



Sector Management In New England's Groundfish Fishery: Dramatic Change Spurs Innovation

Jonathan M. Labaree

AUGUST 2012



**Gulf of Maine
Research Institute**

Science. Education. Community.

TABLE OF CONTENTS

Executive Summary	1
1. Introduction.....	1
2. Setting the Stage.....	2
3. Key Design Elements: How do sectors work?.....	3
4. How industry has responded.....	6
5. How NOAA Fisheries has responded	7
6. How nonprofits and philanthropies responded	8
7. Limits to adaptation.....	9
8. Areas ripe for innovation	10
9. Conclusion.....	13

New England Groundfish Sectors – 2010

(with primary vessel home ports)



FGS	GB Cod Fixed Gear Sector (MA)
NEFS2	II, Northeast Fishery Sector (MA)
NEFS3	III, Northeast Fishery Sector (MA)
NEFS4	IV, Northeast Fishery Sector (MA)
NEFS5	V, Northeast Fishery Sector (CT, RI)
NEFS6	VI, Northeast Fishery Sector (MA)
NEFS7	VII, Northeast Fishery Sector (MA)
NEFS8	VIII, Northeast Fishery Sector (MA)
NEFS9	IX, Northeast Fishery Sector (MA)
NEFS10	X, Northeast Fishery Sector (MA)
NEFS11	XI, Northeast Fishery Sector (NH)
NEFS12	XII, Northeast Fishery Sector (NH)
NEFS13	XIII, Northeast Fishery Sector (MA)
NCCS	Northeast Coastal Communities Sector (MA, ME)
PCCS	Port Clyde Community Groundfish Sector (ME)
SHS	Sustainable Harvest Sector (MA, ME, NH, RI)
TSS	Tristate Sector (MA, NC, VA)

Executive Summary

The implementation of sector management in New England's groundfish fishery sparked dramatic changes in every aspect of the industry, forcing an unprecedented level of innovation and adjustment. The switch from the effort controls of days-at-sea to the output controls of sector allocation, prompted primarily by federal mandates, changed everything from a fisherman's pre-trip planning to business arrangements that get fish from the vessel to the table. Some fishermen are leaving the fishery, unable to compete in an era of tight catch limits, rising operational costs, and a redistribution of fishing privileges. Others are finding that the greater flexibility that sector management affords, with the option to lease additional allocation, and improved market conditions offer advantages over the days-at-sea system. The change to sectors sparked debates about the size and composition of the fleet, the role of private markets in establishing access to a public resource, and the adequacy of assessment science to set catch limits suitable to the new system. These debates are essential and may well lead to modifications in the management process.

This paper describes the key elements of sector management and outlines the extent and scale of the change it heralds. After just two years of operating under sectors, the region's fishing industry, fisheries managers, and nonprofit community have responded with rapid innovation. Examples abound of that new thinking. Meanwhile, innovation also faces barriers. Finally, the region's fishing communities could explore new avenues for maximizing the benefits of the sector system. Adaptation and innovation are central themes, recognizing that sector management introduced huge new challenges while opening new opportunities for the region's fishing communities.

1. Introduction

On May 1, 2010, New England's groundfish fleet underwent a seismic shift. That date marked the transition from days-at-sea limits to sector management—an output control regulatory system that allocates a portion of the total annual harvest of cod, haddock, pollock, flounder, and other bottom-dwelling species to harvesting cooperatives called sectors. The switch from input controls to output controls mandated changes in every aspect of the industry; it requires new data collecting and reporting systems, monitoring protocols, fiscal and legal bonds among fishermen, and fishing strategies. Adapting to these changes has taxed the fleet's ingenuity and resources. Fishermen who are able to invest and innovate will likely succeed under sectors while those who lack the resources needed to operate under the system will find it increasingly difficult to compete.

Sector management introduces a market-based approach to the fishery, dividing the total allowable catch for each stock into allocations that can be traded among the sectors. The new system creates an internal market for fishing privileges (internal to the sector system since sector membership is restricted to those with a limited access groundfish permit). To augment their initial allocation, sectors and their members can lease or trade allocation from other sector fishermen. Ideally, this allows them to build a portfolio that balances target and constraining stocks.

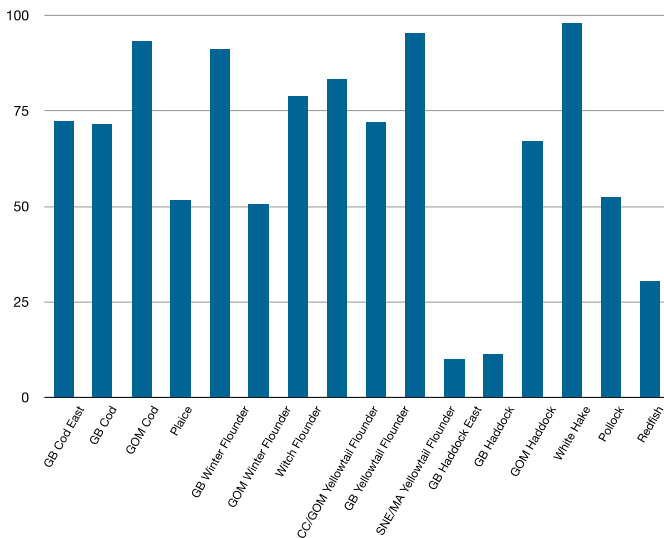


Figure 1. Percent of sectors' annual catch entitlement caught (landed and discarded) in fishing year 2011–May, 2011 through April, 2012. source: NMFS

