5-2017

# From Disaster to Sustainability: The Story of the Pacific Groundfish

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# FROM DISASTER TO SUSTAINABILITY: THE STORY OF THE PACIFIC GROUNDFISH FISHERY

by

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February 6th, 2017

A capstone report submitted in partial fulfillment of the requirements for the degree

of

MASTER OF NATURAL RESOURCES

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2017

The Story of the Pacific Groundfish Fishery

This paper reviews the circumstances that led to the collapse of the Pacific groundfish fishery and the steps that fishery managers took to curb over-harvesting and bring the fishery back to sustainability. Fishery managers utilized various management tools such as a vessel buyback program, regulatory mechanisms, and market strategies to improve the available data on the fishery, improve safety for fishermen, and reduce harvest rates and overcapitalization. By employing a diverse range of measures, managers developed a system by with they successfully balanced conservation objectives and minimized adverse impacts to fishing communities. Overcapitalization and overharvest continue to degrade the health of fisheries stocks across the world. Vessel buyback programs and limited entry programs can control access to the fishery and reduce fishing capacity. Individual fishing quotas and similar market strategies can help reduce harvest rates and improve catch value. While not universally applicable to all fisheries, some combination of the strategies used in regulating the pacific groundfish recovery are applicable for use for other global overfished stocks.

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## Introduction

Overfishing, habitat degradation, overcapitalization, and mismanagement all contributed to reported declines in many different oceanic fish stocks over the last 250 years. A 2012 Food and Agriculture Organization (FAO) report estimated that 86.9% of the world's fish stocks are fully exploited or overexploited (FAO 2012). Since 1994 the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) has declared 53 different domestic fisheries a disaster (http://www.nmfs.noaa.gov/sfa/sf3/disaster_determinations.htm). The specific thresholds for declaring a fishery disaster are not defined in statute therefore giving the Secretary of Commerce (Secretary) discretion in issuing such a declaration (Upton 2013). However, NOAA defines a fishery disaster as "…commercial fishery failure, a catastrophic regional fishery disaster, significant harm incurred, or a serious disruption affecting future production due to a fishery resource disaster arising from natural or undetermined causes, consistent with MSA and IFA" (NMFS Policy Directive 31-108).

For this paper, Pacific Groundfish are the listed 84 species actively managed under the Pacific Coast Groundfish Fishery Management Plan (FMP) for California, Oregon, and Washington Groundfish Fishery (Pacific Fishery Management Council (PCouncil) 2016). Pacific Groundfish, like most US fisheries, was largely unregulated prior to the passage of the Magnuson-Stevens Act (MSA) in 1976. In fact, prior to the US claiming a 200 nm Exclusive Economic Zone (EEZ) in 1983, foreign flag fishing vessels could fish right up to the boundry of state waters, which was just 3 nm at the time (Proclamation 5030). As commercial industry rekindled after World War II, the US

government sought to outcompete foreign fishing fleets by offering large subsidies and tax deferments for investments into the domestic fishing industry (Shaw 2007). Not only did this result in more vessels and larger vessels, the advances in fishing technology enabled boats to get to the grounds quicker, locate the fish easier, and harvest more than ever. This "race to fish" led to dramatic overcapitalization and a situation in which technology was outpacing regulations.

