each region and is identified as a threat to fishing livelihoods. Fishermen and key industry insiders on both coasts speculate that the greying of the fleet is underway and is cause for concern. Although not explicitly described in my interview questions, several people I interviewed referred to the greying of the fleet by name, while others simply described its characteristics. Unlike in Cramer et al. (2018), in New England the concern of ways this would impact the industry was shared by

⁵⁸ The report suggests that crew surveys from 2012-13 and 2018-19 are the source of this data. The bulk of the crew surveyed were from Gloucester and New Bedford, with others included from Portland and Boston, which represent the main groundfish ports in New England. They also report that groundfish crew had slightly smaller crew shares than in other fisheries, and that they hold “less favorable views about fisheries management than crew in other fisheries” (p.7).

⁵⁹ For community engagement, these determinations are based on analyses of value, landings, permits, dealer purchases, and vessels. For reliance, these determinations are based on analyses of value, landings, permits, dealer purchases, and vessels per unit of population).

fishermen *and* community leaders. As one New England community leader who works closely with the fishing industry put it:

There's definitely a greying of the fleet. We've known that, everybody knows that. I know some families where you know there is a generational passing on, but [otherwise] it's people like [Fisherman's name] who take on young people and if they want to figure it out and learn it then they come on...you know, getting young people involved, it's a constant effort (Author Interview, 2019).

This community leader highlights the concern that generational fishing families historically recruited most of the new fishermen to the industry, in addition to unique individuals like the one he mentions. Although little research has been conducted in New England, with notable exceptions (Colburn & Clay, 2012; NEFMC, 2021), this community leader confidently takes the trend for granted. This general feeling was a representative theme on each coast.

Another community leader who directs a non-profit emphasized a lack of agency-level leadership on the greying of the fleet, and for support of the fishing industry in general. He described a feeling that is shared by many of my interviewees in New England—that the relationship with the National Oceanic and Atmospheric Administration (NOAA), and the National Marine Fisheries Service (NMFS) in particular, is unnecessarily adversarial. He contrasted NOAA NMFS support with what fishermen see farmers getting from the United States Department of Agriculture (USDA):

On the agricultural side, if you look at USDA...they have initiatives like “Know your farmer, know your food” and “Buy Local”, all this stuff that is totally absent in the fisheries... I'm not entirely sure why. If it's been a leadership decision that someone high up in leadership has never thought that it's a priority. [I] think we need to do something about it and do something about it fast. Otherwise [the] markets that we do have might get lost. [And] that average age [of fishermen], like 57 [I mean] there's a lot of old timers in this industry, and they're not going to be around forever. And if they don't have a plan, basically a succession plan...I don't know what's going to happen to those to those businesses...That's worrisome. [I] had a fisherman say to me recently, you know, we sit on one of the most productive ecosystems and fishing grounds in the world, which is true. And I don't think we're at risk of—at this point in time—we're not at risk of losing that productivity. What we are at risk of losing is the ability to extract those resources (Author Interview, 2019).

First, this director describes a theme that emerged consistently in my research: that NMFS (also known as NOAA Fisheries) has lacked a formal, public, well-advertised means of support for the fishing industry. While there are efforts to support the fishing industry supported by NOAA, such as National Seafood Month,⁶⁰ this perspective of a lack of promotion and engagement with the industry was common among fishermen and the broader fishing community. As was

⁶⁰ NOAA Fisheries. (2021, October 1). Celebrate National Seafood Month 2021. Retrieved on April 15, 2022 from <https://www.fisheries.noaa.gov/feature-story/celebrate-national-seafood-month-2021>.

the case among many fishermen I interviewed, this non-profit director connects the lack of promotion and industry support mechanisms with the growing problem of aging fishermen and asserts that reliance upon “a lot of old timers in this industry” threatens the sustainability not of the ecosystem and its fish stocks, but of the utility of those stocks. Eventually the old timers *will* retire, and then who will harvest the fish? The director’s point that the status of fishermen and not the fish is what drives sustainability challenges today is a contentious one; many scientists and attendees at council meetings would disagree. It is imperative that, moving forward, researchers and policymakers further explore efforts to maintain a sustainable fishing community to harvest groundfish, particularly since a central tenet of the Magnuson Stevens Act (the analog of the Farm Bill) asserts that “these fishery resources contribute to the food supply, economy, and health of the Nation and provide recreational opportunities.”⁶¹

Fishermen I interviewed described the challenges of the greying fleet by focusing on fiscal concerns, particularly the loss of the knowledge of how to run a fishing business that could leave as fishermen retire: “I’m hoping the new generation will be able to find a way to do it. The greying of the fleet is everywhere. The loss of economic knowledge is everywhere” (Author Interview, 2019). A fish processor I interviewed focused on the practice of learning how to commercially fish: “when some of these skippers move along I don’t even know who could run a dragger” (Author Interview, 2019). The critical lack of an opportunity to learn how, where, and when to fish, to acquire knowledge needed on the water and for running a groundfishing vessel and business under a catch shares management paradigm has, with few notable exceptions (e.g. PFMC & NMFS, 2017; Russell, Sparks, Arias-Arthur, et al., 2014), been too frequently ignored by researchers and policymakers.

This loss in skills and knowledge is accentuated by the trend of a greying fleet through the way new entrants are less incentivized to enter the fishery, as it is more difficult to go through the traditional progressions of deckhand to owner-operator captain because of the much larger financial cost of today’s fishing access. The high cost of entry was identified as a representative theme by fishermen and fishing community members of all types, with the majority citing the shift in management toward catch shares and quota management—or the need to balance allocations of shares of fish species on a competitive market—as a complicating factor that has changed the calculus for a beginning fisherman to one day become a captain:

When the catch share system came into play in 2010, everyone’s permits became very, very valuable according to the amount of quota they had on them. So now for a young fisherman to get into the industry, he’s [got to] have a boat, his crew, all his equipment and then he’s [got to] buy a permit. So permits can go from, from a qualifying permit, which has no quota, for \$20,000, all the way up to a permit full of quota, which is about \$400,000...The cost of getting into the industry in general is really high, but you know the old timers didn’t need to pay much for a permit because they were paying for permits for days-at-sea, and

⁶¹ NOAA. (2007, January 12). Magnuson-Stevens Fishery Conservation and Management Act. Retrieved on December 30, 2021 from <https://media.fisheries.noaa.gov/dam-migration/msa-amended-2007.pdf>.

then [with the shift to] the catch share system taking place in 2010, they based everyone's permits on a 10 year period from '96 to 2006, and then allotted them a permit based on that average catch share, allotted them their quota. And so you know, a lot of guys got out of the industry and just decided to sell their quota instead of fish...the economic and financial requirements for getting into the industry these days are something that is not really achievable for a young fisherman that has been a, you know, a deck hand for his whole life and is now trying to step up into being a captain with a permit (Author Interview, 2019).

The situation described above shows how costs can quickly add up, a circumstance frequently mentioned as a key hurdle for the next generation. Many fishermen I spoke with consider access costs an insurmountable hurdle and speculate pessimistically about the likelihood of a future generation of fishermen. Further, they frequently emphasize the challenges of the catch share management system, which when introduced, disrupted the longstanding career trajectory and how it threatens the existence of the fishery moving forward, as seen in this Pacific example with a groundfish fisherman:

To us there is no next generation. There are no young fishermen. [There is] no salmon, crabbing is [completed] in 3 weeks and you're done, groundfish is so expensive to get into. Where is this next generation of fishermen coming from? And the guys that you know, I hate to say it but the guys that do work on the boats, you have some good guys, but a lot of them all they are is a pair of boots and a set of gloves. [The industry] changed. Sometimes around the buyback it started to change. You know, there [were] stepping-stones that [were] affordable if you worked hard enough and you're good, you excelled and you moved up the line and you just bought bigger boats and did more things. Now there's no opportunity (Author Interview, 2019).

The "buyback" program described above refers to a voluntary initiative begun in 2003, not long after the disaster declaration, where groundfish permit holders in the Pacific region could bid to have their permit bought by the government and exit the fishery. This buyback program reduced the number of permits and vessels in the Pacific groundfish fishery significantly and was mentioned by a majority of Pacific regional interviewees. Some, like above, pointed to it as part of a turning point in the industry, that was also connected to the disaster declaration and the later shift to catch shares.

An interesting component of my findings that confirm the greying of the fleet trend in each region is that several fishermen speculated not only on their own age as a concern, but also on the age of their boats. One Pacific fisherman described not having had his boat out of the water for several years, and how he feared for his safety and that of his crew because he did not know the real condition of the hull on his old, steel boat, but that he simply could not afford the cost to haul the boat out for inspection (Author Interview, 2019). Another fisherman in New England lamented the deferred maintenance on his vessel as we walked across the deck to inspect the hydraulics, but suggested he planned to soon sell it, along with his permit, and hoped that the enticing permit would help a prospective buyer to accept the poor state of the vessel (Author

Interview, 2019). In one New England port, fishermen hinted at this by speaking admiringly of the new boat in the harbor which, besides its obvious advantages in terms of technology, safety and reliability, impressed fishermen and crew members that had heard it had a hot water shower (Author Interview, 2019). In New England, a sector manager when talking about the high cost of permits and quota, connected that cost to deferred maintenance and/or upgrading a vessel: “You know, our fleet of boats is getting older, [therefore], of course the maintenance for those boats, the thought that you might need a new boat [looms over you]” (Author Interview, 2019). My findings highlight this new implication of the greying fleet, emphasizing that median vessel age is a useful metric in studying the viability of a fishery.

Beginning Fishermen, Challenges and Dangers

In addition to challenges brought on by aging fishermen and fishing vessels, at the other end of the age spectrum, beginning and new entry fishermen share concerns about starting out in commercial fishing. Throughout my research, I often heard about the financial difficulties beginning fishermen experienced when attempting to break into groundfishing. Due to these difficulties, many older fishermen dissuaded their children from fishing. While many had great pride in what they do, they nevertheless did not want their children to face the financial difficulties they experience in the industry. This finding aligns with that of the five-year review from the Pacific regional council (PFMC & NMFS, 2017).

In my research, fishermen often described a situation where the initial financial incentives to get into fishing have eroded over time:

My interest when I was a kid, my interest 100 percent of it was dollars-motivated. I mean, the year that I turned 16, shit, I was making 20 thousand, 25 thousand dollars a month. [I'm] not even making that as a captain [today]. It was not uncommon when I was young to have 15,000 in \$100 bills in my front pocket, not even in a wallet or nothing, and to have six uncashed checks in my wallet. And now, holy shit, I wish I had \$15,000 in my front pocket (Author Interview, 2019).

Connected to changes in financial incentives, it was frequently suggested that the shift toward the catch share system has decreased the opportunity for new entrants to ultimately become independent owner-operators. This aligns with the findings of the PCGFSS from the Pacific 5-year catch share review, which describes the ceiling for a fisherman today as “hired captain” rather than owner-operator captain (PFMC & NMFS, 2017). Research on fishing in Alaska, where in sablefish and halibut catch share-managed fisheries the use of hired captains is prevalent (Szymkowiak & Himes-Cornell, 2015), echoes this shift in opportunity. Related research about Alaska suggests that the decreased likelihood of graduating from crew to owner-captain deters new entrants (Carothers, 2015). In the Pacific groundfish fishery, the costs associated with vessels, permits, and quota are identified as often prohibitive for new entrants (PFMC & NMFS, 2017).

One key contact from a fishing industry non-profit in New England offered a bleak perspective on the prospect of fishing today, like his father and grandfather once did:

I think it certainly used to be about family connections, about small communities, and just working, you know, starting by working [as] a deckhand on a boat, and little by little, you know, through hard work, saving up your money and acquiring a boat, and apart from someone you knew, where it was affordable and accessible. That's what it used to be. [Now] it seems like it's just, it's so much. [First of all], the ability for new entrants, young people to [purchase] their own boat permit, it's almost impossible...my father, for my grandfather, when they bought their permits that gave them the access to fish, it was like \$100, which was like the state fee for processing the paperwork...The boat in itself, and gear and all that, sure it added up \$100,000 or more. But the permit? Not so much...Now for that same access for me to buy a permit, a \$100,000, or maybe \$1 million.⁶² For me to go out and earn \$50,000, working hard, the permits to allow me to do that would cost a million dollars (Author Interview, 2019).

Whether or not a million dollars is an accurate number, the perspective that the career is unattainable for a new entrant with a modest amount of capital is consistent with findings in the literature about high entry costs (Himes-Cornell & Hoelting, 2015; Rosvold 2007).

That the cost, risk, and permit challenges dis-incentivize many to choose fishing for a career is a central finding of this research. An overwhelming majority of my fisherman and fishing community insiders focused on the cost of becoming a fisherman today, with a significant minority even describing the system of leasing vessels and equipment for fishing as “sharecropping” (Author Interview, 2019). This concept was also reported in the 5-year review from the Pacific, where respondents from their social study described the career ceiling of hired-captain as an opportunity to work as a “sharecropper” (PFMC & NMFS, 2017). It is important to note here that their use of the term sharecropper is meant to emphasize the inherent power dynamics involved here as similar to the situation in historical situations of agricultural sharecropping, and presumably the fishermen and fishing community members who used this term mean it exclusive of its racialized context.⁶³

This admittedly problematic term came up often in my conversations with fishermen on both coasts, for example:

I can't see going any other way frankly, other than sharecropper. Listen, capitalism, that's what it does, you know? Favors the people who own. There's no incentive. I mean, if you can't own your own boat, why bother working for somebody else? I mean, [yeah], especially on the [individual fishing quota] system...[But now] there's no prospect of owning your own boat. Right. So you

⁶² This member of a fishing industry non-profit provides a huge range in the cost of a permit. There can be large differences in permit costs because of the different quota allocations that unique permits will have. Although a million dollars is likely a high number, the main point is sound: frequently, permits are prohibitively expensive for new fishermen. One location that the majority of fishermen mentioned as a selling place for permits (as well as vessels and quota) is the AthearnMarine.com.

⁶³ Those who mentioned sharecropping were consistently emphasizing power dynamics connected to who owns permits and quota, and who can collect rent from that position of ownership; race was never mentioned.

have a cadre of people who struck the lottery by being alive and in the fishery in 1976. And they got permits...You have baby boomers and Gen Xers like me, working until we're toothless geezers jamming up the throughput of talent and opportunity... [and] you've got a class of people who own the basically control the access to the resource and profit from owning (Author Interview, 2019).

The prospect of fishing for someone else on leased quota or as a hired-captain on someone else's permit came up frequently. Even when not using the term sharecropper, fishermen would describe concern over a similar relationship, as espoused by one retirement-aged fisherman in New England: "If we don't keep our permits [and quota] under control then we're gonna end up working for someone else, well not us, but our progeny, and I don't want to see that happen, I don't want to leave it like that." (Author Interview, 2019).

Other fishermen and fishing family members would describe how they were discouraged from fishing but still found ways to stay involved, such as this former fisherman who now works in a fishing-related business:

I am from a fourth-generation commercial fishing family. I was born and raised in Chatham, Massachusetts, my father, my grandfather actively fished for over 45 years, primarily small-scale fishing for groundfish...I grew up on the boats and spent a lot of time at the docks, I know the fisheries...Fishing is a very strong part of our heritage...My family is deeply connected to why I do this work. But my dad told me not to be a fisherman, don't get into it. He, like so many other fishermen, felt hopeless about the future of small-scale family fishing...[and] he would discourage me, to do anything else, go do anything. But [in spite of this], all through high school, and I went to college, I would commercially shellfish to help pay my way (Author Interview, 2019).

This quote provides evidence of how members of fishing families, just like members of family farms, find detours in and around commercial fishing as a career. Agricultural research suggests that some farmers will find detours around ownership to continue farming in the face of capitalist development (Buttel, 1990, citing Mooney, p. 87). Mooney suggests that farmers exercise autonomy over their work, or "substantive rationality" (Buttel 1990, citing Mooney, p. 87), and that their detours are ways to avoid proletarianization. Here, the former fisherman I interviewed has remained connected to fishing in various ways throughout his life, though he no longer relies directly on it for an income.

Some research suggests that, unlike farmers, prospective fishermen might choose to avoid ownership detours and select a different career path altogether, especially if they ask current fishermen for advice, which speaks to the hardships facing the fishing industry. Seara et al. (2016) found that, when asked whether they would advise young people to enter fishing, fishermen today in both New Bedford, Massachusetts and Port Judith, Rhode Island are much more likely than they were in 1977 to advise against becoming a fisherman (on the order of 60 to 70 percent recommending against, compared to 40 percent in 1977). My research aligns with this finding, which manifests even in multi-generation fishing families:

Every fisherman I know says don't get into this. Which is so sad. Because it's not that they don't love it. It's not that they're not happy in their jobs. It's just that it's like a doomed future. Like, you're not going to doom your kids (Author Interview, 2019).

When describing this “doomed future,” prospects were typically dimmed by perceived issues with management, not by the resource availability. As one of the few young fishermen I interviewed described it:

[You] do like fall in love with the industry. And [you] hope that...if your kids wanted to, that there's something, there's a legacy there for them to continue. And it's, it's so up in the air now. [You know], you can't guarantee that and it's almost like, do you really want to [even] have your kids go into that now? Like, do you want them to struggle? ... Because it's such, it's such honest work. And it's like work that you can be proud of like, you come home and [you] really earned like every cent that you [brought] home. We want that future for them... you know it's what's fed the nation, it's what's fed the world, right? (Author Interview, 2019).

The conflict felt by this young fisherman is something grappled with by a large minority of the fishermen I interviewed. As this fisherman was younger, and had a young child, he might not have determined yet on how he felt about the prospect of his child fishing; in conversations with older fishermen they usually had made up their mind and it was mixed on whether their children commercially fished.

A majority of fishermen and their family members expressed this sense of pride in fishing. Others described fishing as something that fishers needed to have in their “soul,” or insisted it requires a lot of “skill and moxie to make it as a fisherman. But, you know, it also takes the healthy fish stocks” (Author Interview, 2019). This aligns with another finding from Seara et al. (2016), that responses to “Would you still fish if you had to live your life over?” remained relatively stable at ~60-70 percent in New Bedford from 1977 to the 2000s, while decreasing slightly in Point Judith (from approximately 80 percent to 60 percent). While fishermen might not suggest others adopt fishing as a career, they do not seem to regret their own decision to do so.

Often fishermen focused on the lack of viability of fishing as a career and the way that fees from monitoring, buybacks associated with the shift to catch shares, administration fees, and leasing all add up:

And like, the thing is, we're given, you know, we give 5 percent to the buyout. We give 3 percent to the program, you got \$750 a day here for an observer. There's another percent for administration fees [for NMFS], and it all fucking adds up, that's the profit [that is gone]. That's the profit and then you throw some fucking lease rate on top of it. And you're fucked (Author Interview, 2019).

One fisherman on the Pacific shared his rough calculations from his most recent fishing trip. In Figure 3.6, you can see that over 50 percent of the expenses for this trip are quota leasing costs, while another 11.5 percent of the expenses are for fisheries observer coverage (at-sea and dockside). In fact, the leasing cost was almost equal to the pre-tax revenue from the trip (\$9,052 vs \$10,242). To manage, several fishermen described alternative direct-marketing opportunities that they had secured for a portion of their catch to make ends meet. These opportunities include direct-sales to the public, farmers markets, investing in onboard flash freezers, and direct-sales to restaurants.

#offish 34,815
 Trip 5
 Expense

Date 6/5/19
 Ticket# [redacted]

Observer at Sea
 Observer Unload 10% (1040) 34 (4925) 1.46 (505) 1.010
 groceries 997.50
 FUEL 1116 (4 3.90) 158.95
 Dockhand 3,115.30
 Lease 2,060.00
 8% 7% 9,052.45
 Epoch Advertise 419.78
 Ice 1115 700.00

gross: 27,756.60
 expense: 17,513.98
 10,242.62

60% 6,145.57
 40% 4,097.05
 1 share: 819.41
 1/2 share: 204.85

Market# 18,619
 Promotional# 2938
 Observer: [redacted]

Public# 13,358

1% Paid? ✓#

1,024.25 1,014.01 1000 Cash
 819.41 811.22
 614.55 608.40

PAYED

Figure 3.6: A photo of fishing trip accounting. This photo was taken with permission of the captain and I have crossed out the names of crew, on-board observer, and the ticket number (see blue lines).

In the Pacific region, several fishermen pointed to additional costs associated with fishing in California, increasing the difficulty of doing business in their home state.

Bottom trawling was good at the time, [really until individual fishing quotas (IFQs)]. It was getting kinda crunched down before the IFQs, but we were still making a living. Ever since the IFQ came...it just ruined the whole market. I mean, [we're] down to I mean, we're selling now for prices less than I sold in '86. Nuts. That's the key. There's just not very many places to sell it here anymore. Because the problem now is you have to catch so much - which is not a problem- you can catch it, you just can't get anybody to buy it. Because the only processing in California really is Pacific and Caito's, and they can't handle ground fish in any significant amount. [Their] trip limits are still too small for the price of fish (Author Interview, 2019).

This fisherman describes the challenges he has faced economically under catch shares while fishing in California. He identifies that the implementation of a catch share IFQ system was the turning point, where market and processing opportunities declined, likely also informed by consolidation of the fleet that occurred around the same time in his home port.

The idea of there being thinner margins today (and particularly in California) even led some to suggest that this challenge makes the quota system more dangerous, a factor that the shift from days-at-sea to catch shares was intended to alleviate:

Well, yeah, a lot of people like lease their quota out, so they take, they hire a boat to go fish the quota on. [So] I think yeah, you have to do more of it cause you're not making as much money, you're making maybe 40 percent of the total gross, so [you] have to fish more, and be willing to fish in rougher weather [but] it doesn't change the management or anything of the fishery (Author Interview, 2019).

Though a minor theme, safety did arise in several interviews, particularly with smaller, day-boat vessels whose owners felt less safe at times under the current system in several ways, such as that they had to fish “single-handed” (without a deckhand) to save costs, and that they do not see as many vessels out fishing (as there are fewer engaged in the fishery today), so a few interviewees suggested they fear that in the case of an accident they will have neither a deckhand on board to help, nor another fishing vessel nearby to assist in case of an emergency (Author Interview, 2019). This finding adds to the nuance of research on catch shares and its impact on fishing safety, supporting the finding by Pfeiffer et al. (2022) that safety improvements do vary on a fishery-by-fishery basis. For example, in the Pacific region, catch shares improved safety at sea for the fixed-gear sablefish fishery by allowing fishermen to avoid rough weather days, whereas in the groundfish trawl fishery, it had a negative effect because fishermen took higher risks (e.g. fishing on worse weather days) in an effort to shorten their groundfish season so that they could shift their effort to other fisheries (Pfeiffer, Petesch, & Vasan, 2022; Pfeiffer & Gratz, 2016).

Working Waterfronts

Both beginning fishers and those nearing retirement also face challenges on shore: the aging working waterfronts and changes in shoreside infrastructure and ancillary industries. Important shoreside infrastructure includes processors, dredging operations, dockage, chandleries and other equipment suppliers, netmenders, icehouses, and more. The Pacific five-year catch share review observed that shoreside infrastructure for the groundfish fishery had remained relatively stable in Washington, had consolidated in Oregon at Astoria and Newport, and had shrunk significantly in southern and central California (PFMC & NMFS, 2017). In New England, the five-year catch share review does not focus on shoreside services, beyond noting that the number of dealers that reported purchasing groundfish increased from 95 to 128 from 2010 to 2015 (NEFMC, 2021, p. xiv).

On each coast, fishermen and other fishing professionals showed significant concern about the lack of shoreside infrastructure, sharing stories about how consolidation and fewer groundfishermen had over the last decade diminished to scarcity the availability of trucking. Multiple fishermen described a typical workday as leaving before dawn, fishing all day, offloading fish in their local, small port, and then trucking some of their catch in their own vehicle to the closest large city for processing.

In a small port in central California, I asked a fisherman where the fish went once it was caught, and he told me the story of a friend and the lengths he went through to sell his fish:

A couple of years ago [he] was catching fish in Morro Bay, put it in the back of his pickup and driving it up [to San Francisco, about 230 miles distant] to sell it. That's crazy.... This is not an easy road (Author Interview, 2019).

Another California fisherman described how trucks would show up in his home port to offload fish and drive it to the Bay Area for processing. In New England, fishermen described similar situations, driving some of their own catch or struggling to find someone to drive it for them because of the lack of local processing. One fisherman south of Boston, Massachusetts told me:

It goes in the back of a truck. We have absolutely no community processing capacity at all. Most of it is going to Boston some of its going to New Bedford there's an auction, the whaling city, it's being sold at the whaling city auction, and in Boston it's going to a [specific buyer] at the Boston fish pier (Author Interview, 2019).

On both coasts, icehouses proved as scarce as trucking options. A one fisherman from the south of Boston put it, "ice is like gold" in his small port (Author Interview, 2019). In another small port on the central coast of California, a processor spoke admiringly of the firm's new ice machine and how it was a savior for the business, bringing in ice customers as well as supplying its groundfish work. One northern California fisherman claimed he would do anything the icehouse owner needed just to keep the icehouse in business, as it was the only one in port. Another individual involved with fisheries management in California described the state of shoreside infrastructure in bleak detail, pointing to gentrification and the attractiveness to port managers of condominiums and sailboats as a key component of the problem.

We've got ice machines that *might* work on Tuesday and not on Wednesday. And that means that you're going to have to get out and steam six hours to go find ice before you hit the ground. That's not okay. We've got some very limited offloading facilities that are sort of tied up and make you a slave to the distributor there... I think the loss of some of the big volume buyers is a problem, particularly for the trawl fleet. And the other big changes are really like it's just expensive in California, it's much, much more preferable from a port standpoint to [have] condos and sailboat slips than to try to put a fuel dock in and support an ice machine (Author Interview, 2020).

In interviews in Gloucester, Massachusetts, a New England fisherman told me that Cape Pond Ice had to briefly close. The temporary closure for repairs became prolonged and caused him to change a planned fishing trip, but the fisherman laughed about it in our interview, as he recounted how the icehouse had offered to sell him bagged ice (which he remarked would be an incredible number of five-pound bags to fill the hold on his roughly 80-foot trawler).

Decaying infrastructure was a widespread theme in my interviews. One industry member lamented the lack of processors in his port as pushing fishers elsewhere:

The reality of it, it doesn't look good. The harbor is zoned for commercial. [City authorities] are trying [to] rezone it. And they should because [commercial fish processing is] over. Or you could zone it for both [fishing and retail], either-or. But when you look, there's all dilapidated buildings that nobody keeps up because docks are falling in. [No one's] going to fix these docks up. They're just gonna fall over (Author Interview, 2019).

Docks falling over and other crucial infrastructure in disrepair was a theme in each region, and it can be felt differently across each region, its ports, and its individual fishermen. Some fishermen and fishery professionals identify consolidation (an expected outcome of catch share implementation) as the driver. For example, as a fisherman on Cape Cod described:

Yeah, we're seeing that those generally who benefit from consolidation tend to be the larger boats, the larger boat owners, they tend to be more concentrated like densely populated cities or small coastal cities... The impact, especially to like rural fishing communities, has been one of loss of infrastructure, loss of landing, access, loss of all the support systems that thrive off of the fishing community, right. Icemakers, the fuel, the net vendors, all that... [T]here used to be three companies [in Chatham] that were doing net mending [and hanging], and I worked for one of them. Now, [there hasn't been one here] for a long time – the only one that exists is in New Bedford. So, fishermen would have to get their nets sent to New Bedford, [hung there, and then] they bring him back here. That's just one example. But it's, there's so many others. [We] used to have more seafood buyers, [and now] they're [so] much fewer (Author Interview, 2019).

In another small port in New England, today there are fewer vessels actively fishing than in the past, and it led to less negotiating power with the state when discussing the frequency of state-

funded dredging of the harbor; without dredging, the dock in town cannot accommodate the draft of commercial fishing vessels (Author Interview, 2019). This is indicative of the overall decrease in access and quality of public infrastructure that supports the fishing industry.

These changes to the supporting infrastructure provided by federal, state, and private funds have also informed feelings of disappointment from the lack of structural support:

The squeeze of waterfront property development is another huge factor...dockage is going down in all these different ports. And again, here's where the economics etiology comes in, is that you hear that the state needs to save money, so they could try to actively design a consolidation of dockage. So you wouldn't be able to land you know, dock your boat in that many ports so they would consolidate the dockage available... so that's one of the questions about why the government doesn't invest in the fishing industry is because they fundamentally want to flip all these ports. So [it's] very standard, that's long standing, you know, Newport or Newburyport. Gloucester looks at these other ports, [like also] Nantucket, that have flipped. That's another clear and present danger (Author Interview, 2019).

The changes to public infrastructure are compounded by private changes:

The private docks, individual fishermen's private docks [are gone], they sold them for what they thought was for an astronomical amount of money and the people who bought them thought they got a heck of a deal. The large fish plants, a lot of them in the smaller communities like Boothbay. They're gone (Author Interview, 2019).

Together, these two quotes capture the decrease in dockage, or its loss entirely, this fisherman sees an indicator that legislators and policymakers have decided that flipping the port (from commercial fishing to recreational boating and tourism) is a 'clear and present danger' and that is unlikely to cease. This is evidence of a persistent waning of institutional supports that fishermen have, in the past, been able to rely on; this illustrates the pervasive reach of neoliberalization. In this case, the implementation of catch shares as an extension of the neoliberal approach plays a role in the loss of infrastructure, gentrification, and loss of state support. Regional support infrastructure is increasingly centralized and concentrated.

Given the groundfishing industry's general lack of trust of managers, as well catalogued by other research in New England (e.g. Scyphers, Picou, and Grabowski, 2019), the finding that fishermen and other connected fishing industry members suspect fishing resources are being intentionally concentrated and curtailed indicates the far-reaching impact of catch shares. Interviewees on both coasts consider aging and disappearing working waterfronts, whatever its causes, as another related aspect of the greying fleet phenomenon.

Tourism, Gentrification, and Community Resilience

Gentrification and its replacement of fishing industry businesses with hotels, retail shops, restaurants, and tourism-related businesses is a finding shared by fishing communities in each

region. This process is a key driver of consolidation and privatization of small-scale actors in the fishing industry, in particular. But what are the social and environmental implications of consolidating, of losing port infrastructure, fishing vessels, and new entrants to commercial fishing? When a port shifts to tourism, what else is lost?

Many fishing community members and even regulators, like this fishery council member, focused on either the influx of retail establishments or of condominiums. For example,

Down [at] the waterfront, there's just [a handful] of draggers and gillnetters. We have quite a number of summer people now. And the waterfront is changing and waterfront access is being limited, because people want to come here and spend two months here... there's not a lot of working waterfront left...[It's] turning into condos. And, you know, down here in [Portland], I mean, a huge law firm bought up a bunch of working waterfront (Author Interview, 2019).

As another fisheries regulator put it, there might be a few relic boats hanging on, but take Portland, Maine, for example. "Everyone loves Portland, Maine, but it's just a tourist town now" (Author Interview, 2019).

There were many questions about how the character of a place might change. Another regulator spoke about Portsmouth, New Hampshire in relation to Cannery Row:

Cannery Row got hit with this sooner than other places, and other places have learned from Cannery Row. [I think] gentrification is happening smarter than it did in the 1990s. People are more wary about having big ugly chains just take over everything. That said, it's still gentrification. Yeah, and Portsmouth, New Hampshire. I don't know if you've hung out there a lot. But, I mean, I left there in 2003 and came back for Council business ten years later, and it was a totally different place. [A large industrial building] got knocked down and turned into you know, yuppy barns basically...And it's stunning how quickly that can happen. The other thing I found interesting about gentrified Portsmouth is the churn on the retail space. But that tourist economy is not a stable economy, and instability never favors people at the bottom of the economic ladder (Author Interview, 2019).

how is tourism less stable than fishing industry? Year-round connection of fishing. People who are invested in the community and participating in it. They're not trading fishing for something better economically that will support livelihoods.