2. Setting the Stage

The reauthorization of the Magnuson-Stevens Act in 2006 (signed into law in 2007) set the stage for sector management by revising key elements of federal fisheries law. Specifically, the Act mandated strict rebuilding schedules for vulnerable stocks to be implemented through setting annual catch limits that are enforced through accountability measures. Regional science and statistical committees set these catch limits based on the best available science informing stock size and resiliency. Accountability measures are designed to ensure that annual harvests stay within those catch limits and impose additional restrictions if those limits are exceeded.

The New England Fishery Management Council (Council), the body responsible for setting most federal fishery regulations in the Northeast, decided that the days-at-sea system was too unwieldy, especially for incorporating accountability measures. The need to set days-at-sea limits based on the most vulnerable stocks would likely constrain the harvest of abundant stocks. To make days-at-sea work with accountability measures, NOAA's National

Constraining stocks

Fishermen operating in sectors have an initial allocation of up to 16 stocks. The amount they have of each stock depends on two factors. The first is the catch history of that stock associated with their limited access multispecies permit, based on the percentage that their landings represented for a given stock during the determining period (1996 to 2006). The second is total allowable catch for the stock¹ set by the New England Fishery Management Council based on advice from the Science and Statistical Committee. Multiplying the catch percentage by the total allowable catch yields the amount of fish a vessel brings to a sector, also known as its potential sector contribution.

In any given year, a vessel could end up with a high allocation of a stock it rarely caught if the catch limit for that stock dramatically increased. Conversely, a vessel may have been dependent on a specific stock, yielding a high catch percentage, but end up with a low allocation if the total allowable catch is small. The result can create imbalances in allocation relative to a vessel's historical catch compositions. Stocks with low allocations can constrain the ability of a vessel to harvest stocks for which they have ample allocation. This dynamic drives many of the decisions fishermen now must make about the gear they use, areas they fish, when they fish, and how much additional allocation to purchase or lease.

Fishermen sometimes refer to constraining stocks as "choke species". They vary somewhat from sector to sector, but can be identified on a fleet-wide basis from catch data that NOAA reports. Figure 1 shows the percentage of their annual catch entitlement that sector vessels harvested from May 1, 2011 to April 30, 2012. Constraining stocks are those with bars at or close to 100%. Generally, low harvest levels represent stocks that being constrained by the penalties for overharvesting choke species.

¹ Some sectors also withhold a small reserve to ensure fishermen do not exceed their allocation.

Marine Fisheries Service (NMFS) would have had to make adjustments to those limits as the fishing season progressed, likely spurring a race to fish - the tendency to maximize harvest before additional restrictions come into place.

Thus, the Council sought another regulatory system that would comply with the tight deadlines and rebuilding requirements of the Magnuson-Stevens Act and establish more forward-facing and predictable accountability measures. Sector management offered such a solution². The Council avoided potential regulatory delays by making the system voluntary and allocating stocks to sectors rather than individuals. Had the system been mandatory and/or created individual quotas, it might have triggered the need for a region-wide referendum, which could not have been completed in time to meet federally mandated deadlines. The Council implemented sector management through Amendment 16 to the Northeast Multispecies Fisheries Management Plan.

3. Key Design Elements: How do sectors work?

There are 16 groundfish sectors with actively fishing members. An additional three sectors have no active members—instead, they lease out their entire allocation.

How a sector is formed

Any group of three or more federal groundfish permit holders can apply to NMFS to form a sector. After notifying NMFS of their intentions a year in advance, they must draw up by-laws, appoint a board and officers, and incorporate. Most sectors form as 501(c)(5) organizations, a non-profit designation for trade organizations.

Common Pool

Fishermen are given the choice to join a sector or remain under the old days-at-sea system. Vessels choosing to remain under days-at-sea make up what is known as the Common Pool. This group of vessels shares an allocation of stocks, which is essentially the amount of the commercial total allowable catch left over once the sector allocations have been calculated. The majority of active vessels, accounting for approximately 98% of the overall allocation, are enrolled in sectors. For the most part, vessels choose the Common Pool because their owners feel they can harvest more fish under days-at-sea than if they join a sector. In order to ensure that Common Pool vessels stay within their collective allocation, NMFS sets trip limits for the most vulnerable species and drastically limits the days-at-sea available to vessels. In addition, NMFS can make changes to both trip limits and days-at-sea any time during the season, meeting the accountability measure requirements of Magnuson. These in-season adjustments create significant uncertainty for common pool vessels. Beginning in 2012, NMFS will manage the Common Pool's allocation under a trimester system that spreads the annual harvest into four-month periods to ensure the harvest lasts the entire year rather than fished heavily at the start.