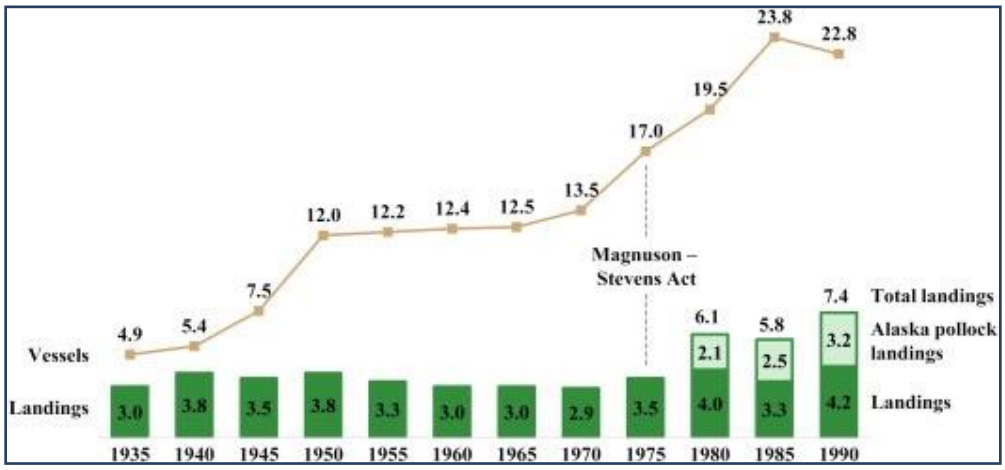
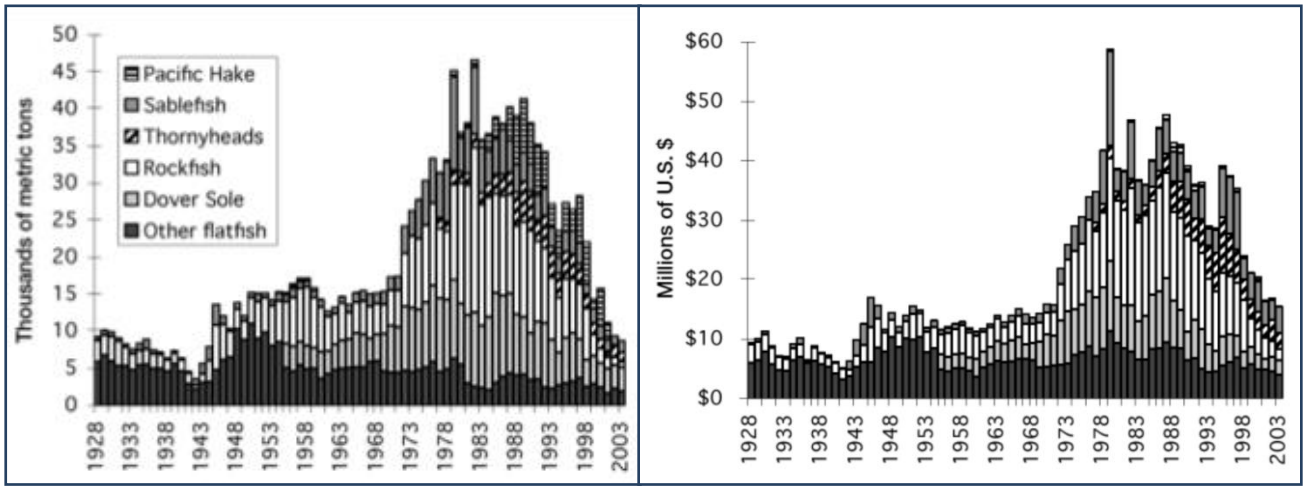



Figure 1. Number of fishing vessels (thousands) and total landings of groundfish (billions of pounds) (Grimm 2012)

The Pacific Fisheries Management Council (PFMC) tried several different management measures to reduce groundfish mortality and improve stock health, including the implementation of the Pacific Groundfish FMP in 1982 (PCouncil 2016). Since then the FMP has been amended 28 times to account for changes to the fishery, the MSA, and legal challenges to the specific regulations enacted under the FMP (Pcouncil 2016). Rapidly depleted fish stocks (Figure 1) forced managers to enact measures to curb harvest rates in this still open access fishery. These measures included trip limits, shorter seasons, bycatch limits, and gear restrictions (Shaw 2007). By the early 90's the PFMC

was forced to implement even more drastic measures by changing the fishery from open access to limited entry and for the first time restricted recreational catch of groundfish (Pcouncil 2016; Shaw 2007). However, these efforts to reduce harvest rates and overcapitalization came as too little too late (Figure 2). After decades of overfishing and reduced harvests the Pacific groundfish fishery was declared an economic disaster in




January of 2000 (United States Department of Commerce News 2000).

Figure 2. Landings of groundfishes by weight (left) and by value (right) for the state of California (Mason 2004).

Since the disaster declaration of 2000 the PFMC has enacted a series of significant management measures, coupled with the federal aid issued to Washington, Oregon, and California, which reduced overcapitalization, controlled harvest rates, and promoted a healthy and stable biomass. There are currently 53 other fisheries nationwide that have been declared federal disasters (http://www.nmfs.noaa.gov/sfa/sf3/disaster_determinations.htm). The Pacific groundfish fishery provides a model that should be considered by other managers to successfully rebuild fisheries and fishing communities nationwide.