This interviewee had an interesting perspective on how changes to a community's development impacts its resilience. Even with the recent economic disaster declaration in the New England groundfish fishery, the interviewee suggests that the town's economy was more stable just before the disaster.

Another fishing community member in New England focused on the year-round nature of fishing as a more stable and resilient base for the community:

I mean, the Bomsters in Stonington just sold out, they were scallopers. I don't know if the buyer of their boats and permits are going to continue to operate out of Stonington [Maine]. But if they don't, that leaves [one person] as the only high-volume, high profit dollar value fishery out of Stonington. The second Stonington fisheries, as soon as scallops leave Stonington fish pier, that thing is going to be t-shirt shops and ice cream joints in about 10 minutes. More working waterfront lost... I mean, that's the most endangered species on the coastline right now is working waterfront. And he said there's no codfish out on the banks. And for the rest of that year I saw strong stoic men scared because of the lack of a resource. And slowly but surely they reopen the fishery, or they never shut it down. But the fishery got going again...All over New England, ports are drying up and dying...it's the out ports that are really getting hit hardest. When you have a lack of economic stability you turn to natural resource industries to beef it up. When those resources fail, you see increases in economic uncertainty, substance abuse, spousal abuse, out migration, poor funding of schools, these towns die and they are replaced by wealthy summertime, vacationers. I have no problem with that. But they're not there to keep the lights on in winter-time or pick up the trash or give a shit about town finances, right or, you know, have no interest in funding schools. And so having a viable year round fishery is actually one of the few ways places like Chatham or Provincetown, or Stonington, Maine or Stonington, Connecticut, to some degree, can stay alive as a functional community (Author Interview, 2019).

For this individual, the fishing industry is a key component of having a year-round stable economic base, but also—unlike in tourism-based economies—the fishing industry connects people to build a greater community. With the loss of working waterfronts, these community ties are at risk of being replaced by seasonal industries and tourists.

My work in Gloucester offered insight into how the fishing community viewed this type of redevelopment. As I mentioned in the opening of this chapter, Gloucester recently had a portion of its waterfront developed into a high-end hotel, the Beauport. One city resident reflected on this change.

I think there's a lot of [change] from my perspective that is a lot of negative. This was a fishing community. And it's becoming tourism, right. That's what's happening...there's a lot of development of knocking things down, building these multimillion-dollar houses, you know, so yeah, Real Estate's gone through the roof. I don't know how the average person affords a house in the city anymore. It's gone crazy. You know, maybe it's a balloon and it'll bust at some point, yeah overall it might, but in this specific area, the way they're developing things and knocking things down?... Is that seen as a positive? I think people see [the Beauport] as a positive, you know, I mean, you've got to look at what was there before then that's definitely a positive, right. But there's a fear amongst the fishermen themselves that they're not going to have a place left to tie up. Because at some point, the city is going to have to make a change to their zoning

laws. Because there isn't enough infrastructure to support it and it's all falling apart, right? So the only, the only bailout is to rezone it and let somebody come in and buy it and make it a marina or restaurant or whatever (Author Interview, 2019).

Several people I spoke with from Gloucester had a similar perspective—that they saw redevelopment as the first wave and not all bad, as long as future development does not necessarily displace the fishing industry. They retained hope that a balance could be found between increasing the economic base through tourism and maintaining the current economic base of fishing industry.

Another fisherman north of Boston questioned whether tourism would last if there were not commercial fishing boats and fish—fishers see their community as part of the attraction of these places.

We're one of the last co-ops around. There ain't many. They had one in Portsmouth but I don't know if they're re-doing it or if they went out of business. And the other thing is too, is you also have, like down in New Bedford, you know what, people come and they want to see the boats. They want to see, to see it... Because the fish, the people came to see the fishermen... So now we're going to put these shops in here. And then they keep pushing and pushing and pushing and pushing you out. And, and then you know, eventually they'll realize it that hey, oh shit. They were comin' to see the boats that we just totally pushed outta here (Author Interview, 2019).

As many of these communities shift from fishing toward other economic drivers, research may wish to explore how altering the culture of the community alters its resilience.

3.8 Discussion: Implications of a Greying Fleet and Gentrifying Waterfronts

Greying Fleet

On each coast, this research identifies ample evidence of a greying fleet and gentrifying waterfronts. How these changes will impact fishing communities on each coast moving forward remains less clear. While the greying fleet has received research interest, not much effort appears to have been directed toward attracting new commercial fishing laborers or investors.

A few recruitment efforts have received attention nationally, including the Alaska Young Fishermen's Initiative and the Alaska Marine Conservation Council's Young Fishing Fellows program. Inspired in part by these efforts, the USDA AMS Farmers' Market and Local Food Promotion Program has funded a new program known as the New England Young Fishermen's Alliance, delivering start-up grants and three years of funding to train 18 beginning fishermen in New Hampshire (a state that an interviewee reported has seen its groundfish fleet shrink to 6 boats—2 gillnetters and 4 draggers). Only one national program pushes for training of new and beginning fishermen. The Young Fishermen's Development Act, enacted in 2020, established a grant program administered by the National Oceanic and Atmospheric Administration's National Sea Grant Office that aims to fund training of new commercial fishermen and seafood farmers producing "food from the sea." These mostly localized efforts may increase interest

and awareness of commercial fishing as a career and begin to counter the loss of generational fishing families, but it is unclear how these programs might prevent the loss of knowledge from fishing communities. It remains unclear how committed these programs will be to integrating an older generation of fishermen.

Is what some fishermen call ‘sharecropping’ going to become the dominant ownership regime in these two commercial fisheries? Many fishermen today question the need to lease quotas from permit banks or businesses that have acquired permits. But, for young fishermen who only know this system, what alternatives might they pursue? Does “sharecropping” offer a viable entry model?

Gentrifying Waterfronts

Though closely linked, gentrification of working waterfronts has drawn less research attention than the greying of fleets. The NOAA has recently published a “storymap” on gentrification in ports in the Northeast,⁶⁴ placing this issue on the radar of the social sciences branch of the Northeast Fisheries Science Center, but it remains to be seen what types of policy or initiatives might follow. One such effort that has been championed in Congress by Representative Chellie Pingree of Maine and others and recently reintroduced is the Keep America’s Waterfronts Working Act⁶⁵. This legislation aims to create a grant program, loan funds, and a task force in the Department of Commerce directed toward sustaining working waterfronts.

While promising, these efforts do not address rapid, contemporary changes like greying and gentrification that threaten key infrastructure and support components for fishing. Key informants and fishermen alike described in detail the importance of resources like icehouses and ample processing facilities, and detailed difficult decisions they face about their future when these resources are lost. These resources would greatly benefit from institutional support, to retain a more diverse economic base in these fishing ports, and circumvent a transition that many describe as an increasing reliance on tourism.

Community Resilience

A greying groundfish fleet and gentrifying waterfront clearly carries implications for the resilience of fishing communities. As described in these research interviews, several fishermen and fishing community members identified groundfishing as the glue that holds a community together; it is a year-round fishery with relatively high-volume landings that—when thriving—keep key fishing support industries in business and available for ancillary seasonal fisheries that flourish for shorter periods every year. A decrease in groundfish landings stresses these support systems. Economic resilience emerged as a topic in a handful of interviews, such as this interview with a fisherman from Massachusetts:

⁶⁴ NOAA Fisheries. (n.d.). Social Indicators of Gentrification Pressure. Retrieved on April 26, 2022 from https://storymaps.arcgis.com/stories/56781eb366f1485e8ffd7c96b16f133f?utm_medium=email&utm_source=govdelivery.

⁶⁵ US Congress. (2021, June 6). *H.R. 3160, Keep America’s Waterfronts Working Act*. Retrieved on April 26, 2022 from <https://www.congress.gov/bills/117/congress/house-bills/3160?q=percent7Bpercent22searchpercent22percent3Apercent5Bpercent22waterfront+workingpercent22percent2Cpercent22waterfrontpercent22percent2Cpercent22workingpercent22percent5Dpercent7D&s=1&r=1>.

Best case scenario. We [want to be] successful. We've got to get some kind of community resilience, we're able to market some of our fish successfully with what marketing [we gain] so we can disassociate ourselves from the commodification of pricing. And then we can divert some of that money back into purchasing permits so that we can continue to enable young aspiring fishermen to become vessel owners (Author Interview, 2019).

This idea of building community resilience may gain traction. As fishing industry retirements increase, the state and federal leadership might not make the investments needed to retain port infrastructure, especially in secondary, smaller ports. This could accelerate a shift to tourism and summer homes in these ports, unless there are opportunities for actively recruiting new entrants to commercial fishing, and/or attracting new coastal industries like offshore wind and aquaculture development. There could be opportunities for alignment between these various coastal industries, but it will likely require larger initiatives focused on maintaining a diverse and resilient community.

3.9 Conclusion

Once more individuals from the greying fleet retire, and once the waterfront is further gentrified, components of each may be difficult to recreate. This research suggests that fishing access is being further curtailed and opportunities for traditional progressions of a fishing career have decreased. Some fishermen suggest they do not want their children to join the fishing vocation. Commercial knowledge and expertise formerly handed down through generations dissipates as waterfront access changes. When a harborside processor is converted to a restaurant, or a chandlery converted into summer condos, it seems unlikely that fishery infrastructure will return, especially if zoning changes follow. When a waterfront shifts from early mornings with trucking deliveries and processing smells to condominiums listed on AirBnB – will right-to-fish laws be required to sustain fisheries? How fishermen retire, and what succession plans they enact, will greatly influence the appearance of the next generation of fishermen and the working waterfronts they require.

Chapter 4: Values-based investing in groundfish

4.1 Introduction: “I’m going to throw you off the fucking boat”

Like most fishing trips, we met on the dock well before dawn. We were on a near shore trip, led by a captain who lobsters, bottom longlines, and scallops – a more diversified collection of permits and species harvested than most fishermen I interviewed, which is likely because he had been at it since the 1970s. I received his invitation to pull lobster traps. It was a beautiful September day on the water – quiet and kind of serene, without many other boats. The early fall days are generally my favorite because it can still feel like summer, except with school back in session there are a lot fewer people out on the water.

“There he is,” the captain said admiringly.

I look around - It’s just me, the captain, and one crew. But there’s a rapping on the window in front of the wheel. A seagull has his head turned so his beak is parallel to the glass, the better to look with one eye and peer in at the captain.

“He visits me most days” says the captain, “he’s only got one leg” as he flips open a side window and tosses a piece of bread onto the bow, which is promptly gobbled.

“Does he keep that loaf of bread there just for the gull?” I asked myself.

By mid-morning we’d pulled a few trawls and our rapport had improved. I was increasingly adept at sorting and banding lobsters, and conversation had loosened for talk of technique to tales of mishaps and frustrations of fishing near shore. The captain told me of how recently an individual on a sailboat tried to curse him out for being in their way while under sail, to which he was all too eager to share with me the litany of colorful language he quickly yelled back, informing them how a commercial fishing vessel at work has the right of way over a sailboat. His blood boiled while telling the story, and this probably should have been a hint that I should tread lightly. Nonetheless, whenever I turned the conversation back to research, I became bolder with my line of questioning. I eventually approached what I knew could be a touchy subject.

Me: “So do you ever work with any of the environmental groups around here on any projects? I’ve heard some people do that.”

Captain: “What do you mean?”

Me: “You know, The Nature Conservancy, Environmental Defense Fund, some of those other groups...” Suddenly the boat lurched as the captain threw it into neutral.

He paused for dramatic effect until the boat had slowed considerably. “If you work with them,” he said, “I’m going to throw you off the fucking boat.”

He wasn’t really going to throw me off the boat, was he?

“No, no, no,” I practically stammered. “I just know some people who fish do and...”

I can’t remember how I escaped the confrontation. He said something about environmentalists and whales, or maybe it was seals? He wasn’t really going to throw me off the boat, I was pretty sure, but I do remember the rest of the day was fortunately less frosty than it could have been, given my gaffe. I clearly remember how the conversation ended, as it’s a line I’ve heard a few times since, but its novelty at the time left an impression.

“Let me tell you something,” he said. “Look around. The most endangered marine mammal out here is the commercial fisherman.”

As the story above illustrates, there are enormous tensions between fishermen, conservation groups, and other environmental nongovernmental organizations (ENGOS). In my research, I quickly learned that this captain was not alone in his opinion. Regularly I heard fishermen say things like “As you know, a lot of people have really negative opinions of ENGOS,” or “Conservation Law Foundation is overeducated and under-intelligent” (Author Interviews, 2019). While some fishermen and community members were quick to share positive experiences working with ENGOS, others were just as quick to criticize, and often loudly. Over time, I learned more about what informed their opinions. For example, many appreciated the way ENGOS work to keep fishing rights in their community and attempt to make fishing access more affordable, while many others resented the role that ENGOS (and their collaborators) play as gatekeepers to that fishing access. Several resented the way ENGOS and some of the associated Community Sustainability Cooperatives (CSCs)⁶⁶ frequently solicit fishermen in an effort to purchase their permits.

Part of the way that ENGOS can act as gatekeepers of fishing access is connected to the values-based investments (and divestments) that certain ENGO entities have made in groundfishing communities. At times they acquire permits and vessels to enable conservation goals to be more easily met. Interestingly, I found that many people I interviewed described the power that ENGOS wield around fishing rights access in a way similar to the power wielded by a new, hedge-fund backed fishing corporation in New England known as Blue Harvest Fisheries, as well as similar corporate fishing entities such as Pacific Seafood in the Pacific region.

In this chapter, I explore the perspectives of fishermen and other fishing community members on the themes of changes to fishing rights access, shifting power dynamics, and the broader topic of values-based investing in groundfisheries of the New England and Pacific regions. As such, I focus on how new forms of values-based investing might change the nature of fisheries management and impact fishing livelihoods.

⁶⁶ Community Sustainability Cooperative is a catch-all term used by some to describe the many permutations of community organizations that aim to keep quota in a given area by anchoring it through a community organization.

4.2 Understanding Values-Based Investing in Fisheries

What is Values-Based Investing?

Conservation-oriented investments are nothing new in natural resource dependent communities. For example, land trusts have long invested in key parcels to achieve conservation goals. However, the values-based investments currently taking place in groundfishing communities reflect new forms of investment that have been facilitated—in part—through the implementation of catch shares as a management approach for these two groundfisheries during the past decade. Relatively novel as a strategy in finance and banking parlance, values-based investing identifies opportunities that carry an additional component of social or environmental responsibility. Unlike traditional investments that focus on economic incentives and returns on investment, values-based investing prioritizes projects and businesses for the social and/or environmental value they create. This value may include anything from enhancing social justice and equity to improving environmental outcomes. Values-based investing embraces the Environmental-Social-Governance (ESG) criteria of investing as important alongside standard economic criteria of investment (Pakhnenko, 2017).⁶⁷

A large range of financial actors (e.g., hedge funds, university endowments) frequently make values-based investments, with many investments now taking place in various sectors of the food system (Fairbairn, 2014; Gunnoe, 2014). And these investments are often opaque, with outcomes that may differ from their stated intent. For example, Ashwood et al. (2020) found, in a study focused on absentee owners investing in farmland, that investors can obfuscate their acquisitions through layered ownership structures, in which complex corporate networks establish a façade of individual corporate investors, when in reality they aggregate through an overarching corporate owner (Ashwood et al. 2020). Other research illustrates how absentee owners, through complicated layers of coordinating firms and land managers, employ ESG criteria to diversify university endowment portfolios. For example, in a case in California’s Cuyama Valley, subsidiaries of Harvard University’s endowment invested in dry rangeland and converted a large portion of it to much more valuable irrigated vineyards, while skirting the creation of new groundwater restrictions through a parallel public process (Fairbairn et al., 2020).

Today, many different non-profit, public, and private organizations engage in commercial fisheries in the U.S., and these various organizations increasingly interact with fishing communities in novel ways. Some organizations focus on support for commercial fishing industry through safety-at-sea trainings and assisting fishermen in obtaining healthcare. Other organizations conduct collaborative research, organize for community-based actions, and/or

⁶⁷ Other similar types of values-based investing concepts that incorporate ESG criteria include Responsible Investing (RI) and Socially Responsible Investing (SRI). Historically, these types of investments were considered primarily the realm of non-profits, but they have grown common in for-profit finance as well (Pakhnenko, 2017).

provide testimony at regional fishery council meetings and submit public comments. Others still are more involved in litigation, regularly suing regulators or industry to achieve desired conservation ends. Of these many fishing-oriented organizations, two kinds of organizations repeatedly came up in this research related to values-based investing: 1) ENGOs and associated permit banks, quota funds, and fishing trusts (referred to by some as Community Sustainability Cooperatives (CSCs), and 2) corporate commercial fishing businesses with values-based mission statements.

4.3 Guiding Research Questions

Given the novel patterns of values-based investment in groundfish communities, this chapter explores several key questions about how these new forms of investment might influence the communities in which they invest. I ask: how might new forms of values-based investing change the nature of fisheries management and impact fishing livelihoods? Given the shift toward a privatized management approach, how are these changes part of broader patterns of neoliberalization⁶⁸ of natural resources and natural resource management? And finally, what can we learn about new forms of accumulation from this research?

To address these questions, I examine scholarship on theories of accumulation and dispossession, and discuss how efforts to create ocean enclosures have occurred in other areas. I also discuss economic theories of ownership and neoliberalization, and existing efforts in values-based investing that occurs in natural resource dependent communities. I find that there is a changing nature of fisheries management and fisheries livelihoods that indicate a new type of enclosure is occurring in these communities.

4.4 Literature Review

Conservation Practice as Primitive Accumulation

David Harvey's theory of accumulation by dispossession describes how the consolidation of wealth and power can often dispossess others of natural resource access. This dispossession and enclosure may occur through various practices, with two common approaches being privatization and financialization (Harvey, 2003). Many scholars have applied Harvey's accumulation by dispossession as a theoretical lens to specific neoliberal acts of enclosure; particularly relevant to this research is scholarship on the relationship between conservation, enclosures, and dispossession (e.g. Chung, 2019; Benjaminsen & Bryceson, 2012; West, Igoe, & Brockington, 2006), while Kelly (2013) has done so with a focus on the role of conservation actions in particular, or "conservation practice as primitive accumulation."

⁶⁸ Here and throughout this dissertation I use neoliberalization in the way that those I interviewed use it—as a term that broadly captures an ideology of market-oriented solutions to various social problems, including the environmental and economic problems groundfishing communities experience. Interviewees most often used neoliberalism to capture the privatizing aspect of the ideology, most likely because of privatization's centrality in the current fisheries management paradigm of catch shares that is used in each region studied here.

Concentrating on conservation as accumulation, an act which Marx defined as “the historical process of divorcing the producer from the means of production” (1906, p. 786), Kelly explores the role of national parks as “exclusionary conservation interventions” (2013). She describes how these parks and similar protected areas are often supported by NGOs and other conservationists as undeniably positive (from the NGO perspective), but contends that underlying economic motives and social impacts like enclosure and dispossession have the potential to be overlooked (2013).

Other research has taken a slightly different tack in that it identifies excessive, purely economic accumulation as what in part is to blame for the 2008 financial crisis, and supports the idea that at least accumulation by conservation has the potential to be a more stable “new ‘phase of capitalism’ as a whole, imbued with a productive form of power that shapes new joint environmental and accumulation possibilities” (Buscher and Fletcher 2015, p. 283). This work examines the position of the global conservation community, non-profit NGOs, and especially the BINGOs (Big Conservation NGOs) – World Wildlife Fund, The Nature Conservancy, and Conservation International – in attempting to “green” capitalism, seeing as it has been suggested that BINGOs receive approximately half of all global conservation funding (Chapin, 2004). At the time of their research, Buscher and Fletcher found these organizations partnered with multiple economically powerful corporations, including Walmart, Northrop Grumman, Boeing, British Petroleum, Coca-Cola, Delta Airlines, Dow Chemicals, Caterpillar, Dupont, Monsanto, Rio Tinto, and Shell (2015, p. 294).

Often, the conservation goals of acquiring natural resources to improve their sustainability and lessen identified impacts to the environment are described as justifying the separation of a natural resource from producers⁶⁹. This type of appropriation—or transfer of ownership, use, or controlling rights—is common in descriptions of “green grabbing,” which often includes novel forms of accumulation and appropriation enabled by collaborations between pension funds, venture capitalists, green activists and consumers alike (Fairhead et al., 2012).

Marx described this separation as primitive accumulation when analyzing relationships between commoners and privatization and the commodification of commonly shared land; others have applied this model to ocean commons. Studies of green grabbing have high seas analogs that include “ocean grabbing” or “blue grabbing” (e.g. Hill, 2017; Barbesgaard, 2018; Bennett et al., 2015; Benjaminsen & Bryceson, 2012). These researchers understand ocean grabbing as an act of dispossession or appropriation of marine resources or spaces (Bennet et al., 2015), a practice less researched than its onshore versions (Hill, 2017; Barbesgaard, 2018). Ocean or blue grabbing may entail appropriation both at sea as well as of coastal land areas; however, they are distinct from land grabbing in that enclosed or bounded ocean spaces, in particular, are still state or nationally owned spaces (held in public trust by the United States)

⁶⁹ I use producers here as I am describing food producers, however in common pool natural resource discourse the term “appropriator” is used to precisely describe those who harvest a natural resource from the commons (Ostrom, 1990).

(Hill, 2017, p. 97). Often those who engage in blue grabbing rely on narratives of overfishing to justify their efforts (Hill, 2017), but in certain cases, small-scale fishers have aligned themselves with the food sovereignty movement as an act of opposition to this trend (Barbesgaard, 2018).⁷⁰ Together, these studies illustrate how Harvey's accumulation by dispossession, and likewise Kelly's conservation practice as primitive accumulation, continue to evolve.

Fisheries Economics and Ownership

Some of the aspects of dispossession, accumulation, and enclosure described above are likely a product of the way fisheries economics and management have long been theorized. In 1954, H. Scott Gordon described biological knowledge of fisheries as relatively sound, but suggested management lacked in certain characteristics of rational economic logic. Here, using the lens of economic theory of production, Gordon suggests that the key issue with our management of fisheries is that it was not set up to derive rents: "most of the problems associated with the words 'conservation' or 'depletion' or 'overexploitation' in the fishery are, in reality, manifestations of the fact that the natural resources of the sea yield no economic rent" (Gordon, 1954, p. 124). He argued that privatizing the resource could achieve this. In Gordon's fishery, there was no disincentive to overharvest, and he contends that by enclosing the commons and seeking rents, the fishery will avoid the depletion that occurs with the overfishing increasingly common since the first two world wars. Gordon's work is important because – 14 years before Hardin's *The Tragedy of the Commons* – it similarly emphasizes that we know a lot about the field of fisheries biology, but that little has been done to think about how to better manage fisheries through this economic lens. Though Hardin coined the term "tragedy of the commons" to describe what he saw as the inevitable exploitation of a commonly held natural resource (Hardin, 1968), for many in fisheries, Gordon's work started the modern economic focus of this line of thought that runs through Aristotle, Thomas Hobbes, and William Forster Lloyd (e.g. Feeny et al., 1990; McCay, 1995). That being said, the centrality of the tragedy of the commons to fishing has led to McEvoy dubbing it "the fisherman's problem" (McEvoy, 1986).

Hardin reiterated this longstanding problem of exploitation of the commons from a biological perspective and aligned the argument further with neo-Malthusian concepts that rising human population pressures partially justified enclosing the commons to prevent tragedy (Hardin, 1968). Neo-Malthusian concepts are central motivators to studies of declining fisheries and ideas of privatizing to avoid the "tragedy of the commons" (Campling, Havice, & McCall Howard, 2012). Fisheries economists have become so single-minded in their pursuit of privatization to cure shortcomings of fisheries management that they have been described as "evangelical," with a "privatize-or-perish dichotomy" that excessively emphasizes ownership (Macinko, 2014). Others have pointed out that Gordon and Hardin make privatization "seductively" simplistic (Acheson and McCay, 1987, p. xiv), while Ostrom's classic work outlines

⁷⁰ As a movement, food sovereignty emphasizes the right of people to dictate the terms of their food system, from production methods to access to natural resources to obtaining healthy and culturally appropriate foods.

ways that resource appropriators (in this case, fishermen) can create the conditions to manage a common pool resource through coordinated actions and the creation of boundaries, such that they are capable of avoiding the tragedy of the commons (Ostrom, 1990). Acheson's work on the lobster industry in Maine illustrates this pooled management approach in fisheries. Acheson describes complex social networks with coordinated actions and boundaries established by lobstermen, arranged in "gangs" with "fiefs carved out of public domain" (Acheson, 1987; Acheson, 1975). This aspect of their boundary setting and perimeter defending is only one of the many collective actions of lobstermen as described by Acheson.

Values-Based Investing in Natural Resources

Research on the impacts of managing groundfish fishing rights through catch shares, specifically in New England, has shown that it can create winners and losers: "[Neoliberal policy] disenfranchises most of the public from the fishery and its management, dividing insiders and outsiders and impeding socio-ecological innovation that might otherwise restore the fishery" (Brewer 2017, p. 115). However, there is not much research into these seemingly stark divisions and some of the motivations behind values-based investing. ENGOs spend millions of dollars a year and are highly engaged in the council process (Read, 2013). With few exceptions (Gordon, 2010; Bradley, 2011; Mamula and Kosaka, 2019; Kauer et al., 2018), little research has focused upon the impacts of CSCs, and even less on corporate values-based investments in groundfishing communities.

In New England, work focusing on groundfish sectors—or the harvest cooperatives established by catch shares that encourage collective actions by fishermen through their exemption from certain regulations that apply to common pool groundfish fishermen⁷¹—describes that state-run permit banks might allow some adaptive management and new entrants into the fishery (Gordon, 2010), or that permit banks might be a reaction to disenfranchisement and the inability of small fishing businesses to compete with larger entities (Bradley, 2011).

In the Pacific region, CSCs were studied for their role in keeping quota in a community by acquiring it to prioritize access by the local fishing community⁷² and comparisons were made across two CSC entities with slightly different operational approaches (Mamula and Kosaka, 2019). Here, perspectives of groundfish harvesters from the two compared quota funds were found to be almost unanimously positive, as these harvesters acknowledged that the funds helped to subsidize fishing costs and greatly improved economic and financial viability. Many harvesters, for example, shared that their businesses were not viable without outside help (Mamula and Kosaka, 2019). Other research focused on a slightly different type of collection of

⁷¹ The sector management system is one type of catch share program and is unique from the individual fishing quota (IFQ) system used in the Pacific groundfish industry. Within the fishery, there are also fishermen in the common pool system, but they must adhere to additional regulations from sector member fishermen. More information on the sector management system is available on the NOAA Fisheries website for the New England region's groundfish fishery, available here: NOAA Fisheries. (n.d.). *Northeast Multispecies (Groundfish)*. Retrieved on April 12, 2022 from <https://www.fisheries.noaa.gov/species/northeast-multispecies-groundfish#management>.

⁷² Some described this as "anchoring" quota (Author Interview, 2019).

quota unique to the Pacific region that operates similarly to a permit bank—the “risk pool” (Kauer et al., 2018). The California Groundfish Collective (CGC) established the risk pool, with up-front investment from The Nature Conservancy, to help CGC members navigate bycatch issues under the privatized quota management system (Kauer et al., 2018).

Examples of values-based investing in other natural resource-dependent communities can be usefully informed through the lens of recent research on financialization. For example, Madeleine Fairbairn (2014) cites Greta Krippner’s definition of financialization as guiding her work on financialized farmland acquisitions and describes financialization as the increasing tendency for economic profit to be made not from productive activities but through finance (Fairbairn, 2014; Krippner, 2011). This research examines the increasing trend of financial actors such as university endowments and retirement funds targeting farmland as “like gold with yield” (Fairbairn, 2014). Recent work has identified the role of ESG criteria as motivating factors for investments as well as environmental uncertainty as another opportunity to improve financial returns (Fairbairn et al. 2020). In fisheries, financialization is less well studied, but has been identified as increasing the vulnerability of local producers when processing companies vertically integrate and own significant amounts of quota (Knott and Neis, 2017). Financialization is also implicated in neoliberal policies that have failed to solve conservation issues in fisheries (Pinkerton, 2017), and in facilitating ocean grabbing (Bennett et al., 2015).

4.5 Relevant Additional Background

ENGOS and Connections to Permit Banks, Quota Funds, and Community Fishing Trusts
People I interviewed on both coasts—including fishermen, sector managers, fishing support organization members, and fisheries council members—often mentioned ENGOS as playing a key role in either purchasing fishing rights outright, as in the case of The Nature Conservancy, or supporting and assisting the purchase of fishing rights by connected community fishing organizations known as permit banks or quota funds, or fishing trusts. These banks, funds, or trusts – broadly identified in a National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum from the National Marine Fisheries Service (NMFS) as CSCs (Mamula and Kosaka, 2019) – frequently have values-based missions to invest in fishing quota in order to retain fishing rights in local fishing communities. Values-based fishing entities like CSCs vary in form and scope across each region, and the CSC term generally refers to mission-oriented actors, organizations, and corporations that are increasingly involved in fishing. CSCs exist in many iterations all over the world, but in New England and the West Coast these entities typically emphasize conservation and/or heritage-based missions in an attempt to preserve the culture of a fishing community.

CSCs are therefore one response to the gentrification of fishing communities, as well as an effort to enact conservation-minded fishing practices (since each coast’s groundfish fishery was recently declared a disaster). These organizations frequently tout maintaining local access and keeping that access affordable. In a way, CSCs are akin to farmland easements that remove the

development rights from farmland in an effort to keep it affordable for farmers to continue farming, or rent control that allows a longtime community resident to stay put as the cost of living increases.

On both coasts,⁷³ interviewees identified The Nature Conservancy's role in making values-based investments in fishing communities, as seen in their purchases of groundfish permits and quota. But there were other ENGOs and similar conservation-focused organizations which were also active and frequently identified by people I interviewed as being involved in the inner workings of permit banks and quota funds⁷⁴. In addition to The Nature Conservancy, other active organizations include, for example, the Environmental Defense Fund and the National Fish and Wildlife Foundation. Table 4.1 lists some of the permit banks in each region and their ENGO affiliations (gathered from the organization's websites, popular press, and research interviews).

⁷³ In the Pacific region, TNC acquired fishing permits and vessels through a private buyout in 2006, which in turn included those vessels' quota when catch shares were implemented in 2011. During this period, TNC redeployed fishing permits with required conservation-oriented practices, helped to develop a "risk pool" – or an insurance system for members to share overfished species quota – and established the California Groundfish Collective. During this time TNC also helped to establish community quota funds in Fort Bragg, Half Moon Bay, Monterey, Morro Bay, and Santa Barbara. In 2019, with the groundfish fishery rebounded and new ownership limits in place, TNC divested the remainder of their fishing rights back to the quota funds they had helped to establish. A good summary of TNC's involvement, from their perspective, is available on their website: The Nature Conservancy. (n.d.) *California Groundfish Project*. Retrieved on April 11, 2022 from <https://www.nature.org/en-us/about-us/where-we-work/united-states/california/stories-in-california/california-groundfish-project/>.

⁷⁴ In New England, TNC acquired fishing permits as well, however because of regional differences in fisheries management, it is unclear exactly how much they acquired. Several fisheries professionals knowledgeable about their ownership described that they are likely one of the top three or four owners in the region, and unlike on the West Coast, they have not divested in New England. The majority of their permits and quota are accessible through several fishing sector partnerships (as a reminder, a sector is a fishing cooperative whose members voluntarily work together), and as described by interviewees, similar to how they operate on the West Coast, TNC requires that you align with their conservation-oriented practices to have access to what is often a discounted rate on their quota. This is likely both a product of higher ownership caps in the New England fishery, as well as attributable to the fact that ecologically the New England groundfish fishery has not rebounded like the West Coast.