Meanwhile, they can recruit members and draft an operations plan that includes harvesting rules, infraction measures, a monitoring plan, and any requests to be exempted from specific regulations. All sectors are exempted from certain regulations, such as days-at-sea, daily, and trip limits. NMFS then reviews these documents and may approve the sector for operation, often pending modifications in response to comments. All of this must happen in time for NMFS to incorporate that sector's plans into their environmental assessment for the coming fishing year, which takes several months to prepare and several more months to go through the federal rulemaking process. (Sectors' operations plans are public and available at <http://www.nero.noaa.gov/sfd/SectorManagers.html> under the "Other Resources" tab.)

² Fishermen based in Chatham, MA, formed two sectors in 2003 and 2004 under Amendment 13 to the Northeast Multispecies Fishery Management Plan. They were granted an allocation of Georges Bank cod to target with hook gear and gillnets. These sectors formed the model for the wider implementation of the concept under Amendment 16.

Joint and several liability

Self-enforcement is integral to sector management—all members are equally responsible for ensuring their sector does not exceed their annual limits. Indeed, federal regulations require members to be jointly and severally liable to each other. That provision, along with logistical concerns, has meant that most sectors formed along social or cultural lines because sector members need to trust each other. Thus, most sectors are geographically based, sometimes further divided by gear type or cultural ties. Another factor that influences sector membership is affiliation with an industry group. For example, most members of the Associated Fisheries of Maine, a leading industry group, joined the large Sustainable Harvest Sector while members of the Northeast Seafood Coalition likely joined one of the 12 sectors that NSC established³. Over time, sectors might realign themselves or new ones might form to reflect marketing strategies or to garner a more targeted allocation.

Annual Allocations

Each sector begins the fishing year with an allocation of 16 different groundfish stocks. The management plan includes another five stocks, four of which are so scarce that sectors receive no allocation for them and a fifth, halibut, has a one fish per trip limit. Sector members decide how they will collectively harvest that allocation and codify that arrangement in their harvesting rules. Most sectors divide their allocation among their members according to catch history, essentially treating it as individual quotas. Some sectors have begun to pool constraining stocks as insurance to guard against over-harvesting that stock, which would stop all sector activity until they were able to buy or trade quota for that stock from another sector. Most sectors have members who are actively fishing and

Catch History and Allocation: Who Got What?

At the heart of the sector system lies the distribution of fish among the sectors. Amendment 16 stipulates that fish get divided based on the collective catch of each sectors' members from 1996 to 2006⁴. Thus, if a vessel accounted for 0.2% of Gulf of Maine cod over that period, then it would bring 0.2% of the annual total allowable catch for Gulf of Maine cod to their sector. While the Council discussed other alternatives, it ultimately decided that this catch history approach best represented a vessel's long-term dependency on the resource. However, it does not account for changes in a vessel's business operations, the movement of permits from one part of the region to another, or the differential impact that effort controls had on different ports. Not foreseeing the dramatic change in management, some fishermen invested in permits with a high number of days-at-sea but poor catch history—those permits quickly lost their value. In this way, an individual's catch history may not always reflect historic participation in the groundfish fishery.

Key to the success of sector management is the ability to trade or lease allocation. This allows sector members flexibility to acquire a portfolio of stocks that best represents their fishing businesses. Members may trade or lease their allocation among themselves or with members of other sectors. Sometimes fishermen make these arrangements themselves and sometimes they may ask their sector manager to do it for them. All trades outside the sector go through the sector manager and are reported to NMFS, which approves the trade if the sectors have enough allocation to cover the deal. Trades that happen within a sector are not reported to NMFS until the sectors' year-end report.

⁴ The exception to this history is to the Fixed Gear Sector, whose history for GB cod was originally set from 1991-2001 in Amendment 13 and was upheld in Amendment 16.

³ These sectors now fall under an umbrella organization, the Northeast Sector Services Network.

others who decide not to fish for groundfish, leasing out their entire allocation instead.

The sector manager

Each sector employs a full- or part-time sector manager. Some managers work for more than one sector. The sector manager's job varies from sector to sector, but has three basic components: tracking and reporting the sector's landings, discards, and trades on a weekly basis; keeping track of the internal division of allocation and catch; and overseeing the trade of allocation with other sectors. Some managers take on additional duties, such as overseeing the sector's finances. Some sectors have subcontracted the tracking and reporting task to a third party. In all cases the sector manager is hired by and reports to the sector's board of directors.