**The Disaster**

While overcapitalization and overharvesting had an undeniably destructive impact on fish stocks, it's important to note that many other factors must also be taken into account. Interdecadal climate variation in the Northeast Pacific Ocean can have substantial effects on all the different trophic levels within the ecosystem. These cycles can correspond with increased recruitment, higher growth rates, and changes in migration patterns and habitat usage (Francis 1998). In addition, the El Niños can exacerbate traditional weather patterns and negatively impact species and increase the natural mortality rate. Coincidentally, the 1997-1998 El Nino was the strongest in a string of five El Niños creating even more problems for struggling fishermen (Shaw 2007). The El Nino environmental occurrence causes substantial fluctuations in surface temperature and the vertical thermal structure of the ecosystem as well as changes in upwelling and currents (http://www.pmel.noaa.gov/elnino/fish-distribution). These habitat changes can greatly alter fish behavior and home range. This "perfect storm" of adverse weather conditions, overfishing, habitat degradation, and low recruitment rates led to a complete collapse of the groundfish fishery in 2000.

**The Recovery**

Two distinct but interrelated areas need to be addressed during a fisheries disaster: the ecological and human factors. Managers need to craft disaster assistance programs to properly address the human factor and take care of fishermen, processors, secondary support businesses, and their communities while also ensuring the recovery of the resource. Often direct and indirect assistance fails to address the overcapitalization and excess harvesting capacity that created the very disaster to which they are providing relief (Upton 2013). The west coast salmon fishery (primarily Coho and Chinook Salmon) is

one such example (Brown 1994). The northwest salmon fisheries were initially declared a disaster in 1994 when the program first began, only to receive subsequent declarations in 1995, 1998, 2008, 2009, and 2010 (http://www.nmfs.noaa.gov/sfa/sf3/disaster_determinations.htm). Surveys conducted after the initial salmon disaster found that nearly 75% of commercial fishermen felt that the relief fell short of their expectations, with many reporting not receiving benefits for nine months or more (Smith and Gilden 2010).

Federal fisheries managers were able to apply lessons learned from the salmon disasters to management of groundfish and related relief efforts. The west coast groundfish fishery received $5 million in federal relief funds that were distributed to Washington, Oregon, and California in 2000 (Shaw and Conway 2007). Each state developed a unique recovery plan. Oregon conducted statewide outreach in the years prior to being declared a disaster in anticipation of significant closures and industry collapse. Most of the Oregon relief money was allocated to fund transition income of up to 1,500 dollars per month for fishermen as they went through job retraining or searched for a new job.

Washington chose to use the majority of their funding to diversify coastal communities with the remaining money funding arrowtooth flounder research. Today, extremely limited data on the effects of this diversification effort exists. This data is inconclusive as to whether this effort played a causative role in the successful recovery of the fishery and the continued prosperity of the community. However, the funding for arrowtooth flounder research continued to support the community by providing Exempted Fishing Permits (EFPs) to struggling fishermen. These fishermen harvested

810 mt of flounder, which would not have been possible without the program (Wallace 2002). The program not only provided a directed fishery but also utilized the opportunity to conduct extensive research on bycatch. This research was used to develop better stock assessments, improve rebuilding models, and improve directed fishery targeting to reduce bycatch (Wallace 2002).

California Department of Fish and Wildlife worked with coastal communities to determine how to allocate disaster funds. Most of the funds (69%) were put into collaborative research, with only 22% going to a transition stipend. California's relief efforts came under fire in Congress for not allocating a substantial enough portion of the funding directly to the fishermen (Decline of the West Coast Groundfish Fishery 2003). The remaining funds were put into program oversight and purchasing safety equipment for fishing boats (Shaw and Conway 2007). While each state's approach varied greatly all three were fairly successful in providing temporary monetary relief for fisherman while transitioning to a more sustainable fishery.