Table 4.1 A selection of values-based fishing organizations in each region	
Organization	ENGO partner(s)**
NEW ENGLAND	
Cape Cod Fisheries Trust (part of the Cape Cod Commercial Fishermen's Alliance)	The Nature Conservancy; National Fish and Wildlife Foundation
Maine Coast Fisheries Trust Permit Bank (part of Maine Coast Fishermen's Alliance)	The Nature Conservancy
Martha's Vineyard Fishermen's Preservation Trust	The Nature Conservancy
Gloucester Fishing Community Preservation Fund	Unknown***
New Hampshire State Permit Bank	Unknown
PACIFIC	
Monterey Bay Fisheries Trust	The Nature Conservancy; The David and Lucille Packard Foundation
Morro Bay Community Quota Fund	The Nature Conservancy; Environmental Defense Fund
Half Moon Bay Commercial Fisheries Trust	The Nature Conservancy; Monterey Bay Aquarium's Seafood Watch
Commercial Fishermen of Santa Barbara	The Nature Conservancy
Fort Bragg Groundfish Conservation Trust (part of the Fort Bragg Groundfish Association)	The Nature Conservancy; Monterey Bay Aquarium's Seafood Watch; National Fish and Wildlife Foundation; Environmental Defense Fund
California Groundfish Collective	The Nature Conservancy; Environmental Defense Fund;
*Some of this information came from a 2019 NOAA publication: Mamula and Kosaka, (2019, August). <i>NOAA Technical Memorandum NMFS: Community Sustainability Cooperatives in Central California: Continued Fishery Participation Through Quota Share Holdings in the Pacific Coast Groundfish Fishery</i>. Retrieved February 16, 2022 from https://swfsc-publications.fisheries.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-620.pdf. **As ENGO partners were identified through organizations' websites, popular press, and through field research, the list is not exhaustive nor inclusive of only official partners. *** The Gloucester permit bank was started with mitigation funds from liquid natural gas development that took place on their traditional fishing grounds.	

The roles that many different environmental organizations, foundations, and corporate entities have increasingly played in fisheries management, and the interconnections between many of them, were well known by many of the people I interviewed. For example, as one fisherman explained quite succinctly:

So, The National Fish and Wildlife Foundation, which has built these programs around catch share policy - The Walton Foundation is the leading partner. So that's Walmart, right? Umm, there are others involved. Other partners include BP Oil, Chevron, Shell Oil, Wells Fargo, and Coca Cola, so those are partners of National Fish and Wildlife Fund, that's funded, that was the core fund for the catch share policy work. And the [Cape Cod Commercial Fishermen's] Alliance

got that funding for several years. The Gordon and Betty Moore foundation and Packard Foundation - that's where the Hewlett Packard comes in – are also contributors to the National Fish and Wildlife Fund. And they've both been instrumental in fisheries privatization policy and align closely with the [Environmental Defense Fund]. Now, on the recipient side, so recipients of these grants are Monterey Bay Fisheries Trust, Gulf of Mexico Reef Shareholders Alliance, and the Maine Coast Fishermen's Association and the Hook, you know, [I mean] the Alliance. Each of those three entities are led by a former staff member of the Alliance or heavily influenced with a partnership by the Alliance. And they are all currently contracted with Catch Invest (Author Interview, 2019).

The increase in the prevalence of CSCs is also seen in various industry collaborations. For example, there are several New England and Pacific region CSCs that communicate at the national level through the Fishing Communities Coalition.⁷⁵ These organizations are one piece of the fishing access and management puzzle, and actively engage in conservation-oriented fisheries policy discussions.

Many of the permit banks described here can also attribute some support to the Walton Family Foundation, which has funded the creation of a document that guides the creation of permit banks.^{76,77} The Walton Family Foundation also has funding connections to an organization active in fishing communities known as Catch Invest,⁷⁸ which aims to consult and assist in creating more community permit banks across the country. On the whole, permit banks have increased in number since the implementation of catch shares in fisheries, as their banking and leasing of quota is enabled through this system.

Corporate Actors

In addition to permit banks, values-based investments have also been made in fishing communities by corporate actors. While many of the commercial fishing corporations in each industry tout conservation-oriented or sustainable fishing practices, in this research the most obvious and frequently mentioned example of a values-based corporation is Blue Harvest

⁷⁵ The Fishing Communities Coalition website contains a list of some of the connected organizations: Fishing Communities Coalition. (n.d.) *Fishing Communities Coalition – Securing America's Fishing Future*. Retrieved on April 11, 2022 from <https://fishingcommunitiescoalition.org/about-1>.

⁷⁶ This guide to creating a permit bank is available online here and states it is made possible by grant support by the Walton Family Foundation: Cape Cod Fisheries Trust. (n.d.) *Banking on your future: How to guide, fund and sustain America's small-boat fishing traditions through the permit bank system*. Retrieved February 16, 2022 from: https://www.ccchfa.org/images/documents/Campaign_Materials/CCFT_Brochure_Web.pdf.

⁷⁷ Another article about creating a community permit bank from the Walton Family Foundation: Grasso, T. (2019, May 30). *A 'Community Bank' That's Helping Fishermen Stay on the Water*. Retrieved February 16, 2022 from: <https://www.waltonfamilyfoundation.org/stories/environment/a-community-bank-thats-helping-fishermen-stay-on-the-water>.

⁷⁸ Catch Invest was an entity mentioned by a minority of the people I interviewed, but well known by those who mentioned it. Their website is available here: Catch Invest. (n.d.). *More fish, More profit, More success*. Retrieved February 16, 2022 from <https://catchinvest.com/>.

Fisheries.⁷⁹ Identified in many interviews in the New England region, and even in some interviews in the Pacific region, the company has made sizeable investments in vessels, permits, quota, and processing facilities since its incorporation in 2014. During the course of my research, Blue Harvest purchased five of the largest fishing vessels (along with their permits and quota) operating in Maine, and in 2020 they purchased fishing vessels worth approximately \$25 million dollars, as well as permits and quota from Carlos Rafael, a.k.a. “The Godfather”.^{80,81}

Blue Harvest is backed by a New York-based private equity firm known as Bregal Partners, a connection surprisingly well known by those I interviewed during my research, and the popular press has described the business as expanding their fishing capability in a “spending spree.”⁸² Bregal Partners lists “Food and Beverage” as one of the three core investment areas for their \$1.25 billion portfolio, and lists “Fishery assets / Fishing rights” as one of their investment sectors within that area.⁸³ Their website includes a recent Bregal Responsible Investment Report Case Study of Blue Harvest Fisheries from 2018/2019⁸⁴ that highlights the ESG impacts shown below in Figure 4.2. Blue Harvest’s website emphasizes conservation and sustainability (“we’re on a mission for a higher standard in seafood”). Interestingly, Bregal Partner’s website also includes a Case Study of American Seafoods, a company that is based in Seattle and works in Pacific region groundfish, but escaped mention in my interviews.⁸⁵

In the Pacific region, the Pacific Seafood company was most frequently mentioned, and their website describes concepts of values-based investing. For example, on their homepage they have a corporate social responsibility report available for download.⁸⁶

⁷⁹ Blue Harvest Fisheries is a relatively new player in the New England fishing community, having formed in 2014. Their website outlines their mission: Blue Harvest Fisheries. (n.d.). *Blue Harvest Fisheries*. Retrieved on April 11, 2022 from <https://www.blueharvestfisheries.com/>.

⁸⁰ The story of “The Godfather” received national press because of how an undercover IRS agent was able to dupe Carlos Rafael into revealing his corrupt business practices, incriminating himself and ushering his exit from the fishery and to prison.

⁸¹ This article in the Bangor daily news describes a purchase by Blue Harvest of Maine fishing vessels and quota: Brogan, B. (2018, December 4). *Fleet of 5 Maine Scallop Fishing Trawlers Sold to New York Based Equity Firm*. Retrieved on April 11, 2022 from <https://bangordailynews.com/2018/12/04/news/fleet-of-5-maine-scallop-fishing-trawlers-sold-to-new-york-based-equity-firm/>.

⁸² Ibid.

⁸³ Bregal Partners describes their industry focus on their website here: Bregal Partners. (n.d.). *Industry and Company Focus*. Retrieved on April 11, 2022 from <https://bregalpartners.com/industry-focus/>.

⁸⁴ Bregal Partners includes a case study on Blue Harvest on their Bregal Investments website: Bregal Investments. (2018/2019). Case Study—Blue Harvest Fisheries. Retrieved February 16, 2022 from <https://www.bregal.com/responsibility/case-studies/case-study-blue-harvest-fisheries/>.

⁸⁵ Bregal Investments highlights their Case Study of American Seafoods here: Bregal Investments. (2019/2020). *Case Study—American Seafoods*. Retrieved on February 16, 2022 from <https://www.bregal.com/responsibility/case-studies/case-study-american-seafoods/>.

⁸⁶ Pacific Seafood makes this report available on their homepage and it highlights their mission and value chain, as well as the Marine Stewardship Council and other sustainability certifications for their facilities and seafood: Pacific Seafood. (2021). *We Can: 2021 Corporate Social Responsibility Report*. Retrieved on April 30, 2022 from <https://www.pacificseafood.com/csr/>.



Figure 4.2 A image showing key ESG impacts and performance metrics. This is included in the Bregal Responsible Investment case study. MSC scores are created by the Marine Stewardship Council, a seafood sustainability certification, and are for seafood products that Blue Harvest has landed and processed.

4.6 Findings

In my research interviews I asked specific questions about CSCs – identifying them by their more commonly used designations as permit banks, quota funds, and fishing trusts, whichever was more common in the given region. I also inquired about knowledge of and opinions on who is interested in buying permits and quota in the region, who the main actors are that are purchasing and/or managing these permits and quota, and whether any particular people or

organizations are impacting the ability to fish, for better or worse. In my research, several key themes arose.

- In each region, fishermen and fishing community members describe a range of opportunities and vulnerabilities associated with CSCs in their communities.
 - A key positive opportunity that emerged as a theme from my research was that CSCs retain an option for local fishing rights access, and some offer this access at a below-market cost.
 - A key negative vulnerability that emerged as a theme from my research was that CSCs potentially exacerbate the perception and experiences of winners and losers created by catch shares implementation, particularly by intensifying insider-outsider dynamics.
- Those I interviewed may distinguish between ENGOs and financial actors (namely Blue Harvest in New England, and Pacific Seafood⁸⁷ in the Pacific region), but also group them together as similar actors that capitalize on privatization and corporatize the fishery.

Opportunities and Vulnerabilities Connected to Values-Based Investing

When interviewing a variety of actors – from fishermen, to processors, to regional fishery council members and other fisheries professionals engaged in management discussions – I would frequently hear acknowledgement of the positive aspects of a given CSC. Some of the most positive opinions of CSCs were related to the way they have anchored quota in a community, particularly as a resource that fishermen with small quota allocations could rely on. This was often relevant for small boat fishermen, which one New England fishing sector manager described in detail after a private sector meeting I attended with him:

Okay, but all the effort that's been done, and all the focus that's been on saving the small boat fishing fleet has done absolutely nothing but killed the small boat fishing fleet. The permit bank helps. It bails them out. [Fisherman's name], and that other guy [points at a recently occupied chair], they wouldn't be here. That saved their ass. You can see that in every other community, you go down to the South Shore, Plymouth, there's probably two draggers left down there. It's a tough way to make a living because there's too many factors against you now (Author Interview, 2019).

This 'saved your ass' mentality was shared by many and seen not as a result of their effort or necessarily a negotiation they had made on their own terms, but a sort of happenstance, serendipitous opportunity that a CSC had begun leasing quota in their community. One fisherman from the North Shore of Boston put it simply: "I'm lucky cause I've got the [Gloucester] permit bank" (Author Interview, 2019), describing how without that opportunity

⁸⁷ Pacific Seafood started in Portland, Oregon and is one of the largest fishing businesses in North America.

he would have had to cash out of the fishery. In this case, a CSC was worth it to the fisherman because it simply allowed him to keep fishing.

One community quota fund manager in the Pacific region described the safety net function of his local quota fund well. He described how in certain cases a CSC will not only retain the quota, but also assist fishermen in learning how to better navigate catch shares, in terms of the balancing act of managing a portfolio of owned and leased quota across a variety of individual species in the fishery:

[I think] many other people do also think that the quota fund is a very good thing in the sense [that these] assets, right, these groundfish commercial fishing assets are anchored in the community...they're here, that was the whole point of it...there are some that would push back and say, "No, we don't want you here," and I think there are some guys that I would push back on and say, "How would you not? How could you say that you don't feel it's valuable to have these assets anchored here, even if you don't plan on ever using them?" ...So I would push back on any of them that say that it doesn't need to be here. As far as how it's working? Yeah, it's a challenge. Yeah, it's a real big challenge because the fishery has transitioned to something that is very complicated for fishermen to participate in. It's very expensive... it's an expensive fishery to participate in and a lot of them can't [participate as a result] (Author Interview, 2019).

Others emphasized the key role of permit banks in keeping fishing access in their community while also absorbing some of the uncertainties and risks that are inherent with the learning curve associated with managing quota in catch shares. While an individual might not be able to absorb losses from cuts to quota, having a nearby state run permit bank, for example, gives them some breathing room. The permit bank was seen as a safety net that could absorb risk while passing along access to the fishermen:

Well New Hampshire has the state-run permit bank and the sector has actually bought some permits [through an] Economic Development Grant...because the permits were going to leave the sector... And the permits they bought had mostly Cod, and then [the New England Fishery Management Council] cut the cod quota by 90 percent...so the goal of leasing fish at an affordable rate of say 30 cents, now in order to pay the loan they got to release them the same as everybody else, two-fifty, three dollars, so that didn't work. The state, [they] bought some permits through one of those Jane Lubchenco's money laundering operations where they got grants to buy permits, that we do get at a slightly discounted rate, just basically take out the administrative fee (Author Interview, 2019).

In this case, the fisherman appreciates the state permit bank because of the way the bank both retained fishing rights access and shielded him from further risk through economic

development grants, which keep quota more affordable. Here you also see some of the disdain for catch shares that many fishermen—but particularly small-boat captains with small quota allocations—espoused. Jane Lubchenco, the former NOAA Administrator and Environmental Defense Fund (EDF) board member, was heavily involved in implementing catch shares, and even now a decade later her name arose often in a derisive manner, such as here, where the fishermen attributes grants for purchasing permits as a product of her 'money laundering operations' (Author Interview, 2019).

The below-market rate that many CSCs provide, through various means, was repeatedly lauded on both coasts: “And it actually is subsidized. Yeah, so it's cheaper than what they would get it from, you know, trading with another sector” (Author Interview, 2019). This point was put into perspective when compared to someone describing what the escalating costs are like for groundfishing on either coast if you are leasing quota on the open market. Several fishermen described how having to lease meant there were added transaction costs as well as additional overhead costs: “They're paying, you know, 80, or 60, or 40 percent of the landed value of the fish right to leave. Right? They are going to fish differently” (Author Interview, 2019). One key way that was mentioned in a few interviews in New England was that some fishermen would go out “single-handed” more frequently under catch shares, increasing their risk at sea in order to cut costs on crew to manage increasing quota and observer costs. This finding aligns with recent research from the Pacific region that shows the improvement of safety at sea by catch shares can vary on a fishery-by-fishery basis and is dependent on a number of factors (Pfeiffer, Petesch, & Vasan, 2022; Pfeiffer & Gratz, 2016).

When the topic of ENGOs came up in regard to CSCs, there were many fishermen and fishing community members who acknowledged and were grateful for the investments they had made in keeping quota in their community and saw their approach as “most middle of the road:”

Oh, today, a lot of people worried about the NGOs buying it all up and controlling it. They're not reading the NGOs program carefully...what I've seen [with The Nature Conservancy] permit bank, they bought those permits and put them into the permit bank to ensure that small scale operators will continue to have access to quota. It wouldn't get locked up by a private firm that then would be leased out as sharecropper. Okay. The big firms want to make the greens out to be this, you know, vast pile of money that will buy up everything and shut everything down...TNC, the thing that I like about TNC is, you know, my job as the frothing at the mouth green is to make TNC look reasonable. Because they've got the most middle of the road approaches to these things. In my heart of hearts, what they come up with is probably going to be the solutions that keep the fishery and the fishing industry alive (Author Interview, 2019).

Few fishermen I interviewed trusted ENGOs as much.

Some fishermen were less diplomatic and were much more heavy-handed in their critique of CSCs in their community. In the Pacific region, some described how they knew “people who have been burned by the quota fund,” or that “Well, I honestly think some of them are a little bit bitter about the quota fund,” describing how its association with catch shares and the increased costs of fishing have just made CSCs another target of a bitterly held grudge (Author Interviews, 2019). In New England, one fisherman bluntly summed up a sentiment that many shared regarding the power and influence of CSCs in the community: “permit banks are like cartels” (Author interview, 2019). In such cases, negative opinions were usually based on someone not liking the requirements for joining a permit bank, or on the experience of a friend or family member who received too small of an allocation on their permit and were effectively forced to sell their fishing rights because they were no longer viable. ENGO-backed permit banks were often the ready-and-willing buyer; many resented that solvency. The requirements for joining ENGO-connected permit banks led to a fisheries regulator describing the situation as “TNC hold[ing] quota hostage” (Author Interview, 2019). Another fisherman declared at a public meeting in Hyannis, MA that the Cape Cod Commercial Fishermen’s Alliance should be called the “Cape Cod Crooked Fishermen’s Alliance,” with a motto of “leasing [quota] out to the people they took it from” (Participant Observation, 2019). In another case, I was sitting at the kitchen table with a fisherman on Cape Cod when he began opening his mail, only to find an unsolicited letter from a permit bank in Maine that was offering to buy his permit – a tactic he found offensive (Participant Observation, 2019).

Part of the offense and frustration with the permit banks stemmed from decades of mistrust in fisheries management. As one small-boat fisherman and policy advocate put it,

People really like to seem to like the permit bank concept, but not in practice. Because, because of just mistrust, I think, I mean, like Nature Conservancy. I know, on the West Coast, they're in permit banks, and I guess they do here as well in New England. From what I've heard nobody trusts them because they're an environmental group. So you can't trust them. It's also I mean, just like, do you want the state to administer a permit bank? No, we don't trust the state. We want industry members to administer it. But then they're like no we don't trust each other. So it just boils down to trust, because once you're talking about like, it's it turns it turns into something that like, seems like it's out of our control (Author Interview, 2019).

This quote illustrates a longstanding challenge of fisheries management: mistrust is layered between fishermen and environmentalists, the state, and each other.

Winners and Losers, Insiders and Outsiders

Many people I interviewed acknowledged that fishermen who had a good catch history prior to catch shares implementation received windfalls when allocations were made and the new

system was implemented in 2010. Even a permit with a small allocation was valuable, even if it was potentially too small to rely on without leasing or buying additional quota. As one fisheries expert described it, this began back when the Magnuson Stevens Act (MSA) was first created in 1976. The MSA established the federal permits for fishermen, which were augmented with the addition of quota when catch shares were implemented:

We got a bunch of people who jumped in and [then] Magnuson Stevens happened. They'll die off and hand the permit off to somebody else. And we've just created another codfish aristocracy...It's, it's medieval. New England fishing is not democratic, it's a feudal system. You have select families that own "the land" - the quota - with some minor exceptions of permit banks and the occasional open fishery...Some of those guys will probably sell it to somebody else and give them a break. These aren't heartless people. But that's a rare exception. It's not a golden ticket but it's worth something. You could make five or ten grand a year, or it could be 150 grand a year, you [just] have to sit on your ass and pick up your phone and say yes. That's pretty good payment for doing nothing. I'll do that. No problem (Author Interview, 2019).

Another described the same situation in a different fishery in the New England region that was converted to catch shares:

[H]ow do we make this into a sellable commodity?...As soon as [the federal government said], okay, so you own 70,000 pounds of scallops, times 11 dollars a pound. And then the guy that got dumped the quota at the golden moment has someone approach him and says we're willing to give you three-quarters of a million dollars for your scallop quota. Well, Florida and tour bus, here I come. But now, that going rate for that scallop quota that he pretty much got for free is 750,000 dollars. The price is set. So now the new guy that comes in. It's not going to work (Author Interview, 2019).

Together these explanations illustrate the windfall many experienced through these 'golden moments' in which the Magnuson Stevens Act created permits in 1976, and then its 2006 reauthorization included catch shares directives that were then implemented in these two groundfish fisheries in approximately 2010. As seen in the comment about the 'codfish aristocracy,' this may be viewed as 'medieval,' and it illustrates the challenges facing new entrants, as described in the previous chapter. Yet it also illustrates the incentive for someone who received this windfall to retain it.

Another fisherman I spoke with focused on the transition to catch shares and how those who were 'in the know' were able to set themselves up for an even bigger windfall than those on the outside:

Before catch shares we were working under days-at-sea⁸⁸...So, when [catch shares arrived] people concentrated on permits that had days-at-sea and not necessarily active permits that had a lot of [catch history], okay. And [then] other people who were in the know sought after permits that had a lot of catch history...There were cases of people who invested heavily in permits, [and then] the permits [end] up being worthless because of no [catch history] (Author Interview, 2019).

This fisherman suggests that the unfamiliarity with catch shares and its focus on catch history—not time able to be at sea fishing, particularly at its start, led some fishermen to make unwise decisions in acquiring permits with insufficient quota. This underscores one salient critique of catch shares: that they can incentivize excess fishing (i.e. non-economic) in non-catch share fisheries because of the prospect that this other fishery could adopt the approach in the future and allocate quota based on catch history; this speculative approach has been called the “race for history” or “fishing for history” (Bromley & Macinko, 2001; Copes & Charles 2004).

Another fishing industry advocate and former fisherman described the situation less as medieval, but more as Puritanical, or reminiscent of the ‘Salem Witch Trials,’ again with fishermen upset with their limited access.

My firsthand interactions with folks who do these quota banking operations here is, you know, it's generally positive...And certainly, you know, the divestment process was good for a fishery, and it was good for, you know, the fishing communities which would have otherwise had these, you know, this opportunity locked away forever...but they also get local politics injected into the mix, okay. And it has some bad outcomes...this is something that fisherman and Halfmoon Bay, in particular, complained to me about all the time, okay, all the time they see, they see the folks who have their hands on the reins down there really, yeah, enriching themselves mostly, but also their cronies. And, you know, folks who are adjacent to these quota funds screwed over by them in the past or pissed off at what you see, they'd be able to tell you or infer things...I think of like, people who are on the outs, you know, from something that's ostensibly community control, same sort of thing. The classic story. Very Salem Witch Trials, almost. Not that anyone's getting burned at the stake now, but they are getting burned at the uh, at the bank (Author Interview, 2019).

In this scenario, the former fisherman describes ‘cronies’ connected to managing quota who are able to benefit from their connections, while those without similar connections are not favored.

⁸⁸ Days-at-sea is the name of a management system that primarily focuses on the amount of fishing effort as the lever with which to manage the fishery, rather than focus on the amount of fish caught as in catch shares.

The way a permit bank can benefit insiders is also reinforced by the makeup of fishing cooperatives, also known as “sectors” in New England. In sectors, those within the cooperative receive right of first refusal to any quota sales. But by relying on their extensive influence and skill at navigating catch shares, many permit banks find ways to get quota to other banks approved of within their network, even recipients outside the permit-bank sector.

And, and the good thing about it is, from an organizational perspective, is that the way the sector system is set up, there is a right of first refusal process...So like, let's say last [year], we own quota in Chatham, but I wanted to send some of that quota to fisherman we're working with in Rhode Island. Okay. Right. And so I can only lease it out to the sector in Rhode Island, at a rate that I can get it out of the fixed gear sector, right. You know, so if cod quota is leasing at 80 cents a pound, you know, maybe I could get it out at like, 60 cents a pound. But I couldn't get it out at 10 cents a pound, somebody else would pick it up. [I mean] the reality is that we work really closely with fisherman and so, you know, we say to them, we will leave you quota at this rate also. So don't pick this up, please. But that's not how the rules are written (Author Interview, 2019).

This ENGO representative above describes their clear knowledge of how to adeptly navigate the catch shares system. They exhibit this through the point about working closely with fishermen to know roughly what price quota needs to be at to circumvent the right of first refusal within a sector, and therefore to allow quota to reach a desired recipient in another sector. Those without a close connection to this network are at a disadvantage in being able to access quota.

Another fisherman reinforces this insider-outsider dichotomy and its connection to ENGOs.

Now, Nature Conservancy is amassing permits on their own, and, you have to be in their special club. Their quota is not accessed by everybody and they exclude people from trying to access that quota, uh, unless you fish under their sustainability pledge. It's a closed deal is what it is, basically. They bought permits for big money, and then leased them, and then those people went and bought permits like mine that are not big money. And then they lease it back to the people that they sold them to. And then they have an offer that they'll sell it back at the same price in a number of years if you wanna. It's an elite club. And they pair up as sponsors of the Hookers Ball, uh, in Chatham, they pair up with the Cape Fisherman's Alliance, so that's the group. And there's no access to that group. You know, those Cape-ers, they're a tight-knit group. And there's a few that've been blessed with it, and there's very few of them that actually groundfish anymore...you know, they leased most of their quota to Carlos [Raphael – the “Codfather”]...there is public knowledge of that somewhere along the way...they were having a little bit of a shit fit when Carlos went down and they're complicit too, I'm sure (Author Interview, 2019).

The takeaway here is that, if you were inside the 'club', then a permit bank was seen as incredibly helpful. One fisherman described how as a member of a permit bank he just had to agree to being part of some research his CSC was doing at the time:

No, it's just that particular research collaboration that they're working on at the time. They also have a temperature and dissolved oxygen meter that they were having guys put on their gillnet. That was another project that was a little easier for the guys to wrap their head around. Yeah. And those were the as far as I know, those are the two research, collaborate collaboration projects that they have had last couple years (Author Interview, 2019). Another fisherman who had collaborated in the past described the permit bank as having a tiered system of pricing in collaborating with TNC in New England:

So, Nature Conservancy has an agreement with as it was called an MOU Memorandum of Understanding yet where if we need money we go to Nature Conservancy, hey, we'd like to buy Okay, Nature Conservancy buys the permit puts it in, in are going to escrow in the permit bank. Okay, but it controls the leasing of the fish to the fish. And how do they do that? The MOU, MOU says they can set the price. And there's three tiers of pricing. Tier One is to a designated research project, which is a very low level. Okay to get a really good deal. Tier 2, it was some kind of gear that they approved, it was usually hook and line gear, versus gillnets or trawls. And then Tier Three is everything else, which is basically market price (Author Interview, 2019).

These research projects were part of a collection of key conservation-oriented sticking points for many fishermen and those who work in other fishermen support organizations—particularly those I would describe as 'outsiders.' Often, outsiders were unwilling to agree to the many additional values-based terms that apply to members of certain permit banks. In some cases, outsiders might be willing to be a part of a research project, but not willing to share related data, such as where and how they are fishing, or other similar knowledge that they have amassed over the years.

In this same vein, some fishermen attributed their hesitance to rumors of TNC's 'big data' efforts to collect and sell fishing industry data in the future:

Yeah. And so what the Nature Conservancy is doing is buying up fishing permits in New England and groundfish. But they're [also] doing it on the West Coast and Alaska. And I think even all [around the world]. They're buying up permits that they put into a trust or a permit bank, like a central location, where then they can determine how that quota gets fished, who fishes that, where they fish, when they fish, right? They can sort of be in control of fisheries access, which on one hand, you can say, oh, well, that's kind of good. A conservation group is able to have you know, an impact on improving fishermen's style of fishing. But on the other hand, you could say, a nonprofit entity has basically taken over a public

resource that they're, you know, them on their board are now determining fishing practices rather than the public. It's actually a tough call for me. It felt like a no brainer, like of course, an environmental [group] managing fishing permits would be better than a wall street company... So while on the surface, it seems like their intentions are geared towards conservation, this is other like profiteering, and really extortion that I've heard, I was just talking to one of the New England sector managers yesterday he was vent as well [as] you're coming out a lot from me, but venting to me now venting to you that what's happening is really extortion. The TNC is leveraging their power over fishermen with this quota. (Author interview, 2019).

"Corporatization" of the fishery

When I asked interviewees about investments being made in the fishery, three entities inevitably came up: The Nature Conservancy, Blue Harvest Fisheries (when in New England and sometimes even in the Pacific region), and Pacific Seafood (when in the Pacific region). Though The Nature Conservancy is an ENGO and the other two are vertically-integrated commercial fishing businesses, in some ways these organizations are operating similarly in fisheries. They each exhibit characteristics of what one fisherman describes below as the "corporatization" of the fishery (Author Interview, 2019). This interpretation is based on the fact that each of these three entities is active in acquiring the means of production in fishing communities (permits, quota, and fishing vessels), as well as playing a role in concentrating fishing access into fewer hands as well as fewer ports. Blue Harvest and Pacific Seafood also have shoreside infrastructure, including processing and marketing components, and a clear profit motive. With the shift to catch shares and quota-based, privatized fisheries management, these entities have each been able to wield more financially-backed power across fishing communities.

This key theme was probably best described by this older New England fisherman, though many put it similarly:

What's really worrying me is what I call the corporatization of the fishery. Now, I don't know if you know the background enough about this guy in New Bedford, his name was Carlos Raphael. He had acquired like 40 to 50 permits, and he basically he was stealing fish. You know, using that as a as a front I guess you'd call it. Mislabeling, you know bringing in fish that have a fairly high market value, and a fairly high lease value and relabeling them as Haddock, which has a very low lease price. So he was able to sell the fish at prevailing market prices, and then re-lease those fish at a very, very low price compared to the guy who's leasing things like cod or gray sole, which is a very high lease price, and kept buying more and more permits. He's just one example. Another example is this, what the heck is the name of it. Something around Blue Ocean Fisheries, I think is the name, Blue Harvest, which apparently is run by a hedge fund. These are just examples. They bought a fleet of boats from a guy names James Odlin in

Maine, in Portland Maine, and they bought the permits and everything. So those boats got pulled out of Portland, all of the jobs went away from Portland, the landings went away from Portland, it all went down to New Bedford. Okay, so I mean, you can do this if you have a couple of million dollars in the bank, you know, you can buy a permit for a few \$100,000, you can buy 10 to 15 to 20 permits and buy one great big boat and catch all the fish. And hire a bunch of guys to work on deck and have a processing plant and, yeah, I think that's where it's headed, absolutely. And that's why it really worries me (Author Interview, 2019).

When asked what facilitates entities such as Blue Harvest, Carlos Raphael, or TNC, this fisherman replied: "Money. Money. Money. The fact that you, anybody can buy a permit, all you have to do is be a U.S. citizen" (Author Interview, 2019).⁸⁹ This New England fisherman has worked on the water since the late 1960s and has one of the longest perspectives of those I interviewed. He describes how consolidation is facilitated by the enhanced role of capital in fisheries management today, and how it worries him because of how it shifts the power in the industry to corporate entities.

A fisherman in California described the analogous situation for the Pacific Region:

Well catch shares, one of the things that really makes me angry about all that is this – is that, it's the death to the industry because there will be no more young people ever being able to get involved in this industry. Because they basically gave this industry to two sort of people, well people or groups: one is the environmental groups, because they bought up a whole crapload of permits and quota, right, because they're trying to manage the industry by owning their quota and dictating who gets to use it for what. Especially the choke species, which is the one fish that keeps everybody shut down all the time...and then the other big group that took over a real large portion of quota were these real large corporations that own boats and markets like Pacific Seafood. So now, Pacific Seafood, nobody is allowed to own more than 2% of the quota. [But that quota limit doesn't happen in reality]. Because, just like the environmental groups, they open up a bunch of LLCs and stuff, and they throw quota here and quota there, but their little group controls it. It's just now owned by little LLCs and corporations, right? (Author Interview, 2019).

⁸⁹ Indeed, shortly after Carlos Raphael plead guilty to tax evasion, conspiracy and falsifying fish reports—which required that he permanently cease commercial fishing—Blue Harvest purchased 12 groundfish vessels and 27 permits that he had owned, as described here: Chase, C. (2020, February 20). *Blue Harvest finalizes acquisition of portion of Carlos Rafael fleet*. Retrieved on May 3, 2022 from <https://www.seafoodsource.com/news/business-finance/blue-harvest-finalizes-acquisition-of-portion-of-carlos-rafael-fleet>.