Catch accounting and reporting

A sector must demonstrate to NMFS that it is staying within its allocation for all stocks. Each week, sector managers file a report to NMFS that shows the beginning allocation available, what was landed, what was discarded, and what was traded in or out of the sector (see Figure 2). Sector managers rely on two sources of data to determine what their members landed: mandatory weekly reports from seafood dealers that provide total landed weight by species and the vessel trip reports that document where the fish were caught to differentiate between stock areas (for example, Gulf of Maine cod versus Georges Bank cod) and the type of gear used. Discarded fish, those below the legal size of a species, must then be subtracted from the landed amounts because those fish count against a sector's allocation⁵. NMFS provides discard data derived from on-board observers and monitors. NMFS also calculates an assumed discard rate that applies to trips that do not carry an on-board monitor. Finally, managers account for any fish traded in or out of the sector over the past week.

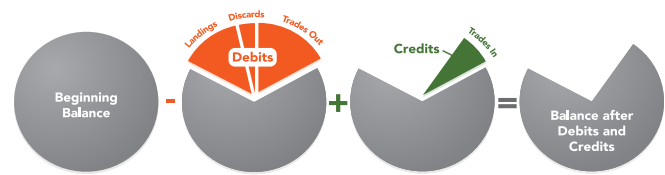


Figure 2. Weekly Allocation Accounting

Monitoring

In Amendment 16, the Council envisioned two types of monitoring—dockside and at-sea. Dockside monitoring was designed to verify the dealer reports (and therefore landed catch) with a third-party monitor witnessing a vessel's off-load to ensure weights and species were accurately recorded. At-sea monitoring produces discard rates and verifies catch and area fished. Amendment 16 stipulates that industry assume the costs of monitoring, but NMFS provided grants to cover sectors' dockside monitoring expenses during the start-up phase of the new sector system. NMFS suspended dockside monitoring in mid-September, 2011 after deciding it was not a good use of funds. In addition, NMFS has run and funded at-sea monitoring through its observer program, pledging to continue funding at-sea monitoring through April, 2013.

When federal support for monitoring is no longer available, the industry will face a substantial new cost. Dockside monitoring costs were inversely proportional to the size of a vessel's offload—costs ranged from about a half cent per pound for the largest landings to close to two cents per pound for smaller ones. Some very small trips landed in remote ports were even costlier. Unless the Council adjusts Amendment 16, dockside monitoring will resume in 2013 at 20% coverage of vessel arrivals.

At-sea monitoring is much more expensive, ranging from \$550 to \$700 a day. NMFS has aimed to cover 38% of groundfish trips with an observer or monitor in 2010 and 2011 and is

⁵ Under sector management, vessels must bring all legally sized fish to the dock.

lowering its target to 25% for 2012. Even at that level, many vessels will be hard pressed to absorb this additional cost. Since discard rates vary by sector, gear type, and fishing grounds, monitors must be deployed to ensure adequate coverage levels for each combination within a sector to attain a Council-mandated level of statistical confidence. NMFS remains committed to its observing program, which covers 8% of trips to collect scientific data. Industry will be responsible for the remaining 17% coverage.

4. How industry has responded

In April of 2011, the Gulf of Maine Research Institute (GMRI) conducted a survey of groundfish permit holders to gain a better understanding of how fishermen have adjusted to sector management⁶. The survey revealed a wide range of changes. The most publicized of which was the number of fishermen who dropped out either permanently (by selling their permit and vessel) or temporarily (by leasing out all of their allocation) because they felt their portion of the sector's annual allocation was not enough to remain profitable (see the graph on page 10 showing the decline in active groundfish vessels over the past decade).

Focusing exclusively on fleet consolidation misses the profound changes that took place among the majority of vessels that remained active. Indeed, fishermen have adapted to sector management with wholesale changes throughout their entire operations, from the number of trips they make to the influence they wield in the marketplace.

More selective gear

Sector management puts an added premium on targeting legally sized fish since undersized fish count against the sector's allocation but cannot be sold. Additionally, employing selective fishing gear may allow a vessel to optimize

its allocation and avoid being shut down by reaching its limit on a constraining stock. In response, captains started using nets with larger mesh to let out undersized fish. Meanwhile, more vessels developed and utilized nets that avoid constraining stocks. For example, the low allocations of cod lead more boats to use the "separator trawl" that targets haddock while avoiding cod or the "topless trawl" that yields more flounder than cod.

Weight-watching

Worried that a single tow might yield more of a stock than they have allocation to cover, some fishermen started using catch sensors that clip to the codend (the tail end of a trawl net where the fish collect) and signal the wheelhouse when the catch reaches a pre-set weight of fish. Similarly, many skippers are making much shorter tows to keep a closer eye on the amount of fish coming over the rail.

Managing allocation

Although most sectors treated their collective allocation as individual quotas, some sectors blurred the lines by swapping allocation around to suit each fisherman's business. Thus, two fishermen might simply trade stocks so that each ends up with a mix of species they had traditionally targeted, regardless of whether one stock is worth more at the dock than the other. In cases where difference in market value is extreme, some money might change hands as well.