Relief funding is a crucial element in successful recovery from a fisheries disaster but it must be part of a larger management effort that addresses overcapitalization and overharvesting to save failed fisheries. Three basic methods are available to reduce overcapitalization: market strategies, vessel buyback, and regulatory mechanisms (Kirkley et al. 2006). Regulatory mechanisms actively restrict vessel operations or impose gear restrictions. Some common examples of regulatory mechanisms are setting quotas, shortening of season length, imposing trip limits, and establishing closed areas to reduce effort across an entire fleet. However, regulatory mechanisms can place strain across the entire fishery and reduce the viability of the industry. The vessel buyback

program is a management tool by which fisheries managers provide low interest loans for industry led purchase of limited entry permits from commercial fisherman. These loans are repaid to the government by imposing a fee on fish landings. Market strategies such as individual fishing quotas (IFQ) impose a regulatory framework by which fishermen can make market driven decisions while meeting conservation goals. Unlike regulatory mechanisms, vessel buyback and market strategies offer compensation for those that choose to leave the fishery (The Nature Conservancy 2006), and reduce the need for regulations.

**National Standards**

Regulatory mechanisms, vessel buyback programs, and market strategies are tools utilized by fishery managers as they develop FMPs for each regulated fishery. FMPs are developed by the eight Regional Fishery Management Councils (RFMCs) who oversee the management of all federal fisheries. All FMPs must address and balance the ten National Standards set forth by the MSA. These National Standards address Optimum Yield, Scientific Information, Management Units, Allocations, Efficiency, Variations and Contingencies, Costs and Benefits, Communities, Bycatch, and Safety of Life at Sea (Magnuson-Stevens Fishery Conservation and Management Act of 1976, 2007).

Overfished stocks may require substantial regulatory mechanisms to reduce harvest rates. RFMCs must ensure that such regulatory mechanisms also minimize adverse economic impacts to fishing communities or the FMP will be in violation of National Standard 8. National standard 8, "Communities", states that "management measures shall, consistent with the conservation requirements…provide for the sustained participation of such communities; and to the extent practicable, minimize adverse

economic impacts on such communities.(16 USC § 38, Subchapter IV-1851)" A fishing community is defined by the MSA as a "community that is substantially dependent or substantially engaged in the harvest or processing of fishery resources"(16 USC § 38, Subchapter IV-1851). Such designations are determined by the Secretary.

It's important to note that any measures taken to minimize adverse impacts to the community must also by consistent with conservation goals. In fact, there is legal precedent set through NRDC v. Daley in which the appellate court reversed the district court decision, ruling National Standard 1 (conservation) supersedes National Standard 8 (community). The PFMC, NOAA, and state fisheries managers successfully developed amendments to the existing FMP that utilized community outreach and vessel buyback programs, which restored the fishery to health while minimizing impacts to fishing communities.

**Vessel Buybacks**

The vessel buyback program attempts to reduce fishing capacity by reducing the total number of permit holders. Each buyback program is administered differently and in the case of the pacific groundfish fishery a 46 million US dollar federal loan was issued to permit holders to compensate them leaving the industry (http://www.nmfs.noaa.gov/mb/financial_services/pacific_coast_groundfish_buyback.html). These loans are paid back with fees from the landings of the remaining vessels (Squires 2006). The level of compensation was determined by the estimated value of the permit using poll data from the members across the industry. A vessel buyback program was implemented for the pacific groundfish fleet in 2003 (Federal Register Vol. 68, No.

102, 2003). There were 91 permit holders that participated, resulting in a 35% reduction in total trawl permits (Figure 3)(Miller 2015).