This fisherman describes the ENGOs and the corporate fishing entities together, as both being adept at navigating the professionalized world of business and making shrewd decisions to avoid caps placed on ownership.

Other fishermen focused on money as the central source of power in the fishing industry today:

That's Catch Invest. And I mean, it's a big money, it's a boondoggle, it's a, it's like a gold rush. Who's gonna end up with the with all the rights? Once you have them, then you're the landlord. You've taken the fishing out of fishing, you've taken it out. I mean, it's like it was a self-actualized life that people had on the ocean. And they had a place in society, they could make a modest to good living, money could go back to the community, they put their kids through college or whatever they could do if they did well enough, and it was sustainable like that (Author Interview, 2019).

Interestingly, this remark also supports what has been a critique of financialization in general, that financialized rents do not instigate economic growth (Brown, 2015).

When I would ask fishing community members about their "worst case scenario 10 years down the line," many pointed to corporatization and purchases of fishing rights as a fear:

Worst case scenario, the whole thing gets bought out by Amazon. [laughs] Somebody, you know, some hedge fund from Dubai. You got to make it bizarre because then you might make it as bizarre as it probably is. And literally that could happen. I again, I this, the thing in New Bedford [with Blue Harvest] really scares me [because] what does a hedge fund really know about fishing? All I know is that you could maybe get 15 percent profit out of your money, right? That's all we know. And you know, if fishing goes [down], then they'll throw that overboard and go do something else. And well what will come of these places? It is scary...it becomes basically a place of drug addicted people hanging out in back alleys, that is what's left. And tourism, it's sad. It really is (Author Interview, 2019).

Another fisherman linked the same issue to "privatization in the name of conservation":

So the other part is, who's funding these groups? [Who's] putting these programs together? I thought it was a really, really good idea to, you know, manage the ocean, privatize the resource, consolidate the fleet, what kind of language, where does that come from? That does not come from small-scale, independent, community-based fisherman. No way. There's never any fisherman who would say that that's a good idea. I mean, at least in our community, right? Where does that language come from? That language comes from corporate entities who have deep experience around commodifying things and usurping resources, exploiting populations of people to consolidate and own...Who's

funding these environmental groups who are saying, “This is what we should do.” And these guys are like, “Yeah, definitely do that. Here’s how you can do it. Let’s work together, we’re going to basically create this whole new economy around fishing and make it really difficult for anybody to access it now.” Because now you’ve taken the public resource and privatized it. Now it’s a feudal system, they’ve got Walmart like investing heavily in fisheries, you know, [not directly into fishing rights], but they might invest in an environmental group as the avenue to get to the resource. It’s privatization in the name of conservation (Author interview, 2019).

This remark highlights how fishermen also see evidence of corporatization through the ongoing collaborations between large corporate interests and environmental organizations active in fisheries. This also connects to Kelly’s concept of primitive accumulation by conservation (2011), as separating livelihoods from the means of production occurs in these examples. Later, this same fisherman continued:

[In a mocking voice] “Well, let’s consolidate, let’s privatize the resource that’ll make it easier to manage, we can manage it better. And then fewer people will have access, fewer people will have ownership over it. And that just makes it easier. Now we’re gonna have a better ecosystem.”...This is why the word stewardship is a problem, in a sense, is because one of the biggest fundamental ideas in consolidating the fleet, which is basically privatizing and all the rest of it, is that a private stakeholder will be a better steward of the resource, but what it turned [out to be is] that’s just a fallacy, like, but this is, so they use this strategy called privatize or perish (Author Interview, 2019).

Here the fisherman alludes to the longstanding scholarly argument about how best to manage a natural resource – whether through privatization or a community-based approach. The mention of the ‘privatize or perish’ mentality draws on concepts from Hardin’s *Tragedy of the Commons* (1968) and H. Scott Gordon’s economic theory that the sea must derive rents (1954), and the implication that this is a flawed approach draws on theories of community-based common pool resource management as described by scholars like Ostrom (1990), and McCay and Acheson (1987). The fisherman contends that once privatized, the corporate entities will not be better stewards than small-scale fishermen.

Other fishing community members go a step further and see corporatization and privatization elsewhere, focusing how the catch shares shift set precedent for other privatization to take place in fisheries and of the ocean in general, linking catch shares with other forms of ocean grabbing:

[T]here are some fishermen who say this is just going to set a precedent that is just going to be a way to manage the ocean, just like monuments, or marine protected areas, things like that. It sets a precedent and then all of a sudden, you

have the federal government saying there should be no human pressure on this area of the ocean. Now the government is saying, okay, everybody's gone. To me, that's an ocean grab. It's no different than privatizing, it's the same thing. It's just from the private sector, ocean grab, grabbing the resource, owning it, managing it, making it yours (Author Interview, 2019).

A good number of fishing community members were, along these lines, critical of the ownership concept in talking about the ocean as a common pool resource, with one succinctly pointing out as a flaw that the catch share paradigm of ownership induces stewardship: "They act as if Warren Buffett is exercising stewardship" (Author Interview, 2019). This fishing community member also astutely pointed out that, if the majority of fishermen are leasing, then they are not owners anyway. Thus, the implication that ownership induces stewardship is also flawed in that sense.

How will fishermen avoid leasing quota if they are competing to purchase quota with a hedge-fund backed entity like Blue Harvest? Rumors, validated after my interviews were complete, circulated that Blue Harvest was in talks with the federal government to buy up Carlos "the Godfather" Rafael's vessels and quota and keep them in New Bedford. A fisherman described this scenario as concerning, as it exemplifies an "inequitable distribution of quota from fishermen to large companies" like the "sale of permits from Carlos Rafael to Blue Harvest, which is an international hedge fund" (Author Interview, 2019). The fisherman continued by explaining how having more quota gives you more flexibility and improves the sustainability of your fishing business, and that NOAA should have found a way for distribution of Carlos's quota to smaller businesses as well (Author Interview, 2019).

The concerns over consolidation of fishing rights being held by corporate entities like Blue Harvest led one fisherman to reflect, rather sadly, that you could take the case of what's happening in New England's groundfish community and write a 'how-to' on corporatization of natural resources:

This is almost like a theft of the resource. Yeah, no, yeah. And it's a, it's a white-collar theft, in a sense, it's done through lawyers, lobbyists, and, you know, it's a long-term plan, it takes a while to achieve. But now it's happening faster, because they've, they've already figured out the streamlined pattern, the steps. Yeah, you know, it should be a Forbes article: Seven Steps to Corporatization of Natural Resources." (Author Interview, 2019).

4.7 Discussion

In 2010 the New England and Pacific groundfish management approach switched to a catch shares management approach. This was a paradigm shift. In swapping out effort control for catch control and allocating shares of fish for trade in a market-based system, this approach inherently privileges the role of capital in fishing. These "paper fish" (Brewer 2011, p. 2) benefit

those who know how to deal in markets and have contributed to what some have identified as insider-outsider governance dynamics in groundfish (Brewer 2017, p. 114). When reflecting on this change, one fisherman I interviewed remarked, “They’ve turned access into a commodity” (Author Interview, 2019). This short statement acknowledges complex changes and tensions. What does it mean for fishing access that Capital is a gatekeeper, and how are different types of fishing community actors attracted to or frustrated by this commodification? I argue that it is problematic that the current fisheries management paradigm clearly favors what fishermen describe as corporatization. My findings illustrate how, regardless of whether the values-based acquisitions of fishing rights are purely centered on conservation or also informed by a profit motive, they have clear implications for fishing communities and livelihoods. Many fishing community members express frustration with the privatizing aspect of the management approach and balk at the access and agency implications of values-based investments that occur in their communities.

Changing the Nature of Fisheries Management and Fishing Livelihoods

The expanding presence of values-based investing on each coast demonstrates the power of capital in this management paradigm. Even when well-intentioned, values-based investing can erect barriers to entry and even act as a gatekeeper for certain individuals in the fishing community. These findings show how certain well-heeled actors and entities exercise power and, in some cases, curtail individuals’ agency within the community. When the people I interview in fishing communities describe the system as “feudalistic,” “sharecropper,” “medieval,” and “very Salem Witch Trials,” or describe certain permit owners as “quota barons,” it is clear that many involved in the fishery are feeling negative impacts to their livelihoods and their individual agency. The sharecropper⁹⁰ approach is not something that individual owner-operators find ideal, but in some cases are resigned to accept.

Research in farming communities has long considered issues of power and transitions to agricultural livelihoods. Farmers will often take detours around becoming a wage laborer, such as leasing or part-time farming (Buttel, 1990), and we see that in this research. Values-based investing in the fisheries context is especially interesting because, when leasing from a community quota fund, for example, there might be stipulations on how that quota is fished. This is different from when agricultural land is leased by a farmer, as they will use whichever farming practices are their norm. When leasing quota, a fisherman might receive a more favorable price if they agree to fish in a certain way, or share data about their fishing practices. These requests might be met with varying degrees of acceptance across the spectrum of older to younger fishermen, and this research also suggests that perspectives could differ substantially on each coast. Once more fishermen from the greying fleet retire, will the younger fishermen who fill their boots be more accepting of working with values-based investing entities? Or will they find new ways to engage in the public policy process and lobby for

⁹⁰ As described in Chapter 3, the term sharecropper is used by a significant minority of interviewees to describe the power dynamic they experience under catch shares, and is not used in a racialized way.

themselves, to build autonomy and fish on their own terms, rather than those of an investor? Groundfishermen are, historically, individualistic, so this remains to be seen.

This research identifies a feeling of discontent, skepticism, and mistrust among fishermen and fishing community members on each coast for CSCs. Curiously, recent research of West Coast fishermen suggests CSCs, on the whole, are viewed in a primarily positive light (Mamula and Kosaka 2019). In the Pacific fishery, a handful of fishermen bristled at how those entities were allocated power over the community by TNC (and other ENGOs). Fishermen and other community members questioned whether CSCs actually leased quota to local fishermen, given the amount of quota the CSC has and how few fishermen remain (for example, they would speculate whether, instead, a California CSC was leasing to vessels from Oregon and Washington, since there were no local suitors). The power dynamics inherent in owners vs. lessors increased mistrust and frustration in the industry around choke species, small allocations, and the percentage of a catch that goes toward paying off buyback loans in the Pacific region.

Patterns of Neoliberalization of Natural Resources and Natural Resource Management
Values based investing is part of a broader trend granting capital an outsized role in natural resource management. As evidenced by conservation practice as primitive accumulation (Kelly, 2013), and by practices identified in this research in which ENGOs wield financial power by investing in permits, quota, and vessels, values-based investing can separate fishermen from the means of production. In this case, an entity who acquires quota may then lease them back to fishermen, whether directly through the ENGO or indirectly after divestment to a conservation-oriented CSC. The well-intentioned, deep-pocketed ENGOs and BINGOs hold substantial power over how fishermen craft and maintain their livelihoods and futures, which aligns with broader practices of enclosure and privatization currently shaping fisheries.

Other types of enclosures have also occurred in the ocean and in other natural resource-dependent communities. In the ocean, the most common example of this is through Marine Protected Areas (MPAs), which aim to shield habitat and marine life from human activities such as commercial fishing. Their implementation varies, but MPAs can shift temporally, or just limit certain, but not all, activities; on the whole, they have been heavily promoted by environmental organizations (Agardy, 2000). Further, they feature prominently in the Biden administration's 30x30 Initiative, which seeks to protect 30 percent of our lands and waters by 2030⁹¹. Another example of enclosures at sea that also feature in federal actions are the creation (or re-creation, in certain cases) of national monuments. Relevant to this study and frequently critiqued by some members of the fishing community is the Northeast Canyons and Seamounts Marine National Monument. This monument, created in 2016 by executive order in the Obama administration, undone in 2020 and later re-created in 2021 by Biden, encompasses almost

⁹¹ Included in EO 14008, the 30x30 plan is outlined in the text available online: Environmental Protection Agency. (2021, January 27). *Executive Order 14008: Tackling the Climate Crisis at Home and Abroad*. Retrieved on April 12, 2022 from <https://www.regulations.gov/document/EPA-HQ-OPPT-2021-0202-0012>.

5,000 square miles and establishes a several-year window within which commercial fishing effort must vacate⁹². Similar to enclosures in the ocean, on land there exist a range of enclosures that occur, and this trend is particularly well studied in agriculture. Land grabs of farmland have occurred in the U.S. and globally (e.g. De Schutter, 2011; Akram-Lodhi, 2012; Fairbairn, 2013; van der Ploeg, Franco, & Borrás, 2015; Chung, 2021). Further, agribusiness industry enclosed and commodified the rights to seeds (Kloppenburger, 2005), further separating farmers from the modes of production.

For many fishermen I spoke with in New England, the concern is often with the process of how a monument is created. There is not significant fishing industry presence in the Northeast Canyons and Seamount area; however, the top-down process of creating the monument by executive order heightens the power imbalance between fishermen and regulators. Such policy further divorces fishermen from power and diminishes agency; even when scientific understanding of the important role of the Northeast Canyons and Seamounts as a marine national monument exists (Auster et al. 2020), the circumvention of discussion with other stakeholders of the ocean commons—like fishermen—is part of what irks them. The development of offshore wind (and the leasing of large amounts of fishing grounds for offshore wind by the federal government), as well as the prospect of similar actions taking place through the development of offshore aquaculture.

New Forms of Accumulation

This research examines new forms of accumulation and their impacts on fishing livelihoods. We have seen how both ENGO and corporate actors can be lumped together by fishermen because of how they are perceived as adept at accumulating access to a fishery by making key, sizeable investments. Whether a temporary investment – such as the case of The Nature Conservancy in the Pacific region where they later divested—or a longer-term action—such as what Blue Harvest and TNC have executed in New England, the implications of these actions are that they may produce lasting effects.

In the case of Pacific region, divestment by The Nature Conservancy came fairly soon (less than two decades) after its investment. This was hastened by the promising and rapid rebuild of the Pacific region groundfish stocks, as well as by The Nature Conservancy's investments exceeding a cap that was placed on the amount of ownable quota by percentage that was set after gaining ownership. If a financial actor makes a values-based investment, there is cause for concern. This is because even after a later divestment or a potential shift in management that could effectively facilitate access, there may not be any fleet left to step in. Further, in the case where a fleet remains, then there may not be any shoreside infrastructure left for them to rely upon.

⁹² The history of this back and forth with the Northeast Canyons and Seamounts Marine National Monument is outlined in detail on a NOAA Habitat Conservation website: NOAA (n.d.). *Northeast Canyons and Seamounts Marine National Monument*. Retrieved on April 12, 2022 from <https://www.fisheries.noaa.gov/new-england-mid-atlantic/habitat-conservation/northeast-canyons-and-seamounts-marine-national>.

The findings of the Gloucester Fishing Community Preservation Fund being formed by the award of money from the siting of a liquid natural gas terminal on the traditional fishing grounds of many Gloucester fishermen is interesting in the context of investments being made in offshore wind, and potentially offshore aquaculture. If these harm a community's fishing ability, then there is precedence for financial compensation in response to other impacts to fishing ability, such as the siting of offshore wind energy in fishing grounds.

4.8 Conclusion

This research shows that the introduction of the catch shares system—essentially a new form of privatization of the fishery—also facilitated new forms of values-based investing by powerful corporate actors. This, in turn, drove concentration in the fishery, enclosing the resource in new ways, and heightening power dynamics surrounding access to fishing rights. The increased role of Capital under catch shares privileges the types of actors who frequently deal in other market-based systems of investment. This research shows how privatization enables values-based investing in fishing rights to enclose a resource in new ways. This new type of enclosure alters the power individual fishermen can wield over their own future livelihoods. The role of finance in fisheries, though not well studied, may increase vulnerability of fishermen (aligning with findings from Knott and Neis, 2017); here the privileging of the ownership class and a power imbalance that may be, in some ways, unavoidable when working with financial investments of this size, echoes this finance-induced vulnerability.

Future research should consider what percentage of quota in a fishery is leased versus rented, to better understand the outcomes associated with varying levels of investment. Further, the lack of transparency of ownership data, and the role that very large entities play in varying levels of ownership—as studied in farmland investments—warrants additional attention.

Chapter 5: Knowledge Contestation and Professionalization

5.1 Introduction: “Hickory shad, American shad, river herring—alewife, bluebacks—I can show them”

“You must have a trusting voice,” said one of my key informants as I walked through the door.

The implication that I was lucky to be there was correct – I was surprised when a fisherman I’d spoken with a few times gave me a call and said he’d cleared it with the sector manager that I could come to this closed-door meeting. I arrived on time, found a seat against the wall, and although about 30 years younger than most in the room, tried not to stick out much. The room was spartan – no decoration to speak of, simple chairs, and a Dunkin’ Donuts “Box O’ Joe” on the table aside a tray of Costco muffins.

With everyone settling in, a fisherman’s cell phone rang loudly—the conversation was brief—just a fisheries observer checking in to confirm an upcoming trip. He hung up and said to the group, “They call in the morning now” to grumbles of agreement.

The meeting commenced with a sharp reprimand about someone speaking publicly about a touchy subject that was voted on at an earlier meeting. Hearing this, I instinctively hunched further into my seat to avoid calling attention to myself as an outsider. A few minutes later, following roll call around the room—“Jim LaChance, graduate student researcher”—and a side conversation with the adjacent seat holder, I was feeling more at ease. I was, I reminded myself, an invited guest.

Discussion opened generally with updates on accounting fees and speculation about sector mergers, but then proceeded to the main topic: a review of the previous year’s catch and accounting numbers. I learned how they were catching over 90% of their Gulf of Maine cod allocation, what quota they had available to carry over to the next fishing year, and what the total revenue looked like. The meeting also provided me with insight on different considerations regarding dayboats versus trip boats, on ‘hooking’ (fishing with hook gear) versus ‘dragging’ (fishing with an otter trawl), and on how recreational fishing harvest overages on certain species can impact commercial quotas for the following year (“That’s bullshit!”). They even touched on the trickier topics like lawsuits, observer costs and electronic monitoring. The meeting exposed to me a general feeling, candid comments, and rich context about fishermen and industry regulation that might not necessarily come up so frankly in public council meetings. What I noticed most was a conversation the fishermen there had with two nervous scientists from the National Marine Fisheries Service (NMFS). At this point, I reflected on the presence of security guards at council meetings; here was yet another indicator of the tension between fishermen and NOAA.

Fishermen and NMFS do not get along easily; it is widely understood that fishermen tend to mistrust scientists and policymakers alike. A bumper sticker I know well from its ubiquity during my childhood in New England reads: “National Marine Fisheries Service: Destroying Fishermen and Their Communities Since 1972.” A fish house in Rockport, MA has this painted on its

exterior, with the addendum: “NMFS - Putting the CON in Conservation” (See Figure 5.1, below).



Figure 5.1 A disparaging sign on the side of a building. This is in a small harbor in Rockport, MA and captures the sentiment of some fishermen in New England.

NMFS (pronounced like the word “nymphs”) employees are, of course, generally aware of this tension and continue with their work. But this division was emphasized strongly in this interaction, and afterwards I could not shake it. Invited to come and speak about a federally funded research project that some of the sector members were participating in, these coiffed scientists in Patagonia fleeces frequently fidgeted uncomfortably and adjusted their glasses as they spoke with fishermen in t-shirts branded with the names of local marine supply shops. After the scientists explained that the first year of data had a statistical bias depending on the vessel the data came from, several of the fishermen eagerly pushed for more research to be done (“why don’t we do this for two years, isn’t two years of data better?” to which the response from NMFS was “well, NOAA [National Oceanic and Atmospheric Administration] usually only funds a one-year project”). Fishermen were steadfast in their belief that the science would be on their side if just implemented correctly.

Further, when the NMFS scientists suggested that a challenge to this work would be separating out similar species of fish that would inevitably be caught in the research, a fisherman quickly spoke up – “You’ll get some river herring after a storm and the river’s flowing, but otherwise you won’t get any. And if you do, then I can help the observer – there’s the hickory shad, American shad, river herring – alewife, bluebacks – I can show them.”

There was a lot of back and forth about the science and approach, and ultimately the meeting ended with an agreement to stick to the current research plan. However, as one fisherman noted, there was at least one statement that everyone seemed to agree upon: “God forbid we catch any cod.” Another chimed in: “If we do, it’s not coming off the sector quota.” In this chapter, I explain in detail why these comments resonated within the group.

5.2 Understanding Knowledge Contestation and Professionalization in Groundfishing Communities

The meeting I attended exemplifies the tensions that exist between the fishing industry, regulators, and any person or organization engaged in the fisheries management dialogue. Many conversations, arguments, and public meetings debate the state of the science and knowledge of the ocean that underpins management decisions. In some cases, fishermen are eager to work with regulators and scientists to find a solution to a problem. For example, the fishermen in the meeting hoped for additional years of data collection and wanted to share knowledge of how to distinguish between similar herring species. In other cases, fishermen mistrust regulators and find fisheries science suspect (as seen in the “God forbid we catch any cod” statement, which is based in years of disagreement over allowable catch levels for cod). The fishermen’s experiential knowledge of fish and of the sea does not always align with the professionalized, scientific knowledge relied upon by policymakers.

The shift to the catch shares management approach emphasized the role of professionalized science and amplified contested knowledge in fishing communities, as this approach creates inflexible catch limits that must be met, widening the gap wedged between scientists and fishermen. When there is a mismatch between professionalized science and fishermen’s experiential knowledge, the professional scientific understandings inevitably prevail through the regulations they underpin. This tension is at the core of this chapter, and there is perhaps no better species to consider than the iconic Atlantic cod of New England’s groundfish fishery. Chronic issues have plagued the management of Atlantic cod and fuel disagreements over fisheries knowledge and stock assessment validity in New England⁹³. Perhaps because of the issues with Atlantic cod, the central focus of this chapter on knowledge contestation and professionalization – a theme that is shared in part across the two regions studied here – is more drastically experienced by those I interviewed in New England.

Despite this key difference that the theme of knowledge contestation was more prevalent in New England, the main site of contestation is the same on each coast: at the respective regional

⁹³ Both fishermen and environmental organizations, though most often on different sides of the argument, identify chronic issues with management of Atlantic cod. Arguments focus on concerns about discards and misreporting, concern that catch limits do not reflect actual abundance, and high variability in catch limits in an annual basis.

fisheries management council. Overall, fisheries councils aim to combine science and public participation to manage and conserve their region's fishery resources, and the councils were created through the Magnuson Stevens Act to meet the needs and unique characteristics of each region. At any given council meeting, lawyers, lobbyists, ENGO representatives, fishing industry and their representatives, the council members themselves – and, of course, security guards to quell any protests – are all present. At these meetings, decisions are made, scientific findings are reviewed, votes are cast, and fisheries management plans and amendments are passed or rejected. This venue and the councils themselves encompass the main forum in which stakeholders argue knowledge and science to inform regulations and policy.

5.3 Guiding Questions

In this chapter, I explore how the shift to a catch shares approach amplifies existing patterns of knowledge contestation in each region's fishery, particularly in New England. How might efforts to rationalize and professionalize the management of a fishery be problematic (or beneficial), and how does this connect to the science that informs management? Do professionalized scientific approaches exclude certain ways of knowing intimately a natural resource, such as groundfish stocks? Moreover, what are some of the key tools of knowledge production that are privileged? Are there opportunities for the knowledge of professionalized science and the experiential knowledge of fishermen to complement each other, to ultimately improve stock assessments and better inform fisheries management decisions? What opportunities are there, if any, to democratize science, through co-production of knowledge generated through participatory methods in these fisheries? What opportunities exist to enhance participatory approaches, and could they build trust or simply increase tension between scientists, managers, and fishermen? These questions are especially interesting to consider in light of the decade old decision to increase monitoring to 100% in the Pacific groundfish fishery, and ongoing determinations of Amendment 23 (an amendment to the New England groundfish fishery management plan),⁹⁴ which increases monitoring rates to 100% for the New England groundfish fishery.

During the course of this research, one of the biggest points of contention at the New England council was a decision that the Pacific council made for their groundfish fishery almost 10 years prior ago—to monitor the fishery at a rate of 100%. As I explained in more detail in chapter 2, the role of monitoring is to collect data on fishing metrics such as the amount and type of fish caught, discards, bycatch, and other information to inform management and ensure accountability for regulations. In New England, there was debate about the effort to implement 100% monitoring of groundfish in Amendment 23. This topic dominated groundfish discussions at the New England Fisheries Management Council (NEFMC) for several years and emerged frequently as a theme in my research interviews. Some fishermen and fisheries professionals view comprehensive monitoring as the key to the success of the Pacific region's groundfish fishery rebuilding process, as well a means to ensure fishermen accountability. Others consider

⁹⁴ The NOAA NMFS fact sheet for Amendment 23 can be found here: NOAA Fisheries NEFSC. (2022). *Amendment 23*. Retrieved on April 23, 2022 from <https://media.fisheries.noaa.gov/2022-01/A23FactSheetFinal-NEFSC.pdf>.

such monitoring a type of excessive surveillance, the costs of which fishermen feel they are unfairly expected to shoulder.

In light of this, my research considers how increased monitoring in the New England groundfish fishery exacerbates the divide between fishermen's expert knowledge and the expert knowledge of professional science. Yet I also explore opportunities for how increased monitoring might provide a foundation for improved accountability and lead to some resolution of knowledge conflicts over what fish are really in the ocean.

To place these questions in context, my literature review will first review scholarship on rationalization and professionalization in fisheries, particularly as it relates to transitions to catch shares management approaches. I will then describe scholarship on knowledge constructs and compare understandings of scientific versus experiential knowledge as they relate to fisheries. Using this background, I will consider the continually evolving norms of surveillance in fisheries in these two regions. I will then consider key differences between the two regions before presenting findings from each fishery, situating my results in the scholarship I have examined. What are some of the implications of rationalizing and professionalizing a fleet? How might fishermen and fisheries managers overcome the challenges of such rationalization and professionalization? As I examine these questions, I compare and contrast how the New England fishery and the Pacific fishery incorporate different forms of knowledge into their management decisions. In my conclusion, I consider potential opportunities for change that I suggest can improve shortcomings of the current fisheries management processes.

5.4 Literature Review

Rationalized and Professionalized Fishing

As a management paradigm in fisheries, the impact of the catch shares management approach is itself often contested. While there have been descriptions of its potential for positive impacts to both the economy and environment (e.g. Costello et al., 2008; Melnychuk et al., 2011; Grimm et al., 2012), others have focused on its potential for creating negative social impacts (Olson, 2011; Pinkerton and Edwards, 2009; Carothers and Chambers, 2012; Foley et al., 2015). Catch shares function as a neoliberal mechanism with what Winder has termed "bio-economic rationalizations" (2018), with a central ideology being the expectation that those engaged in the management system will act in an economically rational way. Drawing on Gordon's foundational economic understanding of fisheries (1954), once fishing rights are privatized and the resource enclosed, fishermen are expected to negotiate the market-based fishing quota system in a predictable way to maximize profit. According to these theories, the rationalizing of fisheries can be viewed as having a homogenizing impact.

Notably, prior to any catch share programs being implemented in the U.S., Ostrom points to the creation of the 200-mile Exclusive Economic Zone (EEZ) as part of the "Law of the Sea Convention" in 1976 as a starting point for government thought on how best to "rationalize all aspects of fishing industry," and cites this shift as beginning to undercut local claims to fisheries (Ostrom 1990, p. 176). Others similarly describe longstanding patterns of U.S. fisheries policy focusing on these types of neoliberal privatization and marketization approaches to managing

fisheries that embody a “rationalizing” mindset (Mansfield, 2004). Here and throughout this dissertation, I rely on Mansfield’s definition, in which rationalizing is the idea that “market rationality (i.e. profit maximization) is natural,” and constitutes the foundation for predictability and sustainability in neoliberal fisheries management (Mansfield 2004, p. 314). In this approach, rationalization relies on property rights to encourage innovation and heal inefficiencies through the enclosure of the natural resource for the greater good (Mansfield 2004). However, the implications of the rationalization can be vast and extend beyond economic impacts.

If rationalization occurs in an economic market sense, then a similar “professionalization,”—or the introduction of formalized structures and trappings of standard business practices—accompanies the pattern. In other words, rationalizing a fishery can professionalize it (Aguilera et al., 2015). The Alaska halibut fishery is often described as a success story for individual fishing quota (IFQ) implementation (Hilborn et al., 2005), and unsurprisingly, professionalization of the fishery is a perceived positive impact of this transition (Carothers, 2013). In New Zealand—which as a country was an early adopter of catch shares back in 1986—research has also supported the trend that the fishing industry became more professionalized and streamlined once the individual transferable quota (ITQ)⁹⁵ system was implemented (Mace et al., 2014; Dewees, 1989). Professionalization has also been noted in other rights-based fisheries in Mexico, particularly in that it is achieved through the addition of more ENGO staff to engage in management and governance of the fishery (Espinosa-Romero et al., 2015).

However, professionalizing and rationalizing may have tradeoffs. Such efforts that occur with limited access privilege (LAP) programs like catch shares can decrease income diversification and create inequitable outcomes in fishing communities (Kasperski and Holland, 2013; Brewer, 2011). Research examining catch shares implementation in Tasmania found an influx of investors, lawyers, and other professionals who are described as “monster” stakeholders who “view the fishery through the lens of individual rights rather than collective responsibilities” (Bradshaw 2004, p. 67). Is this shift in approach a result of professionalizing, and evidence of economic rationalization? Mansfield describes rationalization as “[a term] which derives from the perceived economic rationality of private property, serves to make moves toward privatization sound obvious and intelligent, as the alternative is to remain *irrational*” (Mansfield 2004, p. 321). A fisherman who does not maximize profit is therefore seen as irrational and backwards (Mansfield, 2011).

Considerations of why and how some producers continue to persist within the current economic system without a primary goal of maximizing profit is well studied in the peasant agriculture literature. Alexander Chayanov (1966) posited that the primary motivation for peasant farming is not profits but the reproduction of one’s own livelihood, such that a peasant farm family will even “self-exploit” their labor to maintain their farming livelihood. Some contend that today’s capitalist system transformed peasants into petty commodity producers, or those who are not fully capitalist yet do engage with the capitalist system. Both of these

⁹⁵Another term for an individual fishing quota (IFQ) system.

types of farmers utilize the elasticity of their labor and other avenues of self-exploitation (e.g., accessing alternative markets, doing their own trucking) to maintain market competitiveness and do persist (Lodhi and Kay, 2012; Mann and Dickinson, 1978). In my discussion, I will draw on insights from this literature to fisheries, to ask what happens to small-scale fishermen in the face of professionalizing and rationalizing regimes.

Scientific and Experiential Knowledge

Fisheries science, which underpins fisheries management, is another dimension of the industry that has experienced professionalization. Fisheries management relies on formalized structures of scientific research and knowledge—or the type of expert knowledge that is created through scientific methods, training, complex analysis, peer-review, and publication. The incorporation of new knowledge and technologies in fisheries management processes, however, has been slow (Apostolaki et al. 2008). For example, the basic tenets of this approach to scientific knowledge (particularly regarding the concepts and methods of population dynamics and stock assessments) was originally described in detail by Beverton and Holt in 1957. Since then, though the approaches have grown increasingly complex and technical, researchers suggest that surprisingly little of the basic tenets have changed in the intervening decades (e.g. Hilborn and Liermann, 1998; Schwarz, 2005; Apostolaki et al. 2008). In fisheries as well as in other scientific fields, this type of expert knowledge is frequently in opposition to informal and experience-based ways of knowing. Such practitioner knowledge tends to rely less on method and more on the experienced, quotidian accrual of understanding and meaning gained through repetition---in this case, as a result of a natural resource-based livelihood (Fazey et al. 2006; Neis and Felt, 2000).