Most fishermen lease and trade allocation to keep fishing. The lease price for allocation tends to follow market price and reflect the relative abundance of that stock. Therefore cod, which has a high dock price as well as being a constraining stock for many vessels, is quite expensive—meaning its leasing price is close to the dock price for landed fish. Other stocks (e.g. pollock) that are more abundant and fetch lower prices at the dock are significantly cheaper to lease. Some owners may decide that it is worth buying constraining stocks at a relatively high

⁶ Full survey results available on GMRI website at <http://www.gmri.org/community/fisheries.asp>.

price if it means they can harvest more of their allocation of other, more abundant fish. The financial decisions under sector management have become more complicated.

Most fishermen report that leasing allocation under sector management is relatively more expensive than leasing days-at-sea was under the old system. The exception is owners of large vessels. Large vessels (over 75 feet) were limited to a small pool of days-at-sea that matched their vessel's length and horsepower. Under the days-at-sea system, smaller vessels could buy days from larger ones, but not the other way around. The reasoning was that a large vessel could land more fish per day than a smaller one. Under sector management, it no longer matters what size vessel is landing fish, so allocation can be traded among all vessel sizes, and gear types, expanding the pool of available allocation for the largest boats.

Marketing contracts

Traditionally, groundfish landed in New England passes through auction houses or other dealers with prices varying daily, driven largely by the amount of a given species landed that day. Under sectors, however, fishermen have greater control over their supply of fish because they hold a pre-defined portion of the overall harvest. Some fishermen have responded by entering into forward contracts with processors or retailers to supply a given amount of fish for a certain price, adding stability for both sides.

Fishermen need to be careful, however, not to run afoul of anti-trust laws, which may come into play if two or more enter a contract together. GMRI and the Northeast Sector Services Network hired a legal team to draft a white paper as guidance for sectors. That paper is available on GMRI's website at www.gmri.org/sectorresources.

Processors—companies that purchase fish from dealers or auctions and prepare them for market—have changed their business models to adapt to the new system. Many are seeking contracts with

harvesters to generate more predictable supplies. Large chain restaurants, cruise ship companies, and multi-state retailers comprise the bulk of the seafood market. They want a steady supply so they can streamline their menus or advertise specials well in advance. Processors often take huge risks when negotiating such deals, having to fulfill orders by purchasing fish on the global marketplace. Negotiating contracts directly with harvesters can help reduce those risks, allowing them to pay more at the dock. Some processors want to reduce their risk further by switching to a contract-production model. Under that system, a processor would not own the fish they prepare for market. Instead, a retailer would purchase directly from a harvester, dealer, or auction and either the buyer or seller would contract the processor to process the fish.

Lawsuits

The groundfish industry has not responded solely with modifications to its businesses. Fishermen and fishing communities have banded together to challenge core components of Amendment 16 in the courts. Citing possible conflicts with the National Standards⁷, the suit seeks to overturn Amendment 16. The plaintiffs claim a gross injustice in how catch history was determined for the initial allocation. Specifically, the catch period for one sector was slightly different for one stock and the recreational catch was determined using a different time period than for the commercial fleet. In July of 2011, the court upheld the sector system; however a promised appeal will keep the issue in the courts for some time to come.

5. How NOAA Fisheries has responded

Amendment 16's monumental change did not affect just the fishing industry. It brought commensurate change to the regulatory process as well.

Data management systems

NMFS staff from both the Northeast Regional Office in Gloucester and the Northeast Fishery Science Center in Woods Hole hosted a string of workshops before Amendment 16 took effect. These sessions were designed to gather industry input into how data should flow and to ensure that sectors develop data systems that met federal reporting requirements, such as the weekly sector reports.

NMFS also facilitated sector reporting by establishing a new website called the Sector Information Management Module that provides sectors with the dealer reports and discard data they need to submit their weekly reports. Sector managers use the website to submit their reports and post allocation trade requests, which NMFS must then approve based on the availability of allocation from the supplying sector.

Discard estimation

When a vessel has an observer or monitor on board, that trip gets assigned an actual discard rate. But the majority of trips are not observed or monitored, so NMFS assigns assumed discard rates derived from trips that have been observed. These sector-level assumed rates reflect the vessel's sector, gear type, and fishing location. For example, all vessels in a given sector that fish with gillnets in the southern New England area get the same discard rate.

Financial support for dockside monitoring and sector operations

Responding to concerns from industry that the transition to sector management would be costly, NMFS has made millions of dollars available for sectors. Some of these funds came from two pass-through grants made to GMRI as a cost-effective way to disburse federal support quickly. A total of \$1.8 million was made available to cover dockside monitoring costs. Working with

industry, GMRI developed a system for equitably distributing monitoring funds, accounting for the diverse range of sectors, landing ports, and amount of allocation. NMFS committed a further \$1 million for sector start-up costs. When it suspended funding for dockside monitoring, NMFS redirected the roughly \$1 million of unspent funds to sector operational costs. Funds for sector operations were distributed evenly among all sectors, recognizing that all sectors face similar fixed costs.