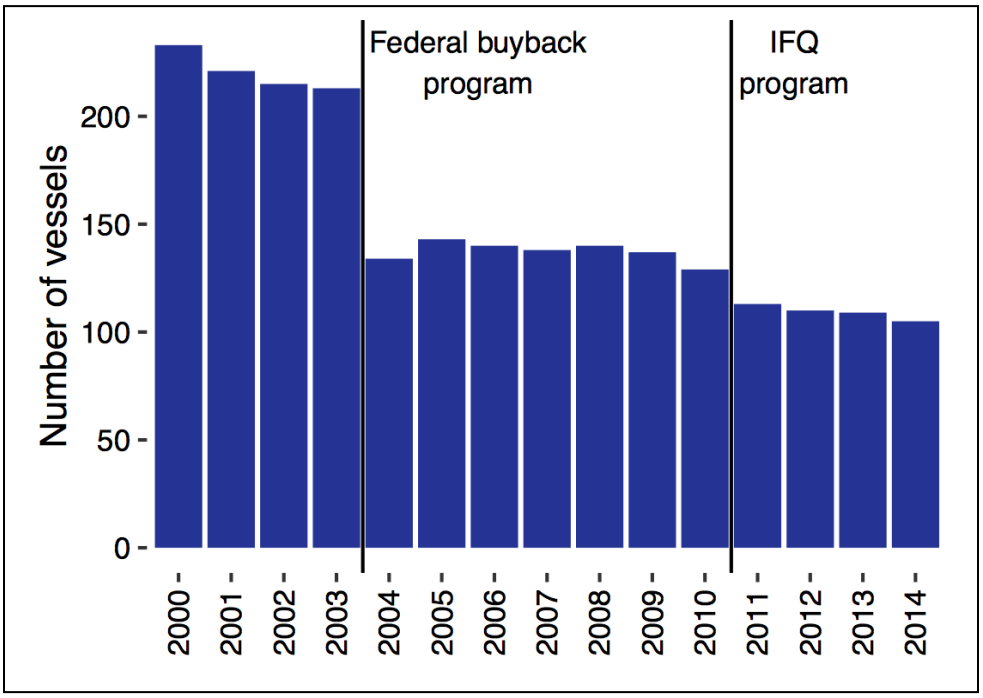



Figure 3: Number of catcher vessels participating in the At-sea and Shore- side limited entry trawl groundfish fisheries (2000-2010) and the number of vessels participating in the West Coast Groundfish Trawl Catch Share Program (2011-2014). (Steiner 2016).

One of the major criticisms of vessel buyback programs is that instead of reducing overall fishing capacity the program uses federal funding to remove latent capacity therefore having little effect on overfishing or improving revenues (Federal Fisheries Investment Task Force Report to Congress 1999). This was not the case with pacific groundfish fishery. The program reduced total fishing capacity by creating a small number of committed fishermen. The overall reduction of capacity paved the way for an individual transferable quota (ITQ) system "catch shares", that would have been impossible without the vessel buyback program (Groves and Squires 2007).

**Using Catch Shares to Improve Safety for Fisherman**

After over a decade in development, the catch share program for the pacific groundfish trawl sector was implemented in 2011 (Federal Register, Vol. 75, No. 240, 2010). As discussed earlier, traditional regulatory mechanisms such as shorter season lengths, gear restrictions, or trip limits can create an industry where there is a race to fish and the lack of individual accountability creates an incentive to cheat. The catch share program stops that race by implementing yearly harvest allocations to permit holders rather than a total allowable catch for a fishery as a whole (https://www.edf.org/oceans/how-catch-shares-work-promising-solution).

The catch share program enabled fishermen to choose when and for how long they fish. Much of the "deadliest catch" stigma was removed as fishermen no longer had to brave treacherous weather conditions during short fishery openers. Instead, fishermen can make a business plan that allows them to harvest based on favorable market conditions throughout the year. A 2012 report from the Environmental Defense Fund found that traditionally managed fisheries were only 26-38% as safe as the same fisheries under catch shares (Grimm 2012). The Coast Guard conducted a similar study, which covered the change from open access to IFQ for the Halibut, Sablefish, and Pollock fisheries in Alaska. The study found that 85% of fishermen felt that the IFQ program made them safer (Hughes and Woodley 2007).

**Using Catch Shares to reduce Bycatch**

Another important impact of the catch share program was the reduction of bycatch. Bycatch is any species harvested incidental to fishing for a target species. Depending on the fishery these non-target species may be required to be retained or discarded. In a catch share management system bycatch quota is allocated along with

quota for target species (https://www.nwfsc.noaa.gov/research/hottopics/catchshares.cfm). This shifts the responsibility down to an individual level and creates a greater sense of ownership. In the pacific groundfish catch share program bycatch was reduced 30% from levels during traditional management with some species seeing 79% reductions (Figure 4) (Grimm 2012, NOAA 2015).