Globally, intensive management of marine fish stocks works to sustain and even increase fishery harvests (Hilborn et al., 2020); this management frequently relies on professionalized systems and tools of knowledge creation. The successes of these intensive management approaches are especially apparent nationally, as the Magnuson Stevens Act requires plans for rebuilding fisheries and sets clear catch limits (Hilborn et al., 2020). But the science behind fishery stock assessments is complicated and can vary by fishery and fishery management plan, relying on technical, professionalized types of knowledge met by many challenges, as is seen in the case of groundfish.⁹⁶

Analysis of complex scientific questions without relying on professionalized scientific skills exists. Movement away from a singular view of what science is, beyond the view of experts and toward community-based evidence, was decades ago described as “post-normal science” (Functowicz and Ravetz, 1992). Others have refined this idea to posit a duality of scientific versus experiential knowledge, identifying the latter as a complement to the former that, through its atypical approach, can be used to improve conservation actions (Fazey et al., 2006). Importantly, these experiential forms of knowing have been shown to be powerful in combatting “technocratic” governance common in climate change policymaking, and have enabled more just socioecological outcomes (Rice et al., 2015, p. 254). In fisheries research, in

⁹⁶ While the Pacific region’s groundfish stocks are almost entirely rebuilt almost 20 years after their disaster declaration, the New England groundfish fishery is still experiencing challenges with several key species.

particular, these approaches have been found to be useful. The sheer amount of time that fishermen spend on the water provides them a wide range of datapoints and affords fishermen a different perspective than, for example, a standardized scientific survey (Neis and Felt, 2000; Palsson, 1998). Including fishermen and other stakeholders in fisheries management and related research discussions early in the process can create a wider knowledge base (Linke et al., 2011). But how do you operationalize this wider knowledge base for conservation goals?

Part of the emphasis on experiential knowledge comes from a desire to democratize science, or to facilitate co-production of knowledge. This type of co-creation and participatory approach to knowledge can help to divert crises in natural resource dependent communities and can provide power and agency in the shared knowledge construction process (Cooke et al., 2021), creating holistic knowledge instead of relying on professionalized, reductionist science – this is described by Pimbert (2017) as a new knowledge paradigm. In contrast to un-reflexive science, or science that does not self-reflect on its process, democratized science requires participation (Carolan, 2008), or what others call coproduction (e.g., Salomon et al., 2018). In agriculture, Kloppenburg framed this distinction as “actually existing” science and an alternative science reliant on local knowledge (1991). While cautioning against romanticizing its potential, Indigenous knowledge has likewise been long identified as overlooked in part because of norms of “scientific professionalism” (Thrupp, 1989; see also Hoover, 2017; Norgaard, 2019).

The New England Context

Much of the New England groundfish harvest takes place in the Gulf of Maine and its environs, which have been heavily harvested for centuries. Prior to the 1950s, the ecosystem was primarily populated by groundfish predators (e.g., cod, haddock) and their prey (e.g., lobsters, sea urchins) (Lynham et al., 2017 p. 12). After decades of intensive exploitation by international fishing fleets and later, following creation of the U.S. exclusive economic zone (EEZ) and an equally aggressive harvest by domestic fleets, the Gulf of Maine and nearby regional waters saw groundfish populations decline, until the near and offshore cod populations collapsed in the late 1970s through 1990s (Steneck et al., 2011). At the same time, other groundfish like haddock and yellowtail flounder were also restricted due to overfishing (Fogarty and Murawski, 1998, p. 6). Today, cod are still at historically low levels, and much of the Gulf of Maine is best described as a lobster monoculture (Steneck et al., 2011), with climate change and food web dynamics persistent problems for cod (Greene and Pershing, 2007; Runge et al., 2010).

Historically, researchers and regulators have shown little interest in fishermen’s perspectives and knowledge in the New England context, describing the integration of fishermen’s knowledge into science and management as “at an embryonic stage” (Pederson and Hall-Arber 1999, p.190). However, given the disaster declaration in the New England groundfish fishery in 2012, there is renewed interest in incorporating socioecological knowledge of locally-scaled information into the regional catch share policy (Brewer, 2017). Indeed, recent research in the New England context has already attempted to incorporate fishermen’s knowledge into its methods. Ames (2005) worked with fishermen’s knowledge on improving understanding of Gulf of Maine cod and haddock spawning grounds, finding a particular use for local ecological knowledge in identifying fine-scale changes that are often overlooked by broader, systems-based fisheries assessments, and emphasizing the role this knowledge can play in restoring

commercial stocks. This work emphasizes the importance of corroborating multiple perspectives, as well as cross-referencing them with historical understandings to improve reliability and usefulness of the data, which in Ames' work involved mapping cod and haddock spawning grounds (2005). The Northeast Fisheries Science Center (NEFSC) has also participated in a cooperative research project on the Ilex squid fishery, which was motivated in part by the closure of that fishery in 1998 (Johnson, 2011). This project relied on scientists who were considered "boundary spanners" with industry and highlights the role of trust in collaborative science, as the boundary spanners who straddle policymaking and science can have their position and relationships unravel quickly (Johnson 2011). More recently, Hansell et al. (2020) have relied on fishermen's knowledge to overcome challenges associated with surveying halibut in the Northwest Atlantic, a flatfish species adept at avoiding a bottom trawl. Similar research from Oregon has shown that local ecological knowledge can enhance understandings of fishing grounds that are less frequently a part of fishery-independent bottom sampling, and that this local knowledge can provide support for ecosystem-based management goals (Sjostrom et al. 2021).

The NEFSC has long aimed to better understand the changing ecosystem and fish population dynamics in New England. NEFSC conducts a wide range of coastal and ocean scientific studies to inform management throughout the region, including the bottom trawl survey for groundfish in federal waters. Analysis of the NEFSC's bottom trawl survey method identifies multiple challenges experienced over the years, including inconsistent sampling due to lack of funding and/or increased presence of fixed fishing gear that impedes the survey; variation in the timing of spring and fall surveys; concern that the Research Vessel (R/V) Bigelow's trawl setup is not accurately surveying some highly demersal species that dive down when approached by a trawl; failure in survey protocol to consider tow direction with respect to currents (a common practice by fishermen); exclusion of areas with hard bottom or fixed fishing gear without consideration of distribution of fish near these areas; and concern that the survey samples too small an area (equal to approximately .001% of the 54,000 square kilometers of the Gulf of Maine and surrounding waters) (Grabowski et al. 2021). Given these challenges, the NEFSC has augmented its approach to better understand fish stocks. It has created a bottom longline survey that attempts to correct for some of the bias of habitat areas that are excluded from the trawl survey (such as areas where the trawl cannot tow, or where the bottom is rocky, for example), and NOAA Fisheries is evaluating including fishermen's vessels in future bottom trawl surveys conducted with the R/V Bigelow⁹⁷ (Grabowski et al. 2021).

Outside the efforts of the NEFSC, there are several efforts to examine how to improve fisheries science by incorporating fishing industry knowledge and vessels into bottom trawl research

⁹⁷ The NEFSC has also expanded industry-based research projects in lobster and Jonah crab. With the relatively new hire of their Cooperative Research Branch Chief Dr. Mercer, who before joining NEFSC worked as Executive Director of the Commercial Fisheries Research Foundation in Rhode Island (a collaborative commercial fishery research organization), several I interviewed expressed optimism that more collaborative research opportunities will be possible in the future. For more information on the lobster and Jonah crab research, see: NOAA Fisheries. (2020, October 16). NOAA Supports American Lobster and Jonah Crab Research Fleet Led by Fishermen. Retrieved on May 1, 2022 from <https://www.fisheries.noaa.gov/feature-story/noaa-supports-american-lobster-and-jonah-crab-research-fleet-led-fishermen>.

projects and surveys. For example, the Massachusetts Department of Marine Fisheries conducted industry-based trawl surveys in 2003 through 2007, and again in 2016 to develop a clearer picture of groundfish populations in state waters (Grabowski et al. 2021). Other research highlights the many underwater video monitoring methods broadly utilized in fisheries assessments for the past 60 years and suggests they can be a cost-effective method to understand important species metrics such as fish abundance and behavior (Mallet and Pelletier 2014). Researchers at the University of Massachusetts, Dartmouth School for Marine Science and Technology (SMAST) have developed specific underwater video methods for installation on the “cod end,” or the narrow end of a trawl net that capture fish on a bottom trawl (DeCelles et al. 2017; Stokesbury et al. 2017). Through these methods, researchers have been able to overcome a key challenge of survey methods – the sheer amount of time spent dragging and hauling a net; in this work, the bottom trawl can take place with the cod end of the net open, such that longer trawls (with more data points) can be completed, enhancing the quality of the findings (Stokesbury et al. 2017). Video research with an open cod end gathers useful spatial and fish aggregation data and also limits groundfish mortality associated with a survey, as the fish are not hauled to the surface (Stokesbury et al. 2017).

These collaborative methodologies outside the NEFSC hold promise for informing the NEFSC trawl survey. It is worth considering whether the expansion of this approach might corroborate industry reports of fish abundance, or whether this expansion might eventually validate current scientific knowledge.

Surveillance and Science

Over the past decade, as the catch shares approach has been implemented in these two groundfish communities, there has been an increased focus on surveillance to ensure that fishermen abide by catch limit regulations. Surveillance in fisheries includes the on-board observer program, the shore-based observer program, options for electronic monitoring (EM), as well as vessel tracking systems.

On-board and dockside fishery observers are individuals who, through NOAA, count and measure fish, landings (fish caught), bycatch (fish unintentionally caught), and similar metrics to both track the health of the resource and monitor the actions of fishermen. These efforts can cost a fisherman approximately \$700-800 per day (if an on-board observer), and approximately \$550 per day for dockside monitoring⁹⁸. In some fisheries and in certain fishing years, these costs are reimbursed to fishermen, as they are significant, and federal funds have been appropriated to support the industry in this way. Many fishermen balk at the presence of an observer on their vessel, and there is a serious problem with observer harassment by fishermen.⁹⁹

In addition to observers and fisheries monitoring, the tracking of fishing vessels in the U.S. occurs alongside these programs and exists in three primary forms. The Vessel Monitoring

⁹⁸ These numbers are approximate and come from author interviews with fishermen.

⁹⁹ See NOAA Fisheries website on this topic: NOAA Fisheries. (2019, December 11). *Keeping Fishery Observers Safe from Harassment*. Retrieved on April 26, 2022 from [https://www.fisheries.noaa.gov/feature-story/keeping-fishery-observers-safe-harassment#:~:text=%E2%80%9CObserver%20safety%20is%20a%20top,\(800\)%20853%2D1964](https://www.fisheries.noaa.gov/feature-story/keeping-fishery-observers-safe-harassment#:~:text=%E2%80%9CObserver%20safety%20is%20a%20top,(800)%20853%2D1964).

System (VMS) tracks commercial fishing vessel movements via satellite at least once every hour, a surveillance method used to aid in enforcement of regulations. The Automatic Identification System (AIS) uses a vessel transponder to track a range of vessels worldwide, including U.S. commercial fishing vessels over 65 feet in length. These two datasets have been used to study where fishing vessels are found across the globe; one study suggests that the global footprint of fishing vessel effort exceeds that of agriculture by more than four times (Kroodsmas et al., 2018). Vessel activity data can also be combined and compared to a third monitoring format, Vessel Trip Reports (VTRs), which are submitted by fishermen after a fishing trip and provide data on landings, fishing methods and locations to NOAA. As of November 10, 2021¹⁰⁰, VTRs are required to be submitted electronically.

Combined, these various methods of surveillance support enforcement activities, as evidenced in a recent US Coast Guard report “Summary of Stock Area Analysis and Investigation of Misreporting in the Northeast Multispecies Fishery” (USCG, n.d.). This report shows misreporting present in 2011-2015 in the New England groundfish fishery and finds that potentially 2.5 million pounds were incorrectly reported in that time period. Further, the report suggests that the current regulation approach is vulnerable to misreporting (USCG, n.d.). This vulnerability was infamously exploited by Carlos Rafael, a.k.a. “The Codfather,” a New Bedford fisherman who is in jail for orchestrating a mislabeling and misreporting scheme that was uncovered by an undercover IRS agent¹⁰¹.

Misreporting and mislabeling is part of what fisheries monitoring and observers exist to prevent. NOAA Fisheries already has an extensive on-board and shore-based fishery observer network, and there has been considerable research of the role of, and data collected by, fisheries observers. One frequent research question is whether the data collected by observers on a subset of fishing trips can be extrapolated to unobserved fishing trips, to provide estimates of discards, catch composition, and other key metrics. However, findings suggest that the data is not exchangeable; instead, several types of bias—including a deployment effect, where there is nonrandom distribution of observers, or an observer effect, where fishing practices change in the presence of an observer—can be introduced by observer programs such that the data is not able to be corrected (Benoit and Allard, 2009).¹⁰² Other examples of observer effect include that groundfish fishermen could fish differently or for a shorter period of time because there are costs associated with slowed fish processing and sorting as a result of observer data recording, and that in the absence of an observer there can be an economic incentive to illegally discard fish for which a fisherman does not have quota or for which the cost of quota is

¹⁰⁰ A new requirement from NOAA is the VTRs must be submitted electronically by all commercial and for-hire fisheries, with the exception of lobster, as of November 10, 2021. NOAA Fisheries. (n.d.). *Vessel Trip Reporting in the Greater Atlantic Region*. Retrieved on April 23, 2022 from <https://www.fisheries.noaa.gov/new-england-mid-atlantic/resources-fishing/vessel-trip-reporting-greater-atlantic-region>.

¹⁰¹ The Codfather’s story garnered national attention in the press and was mentioned by a significant minority of interviewees. An example of the national news coverage is here: Goldfarb, B. (2017, Mar/Apr). The Deliciously Fishy Case of the Codfather. Retrieved on April 23, 2022 from <https://www.motherjones.com/environment/2017/03/codfather-carlos-rafael-fish-fraud-catchshares/>.

¹⁰² Similar observer effects were described at the NEFMC meeting on 6/12/19 in Portland, Maine, as evidence for why council members and other fisheries managers cannot effectively extrapolate from observer data.

high (Demarest, 2019; McNamee et al., 2019; Nitschke, 2019; Leskiw, 2020). In sum, fishermen might change their behavior when an observer is present for either valid or nefarious reasons; there are many possible motivations. Interestingly, research does suggest that people behave differently when they are watched, a phenomenon known as the “Hawthorne effect” (McCambridge et al., 2014), which could support the notion of observed and unobserved trips always being significantly different.

In addition to fisheries monitoring through observer programs, there exist public and private efforts to develop electronic monitoring (EM) options for the groundfish fleet in each region. Electronic monitoring includes the installation of cameras, sensors, and GPS as an on-board technology suite to achieve similar ends as an on-board observer. Currently, in the New England groundfish fleet there are two EM options being studied through the NEFSC—the audit model, in which discards are monitored by video, and the max retention model, in which caught fish are retained and accounted for shoreside.¹⁰³ The audit model is further along in its development and has had many more vessels participate in pilot studies. However, both approaches intend to improve accountability in fisheries through achieving 100% monitoring of the catch, while limiting the need for potentially inexperienced on-board fisheries observers to join fishing excursions.¹⁰⁴ In the Pacific region, ENGOs and other research partnerships have been attempting to improve the usability and affordability of similar EM technology on the groundfish fleet.¹⁰⁵

As interest in and opportunities for deployment of EM increase, there are concerns about linking accountability with economic and broader feasibility challenges. An increase in accountability could disproportionately impact certain fishermen, such as those on different sized vessels, or those who fish at different frequency (levels of effort). Justifying the cost of installing EM could look very different for a small-vessel fishing a few dozen times a year, versus a large vessel fishing hundreds of days a year. Research after the economic disaster declaration in the New England groundfish fishery suggests there is a need to examine the relationship between accountability and adaptive learning, and cautions that neoliberal audit-based mechanisms of accountability can hamper transformative learning (Brewer 2017). This is relevant in decisions on how to proceed with surveillance and monitoring approaches in the near future, particularly as initial policy research suggests differential impacts to larger, more active fishing vessels and smaller less-active vessels, with the small-boat fleet feeling an increased cost of monitoring as a proportion of revenue (Leskiw 2020). If the costs of increased monitoring or of installing EM do not pencil out for smaller vessels, then the proposed changes could potentially further consolidate the fleet.

¹⁰³ Video of an audit model approach is available on the Gulf of Maine Research Institute’s site here: GMRI. (2015, December 31). Exploring Electronic Monitoring for New England Groundfish Fishery. Retrieved on April 23, 2022 from <https://gmri.org/stories/exploring-electronic-monitoring-new-england-groundfish-fishery/>.

¹⁰⁴ Details on each EM approach in the Northeast are available here: Fitz-Gerald, C., Rossi, N., Cronin, H., Sanderson, M. Electronic Monitoring in the Groundfish Fishery. Retrieved on April 23, 2022 from https://s3.amazonaws.com/nefmc.org/3c_GF-EM-in-the-northeast-for-AP-and-Cmte-8_6.pdf.

¹⁰⁵ Damrosch, L. and Kauer, K. (2021, September). Electronic Monitoring in the West Coast Groundfish Fishery. Retrieved on April 23, 2022 from <https://www.pcouncil.org/documents/2021/08/informational-report-2-electronic-monitoring-in-the-west-coast-groundfish-fishery-exempted-fishing-permit-report-2015-2020.pdf/>.

It is worth considering too how these approaches to increase monitoring align with understandings of “surveillance capitalism,” or what Zuboff describes as a new logic of accumulation that thrives on collecting (heretofore private) so-called big data and analyzing it to increase revenues and market control (2015). The collection of more electronic data—vessel tracking, fishing practices and landings tracking, and bycatch and discard tracking—could be used in other ways besides improving the health of the fishery. This is already the case in agriculture, with big data penetrating the rural realm, shifting focus from smart cities to smart farms (Klauser 2018). On farms, big data is expected to exert power in new ways—through data collected from a range of “smart sensors,” and made available (or not) to various suppliers, and private and government actors (Wolfert et al. 2017). Zuboff does make the case that technology is not synonymous with surveillance capitalism, equating technology instead to “the puppet” with the economic orientation being the “puppet master” (Zuboff 2019, p.11). The catch share approach—as a neoliberal, market-based entity—could essentially fill the role of a puppet master in fisheries.

Depending on how EM is deployed, it could eventually lead to a proliferation of big data on fishing practices, just like the transformation seen through technological advancements in agriculture. In agriculture, big data provides an opportunity throughout the many stages of the value chain to improve ecological and economic understandings of agricultural systems (Coble et al., 2018), and it is suggested that big data could improve sustainability through “precision agriculture” as well as through blockchain, AI, and Smart Farming (Bhat & Huang, 2021; Wolfert et al., 2017). However, challenges still exist with implementing these technological advancements in agriculture, and research particularly emphasizes the shifts in power dynamics among food system actors and the governance, security, and privacy concerns with these technologies (Wolfert et al., 2017; Klauser, 2018).

5.5 Further context for groundfish science and management

Regional Catch Share Approach

After the New England and Pacific groundfish fisheries experienced an economic disaster declaration by the Department of Commerce in the early 2000s, rebuilding efforts began. As part of this process for each coast, there have been various challenges – including contestations over allocations of fishing quota, ownership caps, and the methods of assessing fish stocks. The latter is of heightened importance under catch shares, given how this approach caps not fishing effort, but the allowable catch. If a stock assessment is incorrect in the allowable catch limit (ACL) it sets for a stock, then it could allow landings that are too large, or too small, depending on the direction of the error.

The policy of catch shares was implemented differently in these two regions. The Pacific region implemented an individual fishing quota (IFQ) system, and New England implemented a sector-based system. In each system, the fisheries management plan (FMP) establishes an ACL (also known as total allowable catch (TAC), and fishermen rely on allocations of quota derived from calculations based on ACLs that enable them to land those fish (in the New England sector system, quota is actually dealt with at the sector-level through an annual catch entitlement

(ACE), but is similarly derived from ACLs). Unlike in the days-at-sea system of the past – where regulators were able to control the fishing effort by decreasing days-at-sea in a given fishing year – under catch shares, regulators control the number of fish of a given species that can be caught (this is what is described as the shift from effort control to output control). Stock assessment science has always been important – and contested – but the implications of contestations under catch shares can be very specifically limiting for fishermen because of the hard caps that are put on ACLs.

Status of Stocks

The most recent stock assessment report continues to show promise for all groundfish stocks in the Pacific region, with no species listed as overfished or having overfishing occurring, and only one fish – yelloweye rockfish – identified as still being rebuilt (NOAA Fisheries, 2021). In the Pacific region, from an ecological standpoint it looks like the current management approach of the IFQ is likely playing a role in improving the status of fish stocks. In New England, rebuilding of fish stocks continues, and several stocks remain on the overfished and overfishing lists (see Figure 5.2 below for a snapshot of all of the non-highly migratory species of each region that are either overfished or where overfishing is occurring).

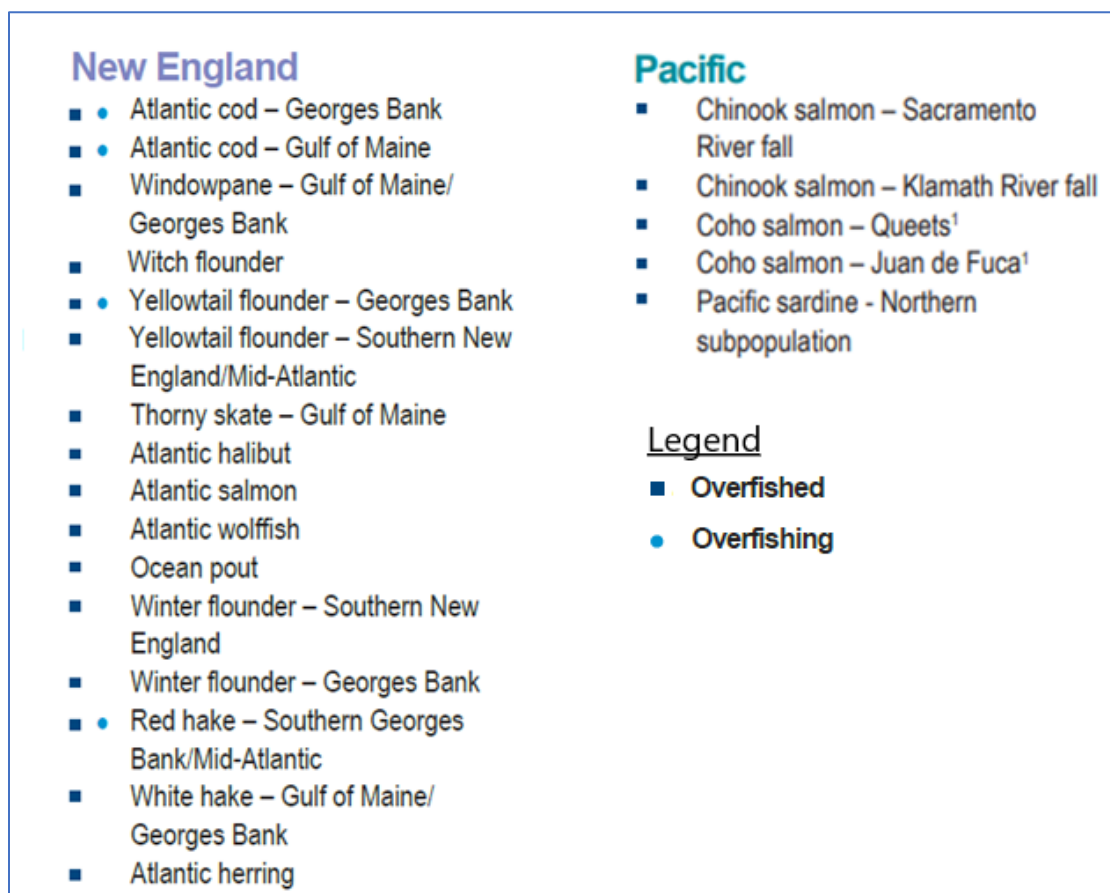


Figure 5.2 Regional overfished and overfishing of stocks. Adapted from the NOAA 2020 Status of the Stocks Report to Congress. This figure shows all of the species in New England and the Pacific regions that are Overfished (blue square) and where Overfishing (blue circle) is

occurring. Note that no groundfish are listed in the Pacific, and that while several are overfished in New England, four stocks have overfishing occurring as of the 2020 report data.

Allowable catch limits (ACLs) are a key metric in a fishery management plan (FMP). The science that underpins the setting of the ACL remains critical, as timely and accurate stock assessments are needed to allow fishermen to plan how and when they fish during the season, as well as to maintain healthy fish stocks that sustain a viable business. Changes to an ACL, particularly drastic ones, can greatly influence the economic viability of the fishing community, but in some cases could be necessary for ecological sustainability of fish stocks. Alternatively, such a drastic shift in a stock assessment over a short period of time (e.g., one year) could also reflect challenges encountered in the assessment process.

Low allocations and/or high variability in allocations significantly challenge fishermen year after year in each region studied here. In the Pacific region, when species like yelloweye rockfish were at incredibly low levels, catching even just one fish could spell disaster for a fisherman under catch shares.¹⁰⁶ This is in part why some fishermen in California joined a risk pool, in which groups of fishermen combine their very small allocations of these overfished species to accommodate accidental hauls of even one of these fish by a pool member (Kauer et al. 2018).

Similar challenges face fishermen in New England, particularly around Atlantic cod and some species of flatfish, where allocations became very low and sector fishermen loathed any significant landing of these species, reflected in the “God forbid” comment in the introduction of this chapter. New England’s most extreme example of cuts to the ACL of Gulf of Maine cod occurred from 2010 to 2017, with the limit in metric tons of cod decreased over 90% from 2011 to 2015 (see Appendix D, Figure 5A). Unlike the risk pools developed in the Pacific region (Kauer et al. 2018), in New England, these challenges are most frequently managed at the level of a fishing sector (a group of fishermen who individually hold groundfish fishing permits but coordinate based on their sector’s annual catch entitlement).

Choke Stocks

One of the most common manifestations of conflict between scientific understandings of stock assessments and on-the-water assessments arises with “choke stocks” or “choke species” (Author Interview, 2019) - because they choke off fishing for other fish. If, in the New England case, Atlantic cod were always scarce, then they would not be able to choke off fishing for other species. The challenge with a choke stock is that, if a fisherman accidentally lands cod for which he does not have quota, then he or she could have to pay a premium to acquire available quota from someone else.¹⁰⁷ Problems such as choke species can be thorny, as federal fisheries surveys, modeling, and analyses typically take a long time to be reflected in ACLs and choke stock quotas become expensive due to limited availability.

¹⁰⁶ A fisherman in California described how most fishermen in his area each had around 10 pounds of yelloweye quota so they “avoided it like the plague” (Author Interview, 2019).

¹⁰⁷ At the end of a fishing season when there is less of a supply of quota, the price will further increase. Many fishermen I interviewed described how it can often cost more to lease cod quota than they can sell the fish for at the dock (so each pound of cod landed can actually cost them money).

Recent research has focused on the mismatch between scientific projections and fishing experience on choke species. A recent New England groundfish fishery-wide social impact survey in 2018 showed that 63.6% of fishermen experience choke species impeding their ability to fish (Grabowski et al. 2021). How fishery managers on both coasts handle choke species significantly impacts the livelihoods of fishermen. Manager choices often reflect the privileging of one type of knowledge over another; professionalized science is often – although not always – valued over the local, experiential knowledge of fishermen, and this privilege rests at the root of many contestations and broader mistrust in fisheries management, underscoring the need for collaborative research efforts that could build trust between parties.

Fishery Observers and the Surveillance of Fishermen

Fisheries managers in each region have utilized monitoring as an accountability measure. A key accountability measure employed by NOAA is to place fisheries observers on the decks of fishing vessels and at the docks and ports where fish are landed. Fisheries observers collect the first-hand data on commercial fishing vessels for NOAA across the country. They help to monitor the actions of fishermen, their landings, bycatch, and discards, assess the health of fish populations, and aim to inform sustainable fisheries management. As such, observers feature prominently in the groundfish fisheries of both the Pacific region and New England. Fishermen frequently contest observers' roles and deployment across the fishery, especially in New England, where at the first New England Fishery Management Council meeting I attended in June 2019, there was a serious discussion of observer harassment. As a result, NOAA closely monitors and enforces the mistreatment of observers everywhere, but as of late, with attention paid to New England.¹⁰⁸

A key challenge with observer coverage is the cost – on each coast, fishermen quoted roughly \$700-800 per day for an on-board observer and \$550 if there is a shore-based observer. The reimbursement of observer costs does occur, but it is complicated and generally relies on appropriations from Congress related to the federal disaster declaration. Also, importantly, observer costs will not be reimbursed in perpetuity; reimbursement is a stopgap.

Pacific Region Observer Coverage

When catch shares were implemented in the Pacific region, the Pacific Fishery Management Council set the observer coverage rate at 100%, which means that all fishing trips are observed. The intention of this approach was to achieve high accountability through observer coverage on every fishing trip. Now, approximately two decades after its disaster declaration and one decade after implementation of the catch shares approach, the Pacific region groundfish fishery is both “mostly not overfished” and “not experiencing overfishing” (NOAA Fisheries, 2021); cowcod was recently rebuilt and removed from overfished designations, and only yelloweye rockfish remains designated as overfished. Popular press has reported on fishery rebuilds, as

¹⁰⁸ As of March 2022, NOAA has increased enforcement in the Northeast to curb the harassment of federal fisheries observers and at-sea monitors by vessel owners, captains, and crew: NOAA Fisheries. (2022, March 1). *NOAA to Increase Enforcement Actions to Ensure Safety of Federal Fishery Observers, Monitors*. Retrieved on April 23, 2022 from https://www.fisheries.noaa.gov/feature-story/noaa-increase-enforcement-actions-ensure-safety-federal-fishery-observers-monitors?utm_medium=email&utm_source=govdelivery.

has NOAA itself on major improvements to the groundfish fishery in fall 2019.¹⁰⁹ Since the NOAA declared groundfish disaster in the early 2000s, nine of 10 overfished stocks have been rebuilt, and the 10th, yelloweye rockfish, shows signs of recovery (See Appendix D, Figure 5B for the observer coverage rate in the fishery before and after the implementation of catch shares in the Pacific region).

New England Observer Coverage

Conversely, when a catch shares approach was implemented in New England, the observer rate was set lower (approximately 40%).¹¹⁰ Though it has fluctuated over the years, most recently it was set at approximately 40% of trips, and it exhibits significant year-to-year variability (See Appendix D, Figure 5C for the actual annual observer coverage level for New England for 2010-2016).

Given the aforementioned cost concerns with observer coverage, the coverage rate and who will bear the cost has been a focal point of discussions in New England during the time period of this research and writing (roughly 2018-2022). These NEFMC deliberations were extended by the difficulties of the COVID-19 pandemic, and Amendment 23 passed by council vote in the fall of 2020. While the exact implementation is still being determined by NOAA, in short, Amendment 23 sets the New England groundfish fleet on the path to 100% observer coverage for the next four years, with NOAA covering the cost of observers in that window or the rate dropping back down to 40% coverage.¹¹¹ In some cases, Amendment 23 also opens the door for an increased role of electronic monitoring as an alternative to on-board observation.

Three Key Regional Differences of Note

In addition to the differences between an individual fishing quota (IFQ) catch share system in the Pacific region, and a sector-based catch share system in the New England region, there are additional unique aspects to each region that fishermen and fisheries professionals frequently described. As such, these warrant attention when considering how knowledge is contested on each coast.

The first is oceanographical. In New England, groundfish fishing takes place on a large and relatively shallow continental shelf, whereas the Pacific region features a sharp drop off the coast and significant upwelling of deeper water. These differences impact when and how fish species aggregate and how frequently they may be found in aggregations with other species. This, in turn, impacts how fishermen may avoid a choke species; certain choke species appear to be more avoidable on the West Coast because of their small habitat areas, while on the East Coast, certain choke species can be broadly distributed among other fish populations.

¹⁰⁹ NOAA Fisheries. (2019, October 10). *Reeling to Rebuilding: Success for West Coast Groundfish Fisheries*. Retrieved on April 23, 2022 from <https://www.fisheries.noaa.gov/video/reeling-rebuilding-success-west-coast-groundfish-fisheries>.