Collaborative research

In 2010, NMFS directed most of the region's collaborative research funding towards projects that would help industry adjust to sectors. One such project is GEARNET, a network of fishermen and scientists. The project solicited ideas from each sector and the common pool, funding 17 in all. As a result, these fishermen are testing new nets, catch sensors, and mammal deterrents. More information about GEARNET can be found at www.gearnetwork.org.

6. How nonprofits and philanthropies responded

Technical assistance

Nonprofits and industry associations throughout the region, including Cape Cod Commercial Hook Fishermen's Association, Penobscot East Resource Center, the Island Institute, EarthJustice, the Associated Fisheries of Maine, the Northeast Seafood Coalition, and GMRI moved to provide technical support to the groundfish industry during the transition to sectors. The sheer complexity of forming a sector necessitated outside assistance. Given all the demands on their time and resources, a small group of fishermen would have been hard pressed to prepare the hundreds of pages of documents, including a highly technical environmental assessment, needed to gain NMFS approval. Environmental Defense Fund also worked

⁷ The Magnuson Act lays out 8 National Standards that should guide the development of FMPs. The standards can be found here: http://www.nmfs.noaa.gov/sfa/domes_fish/national_standard.htm.

to bring successful models to New England from outside the region. These efforts gained the support of several major foundations that wanted New England's sector model to succeed.

Permit Banks

Other nonprofits, notably the Cape Cod Fisheries Trust, the Gloucester Fishing Community Preservation Fund, and The Nature Conservancy, support the industry with permit banks (though Cape Cod's and Gloucester's pre-date sector management). Each permit bank has a different emphasis, but they all offer fishing businesses a way to augment their allocation with below-market leases. The Nature Conservancy has used its permits to support conservation engineering research to test more selective and fuel efficient gear. Permit banks also exist to support fishermen in Boston and on Boston's South Shore—these, too, pre-date sectors.

Congress directed roughly \$5 million to Maine, Massachusetts, and New Hampshire to establish permit banks. Through a memorandum of understanding with NMFS, the state permit banks focus on making allocation available to smaller vessels (45 feet or less) from small communities. Maine, which received a total of \$3 million for its permit bank, has established its own lease-only sector. New Hampshire is planning to put its permits in with the two sectors based in that state. Massachusetts has opted to create a revolving loan fund rather than a permit bank to assist fishermen to buy new gear or lease allocation.

Research

In addition to the GEARNET projects, research institutions in the region, including the University of Massachusetts School of Marine Science and Technology, the University of New Hampshire Cooperative Extension, the Commercial Fisheries Research Foundation in Rhode Island, and GMRI have focused research projects on sector needs. This work includes economic and social analysis, gear development,

by-catch avoidance, fuel conservation, and fish handling techniques.

Marketing

With its market-based approach to environmental issues, Environmental Defense Fund has been a proponent of catch shares and continues to search for ways that industry can improve profitability under sector management. To that end, they sponsored a workshop in February, 2011, that brought fishermen, processors, and retailers together to explore new marketing opportunities. With fishermen holding an allocation of fish, they can treat that allocation as an inventory from which to draw over the course of the year. Likewise, processors and retailers have a better sense of what supply might be available and can structure contracts or promotions based on that information.

Lawsuits

Several industry-based nonprofits joined the lawsuit challenging Amendment 16 for being too restrictive on industry. Another nonprofit, Oceana, brought a lawsuit against NOAA arguing that the amendment did not go far enough to account for the new system's impact on some marine mammals, by-catch, discards, and highly vulnerable stocks. At the end of 2011, the District of Columbia Federal District Court ruled largely in favor of NOAA, but agreed with Oceana that the Amendment did not create suitable accountability measures for five severely depleted stocks⁸.

7. Limits to adaptation

Although industry, NMFS, and nonprofits are quickly adapting to the new system with innovation and ingenuity, there are limits to the speed and depth of adaptation. One constraint is the sheer enormity of the change. Fishermen have had to adapt to so many new regulatory requirements that many have not been able to make additional adjustments that could provide added benefits, such as forward contracts.

Another constraint is the availability of capital—change is expensive and making investments in new gear or additional allocation is beyond the means of many vessel owners.

More than ever, fishermen must be shrewd entrepreneurs, not just successful harvesters. Sector management adds a new dimension to their businesses—managing allocation—and new demands for investment—purchasing additional allocation and/or more selective gear, all against the backdrop of increasing vessel safety regulations and an aging fleet of vessels. Many fishermen also serve on their sector's boards. As a result, they are spending increasing time in meetings working through the business of running sectors and learning the ins and outs of nonprofit management.

The stock-specific relationship between investment and return forms the underpinning of the market incentives that drive this new system. Through the basic laws of supply and demand, this market-based approach makes it relatively more expensive to harvest stocks with low catch limits than stocks with higher limits. The effect should be to push fishing effort to more abundant stocks. However, that effect is somewhat dampened by price increases for scarce but desirable products and by constraints to changing fishing practices. The seafood market is global in scope, so a relative scarcity in New England does not necessarily yield a higher price, which would help offset lower catches. The global nature of fisheries also means that New England fishermen risk losing market share permanently if wholesalers can find a more predictable source elsewhere, such as Norwegian haddock.