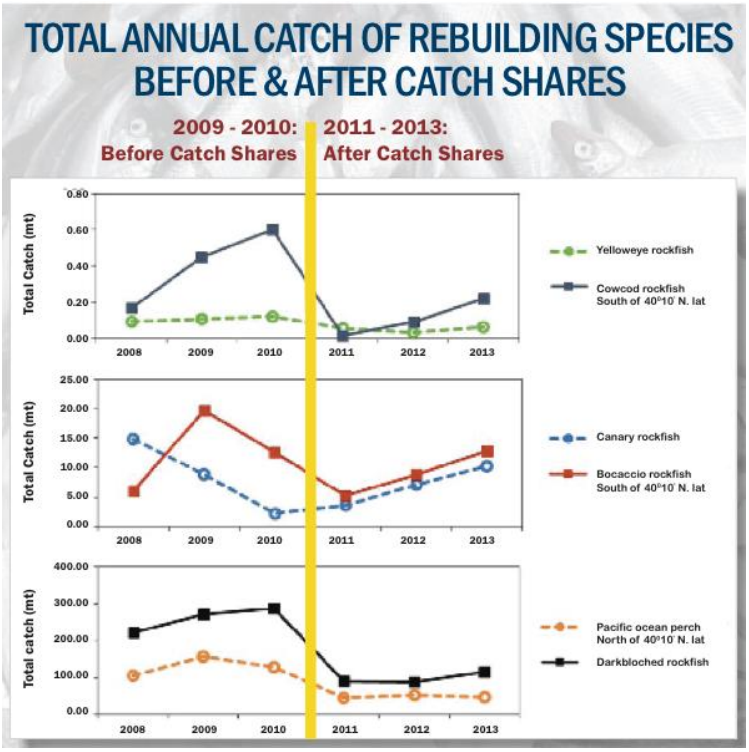



Figure 4: Total annual catch of rebuilding species from 2008 through 2010 in the limited entry trawl and shoreside whiting fisheries, as well as 2011 through 2013 in the Shorebased Catch Shares Program, in metric tons. The yellow vertical line separates years before and after the Catch Shares Program was established. Source = West Coast Groundfish Observer Program (WCGOP) Groundfish Mortality Report (2008-2010) and the Shorebased IFQ Vessel Accounts System (2011-2013). (NOAA 2015)

This reduction in bycatch is especially important for in the pacific groundfish fishery because many of the groundfish species that are susceptible to incidental harvest take a very long time to mature resulting in very slow rebuild timelines (Cope 2012).

**Using Observers in Catch Share Programs**

In January of 2000 fisheries managers were left trying to uncover the causative factors for the pacific groundfish collapse. The exact cause or causes were difficult to pinpoint due to a lack of information about each key species, specifically the incidental bycatch of species. In 2001 fishery managers implemented a limited observer program in order to collect and analyze critical fisheries data, properly assess the magnitude of bycatch discarded, and calculate the impact on stock assessment (Miller 2015. https://www.nwfsc.noaa.gov/research/divisions/fram/observation/index.cfm). This program required certain portions of the groundfish industry to bring a contracted observer onboard to log catch information to include haulback position, bycatch data, and general target species assessment. This information is critical for accurately estimating fish mortality and recovery timelines (Howe 2015). It's difficult to put a numeric value on the bycatch reduction achieved by the observer program due to the unknown and highly variable bycatch rates prior to observer coverage and the coinciding of observer requirements and the catch share program. However, observers openly work with the Coast Guard and NMFS Office of Law Enforcement to build cases against vessels not reporting illegally discarding bycatch. This partnership with fisheries law enforcement personnel creates an ever-present deterrent to illegal fishing activity. It works the same way that driving beside a police office can improve adherence to speed limits.

**Increased Profitability**

Managers used the above tools to improve the data we have of key species, better assess stock heath and harvest rates, reduce overcapitalization, and decrease bycatch rates. All of these measures helped to align the pacific groundfish FMP with the MSA

National Standard for conservation. But simply improving conservation efforts is not what makes the rebound of the pacific groundfish important.

We only need to look to the tragedy of the Cod to see how conservation goals can destroy fishing communities. In 1992, with catch rates at an all-time low and a species in peril, the Canadian Minister of Fisheries and Oceans declared a moratorium on the Northern Cod Fishery (Kurlansky 2010). This extreme measure put tens of thousands out of work and badly damaged the economies of fishing communities along the coast. Almost 25 years after the industry shut down, stock sizes are finally starting to rebound and there is hope that soon the industry can reopen, even if only a fraction of what it once was (Abel 2016).