¹¹⁰ Again, as observer costs are significant, there has historically been a hesitance to institute higher rates of observed fishing trips.

¹¹¹ The NOAA NMFS fact sheet for Amendment 23 can be found here: NOAA Fisheries NEFSC. (2022). *Amendment 23*. Retrieved on April 23, 2022 from <https://media.fisheries.noaa.gov/2022-01/A23FactSheetFinal-NEFSC.pdf>.

Another key difference is historical. The fishing industry in the Pacific region is younger than the New England fishery, and the fishing culture of New England has been embedded in its heritage for a longer period. The oldest commercial port in the country is Gloucester, Massachusetts, where fishing has been a key economic driver since 1623. The fishing ports in the Pacific region are significantly younger, and fishing community members frequently noted this (for example, Astoria, Oregon, a key fishing port today, was founded in 1811. Commercial fishing did not increase in prevalence there until the late 19th century).

Finally, federal authorities at the respective regional science centers use different methods to assess groundfish stocks. Fisheries stock assessment methods are detailed and complex, and there are accordingly many differences between the processes for each region; however, the main difference that was frequently cited by fishermen and fishing community members was that in the Pacific region, regulators contract with industry vessels to conduct trawl surveys (Keller et al. 2017), while in New England, NOAA scientists assess stocks from the deck of the R/V Henry Bigelow, a scientific research vessel engaged in a wide range of NOAA research.¹¹² The contracting with industry vessels in the Pacific region builds trust between fishermen and NOAA stock assessment scientists.

5.6 Findings

Knowledge contestation and professionalization in the groundfish fisheries of New England and the Pacific region presented itself somewhat differently by region. However, several key themes from these regions emerged in my research. I will present each finding in turn, with first a description of how efforts to professionalize fishermen are problematic in that it can increase tensions and cultural divides. Fishermen from each region expressed feeling that they are perceived as backwards. This backwardness finding is relevant too in how their experiential knowledge is viewed and also ties in to efforts to increase surveillance in fisheries. Building on the perceived backwardness finding, I explain how scientific approaches of stock assessments are increasingly complex and do not adequately integrate diverse ways of knowing, like the experiential knowledge of fishermen. Further, I show how fishermen hold experiential knowledge of significance and illustrate that they even conduct some of their own research, and sometimes bridge the gap by participating in scientific research efforts. From this base, I illustrate opportunities for strengthening collaborations between fishermen and scientists, and suggest that there are opportunities to democratize fisheries science.

The findings I will present in this section include:

- Fishermen from each region express feeling perceived as “backward” or uneducated. This description often arose within discussion of professionalization permeating the fishery, which some credit to the catch shares approach.
- Key informants and fishermen on each coast recognize the differences between the stock assessment approaches in the Pacific region and New England, and many identify longstanding challenges within trawl survey science conducted by the NEFSC.

¹¹² NOAA Ocean Exploration. (n.d.). *NOAA Ship Henry B. Bigelow*. Retrieved on April 23, 2022 from <https://oceanexplorer.noaa.gov/technology/vessels/bigelow/bigelow.html>.

- New England fishermen express conflicted feelings on a key amendment to the NE fishery management plan (Amendment 23), which aims to improve accountability by increasing monitoring, as well as on monitoring, itself. Electronic monitoring may dramatically cut monitoring costs for fishermen, but some express concern about privacy and/or the logistics of deploying this technology on certain types of vessels.
- Fishermen hold significant experiential, local ecological knowledge that stands apart from scientific knowledge, and some fishermen conduct their own research.
- Multiple interviewees in New England describe a mismatch of scientific versus experiential knowledge and share the perception that federal stock assessment functions poorly and could improve.
- In interviews and participant observation, fishermen repeatedly expressed and illustrated an interest in fisheries science, indicating opportunities for collaborative, empirical work to pull fishermen into research, combine expert and experiential knowledge, and improve management assessments and practice.

Professionalizing Backward Fishermen

In my interviews in both the Pacific and New England fisheries, a common theme emerged, particularly with fishermen. As we turned to discussions of how managers and fishermen interact, fishermen would start to describe a similar perception. I would frequently hear the word “backwards” used to describe how fishermen feel they are perceived by managers, or other descriptors like “underclass,” “uneducated,” “toothless,” and even “the unwashed and uneducated masses” (Author Interviews, 2019). Early in one interview, a non-profit leader described the recent changes she has seen in the fishery in New England as akin to the playbook deployed in agriculture in the middle of the 20th century:

The argument that we need – that was sort of the argument 50 years ago, at the start of the Green Revolution, essentially, right – we need to get rid of, we have too many farms operating too inefficiently. We need to professionalize the farming sector in order to feed the world. Uneducated...It’s the same thing I was told when I started working on fisheries issues. We have too many boats, working inefficiently (Author Interview, 2019)

Researchers associate the act of professionalizing a fishery through consolidation and improved efficiency with the catch share approach (e.g. Aguilera et al. 2015; Carothers 2013). My findings suggest that both fishermen and the fishing community share this perception of the linkage of professionalization with the catch share approach. Some people I interviewed saw professionalization as a blessing – an opportunity to move beyond the ‘backwards’ public image they feel they have:

Sort of forcing people to be more professional...is a good thing...I think that you're finding people [looking] at this more business minded, right...[Some] people that want this to be this wild and free, I put my boots on, I go out, and it's man versus ocean, you get all that. But this is a business or you don't do it. Or [you should] go be a rec[reational] fisherman, right. So [the] IFQ [catch share approach] helps you manage your business...gives the semblance of some

management tools, the structure. It doesn't make it, you know, it doesn't make it nuts and bolts out of a machine but at least it helps a little bit...So the more we in the industry can present to people outside the industry – I mean, yes, we swear, and yes, it's dirty and it's stinky sometimes – but this is an industry with a level of professionalism. I think the more we can teach that to your kids in class...and it doesn't help that, like every time there's a situation in the news, they find that guy with the least teeth, and the worst hair. I'm like oh for Christ's sake. But they always find that lowest [person] dragged out from under somewhere (Author Interview, 2019).

From this fish processor's perspective, the catch shares approach is described as helping to balance out the unpredictability of fishing, and professionalizes the fishery in a positive way. This processor comes from a fishing family and is hoping to capitalize on the imposed structure of catch shares to present a more polished, responsible image to the public, while also running a more profitable and predictable business as a result.

Other fishermen, particularly in the Pacific region, were aware of the professionalization that was occurring and also viewed it comparably in a positive light. For example, a fisherman out of Washington had a similar take on catch shares and its professionalization of the fleet:

[I]t's hard to generalize too much, but I'd say certainly in Alaska [catch shares] has professionalized the longline fleet. You know, in the derby days, the longline fleet was a bunch of, I mean, every cowboy on Earth was out there. And now, if you want to make a living longlining, there's a damn good living to be made. But you better have your shit together and show up on time and work hard. It's a much more professional industry. I mean, [if you're] a full share man on a union long liner, you're gonna do good, and you're gonna earn it. And you've got everybody's respect. Down here, there's a little bit more ragged edges to it. But I'd say the fleet is more professional than it was before. On the dock side...You know, the small buyers [are] fading away. And along with it, a lot of the small ports are losing infrastructure. We barely have ice in the ports. We barely have a dock crane any more. Okay? I mean yeah, it's hard to keep the lights on. But we've seen [a few] new players in the market who I'd say have disrupted and improved things (Author Interview, 2019).

Interestingly, while the Pacific region is described here as having 'ragged edges to it,' this fisherman is largely positive about catch shares, and focuses instead on the challenges of consolidation – the loss of shoreside infrastructure and working waterfronts in the small ports. The loss of shoreside infrastructure in this case could be a result of the consolidating and concentrating forces of catch shares. This fisherman has worked around this loss through a niche opportunity with direct marketing, but that is not something that is sustainable for all fishermen across the wide range of fishing practices and various business scales and arrangements.

Many fishermen and fishing community members in each region focused on how professionalization through the catch share approach meant fishermen had to learn a wide

range of new business-oriented skills. I often heard how you could not simply be a fisherman any longer, but that you also had to be competent in many additional professions. The mother of a fisherman who works for a fishing support organization described how fishing necessitates competency in many skills just because of the nature of working alone at sea. For example, on one trip a fisherman might draw on skills as a diesel or hydraulics mechanic, deliver first-aid, and think about the biology and ecology of fish and the ocean, all while running a ship and landing fish. But now, with the changes to the system, this fisherman was frustrated that fishermen had to work as lawyers and economists, too (Participant Observation, 2019).

A fisherman in New England described the increasing need for an ever-expanding repertoire of skills as evidence of a level of sophistication that was not formerly needed to commercially fish:

But what I've seen has been it sparked a cultural shift within a fishery. [The younger] guys recognize that to be a fisherman [today]...it's a more sophisticated job than running your boat catching fish and offloading the boat. That's hard enough. But especially in areas where the sector system has been embraced. You see a recognition that the fishery needs to professionalize. You need to understand what's happening on a regulatory level, you need to understand what's happening at a science level, science, we all need to understand biology better, you understand economics better...the guys who are, you know, 40s and younger...there's not many of them. But they understand, they're more comfortable with this idea (Author Interview, 2019).

It is easy to see why some fishermen resent catch shares for the learning curve and additional labor described above. However, the biggest concern across fisherman was not necessarily the additional work associated with a still relatively new catch share-based management system, but the science that underpins it. As one fisherman in a public listening session reviewing the catch share approach in New England remarked: "It's not about catch shares or foul ball shares or whatever you want to call them – it's about bad science and the ACLs" (Participant observation, 2019).

Contested Science

The buying, selling, leasing, and trading of quota – the "stock exchange" for fishing access, as one fisherman called it – relies on stock assessment science to be accurate and timely, such that ACLs reflect what fishermen are seeing on the water today (Author Interview, 2019). However, the Pacific and New England regional science centers and federal researchers conduct stock assessment science differently. In each region, many fishermen and fishing industry professionals appeared aware of this difference, and could describe in detail their opinion of the failures and successes of each.

As one ENGO representative described it, there is a stark contrast between the groundfish assessments and their outcomes on the two coasts:

I mean, one time we had an exchange a couple of years ago, where [ENGO rep's name] and [ENGO rep's name] from [The Nature Conservancy] brought out some New Englanders and we went around all the ports out here. And one of the

fishermen sat back on day three, and he was like: “I can't believe this. We don't have any fish and we're struggling. You guys have all these fish and you can't figure out how to get your heads out of your asses.” ...[And] I think like the distrust between science and fishermen in New England is a huge problem. And it sort of permeates every conversation and every management decision. The other issue is accountability (Author Interview, 2020).

This ENGO representative reduces the issue to two things: distrust and accountability. Across both coasts, the majority of fishing community members were aware of issues of distrust between fishermen and fishery managers in New England that did not carry the same intensity in the Pacific region's fishery.

Some, like this representative from a different ENGO, put this squarely on the fault of the scientists:

The science is broken in New England...[with] many review panels showing that the retrospective errors are just too strong, you know, the models are not working. So they need to get over it and dump [the models], you know, and start over...Traditionally they worked great, but now they don't. So they just have to become more self-aware. And they also have to get off this trajectory of making ever more complex models, [and] get more data to improve the sampling programs. And more accountability for the fleet could help them because you get more and better fisheries dependent data. So it's a two-fer. It's good for science. It's good for fishery accountability (Author Interview, 2019).

Above, this ENGO representative picks up on what Carolan describes as a problem with some approaches to knowledge creation – its “un-reflexivity” (Carolan 2008). The “more and better fisheries dependent data” approach this person describes is what many in the Pacific region in part credit for the fast recovery of their groundfish stocks post-disaster declaration. Pacific region stock assessment methods include leasing industry vessels and other related participation from the fleet, and were generally described as being more transparent. In New England, however, the failures of the assessments executed exclusively by scientists were a well-known and frustrating point of contention, as the above ENGO representative continued:

Anyway, look up the [World Conference on Stock Assessment Methods] held in Boston a few years ago, and, this is a gathering of all the world's best stock assessment scientists, right? Butterworth was there. All these guys from New England were there. And they're really brilliant people. And they had these fancy models. And Cadrin [a professor from UMASS Dartmouth] had this great idea. Let's test them. So they gave everybody a fake data set for which the benchmarks were known, had fake volatility built into it, and he said, do your assessment on this file and see how close you get to these benchmarks. And they all failed miserably. They all had retrospective errors, okay. The empirical methods, these data, these models, they work pretty well. So guys like Butterworth, they admitted failure and they stood up the next day and they said, “You know what? We're making these models way too complex, they're over

parameterized, we need better data, not better models” (Author Interview, 2019).

This remark illuminates how the issue with the stock assessments has been longstanding – the paper he mentions, describing this event at the World Conference on Stock Assessment Methods, is from 2013 (Deroba et al. 2013). The model-based approach is indeed suggested as becoming too complex, too technical. Many fishermen and fishing industry professionals had a similar feeling that the models were not accurate and that more empirical data points—including from industry—are needed in the stock assessment process in New England.

Many fishermen and fisheries professionals on each coast, especially in New England, were interested in incorporating the industry into the stock assessment process. One ENGO professional engaged in fisheries management compared the two coasts stock assessments further:

“[The Pacific Science Center] is completely different [than the NEFSC] and with completely different outcomes...on the West Coast, there’s a level of mistrust between fishermen and scientist, but it’s been more participatory and the transparency is higher I think. The stock assessment process on the West Coast is pretty open, you know...the fishermen are pretty sophisticated, they can do a pretty detailed critique, of every annual catch limit, and what’s the rationale, and here’s some new data did you consider this?...In New England, ... the scientists go out, get the data, analyze it, turn it into a model that nobody can understand, and then put out results that nobody can understand...and I have to say, you know, the fishermen were actually right about some stuff in the northeast. They used to be saying stuff like, well, "you're not towing where the fish are," which is easily pushed back upon, because that's not random sampling. But they were also saying, "you're using the wrong gear," which they were right. I mean, you know the gear selectivity issues...and you know, the sampling program did not adapt to changes in distribution and patchiness, so from a scientific point of view, you know, yes, you want to be rigorous and random and all that. But if, if the stock is declining in abundance, some species tend to clump more and cod is one of those species. So the average density goes down, but there are aggregations, and fishermen know where to find those. So that's why they say "the scientists don't know what they're doing, they're not going to where the patches are" (Author Interview, 2019).

Just as the specifics of how to design a sampling approach for a trawl survey are second nature for a stock assessment scientist, a fisherman is adept at knowing how to fish and with what gear. The gear selectivity issues alluded to in the passage above include how fishermen can modify their trawl nets to better capture or avoid certain species and/or sizes of fish (e.g. modifying the footrope to avoid certain flatfish species or adding openings for certain species or sizes of fish to escape based on unique behavioral characteristics). But it also highlights the need to incorporate this knowledge into the scientific stock assessment process.

To the credit of the Northeast Fisheries Science Center, there was an attempt to bring in fishermen in the early 2000s by having them onboard the R/V Bigelow while it was conducting surveys, but this collaboration was effectively a disaster. Dubbed “Trawlgate,” it was mentioned by a large number of the fishermen I interviewed in New England who described the mistakes made by fisheries scientists conducting the federal survey. In our conversations about this event, they described issues they perceived with the survey approach such as the doors—large metal plates that are towed ahead of the opening of the net to keep it open and actively catching fish—on the trawl not being even, the length of the tow not being long enough for the net to properly settle near the bottom, the direction of the tow in comparison to the running of the tide being incorrect, and more. As one fisherman said, “It takes seven minutes for a net to settle down and start fishing during a tow. With the Bigelow doing a 20-minute trawl, that means it only has 13 minutes of fishing” (Author interview, 2019). The original ‘Trawlgate’ finding even made its way into the journal *Science* (Malakoff 2002), and issues with the stock assessment science were also described at the time of the shift to a catch share approach in New England (Schrope, 2010). This well-known ‘Trawlgate’ story highlights the longstanding nature of the stock assessment challenges and contestations that fishermen described in New England, and stood in contrast to the more cooperative approach relayed during interviews in the Pacific region.

Mixed Feelings on Increased Surveillance

One interesting theme that arose from this research pertained to fisheries management and attempts to improve fisheries management science through increased surveillance efforts on the ocean. While feelings were mixed, some expressed optimism that increasing monitoring will increase accountability, and there is also hope that electronic monitoring can help to reduce costs by reducing the need for on-boat observation.

Part of the reason that increased monitoring is a complicated issue is that many fishermen already mistrust NOAA and other enforcement agencies, and feel they are already monitored carefully and their actions accounted for at sea. One fisherman in Massachusetts described the feeling of constantly being perceived as a criminal:

The guys from NOAA...watch the boats on the screen. And they know, they'll see somebody who made like an unusual amount of tows. ‘Oh man. This guy's got too much scallops I know it.’ He sits there all like stealth with his binocs like waiting for them to come in...really, the guy just...had an issue with his dredge. He doesn't have more scallops. He was having a bad day out there...And you're stealthily sitting on my dime and I'm paying your salary, to sit there and consider that guy who's got his two kids on the boat who's exhausted because he's going round the clock trips, just so he can put dinner on the table, and you think he's a criminal? That's...and we're fucking food producers. Yeah, all we're doing is trying to feed people. Yeah, but they look at us like we're criminals. It's mental (Author Interview, 2019)

Clearly, as described by this fisherman above, mistrust between fishermen and regulators grows into understandable animosity. Some fishermen complained of a lack of privacy – “Well,

why don't they put a camera in my bedroom?" one asked (Author Interview, 2019). Another compared being observed to policing: "It's like putting a state trooper on your boat to go fishing with you. He watches you every day" (Author Interview, 2019). Others described why trips with observers on board do not compare to unobserved trips with comparisons to driving. When you drive and there's a police car behind you, he explained, "you drive differently" (Author interview, 2019).

This animosity informs why certain fishermen avoid electronic monitoring, a potential replacement to on board observers. "What was happening is you're doing research projects that the fishermen don't want to do, like electronic monitoring," one explained (Author Interview, 2019). "A lot of our fisherman are not interested in electronic monitoring, they are a very distrustful group as it is towards the National Marine Fisheries Service. They do not want a monitor on their boat monitoring their every move. And it's something they're not interested in" (Author Interview, 2019).

Others have participated in pilot programs for electronic monitoring as a means of maintaining access to affordable fishing quota, as one older fisherman described: "Who's not familiar with electronic monitoring? That's one of The Nature Conservancy projects now. So if you put cameras on your boat, you're definitely in that low-cost [quota access tier of partnership with TNC], you know, participating in that research...[it was] a tough sell in the beginning...[that] wasn't a choice that [a fisherman] would have normally taken. But it was an opportunity to keep the permit in the sector" (Author Interview, 2019). The fisherman thought that he and others who had participated in electronic monitoring pilots would not necessarily have wanted to have that equipment on board, but that the need to remain economically viable and to continue to fish in their local sector outweighed their concerns about participating:

So there was a trust element there, like, you know, the folks will tell you, what folks will say is that the trip boats didn't want to do a maximize retention EM because they were comfortable with 15%. Okay, which, you know, that's part of it...So like these folks that are big proponents of [EM]. I don't know what they're smoking (Author interview, 2019).

Others were happy with EM and realized real benefits from participating in pilot programs. For example, in the Pacific region a fisherman who has been using EM described the improved safety of keeping observers off of boats:

I don't know why in the world we have regular observers on the boat. I got in an argument with a fisheries person up here when that first came up that we were going to put observers on the boat that we've been using the cameras for years, and they've been incredibly effective. And, and I said the first thing that's going to happen you guys, some kid from Iowa [will] come out here and get on the trawler and they're going to die. Because... it's a very dangerous industry, right? And he said no, that'll never happen. Two years later the Lady Cecilia goes down and with a kid from Iowa. Iowa. Exactly, exactly what I thought. We really should have stayed with cameras, [but they] said we're all criminals and they were going to catch us (Author interview, 2019)

This idea of improved safety and not wanting to be responsible for an observer's safety on deck was described by several captains on each coast. This comment also illustrates that even with EM there can be additional challenges; just like with any technology, there can be a glitch. If "the camera gets shut off," as described above, there will have to be a pre-determined enforcement protocol in place.

Fishermen's experiential knowledge and research

Fishermen typically approached their interest in conducting their own fisheries science in two ways. Some worked with academic researchers and scientists. Others simply did their own research. Both approaches demonstrate a commitment to knowledge and an interest in the work of science, despite the perceived and actual animosity between fishermen and scientists.

Some fishermen described being familiar with working with academic and state-funded researchers to improve trawl survey science, with several mentioning the success of a similar collaboration at improving scientific assessments of the scallop industry:

What you usually need to do as a fisherman is you need some sort of academic partner. [One] really good academic partner was the school for marine science and technology – SMAST [at] UMASS Dartmouth...That was the salvation, I would argue of the scallop fishery. They went out with a drop camera using basically in the beginning the scallopers own money and took pictures of scallops, which they contended that the federal government was missing with its survey. And they prevailed in their argument. Plus, they got lucky. There was a huge crop of scallops that came along. And they're now the second most valuable fishery in the country...We did a lot of a lot of different projects over the years [with drop cameras]...I got my start as a matter of fact with the Mass[achusetts] Division of Marine Fisheries taking a skin divers camera and zip tying it to the net to see what was going on. Because nobody really knew what was going on...Now you get these little video things as big as your watch and you just put them on the net. GoPro (Author Interview, 2019).

Other fishermen described working with state-funded scientists to improve the selectivity of their gear through conservation engineering programs (to avoid catching certain fish, while targeting others), and others still were familiar with collaborative research efforts, but described how they do not have insurance for their boat so could not have the researchers on board (Participant Observation, 2019).

In addition to partnering with researchers, some fishermen created their own research projects. One fisherman allowed me to take photos of the investigative tools he created using GoPro cameras and a welded camera mount that rides in the water in front of his trawl and records the net while fishing. These tools are seen below in Figures 5.3 through 5.5.



Figure 5.3 A fisherman's research equipment. This was welded together and made for mounting a Go Pro in front and above his trawl so that he could get a better perspective on what is happening in his net when he fishes.

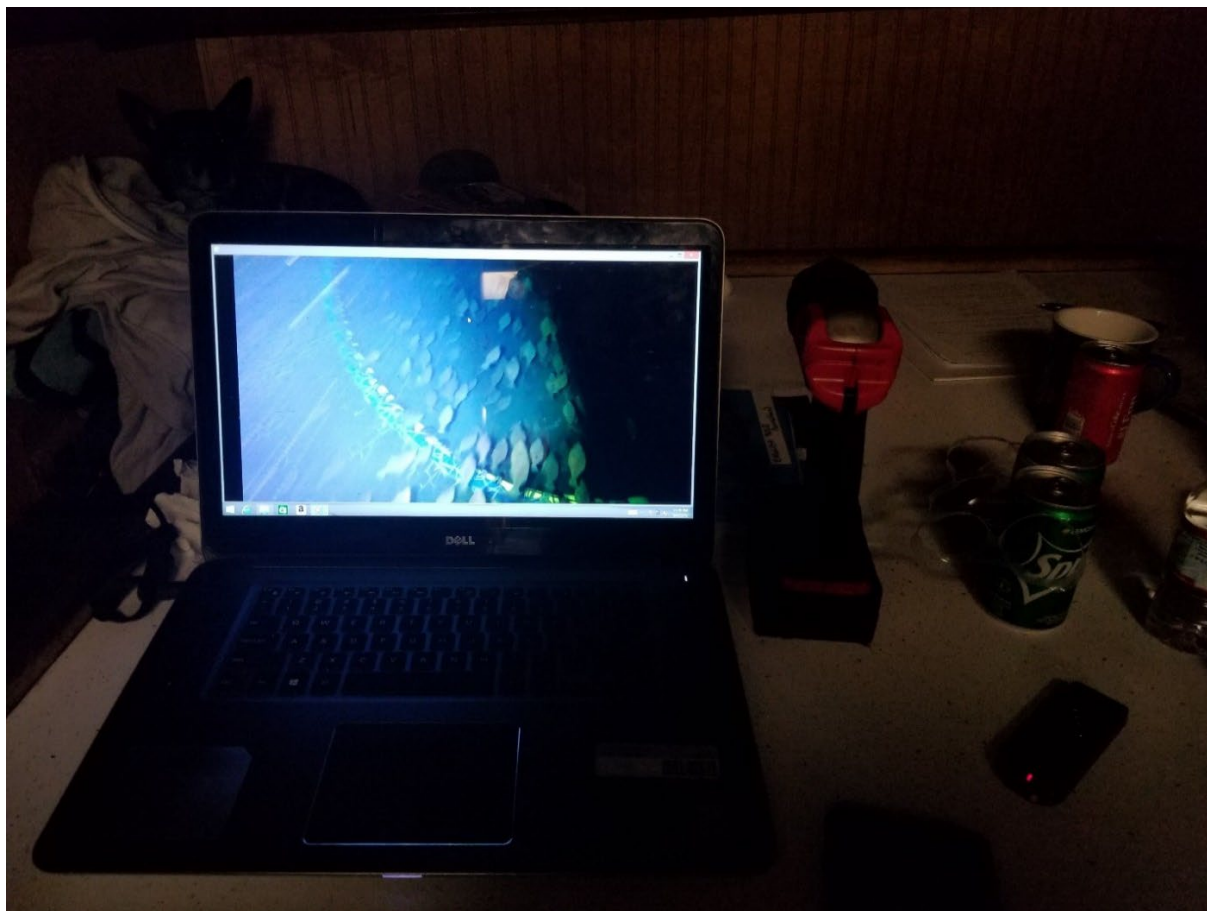


Figure 5.4 Playback of video from a recent trawl. This video shows flatfish interacting with a change the fisherman made to the footrope on his trawl net.



Figure 5.5 Fisherman showing me the modification to the footrope. We are standing at the stern of the vessel.

Other fishermen did similar, non-video related research of their own, with one fisherman describing how he decided to investigate what age the fish he caught might be so that he could better understand how climate change was impacting what he was catching:

What they are doing based on other research I've done is as the waters warm, cod are not a warm water fish. It's why you don't have cod in Florida. So, as the waters warm, they grow quicker. So they reach sexual maturity faster. They, they grow quicker so they appear to be older than they really are so a fish we used to, I could eyeball a cod and I'd go, that's a seven-year old fish, but when you took the otoliths out and aged them it was actually a five-year old fish. And they don't live as long (Author interview, 2019).

Here the fisherman, curious about how cod he catches might be changing over the years, cut out the otoliths—a bone in the ear commonly used by scientists to age a fish—to discover for himself how his ability to ‘eyeball’ the age of a cod needs to adapt to the impact warming waters are having on the growth rates of cold-water fish like cod. Whether or not the fisherman’s scientific theory of the impacts of climate change aligns with professional climate science, this action illustrates his engagement with scientific inquiry and his ability to attempt to solve cutting edge scientific research questions. This interest and action could be amplified and better incorporated into collaborative scientific efforts in the fishery. Another fisherman in the Pacific region described tracking water temperatures on the ocean floor with sensors on his nets, and how he developed modifications for his gear to adapt to a novel abundance of tunicates—a small marine invertebrate—that showed up on his fishing grounds and started clogging up his shrimping gear (Author Interview, 2019).

Both of these tactics could just as easily be components of a collaborative conservation engineering scientific effort between fishermen and scientists. Modifying gear to avoid a novel pest is the type of troubleshooting that, while not overly complex, is akin to the types of applied research projects conducted by University-based cooperative extension programs in agriculture.

Together, these findings suggest that fishermen in their own way exhibit sustained and collective inquiry akin to scientific methods that inform expert scientific knowledge. That they are already asking questions and posing hypotheses of their own—whether or not their findings are correct in every case—they illustrate the opportunity to connect with professionalized science in their respective region. A significant minority of the fishermen I interviewed described conducting their own experiments and learning from trial-and-error, an approach akin to the scientific process that could provide additional perspective and complement efforts of expert knowledge in fisheries science.

Mismatch of Scientific versus Experiential Knowledge

Throughout my research I heard many different interpretations and ways of constructing and classifying knowledge systems – as one interviewee put it, you have “the -ologists” and the “empiricists” (Author Interview, 2019). This binary framing nicely captures the context of perspectives and understandings in fisheries management, and many of the people I interviewed, including both fishermen and other fisheries professionals, frequently described

specific examples illustrating this knowledge contestation. Table 5.6 below shows some of the ways scientists and fishermen described their sources of knowledge and examples of what they rely upon for operationalizing knowledge.

Table 5.6 Examples of Scientific and Experiential Knowledge

Scientific knowledge	Experiential knowledge
Stock assessment models	Hauling the net many times
Equations used to estimate fish abundance	Mounting GoPro cameras to nets
Retrospective patterns	Seeing novel species in an area
Uncertainty buffers	Warming water
Novel eDNA stock assessment methods	Species spawning at night
Novel acoustic recording assessments	Predicting seasonal fish migration patterns
R/V Bigelow trawl survey methods	Fish moving up (north) and out (east) in New England because of climate change
Randomized sampling approaches and similar experimental design descriptors	Cod aggregations are not being recognized
Textbook species identification practices	Logbooks and charts with decades of fishing notes and locations
Processes of peer review	Inherited family fishing knowledge
	How a trawl net functions underwater
	How to fish during certain tides
	Local species identification practices
	"There are going to be years a spawn sticks, and years a Nor'easter wipes out the whole thing"

The mismatch between scientific and experiential knowledge most often arose with respect to "choke species" problems, and more frequently in New England than in the Pacific region. At times fishermen and other community members could make light of the issue: "Some stocks are not being fished effectively because of choke stocks," said one fisherman, "the haddock are dying of old age," a joke perhaps softening a key source of frustration (Author Interview, 2019). Many fishermen suggested that what they saw on the water does not align with what the NEFSC finds when they conduct the surveys that underpin allowable catch limits.

An ENGO representative highly engaged in fisheries management in both regions concisely laid out the problem with choke stocks and the stock assessment in New England:

The [stock] assessments aren't that good because we're feeding [the models] garbage. And if we want our businesses to be able to not get choked out, we need to feed them better information. You know [when] I talk with fishermen [about], everybody talks about sort of choke stocks, you know, and I always try and say [it's] important to recognize [that], what a choke stock really is, is a mismatch between science and the ocean. No fish is just no fish. You know, like, wolf fish is like, nobody catches them, there aren't that many of them, but it's

not a choke stock. There's just none of them. [So] a choke is really when you have that mismatch...I mean, there's exceptions to the rule, but in general, that's the issue....Okay, if this is a problem, that we're feeding shitty data into the assessment. What about that? (Author Interview, 2019).

The ideas of putting 'shitty data into the assessment and that 'we're feeding [the models] garbage' emphasizes, from the point of an ENGO representative, just how misaligned some of the scientific data collection efforts are. This representative's perspective aligns with the earlier quote from an interviewee in the Pacific region who highlights a need for more empirical data, and this again provides evidence of opportunities to increase collaboration and involvement of fishery dependent data.

Fishermen I interviewed were often less kind in their assessments of the scientists themselves:

I mean, the old adage is you can't catch what isn't there, you know...we bend over backwards and jump through hoops to avoid cod. We don't know how the government manages not to catch any cod because they appear to be the only people on the planet that can't catch 'em....they don't catch anything. It's astounding. Because there's cod everywhere there has ever been cod. You know, and the places that don't have cod didn't have cod when they claimed there were cod. You know, they're not randomly distributed, they're patchily distributed. They always have been...[a] former regional administrator, a man I thoroughly disliked [said] - "Well, you're just seeing the last huddled masses." When I can talk to boats from, you know, pretty much fish in any place that cod had ever existed on the same day and they all saw cod, so where's the last huddled masses? They're on Middle Bank, they're on Jeffrey's [Ledge], they're in Ipswich Bay, they're on Platts [Bank], Tillies [Bank], Cashes [Ledge], Fipennies [Ledge], Famous Swell, Northern Edge of Georges. You know...are there as many cod as there were in other times? No, I'm not saying we don't have a cod problem. What I am saying is that they're not at 2 percent of their biomass, right, not even close (Author Interview, 2019).