The increased costs associated with transitioning to sectors hit industry at the same time that catch limits were decreasing on many key stocks, as mandated by tight rebuilding periods in the

Magnuson-Stevens Act. Between 2009 and 2010, catch targets on 12 groundfish stocks declined, some by as much as half. For example, the 2010 catch limit for Gulf of Maine cod, a key stock for many smaller boats, was 60% less than the 2009 catch target. (Under days-at-sea, the overall limit was called a catch target while under sector management, it is called a catch limit). As a result, many vessels saw their revenue decline from 2009 to 2010. The decrease was partly offset by higher market prices, but not entirely.

A major obstacle for many boats was the effect of the allocation formula used to distribute the catch limits among sectors. Some fishermen found themselves with low initial allocations, forcing them either to lease in more allocation, lease theirs out and concentrate on other fisheries, or sell their permit and leave the fishery all together. It is impossible to tell what spurred individual decisions, as the fleet was already contracting under days-at-sea, but Figure 3 shows NMFS data on the number of vessels undertaking at least one groundfish trip.

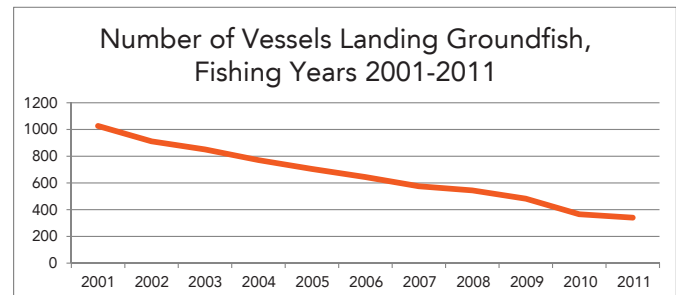


Figure 3. Number of Active Groundfish Vessels, 2001 to 2011.

8. Areas ripe for innovation

Managing a sector

Currently, most sectors follow the same model: a full- or part-time sector manager conducts the bulk of the sector's business - tracking catch, executing trades, reporting to NMFS, and interacting with the board of directors. Federal assistance, over \$3 million in total, has been crucial for this initial start-up phase. But as that

⁸ Atlantic wolfish, ocean pout, Southern New England/Mid-Atlantic Winter flounder, Southern and Northern windowpane flounder, and Halibut.

assistance fades out, sectors will need to develop lower cost models for managing their businesses. The New England Sector Services Network, an off-shoot of the Northeast Seafood Coalition, offers one model for centralizing certain sector tasks, such as the annual application process, and frees up sector managers to focus on marketing or optimizing allocation. Another model is for sectors to share or subcontract the intricate catch reporting tasks. Additionally, sectors will have to take a close look at the seasonality of their groundfish activity and the premium they might be paying for keeping their membership small. Some sectors may either have to merge or concentrate their fishing activity to a few months to limit their need for a manager.

Sector composition

Because many sectors formed initially along geographic and social lines, they were not necessarily developed with an eye toward the mix of allocation that their members might bring, nor their fishing philosophy or marketing aspirations. Some harvesters may find benefit from forming sectors to create a specific mix of allocation, join with others using selective gear so they reduce their discard rate, or align along sustainable marketing strategies.

Cost and effectiveness of monitoring

Monitoring sectors potentially involves both dockside and at-sea monitors to verify the now-critical catch, discards, and stock data. New monitoring requirements place additional demands on industry's financial resources, as well as introducing safety and logistical concerns. The traditional approach to at-sea monitoring that relies on a human observer will be too expensive for many fishing businesses once federal funding ceases. New approaches, such as using video cameras, hold promise but still face cost and logistical hurdles.

Size and composition of the fleet

The introduction of sector management has reignited debate within industry about how many boats should be fishing and what is the right balance between smaller, in-shore vessels and larger, off-shore vessels. The many changes highlighted thus far have dramatically changed the commercial groundfish landscape. The result will certainly be a restructuring of the fleet. Amendment 16 places no cap on permit or allocation ownership, either by an individual or a sector. Attempts to add those to the fishery management plan are ongoing, but very difficult to institute.

Short of a major overhaul of the permitting system, market forces will ultimately shape the size and composition of the fleet. Smaller vessels, with lower margins, might find new, more localized markets to get a premium for their fish, much like local farmers throughout New England. An added undercurrent is the gradual aging of the fleet. Many of the vessels operating today date to the 1970s. Replacing those vessels is expensive – particularly because new Coast Guard regulations have improved safety but added cost. As fishermen upgrade their vessels, they will face six- and seven-figure prices for new boats. Financing capacity and risk tolerance will likely reshape the fleet toward consolidation and more business-focused management.