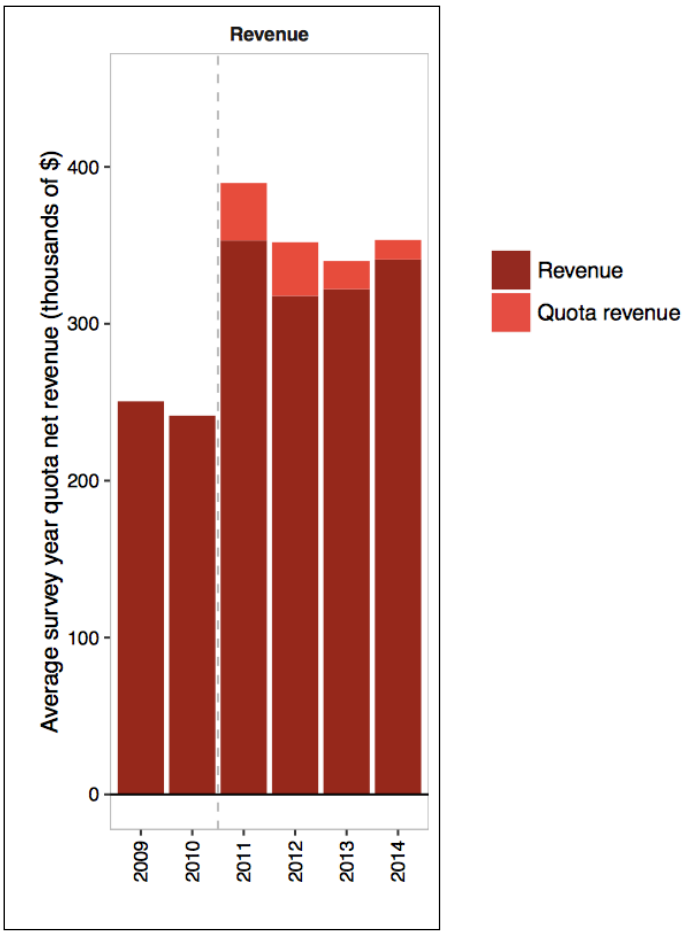


Figure 5: Non-whiting groundfish vessel average net revenue and quota revenue for all catch shares participation with quota earnings and costs by survey year. Average ex-vessel revenue and quota revenue. Dashed line represents the beginning of the catch share program. The light red quota revenue value is the revenue earned off sale of quota. (Steiner 2016)

Due to the early and substantial actions taken by fisheries managers, the pacific groundfish industry was able to escape the fate of the Cod. In fact, the vessel buyback and catch shares program actually increased profitability while decreasing harvest rates and bycatch and were instrumental in preserving the industry and protecting fishing communities (Figures 5 and 6) (Squires 2006, Catchshareindicators.org 2013 report).