Although not taking responsibility for the low numbers of cod, this fisherman makes the very important point that the cod that he and his fellow fishermen are seeing—that are choking their fishing effort—are not the 'last huddled masses'; he and others are seeing cod aggregating in all the places they have historically targeted them. He, like others, contends that the cod biomass measurement as derived from the survey is inaccurate.

Additionally, another fisherman reminded me how crucial a role choke species play in fisheries business plans. The ability for fishermen to remain viable in the catch share system is threatened by the losses incurred through high prices of the choke stock quota. Some fishermen also implicate the cutbacks to ACLs in the ever-increasing reliance of the U.S. on imported seafood:

There's nothing that stops the sector system from becoming a valid business system and for fishing businesses to be able to make money at it. The only thing

it needs - there's two factors that hold it up. Number one: the choke species - codfish, grey sole, and American plaice. Those species - they keep cutting back the quotas and they become scarcer on the market. As they become scarcer, the lease price goes up. The other thing that comes into play in this if you look at us... the prices are lousy. And they have been lousy since they instituted this fucking system. The reason why that is, is because leading up to this our New England fishery has always been a fresh fish fishery. Most of the fish never left New England and went to every restaurant and small fish market. They cut us back on our days-at-sea, they cut us back, cuts us back, cut us back—we could no longer feed the demand of the marketplace. And when that happened, [the seafood buyers] went elsewhere. They went to Iceland, they went to Sweden, Norway (Author Interview, 2019).

Many fishermen on each coast, though more frequently in New England, described this same problem with choke stocks—that they would lose money on landings of the choke stock (that they have difficulty avoiding) while attempting to catch another fish. This older New England fisherman connects the ACL cuts and choke species problem to the loss of local and regional markets and the upswing in imports. Surprisingly, several other fishermen I interviewed in New England also had positive things to say about the quality of the Icelandic cod and haddock that they saw in the market, while nevertheless being frustrated that they could not compete with either on price given the expense of cod quota.

Some fishermen attribute the problems with quota prices and the ACL cuts to difficulties they experience with not just the NEFSC stock assessment, but also more broadly with the council process. As one fisherman put it, “The council, [it consists of] good people, intelligent, but they don’t know shit about the ocean...they’re all number crunchers. We need real people, real fishermen, involved in the council” (Author Interview, 2019). Or as another fisherman succinctly put it, “some of these scientists think a math problem is how the world works, and that's not how the world works” (Author Interview, 2019).

Alongside criticism of the technical stock assessment process,¹¹³ interviewees also consistently shared criticism of scientists’ perspective of fishermen’s knowledge:

I think there’s this long-standing conflict and debate over whether the NMFS data collection and modeling efforts are anywhere near sufficient to understanding what's out there and where. And NMFS hides behind the requirement for best available science and they have these single stocks... you know and then they send out this Bigelow ship, you know, and they avoid where the lobster pots are and they do testing on grids where they're not even

¹¹³ I have mentioned on several occasions in this chapter that stock assessment processes are complex. Not to conflate quantity with complexity, but the two most recent reports on stock assessment methods and findings from the Pacific and New England total ~600 pages (PFMC, 2020; NEFMC, 2019). As such, I focus primarily on the key finding on the stock assessment process from my interviews, which is that a majority of fishermen in each region are aware that there is a more cooperative, industry-based component that is incorporated in the approach used in the Pacific region. I acknowledge there are many other differences that exist between the two stock assessment approaches.

remotely close to where the fish are, and then they under sample where the fish actually are and there has definitely, I think people agree, been movement in-shore of the stocks, and then they attribute that to that's the sign of they're about to collapse completely. But then the fishermen say well, no, that's going too far. And anyway, huge uncertainty in the stock assessments and they keep truckin' on with the same data collection methods and modeling you know, that, that spew out these numbers about stocks that fishermen don't believe in, and there's tons of under investment in...and they're unwilling to put sufficient resources into stock, number one, sufficient resources into actual serious stock assessments. And number two, they're absolutely unwilling to work with fisherman to look at any alternative perspectives...They are unwilling to accept that fishermen have any knowledge or expertise on the question of what's going on out there at all (Author Interview, 2019).

Others echo this sentiment, that science undercounts stocks and that its failure to collaborate with fishermen harms the industry and the science.

No, I mean, it's scientific data. And uh 'we're just fisherman, so we don't understand [how] the numbers work [laughs]'. And that's what they say. Yeah, pretty much.

How common is that kind of attitude towards you guys?

[That kind of attitude from the scientists], I think it's very common unless you can, you know, unless you can earn their respect, I guess. But ultimately, they'll listen to you. And then behind closed doors, this, you know it's [they disregard you]...If I go into Ipswich Bay in January, yeah, and do a whiting survey, I'm gonna close the whole fishery down because they're not there, but if I go in July, they're gonna be balls deep. So it makes a difference where you go, when you go. But this, their, their theory is that if I tow a net that's this wide. For 20 minutes, I cover one square mile of area, if I catch one codfish that means there's one codfish in every square mile of area, right? Which is bullshit...How many of those tows did you actually do in that cod footprint where the cod live, and most of the time it's none? So how are we ever going to get a real number? So they paid for a private survey to do it...And [though the scientists won't listen to what he found out], he estimated that just outside of Gloucester...there's something like two times as much codfish as they [found in the whole] Gulf of Maine. He says there's more codfish there. I think it was the University of Rhode Island [guy],...he did it, with a trawl survey with a camera in it. Open cod end, just counting the fish as they went in. It was unbelievable how much fish was going through it. It was crazy (Author Interview, 2019).

This quote illustrates again the underlying issue of mistrust that exists between fishermen and scientists, as well as the finding that fishermen feel they are perceived as backwards, as is seen here in the "we're just fishermen, so we don't understand how the numbers work," statement, followed by laughter. This sector manager again emphasizes the misalignment of expert and

experiential knowledge through his derisive “How many of those tows did you actually do in that cod footprint where the cod live?” in describing the scientific approach of the NEFSC surveys.

It is worth noting that some of those engaged in the council and science center processes in New England did share interest in engaging further with the fishermen to overcome the challenge of their mismatched perspectives. Some, including this fisheries scientist, were complimentary of their understanding of the natural resource and their ability to locate similar fish species:

[F]ishermen... I'm sure you know, they definitely have targeting abilities, but there are inherent limitations to what they can do. And so if they're principally interested in a particular species, let's say cod, they can, they know, I mean, good fishermen are good naturalists (Author Interview, 2019).

Here this fisheries scientist is acknowledging the limitations of the management approach of catch shares – that it focuses the science in a way at the level of a species, but fishermen catch multiple similar species at a time. It is difficult for the realities of management and fishing to reconcile, but a complementary approach that combines scientific and experiential knowledge could begin to improve management outcomes. In the Pacific region, fishermen are “pulled in” to the stock assessment surveys, and these findings suggest that this improves management outcomes for the region and its groundfish fishery in particular.

Pulling Fishermen into Research

Fishermen and fishing community members frequently described the stock assessment approach in the Pacific region as better and emphasized the industry component as key to building trust and improving the science. As one fisheries professional described when asked what details he knew about the difference in stock assessment approach:

[It] makes the fishermen think that ok this is more reasonably approximating the way I fish [and] it kind of pulls the fishermen in more, they're participating at least in some level, by leasing the vessel, being on the boat. Another thing is that, so. So the scientists in New England were pushing back and say[ing], “No, no, you don't understand random sampling, we've got it under control,” but then all this retrospective analysis occurred, and it turned out that they had very strong errors and bias (Author Interview, 2019).

Although scientific and experiential knowledge may at times be antagonistic, a large number of fishermen were well studied on the scientific approach of the stock assessment; some fishermen, like the one from New England below, exhibited an aptitude for review of scientific publications and described how they frequently read scientific papers to improve their understanding of the assessment process:

So [a lot of] science, or a lot of stock assessment, is based on theoretical lifespans and natural mortality rates of what's called a .2...roughly 20% of the population dies every year. And so if you start with 100 [fish, then] you'll have 80

[fish]...And the theory when you run the curve out – theoretically fish live to be 15 or so, a very small number of them, and then they become functionally gone. But if natural mortality is actually 0.4, which appears to be what it is at the moment, then the fish only live to be about 8 years old, and the biomass that the area is capable of producing drops substantially. So you'll have a smaller population...At the last cod stock assessment, they assumed the previous year's mortality of .4 based on their research, but magically, and I call it quote, "magically" divine intervention, it's going back to .2 next year, because if it was at .4 they could never justify the 60,000 ton biomass. It's impossible to get there...The math is almost incomprehensible to anybody that's not a mathematician... Okay, I read seven scientific papers today. Four of them had math in there that if I wanted to spend, you know, six weeks on each paper, and diagram out every sentence and every, you know, calculus equation, I could probably prove out the math, but I don't have that time. So basically, I just skimmed over those parts and hope that the reviewers that read it actually understood the math. Because I haven't got the time (Author Interview, 2019).

This fisherman describes how the complexity of the models is something that he thinks the scientists hide behind; their “magically divine intervention” is relied upon, in his opinion, to correct the mortality rate. Here again he shows his distrust of the scientists, calling them magicians, a familiar refrain, as I heard from another fisherman say about large changes to ACLs: ““NOAA brings in the magic wand - oh we didn't do the numbers right, here's a 400% increase over night. There must have been a decimal point out of place.” (Author Interview, 2019). Other fishermen called this “rollercoaster science” or “[a] herky-jerky thing every year,” suggesting “there’s a lack of accountability when a knee-jerk reaction is made to honky tonk science” (Author Interviews, 2019).

Despite frustrations with the scientific process and distrust of scientists’ methods and math that is “almost incomprehensible to anybody that’s not a mathematician,” it is important to acknowledge that some fishermen are conducting their own research (whether reading scientific papers or installing cameras on their nets), and that this is evidence of an opportunity to combine expert and experiential knowledge constructs.

5.7 Discussion

This research suggests that problems of management in New England endure. As one New England fisherman succinctly said, “If this was a disaster in 2012, we have a tsunami now. I’d go back to 2012 in a second” (Author Interview, 2019). In the decade since the disaster declaration, the viability of groundfishing remains challenging for many fishermen in New England. The findings of this chapter show that fisheries management and science in the New England groundfish fishery have opportunities to improve and rise to the developing challenge of groundfish populations and industry need.

Scientific knowledge is an important management tool, but it can privilege certain ways of knowing and certain actors, while discounting others. Though fishermen in this study recognize

that they are often perceived to be backwards, this research suggests they are often interested, engaged individuals who rely on personally gathered knowledge. The shift to catch share approaches as emphasized under the Magnuson Stevens Act in 2006 amplified the importance of timely and accurate stock assessment science. While this chapter frames knowledge in a binary contest of scientific versus experiential information, the reality is that fishery knowledge spans a gradient. Fishermen take actions and engage thought processes akin to scientific knowledge that could well complement typical scientific approaches.

Given the engagement of fishermen both with academic and state scientists, as well as with their own research projects, opportunities to foster more collaborative research in the future abound. Such collaborative research approaches flourish in other fields and warrant consideration in groundfish fisheries.

Certain agricultural researchers emphasize synergistically combining farmers' "deep and narrow" knowledge with the "broad and shallow" knowledge of scientists (Vandermeer and Perfecto, 2013). Some fisheries researchers and managers around the world have embodied this synergistic approach by successfully incorporating traditional ecological knowledge (TEK) and local ecological knowledge (LEK) into both research and regulatory decisions. Recently, Berkes has described this complementation of Indigenous and rural peoples' knowledge to scientific knowledge as "sacred ecology" (Berkes, 2017).

Researchers in the United Kingdom complement their scientific understanding of essential fish habitat by integrating fishermen's knowledge of key fishing grounds and habitats with their own data from groundfish surveys. Through this work, they found new areas of essential fish habitat and recognized fishermen's knowledge as "invaluable" in supplementing datasets and making new scientific connections between certain species and habitats, including establishing a connection between haddock and brittle star beds (Bergmann et al. 2004). Other researchers have found similar use in integrating local and scientific knowledge in fisheries assessments (Mackinson, 2001), with research out of Australia's trawl fishery identifying the need for scientists and fishermen to collaborate more frequently, and to include qualitative data (Baelde, 2001). Research from the Northwest Mediterranean in the deep-water Norway lobster fishery similarly has shown how environmental data from fishermen can be incorporated into assessment and management of fishery stocks (Maynou and Sarda, 2001). Part of what this research emphasized was that fishermen haul back their nets more frequently than a scientist could ever sample, and that this volume of observations – of how and when they catch fish, under what conditions, and what species come up in their nets – could usefully augment scientific understanding of fisheries (Maynou and Sarda, 2001). These studies suggest a conversion of knowledge similar to TEK and LEK, knowledge gained not only through decades of fishing, but also through decades of observations that have been passed down generationally (Freire and Garcia-Allut, 1999).

A shift toward a collaborative approach could also improve trust, and facilitate further inroads for electronic monitoring in the fleet. It may produce ancillary benefits, as well, such as increases to the ACLs (and ACEs in the sector system) because 100% monitoring provides opportunity for the large buffers built into stock assessment models—or the difference between a catch limit if there were perfect data versus real data—to go away. The uncertainty

that is built into ACLs could potentially be added back into catch limits and help to offset the costs of EM and human observers through increased landings.

Incorporating fishermen into research also enhances food sovereignty—the rights of a people, in this case, over their seafood system—by improving agency for fishermen and giving them a say in how they fish. It could also begin to repair fractured trust between fishermen and regulators. In some cases, fishermen likely fish too much. But with multiple fishermen describing how they feel like they’re thought of as backwards or as criminals, it should be acknowledged more directly that this perceived characterization is inaccurate, and regulators may wish to promote a more accurate and just characterization of fishermen.

In similarly managed fisheries, such as the Atlantic scallop fishery, the industry has done well enough to fund research set-asides—or a percentage of the allowable catch is set aside and awarded through a grant process, where a fisherman is allowed to harvest the set-aside scallops to pay for the research and better support a sustainable industry. While this is not likely possible today in the struggling groundfish community, set-asides may become possible if trust between regulators, scientists and fishermen can be rebuilt and harvests improved.

Finally, the comparative approach of this study highlights several important differences and similarities between the regions. One key difference was the way that choke stocks were described in each region. In New England, fishermen and other fisheries professionals frequently focused on choke stocks and the mismatch between what they are seeing on the water versus what the stock assessment reports; in the Pacific, mentions of choke stocks were less frequent (though still present), and many fishermen described that they could generally avoid those species. Another difference that was mentioned several times was the length of tenure of commercial fishing pressure in the two regions, which differs on the order of over two hundred years. This substantial fishing history in New England likely is part of the foundation of deep-rooted beliefs by fishermen and scientists alike, and could potentially make efforts to change approaches to knowledge and understanding more difficult. An interesting similarity between the two regions—which could provide a key lesson moving forward—is that in each region the industry-based approach of the Pacific region’s stock assessment was well known and spoken of positively. That some fishermen in New England are especially aware of this difference is interesting in itself and speaks to how long knowledge contestation has occurred in the region; fishermen, while doing their research, have also considered how others approach the problem of knowledge contestation. Given this awareness and that the industry-based approach is favorably perceived (and especially when combined with the shared finding that fishermen in each region are eager to conduct research and that they possess their own type of experiential, local ecological knowledge), there is ample opportunity and examples of how to consider improving assessments in the New England region.

5.8 Conclusion

The implementation of catch shares in the New England groundfish fishery amplified longstanding issues with stock assessment science. As one fisherman neatly surmised: “When we went to hard [total allowable catch limits] at the last Magnuson reauthorization [of 2006],

that's what the science wasn't ready for" (Author Interview, 2019). To get the science caught up, especially in the New England context, the best available science must utilize fishermen's knowledge and "pull in" fishermen. Though not historically included in assessments, the experiential knowledge of fishermen may be made accessible in groundfish fisheries as it is in the fisheries of the United Kingdom and the Atlantic scallop trade. This may well create trust, nurture new methods for developing the best available science, and ultimately improve management. A broader, more holistic approach to all types of fisheries knowledge must be embraced.

Chapter 6: Conclusion - Groundfish futures?

6.1 Introduction

This dissertation describes three key issues facing groundfishing livelihoods and communities in both the New England and Pacific regions:

- The greying of the fleet and gentrifying waterfronts.
- The emergence of new forms of values-based investing in groundfishing communities that are creating power imbalances and diminishing the agency of some fishing community actors.
- The implementation of catch shares has heightened conflicts around scientific knowledge that informs fisheries management, with conflicts particularly acute in New England.

With these three issues in mind, what comes next for the New England and Pacific region groundfish fishermen and fishing communities?

6.2 Climate Change, Offshore Wind Energy and Aquaculture Development

While not the focus of this dissertation, fishermen and other community members in each region described several other concerns that, when articulated with the findings above, could significantly complicate fishing livelihoods moving forward: climate change, offshore wind energy, and offshore aquaculture.

Climate Change

Fishermen in both regions feel the impacts of climate change. “There hasn't been a shrimp season now for five years,” explained one New England fishermen, echoing the concerns of others, “not because of overfishing but because climate change in the Gulf of Maine. [We're] at the southern end of the range and they aren't here anymore” (Author Interview, 2019). Other fishermen in New England—especially lobstermen—were quick to tell me about how they are now finding black seabass filling their traps (as seen below in Figure 6.1). (Black seabass is a species that is managed by the Mid-Atlantic Fishery Management Council but is increasingly found in New England waters.)



Figure 6.1 Two photos of lobster traps pulled in the Gulf of Maine. These are occupied by black seabass, a species historically more common in the mid-Atlantic and managed by that region’s council.

Others described expecting more skates and rays with warmer waters, and predicted that cod would move farther north and east in search of colder temperatures (Author Interviews, 2019). Fishermen also expect lobster to shift northward and, at certain times of year, to the east (Author Interview, 2019). In the Pacific region, there were similar concerns about species shifts, as well as the fear of domoic acid—a climate change induced threat (Trainer et al. 2020; Ekstrom et al. 2020)—shutting down their Dungeness crab fishery. These issues are complicated in the Pacific region by the recent presence of the “Blob,” a mass of warm water—also known as a marine heatwave—off the West Coast. Scientists believe the Blob is likely not a result of global warming, but that it provides a preview of some of the future impacts of climate change. For example, the Blob highlighted the lack of knowledge of how marine heatwaves can impact fish stocks, and recent research suggests that marine heatwaves could double the impact of climate change on fish stocks by 2050, suggesting that additional adaptation and management efforts will be needed to navigate this challenge (Cheung & Frolicher, 2020).

For groundfish fishermen, and members of other fisheries managed by regional councils, a key implication of climate change will be what to do if the distribution patterns of certain species change. If a stock or species of fish that are managed by one region’s council start residing in another region, for example, as appears to be occurring with black seabass on the East Coast,

then management will have to adapt. As populations shift, then permits and quota may need to shift with them.

Offshore Wind Energy

Offshore wind energy development has been on the horizon for over a decade—notably in New England with the Vineyard Wind project—but has accelerated in recent years. Leases for offshore wind have been established all over the country,¹¹⁴ and calls are out for public comment in the Pacific region,¹¹⁵ and new technologies have been developed for anchored (rather than pile driven) turbines in deeper waters (like off the West Coast).¹¹⁶ Prediction of how offshore wind energy development will impact fish stocks is difficult because of the novelty, scale, and duration of the installations (particularly off of New England) (Perry & Heyman, 2020). Further, it is complicated by how ongoing climate change shifts impact fish stocks, which are subject to anthropogenic climate change, and have already experienced changes from warming waters (e.g. Henson et al., 2017) and ocean acidification (e.g. Kroeker et al. 2013). Climate change-caused habitat and species shifts have been tracked in wind energy lease areas (Torre et al., 2018). Nonetheless, offshore wind energy development is progressing quickly because of the urgent impacts of climate change.

Some fishermen I interviewed understood that the climate change impacts they were seeing in fish are directly linked to the need to shift to renewable energies – like wind – but were still concerned about what this shift might mean for their livelihoods. Many felt that they would be left in the lurch – “Again, we’re about to embark on an extremely forceful industrial event on the ocean,” one fisherman said about wind farms, before continuing: “The people responsible for that development won’t be held liable for it. It will be us” (Author Interview, 2019). Others focused on how these developments will inevitably impact how they fish, and how stock assessments are conducted: “With Vineyard Wind, they won’t be able to get the [NEFSC survey research vessel the R/V Bigelow] into turbines,” said another fisherman, who continued: “So the 40-year time series [of the NEFSC trawl survey] held so dear for so long is gone” (Author Interview, 2019). Some attempts to ameliorate this concern through outreach efforts are being made by developers, such as seen in Figure 6.2 below. This map conveys the scale of the turbine array and helps fishermen to visualize how a variety of different fishing practices could potentially interact with an array.

¹¹⁴ Bureau of Ocean Energy Management (BOEM). (n.d.) *Lease and Grant Information*. Retrieved on May 6, 2022 from <https://www.boem.gov/renewable-energy/lease-and-grant-information>.

¹¹⁵ Bureau of Ocean Energy Management (BOEM). (2021, July 28) *BOEM Advances offshore wind leasing process in California*. Retrieved on May 6, 2022 from <https://www.boem.gov/newsroom/press-releases/boem-advances-offshore-wind-leasing-process-california>.

¹¹⁶ Bureau of Ocean Energy Management (BOEM). (n.d.) *Technology Assessment*. Retrieved on May 6, 2022 from <https://www.boem.gov/renewable-energy/studies/technology-assessment>.

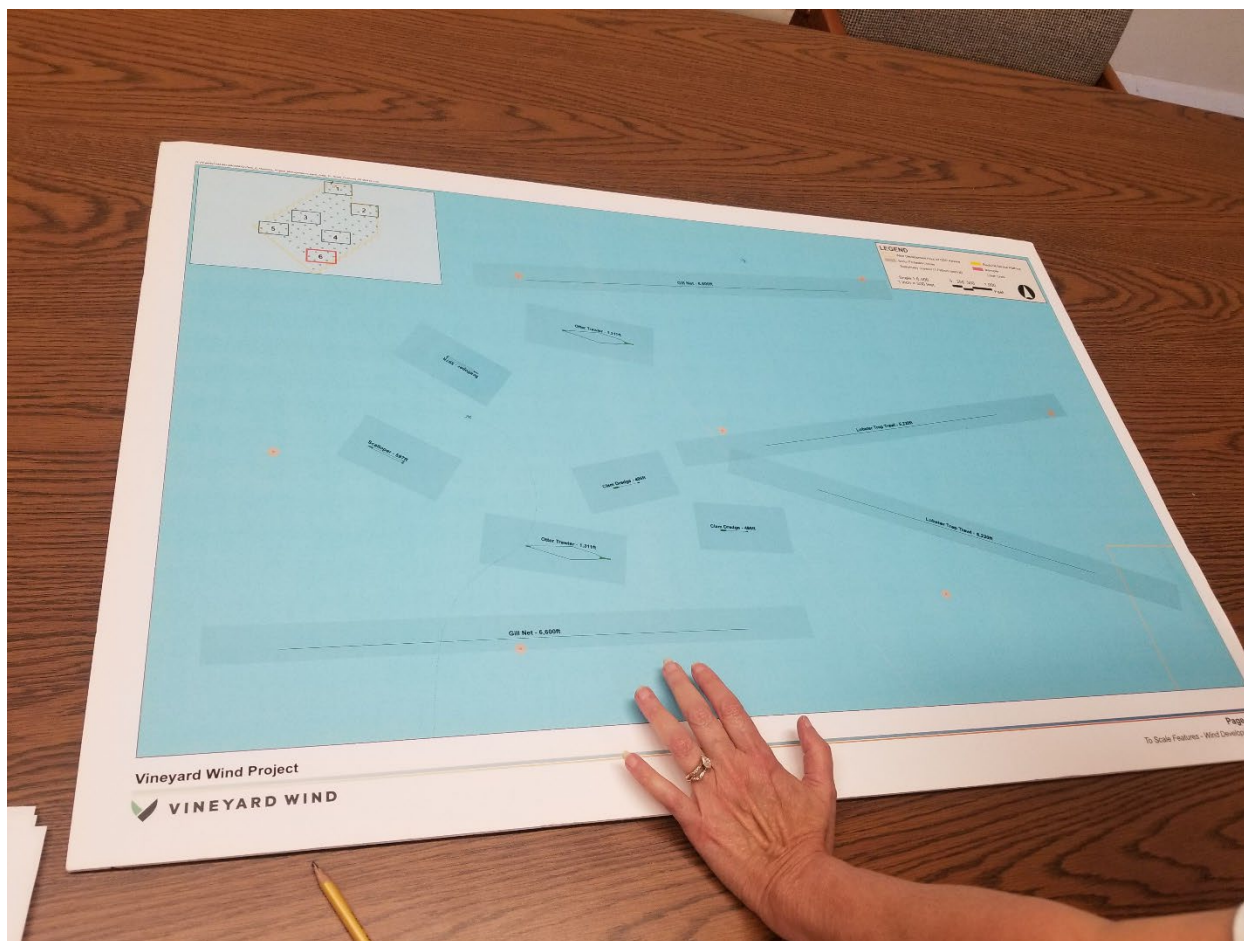


Figure 6.2 The overlap of wind energy turbines and fishing uses. The turbine array (pink dots) is shown in context of various commercial fishing activities (the transparent lines overlaying the dots) to better conceptualize what activities can and cannot take place in and around the proposed grid of turbines.

Some fishermen and other community members have questioned whether they will be able to transit an array, or also fish, and further, whether the Coast Guard can attempt a rescue within an array (Author Interviews, 2019).

Offshore Aquaculture

Offshore aquaculture has been discussed for decades, but its development has been consistently stymied by regulatory uncertainty.¹¹⁷ This has begun to change because of Executive Order (EO) 13921: Promoting American Seafood Competitiveness and Economic Growth. This EO clarifies the permitting and regulatory process for aquaculture in federal

¹¹⁷ Congressional Research Service. (2019). *U.S. Offshore Aquaculture Regulation and Development*. Retrieved on May 6, 2022 from <https://crsreports.congress.gov/product/pdf/R/R45952>.

waters.¹¹⁸ It also identifies regulatory uncertainty as a key impediment to increased competitiveness and attempts to stimulate investment in aquaculture development through the identification of aquaculture opportunity areas (areas that have been vetted for appropriateness that will, ostensibly, facilitate investment and development), given that the US has the largest exclusive economic zone in the world, but ranks 17th in aquaculture production.

According to one fisherman, offshore aquaculture, like offshore wind power, has “got this inevitability baked into it” (Author Interview, 2019). The prospect of offshore aquaculture wading into the crowded waters occupied by commercial fishing, offshore wind power, shipping vessels, and recreational users has increased.

6.3 Young Fishermen and Working Waterfronts

This research has identified greying fleets and gentrifying waterfronts on both the New England and Pacific coasts. A fisherman in Gloucester described the changes he has seen there as a huge shift. “[Now] we’re a tourist town with a fishing problem” (Author Interview, 2019), he observed. But opportunities to retain working waterfronts remain.

The Young Fishermen’s Development Act (YFDA), passed in 2020, is a step by the federal government toward addressing the need to develop more commercial fishermen,¹¹⁹ though it is far from sufficient. This act was transformed from its original focus on commercial fishing to incorporate “food from the sea”; programs that develop fishermen and aquaculture farmers may apply for YFDA competitive grant funding. Other local programs to train commercial fishermen have been successful in Alaska and have recently been created in New Hampshire. Such programs will be key to expanding this effort to bolster the fisheries and aquafarming workforce. Access to fishing rights and opportunities for viable careers could hinge on increasing agency and ownership opportunities for young fishermen, as many interviewees described, although it is possible that new entrants to commercial fishing may be amenable to the leasing arrangements of fishing rights access described in Chapters 3 and 4.

At the other end of the age spectrum, research and outreach that focuses on succession planning for commercial fishermen could provide an added boost to efforts aimed at attracting new entrants; if it is clear that retiring fishermen are thinking about who will inherit the fishery, such programming may encourage more new entrants willing to work toward ownership and captaincy.

Future research into the concerns about leasing as the primary fishing access strategy is warranted. Many fishermen and community members I interviewed would likely agree with the

¹¹⁸ Federal Register. (2020, May 7). *Executive Order 13921*. Retrieved on May 6, 2022 from <https://www.federalregister.gov/documents/2020/05/12/2020-10315/promoting-american-seafood-competitiveness-and-economic-growth>.

¹¹⁹ S.496 - 116th Congress (2019-2020): Young Fishermen's Development Act. (2020, December 3). <https://www.congress.gov/bill/116th-congress/senate-bill/496>

sentiment one New England fisherman had: “It’s gonna happen soon” he said, “there’s gonna be more fish to lease and no one to lease them” (Author Interview, 2019).

It is possible that the recent effort to develop the National Seafood Council (NSC) may help attract investment in programs for new fishing entrants. The NSC is intended to research, educate, and market U.S. seafood;¹²⁰ however, its initial efforts were stalled because of a lack of sufficient funding. A similar organization – the Seafood Nutrition Partnership (SNP) – tried to capitalize on the delay, but its initial report was met with criticism for dropping its focus on domestic seafood and instead focusing on increasing seafood consumption. Critics suggest the goals of SNP’s funders, many of which sit ensconced in the world of processing and selling imported fish, directly compete with the aims of those the NSC was designed to assist.¹²¹

Finally, newly attracted entrants to commercial fishing will need working waterfronts to rely upon. The zoning of working waterfronts must invite access for current and new fishermen. While some fishing communities I visited in this research indicated that they have allowed for zoning changes, others retain local variations on commercial fishing zoning. Research and funding to assist with revitalizing small ports may sustain a diversity of commercial fisheries, and support stronger community resilience than a shift toward tourism-based economies.

6.4 Democratizing Science by Acknowledging Diverse Ways of Knowing

Historically, there has been little interest in seeking out the perspectives and knowledge of fishermen, particularly in the New England context (Hall-Arber 1999). Democratizing science (where everyone can participate in the knowledge-building process) and acknowledging diverse ways of knowing would demonstrate respect for the fishing community and improve fishery relationships between fishermen and regulators.

In my research, I frequently heard phrases like “I’ve fished all my life, 60 years fishing. What’s wrong is they don’t use knowledge of fishermen” (Author Interview, 2019). Fishermen show interest in solving fish population decline and offer critical, complementary knowledge that could benefit fisheries management. I suggest that there exists a significant opportunity to democratize fisheries science. The binary of expert versus practitioner would first have to be dissolved. The complementary aspects of each type of knowledge need to be emphasized and combined to improve scientific understanding. While complicated by mistrust and animosity between the two sides, this endeavor would have the added potential to build trust, improve agency, and establish two-way accountability. Democratizing fisheries science has the potential to mend deep divides, begin to counteract the chronic social disruption acutely felt in New

¹²⁰ NOAA Fisheries. (n.d.). *Federal Advisory Committee Recommends Establishing a National Seafood Council*. Retrieved on May 6, 2022 from <https://www.fisheries.noaa.gov/federal-advisory-committee-recommends-establishing-national-seafood-council>.

¹²¹ Dunn, Elizabeth. (2022, March 1). *As a National Seafood Council Takes Shape, Whose Interests Will It Serve?* Retrieved on May 6, 2022 from <https://civileats.com/2022/03/01/as-a-national-seafood-council-takes-shape-whose-interests-will-it-serve/>.

England (Scyphers, Picou, & Grabowski, 2019), and could support a robust fishery and fishing community into the future.

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Appendices

Appendix A: Initial IRB Approval

UNIVERSITY OF CALIFORNIA AT BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO



SAN FRANCISCO • SANTA BARBARA • SANTA CRUZ

COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS OFFICE FOR THE PROTECTION OF HUMAN SUBJECTS

University of California, Berkeley
2150 Shattuck Avenue, Suite 313
Berkeley, CA 94704 -5940

(510) 642-7461

Fax: (510) 643-6272

Website: <http://cphs.berkeley.edu>

FWA#00006252

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE: *November 20, 2017*

TO: *Kathryn De Master, ESPM*
James LaChance, ESPM

CPHS PROTOCOL NUMBER: *2017-06-10094*

CPHS PROTOCOL TITLE: *Understanding marine fishing rights access and associated regulatory changes that impact coastal livelihoods*

FUNDING SOURCE(S): *NONE*

A(n) *new* application was submitted for the above-referenced protocol. Your submission has been reviewed by the Office for Protection of Human Subjects (OPHS) and granted exemption, as it satisfies the Federal and/or UC Berkeley requirements under category(ies) 2 .

Effective Date: *November 20, 2017*

Amendments/Modifications: Any change in the design, conduct, or key personnel of this research must be approved by the OPHS *prior* to implementation. For more information, see [Amend/Modify an Approved Protocol](#).

Please note that although your research has been deemed exempt from full committee and subcommittee review, you still have a responsibility to protect your subjects, and the research should be conducted in accordance with the principles of the Belmont Report. Download the Belmont Report at this link: www.hhs.gov/ohrp/humansubjects/guidance/belmont.html.

This approval is issued under University of California, Berkeley Federalwide Assurance #00006252.

If you have any questions about this matter, please contact the OPHS staff at 642-7461 or email

ophs@berkeley.edu . Sincerely,

A handwritten signature in black ink, appearing to read "Rebecca Armstrong".

Rebecca ARMSTRONG

Committee for Protection of Human Subjects

Appendix B: IRB Amendment



Committee for Protection of Human Subjects (CPHS)
Office for Protection of Human Subjects (OPHS)

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Berkeley, CA 94710-5940
510 642-7461
ophs@berkeley.edu
cphs.berkeley.edu
FWA# 00006252



NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE: *March 11, 2019*

TO: Kathryn De Master
James LaChance, ESPM

CPHS PROTOCOL NUMBER: *2017-06-10094*

CPHS PROTOCOL TITLE: *Understanding marine fishing rights access and associated regulatory changes that impact coastal livelihoods*

FUNDING SOURCE(S): *NONE*

A(n) *amendment* application was submitted for the above-referenced protocol. The Office for Protection of Human Subjects (OPHS) finds that this study is still granted exemption as it meets the Committee's requirements under category 2 of the federal regulations.

Effective Date: *March 11, 2019*

Expiration Date: *March 10, 2029*

Please note that although your research has been deemed exempt from full committee and subcommittee review, you still have a responsibility to protect your subjects, and the research should be conducted in accordance with the principles of the Belmont Report. Download the Belmont Report at this link:
www.hhs.gov/ohrp/humansubjects/guidance/belmont.html.

This approval is issued under University of California, Berkeley Federalwide Assurance #00006252.

Note: Exempt determinations are good for ten years. If the study continues beyond the ten-year period, the protocol must be cloned and re-submitted for an updated exempt determination.

If you have any questions about this matter, please contact the OPHS staff at 642-7461 or email ophs@berkeley.edu.

Sincerely,

*Office for Protection of Human
Subjects (OPHS) UC Berkeley*

Appendix C: Interview Guide

Title of Study: Understanding marine fishing rights access and associated regulatory changes that impact coastal livelihoods

Principle investigators: James LaChance (UC Berkeley); Dr. Kathryn De Master (UC Berkeley)

INTERVIEW GUIDE

General questions about operation

Can you tell me a bit about your connection to the fishing community?

How long have you lived/fished here?

- What's your general approach to fishing?
- What are your biggest challenges as a fisherman?
- How do you go about making big decisions? For example, who do you consult with? (E.g., bankers, family, distributors, other fishermen).

Questions about community

How do you think the community has changed over the years?

- To what degree are they positive and negative changes?
- What was it like here when you were young?

How have the demographics of the local population changed?

Have there been changes in the way that people make their living? Relate to each other?

Questions about the environment

Do you see the current catch share system as benefiting or hurting the marine environment in any way?

What changes to the environment have you noticed in your years living/fishing here?

- How many years?

What do you think of the health of the marine environment in [Region]?

What do you think of the quality of fish caught in [Region]?

Rights access

How did you get your start fishing?

How do you think most fishermen get their start today?

Has your/their ability to access fishing rights changed over the course of your career?

- What do you think are the main factors behind these changes?

Have you seen changes in who fishes? What do you think is responsible for biggest changes?

Who do you think should be able to fish?

What do you think of the catch share system in general?

How does the catch share system influence your fishing practices?

- Does the price of quota influence your practices?

Where does most buying and selling of fish take place? What about fishing quota?

- Has this changed over time?
- What are some of the main determinants of the price of fishing quota?

Related access and ownership questions

Have you seen broader changes in who is interested in buying fishing quota in this region?

What about who is buying fishing vessels, or marinas? Or fish buyers, markets, or distribution centers?

Are there any people or organization who you see impacting the ability to fish, for better or worse?

Do you know who the main companies or individuals are that purchase or manage fishing quota in this region?

Do you fish quota differently if you own it versus lease it?

Could you describe the current climate for fishermen looking for quota? Do you sense any new challenges or opportunities for them?

Structures in community

Are there any organizations that have been particularly helpful (or not) to you or the community?

What would be the best way to address fishing quota access in the region?

What about for beginning fishermen - has the ability to own your own boat and be an independent fisherman changed?

Is the current generation sticking around to become fishermen?

Are you familiar with permit banking systems? What is your opinion of this approach?

Concluding

If you were to project ten years ahead, how would you describe the best-case scenario for New England's fisheries? For the marine environment? What about worst case scenario for each?

Appendix D: Additional Figures and Tables

Chapter 2

Table 2A. State landings revenue for New England (NOAA FUS, 2021).

2017 New England Industry	
State	Landings revenue
Connecticut	\$13,717,000
Maine	\$511,315,000
Massachusetts	\$605,250,000
New Hampshire	\$35,011,000
Rhode Island	\$100,768,000
TOTAL	\$1,266,061,000

Table 2B. Top two groundfish species groups that are in the top 10 in revenue in New England (NOAA FUS, 2021).

Groundfish fishery species/species groups in the top 10 in revenue and landings for the New England region (2017)			
	Revenue (\$)	Landings (pounds)	Average ex-vessel price per pound
Cod and haddock	\$16,368,000	13,947,000	\$1.17
Flounders	\$25,343,000	9,784,000	\$2.59

Table 2C. State landings revenue for Pacific region (NOAA FUS, 2021).

2017 Pacific Seafood Industry	
State	Landings revenue
California	\$209,846,000
Oregon	\$147,058,000
Washington	\$277,740,000
TOTAL	\$634,644,000

Table 2D. Groundfish species/species groups in the top 10 in revenue for the Pacific region (NOAA FUS, 2021).

Groundfish fishery species/species groups in the top 10 in revenue and landings for the region (2017)			
	Revenue	Landings (pounds)	Avg annual ex-vessel price (dollars per pound)
Flatfish	\$17,250,000	23,618,000	\$0.73
Pacific hake (whiting)*	\$60,373,000	773,885,000	\$0.08
Rockfish	\$15,031,000	27,665,000	\$0.54
Sablefish	\$33,573,000	12,194,000	\$2.75
*These numbers include revenue of at-sea processors. ¹²²			

¹²² For additional analysis of this data, see: National Marine Fisheries Service, West Coast Region. (2018, May). *Pacific Coast Groundfish Fishery 2019-2020 Harvest Specifications and Management Measures*. Retrieved on April 14, 2022 from <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=161280&inline.1>, and additional information can also be found here: [NOAA Fisheries. \(n.d.\) Fisheye Fisheries Economic Explorer. Retrieved on April 14, 2022 from https://dataexplorer.northwestscience.fisheries.noaa.gov/fisheye/](https://dataexplorer.northwestscience.fisheries.noaa.gov/fisheye/).

Chapter 3

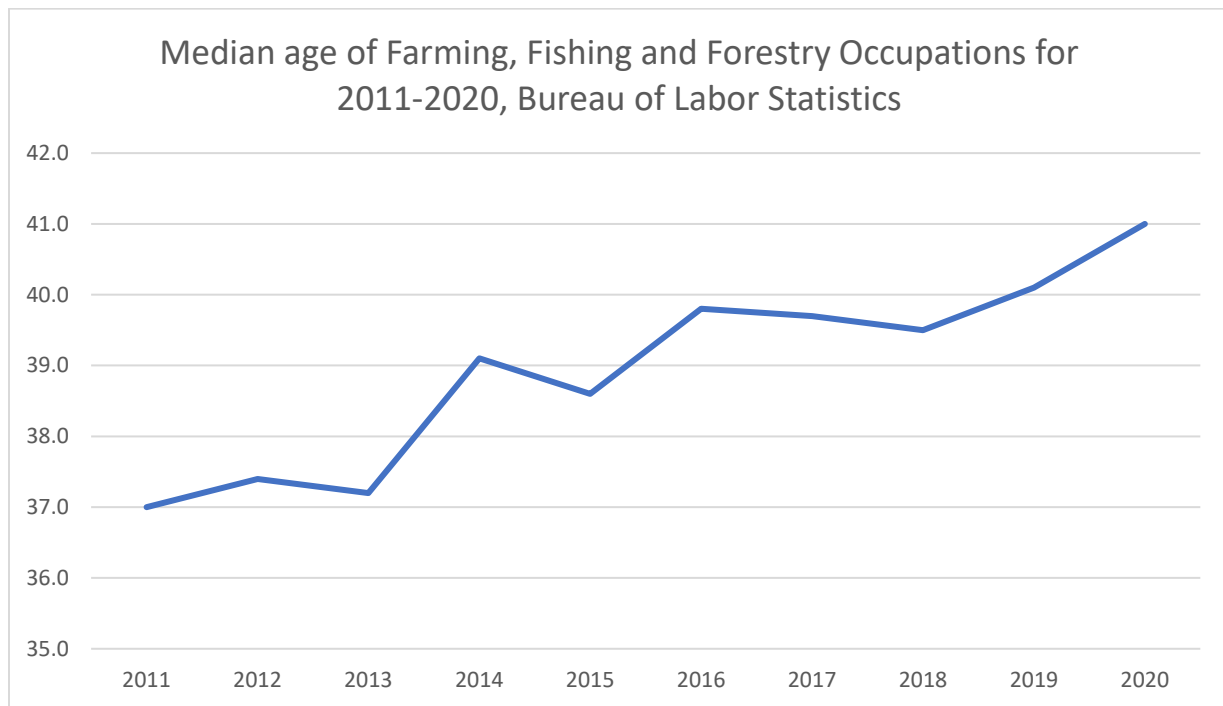


Figure 3A. Median Age of Farmers, Fishermen, and Foresters from 2011-2020

The median age of farmers, fishers, and foresters has increased from 37 to 41 from 2011-2020. This data is available from the Bureau of Labor Statistics Demographics page, Retrieved April 9, 2022 from <https://www.bls.gov/cps/demographics.htm#age>.

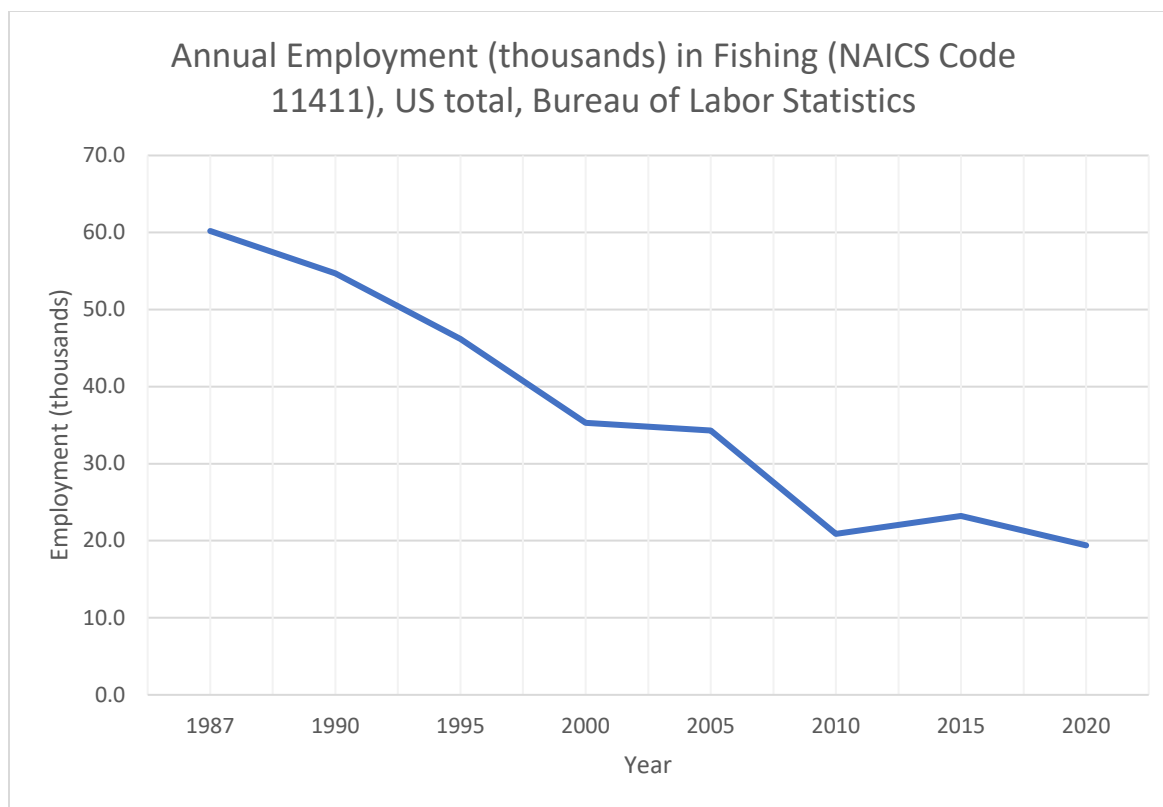


Figure 3B. The total number of individuals employed in Fishing. This number has decreased from approximately 60,200 in 1987 to 19,400 in 2020.¹²³ Fishing, North American Industry Classification System (NAICS) Category 11411 (a standard used for statistical analysis of US businesses), is a part of the Agriculture, Forestry, Fishing and Hunting sector and includes individuals primarily engaged in the commercial catching or taking of finfish, shellfish, or miscellaneous marine products from a natural habitat, such as the catching of bluefish, eels, salmon, tuna, clams, crabs, lobsters, mussels, oysters, shrimp, frogs, sea urchins, and turtles.¹²⁴ Unfortunately, there are not enough data points to show a median age for this category.¹²⁵

¹²³The BLS Data Viewer can be used for more focused or general research for this code and is found here: Bureau of Labor Statistics Data Viewer. NAICS 11411. Retrieved on April 9, 2022 from https://beta.bls.gov/dataViewer/view/timeseries/IPUAN11411_W200000000.

¹²⁴ NAICS Category 11411 is defined here: NAICS Code Description. *11411 – Fishing*. Retrieved April 9, 2022 from <https://www.naics.com/naics-code-description/?code=11411>.

¹²⁵ BLS data of this type requires a minimum of 50,000 individuals in this category to determine the median age.

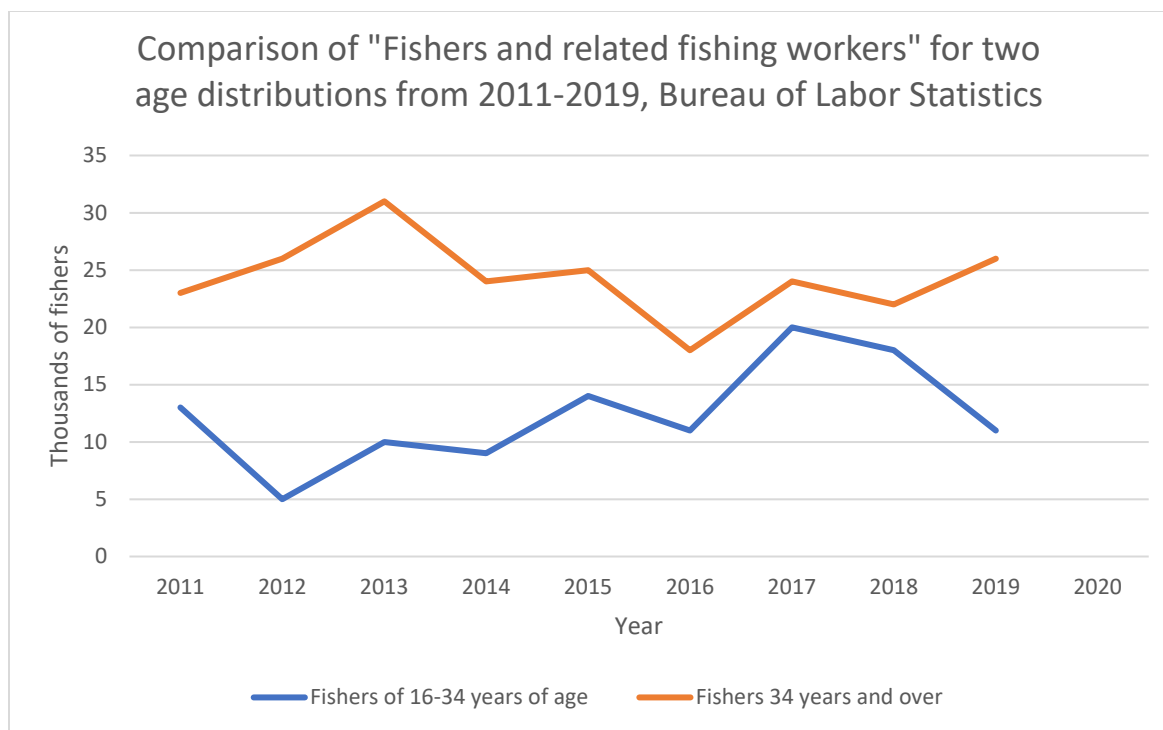


Figure 3C. Comparison of Older and Younger Age Groups of “Fishers and related fishing workers” This figure shows two age categories for “Fishers and related fishing workers,” with the orange line representing older fishers (34 years and over) and the blue line representing younger fishers (16 to 34 years in age). There are more fishermen in the older (orange line) category. Further, although a strong trend does not exist over the available data, the past three years of data show a decrease in the number of younger fishers, from roughly 20,000 to 11,000; while the last four years of data show an increase in the number of older fishers, from 18,000 to 26,000. While this code captures a wide range of types of workers in the fishing industry, it again illustrates a trend of fewer young workers and increasing older workers. Note that this data category was discontinued after 2019 and is therefore not available in the 2020 dataset, as it has been combined with hunting occupations.

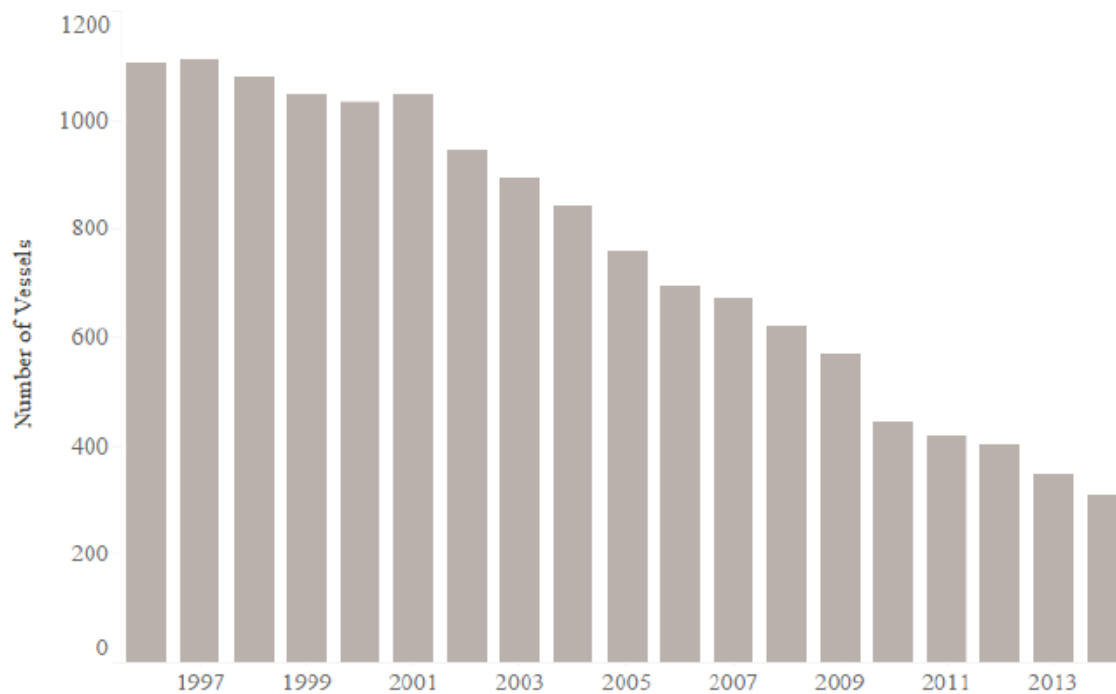


Figure 3D. Decline in Number of Vessels in New England Groundfish Fishery from the Executive Summary (April 2020) for the Northeast Multispecies Catch Share Review (NEFMC, 2020). It shows a steady decline in the number of vessels since the late 20th century.

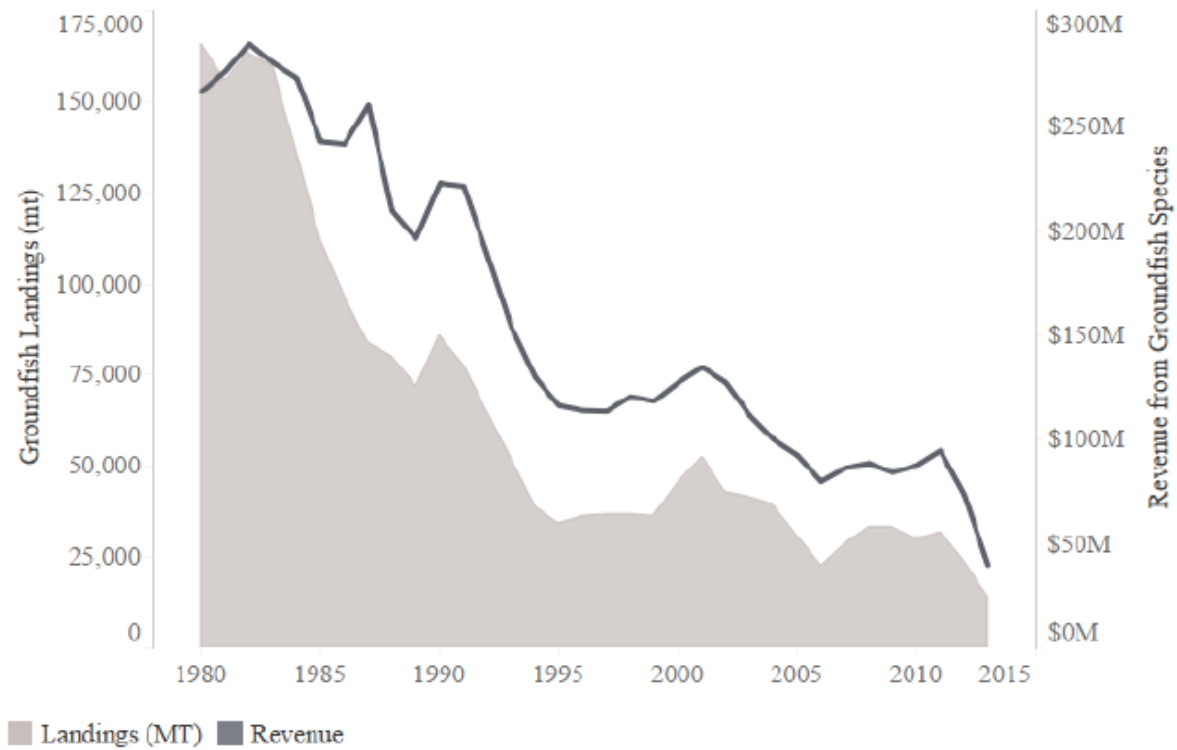


Figure 3E. Decline in Landings from New England Groundfish Fishery from the Executive Summary (April 2020) for the NE Sector Program Review (NEFSC, 2020). It shows the decline of groundfish landings and revenue since the late 20th century.

Chapter 5

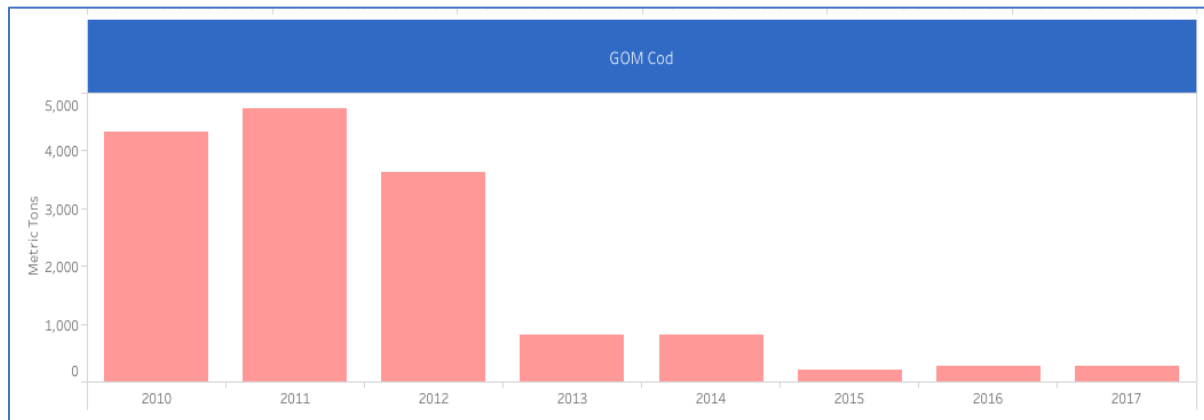


Figure 5A. Gulf of Maine Cod ACL for 2010 through 2017. From the four-year span of 2011 to 2015, the ACL was cut over 90%. Catch Share Indicators. (n.d.). *Measuring the effects of catch shares*. Retrieved on May 7, 2022 from catchshareindicators.org.

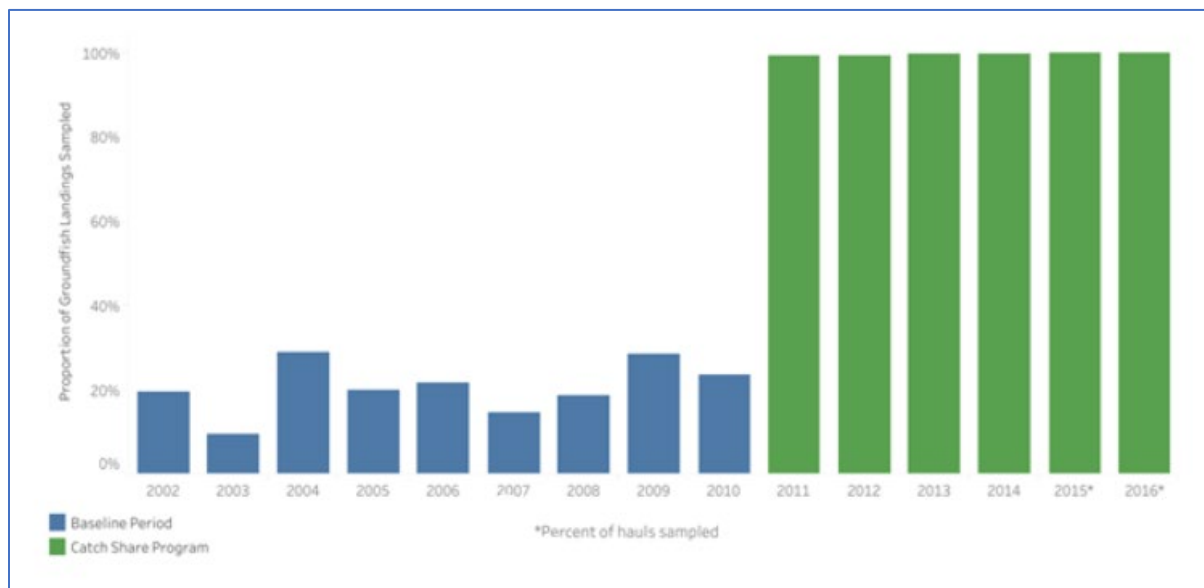


Figure 5B. Pacific Region Observer Coverage rates from 2002 to 2016. Catch Share Indicators. (n.d.). *Measuring the effects of catch shares*. Retrieved on May 7, 2022 from catchshareindicators.org.

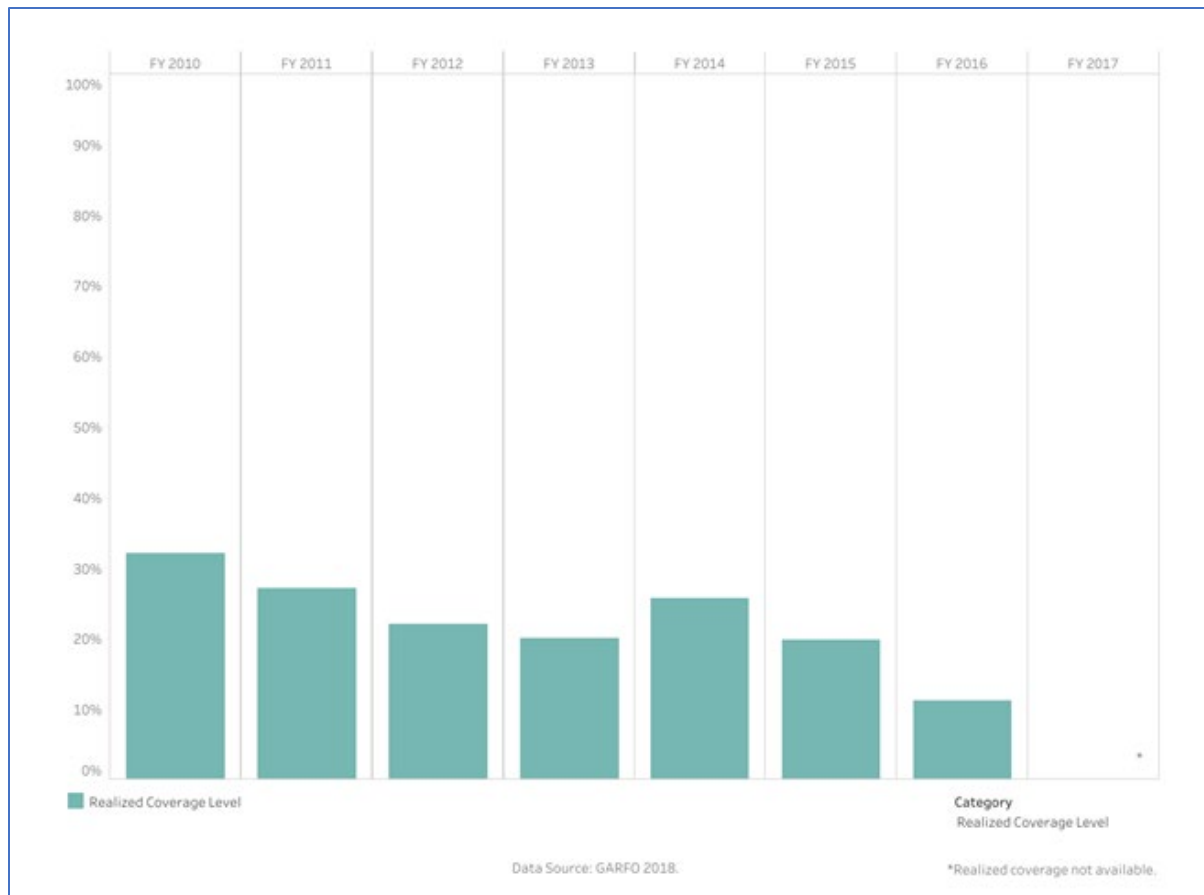


Figure 5C. New England Observer Coverage rates from 2010 to 2017. Catch Share Indicators. (n.d.). *Measuring the effects of catch shares*. Retrieved on May 7, 2022 from catchshareindicators.org.