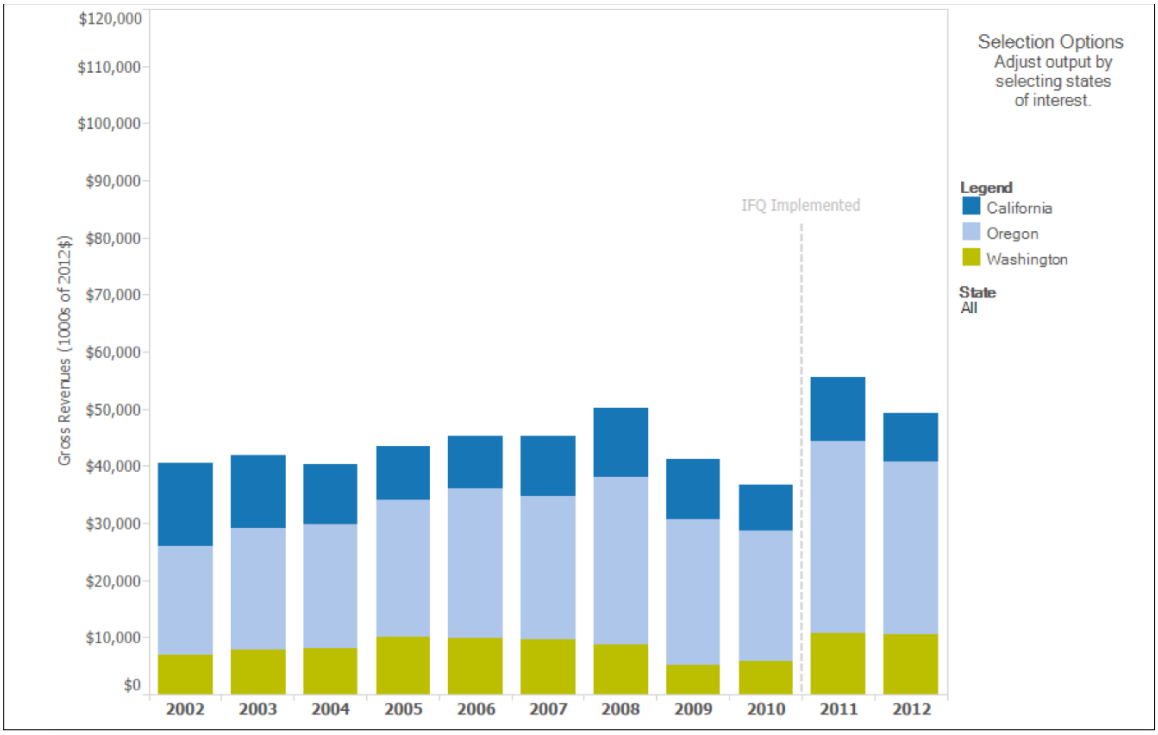



Figure 6: Value of Groundfish Limited Entry Trawl Permit Landings for California, Oregon, and Washington from 2001-2012. (Catchshareindicators.org 2013 report)

This catch shares model will not adapt well for all fisheries. Take for example the sockeye salmon fishery in Bristol Bay, Alaska. Unlike the Pacific groundfish, which can be harvested almost year round, the sockeye season in Bristol Bay is only roughly six

weeks long (http://www.alaskafishingjobsnetwork.com/getting-a-job/alaska-fisheries-calendar-and-seasons/). The anadromous nature of the species and the remoteness of the fishing grounds forces a race to fish in which the price point is set by a handful of large processing vessels. The flexibility of the catch shares system lends itself to a more deliberate harvesting in which vessels can use supply and demand to ensure they receive the premium price for their catch.

**Management Costs**

Economic models from other industries provide examples that are analogous to fisheries management. The fishing industry most closely mirrors the mineral extraction industry (gas, oil, coal, etc…) in that a common pool resource is utilized by a private entity. Many sectors of the fishing industry are still open access and require only nominal fees to participate. Therefore, the vast majority of the burden for funding management and oversight falls on the taxpayers. For programs such as catch shares with limited access restrictions, a substantial market value is indirectly associated with the assigned permits. This additional value essentially creates millionaires overnight (van der Loo 2014).

In contrast, the cost recovery for land management is built into the system. Companies seeking rights to conduct mineral extraction on publicly owned lands must pay permit and licensing fees and bid for temporary land use permits (http://www.blm.gov/es/st/en/prog/east_lynn_lake_coal/faqs.html). The BLM also imposes fees per unit extracted. This system forces the industry to pay for the very resource they harvest.

Management decisions for the pacific groundfish have utilized vessel buybacks, regulatory mechanisms, and market strategies to develop a FMP that meets National Standards and takes into account fishing communities. In fact, much of the initial costs for management measures such as Vessel Monitoring Systems (VMS) and the observer program were completely absorbed by the federal government initially and then slowly transitioned to the responsibility of the fishermen (PCouncil 2016). As fishermen began to feel the increasing burden of management costs they also experienced increased revenue from the very same management measures.

Management costs vary from fishery to fishery depending on the size and location of the fishery, fishing vessel harvest capabilities, duration of the harvest season, environmental sensitivity, and presence of other sensitive species. Not all management measures are applicable for all fisheries. For example, for fisheries such as the pacific halibut in Alaska and scallops in New England and the Mid Atlantic there are well-defined harvest areas. Gear restrictions and quota can vary greatly from one area to the next. VMS allows managers to view a GIS representation of vessels actively fishing, the permits they posses, and what fishery they are currently declared for.

Similarly, the observer program can be very effective with large to mid sized fishing vessels that engage in a fishery that targets multiple species. Large and very profitable fisheries can more easily bear the cost of observer coverage than smaller fisheries.

**Conclusion**

Creating sustainable fisheries demands more than maintaining a healthy stock size. The management of the pacific groundfish successfully revived the industry from

disaster to sustainability. Managers created multi-dimensional regulations that take into account human dimensions, social, and cultural needs. The implementation of a catch shares management system, vessel buyback program, and investment into local communities is the reason that Washington, Oregon, and California still have a thriving fishing industry and a diverse coastal community.

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