Higher yields of annual catch limits

Despite the economic hardship faced by many during the first year of sector management, the fleet as a whole did not catch more than 85% of any allocated stock. While some sectors did harvest 100% of a few of their allocations, industry will be looking to increase their harvest levels as much as possible. Part of the solution to increasing yields may be to reconsider closed areas; many fishermen contend that closed areas constrain their ability to stay on schools of haddock or pollock. Increased use of more selective gear, bait, and fishing practices may also help sectors harvest more of their allocations. Finally, sector members may find benefit from planning their activities around their sector's total allocation rather than treating each member's allocation as an individual quota.

Price stabilization

The change to sector management has the potential to bring significant change to the way catch is sold and, therefore, the price fishermen receive. Fishing against an annual allocation allows the fishermen more control over their effort and the ability to time their activity to general market trends. In addition, sectors introduce the opportunity for vessels to contract more directly with retailers by entering into longer-term contracts for a certain amount of fish for a set price. In a world ruled by uncertainty, the thought of a more stable price holds great appeal for many fishermen, just as a more stable supply, even at a premium, holds appeal to supermarkets and restaurants.

Traceability

While not directly linked to sectors or catch shares, the ability to trace a seafood product from its point of harvest through processing to the retailer can strengthen the connection between harvester and consumer. With the increased interest in local, sustainable foods, demonstrating those connections is critical for reassuring the public about the authenticity of its seafood. Traceability can mean several things, but at its core, it is the ability to trace the origin of a product through the various transactions that bring it from its source (in this case, a fishing vessel) to its consumer. Seafood typically changes hands multiple times as it gets landed, auctioned off, transported to a processor, processed into fillets or other products, sold to a distributor, and finally conveyed to a retail venue such as a grocery store or restaurant. Steps along the way may be skipped if, for example, chefs buy directly from a vessel or fish are sold through a community-supported fishery. Regardless of the number of steps, tracing a product's origin back to a specific vessel (or even specific fishing ground) adds value—and accountability—especially if it also allows a retailer to tell a story about that origin.

Sustainability and the Marketplace

Holding allocation at the vessel or sector level creates new opportunities for fishermen to distinguish themselves in the marketplace. One of the tenets of quota-based fishery management is that it grants participating vessels a greater sense of ownership over their portion of the overall catch. Fishermen have always been stewards of the resource, but if that resource is held in common, the actions of individual fishermen get lost in the collective activity of the entire fleet. Having a set amount of fish to harvest - with the possibility of purchasing more - creates a system more analogous to manufacturers holding an inventory of product. Investments made in gear that reduces its impact on habitat or requires less fuel not only reduce operating costs, but also yield higher prices by responding to the increased market demand for sustainably sourced food.

Assessment science

The 2006 reauthorization of the Magnuson-Stevens Act draws a clear distinction around using the best available science to set catch limits. Councils may not set catch limits above fishing levels set by their Science and Statistical Committees. In addition, the switch to an output-based management system places a new emphasis on assessment science. Not only are absolute numbers of each stock important, but their abundance relative to each other becomes critical. Assessments for the majority of stocks might be accurate, but if the assessment for a constraining stock is too low, it impacts industry's ability to harvest all other stocks as well.

The need to create stock-by-stock catch limits that are tied to strict accountability measures has pushed the limits of current assessment science. The current cycle of assessments every three years may not be frequent enough to capture changes in the ecosystem and our understanding of population structure may not be refined enough to explain changes in abundance and geographic distributions. Gulf of Maine cod and Georges Bank yellowtail flounder serve as two examples of stocks whose recent assessments

differed dramatically from estimates made just three years ago.

The planned move to an ecosystem-based approach to managing fisheries will place even more demands on the scientific community. Managing the fishery at the ecosystem level rather than the stock level will likely require aggregating stocks into larger family groups (such as all gadids—cod, pollock, and haddock) and unifying the broad management areas to include all stocks (currently, different stocks are managed with different stock boundaries). The increased complexity of understanding and accounting for interactions across stocks will present a huge challenge for scientists. Translating that complexity into an equitable and efficient management system will prove equally challenging for managers.

9. Conclusion

Sector management has changed the legal, economic, and cultural landscape for New England's groundfish industry, resulting in monumental changes to historical fishing practices and a way of life. The fishing industry has responded with everything from tinkering with their fishing gear to complex marketing agreements that help stabilize price to lawsuits seeking to halt sector management altogether. As sectors take hold acute challenge are emerging: uncertainty in stock assessments, data management constraints, monitoring costs, and the increasing need for capital to compete effectively. Overcoming those challenges will require individual and collective innovations of all stripes—technical, social, economic, and political. Much innovation has occurred already. But many questions remain:

- how does industry survive the impending era of drastically reduced catch limits on key stocks such as the 22% drop in Gulf of Maine cod for 2012 (and a much larger drop anticipated for 2013)?
- can assessment science improve to provide more timely and accurate catch limits?
- how do smaller vessels with limited access to capital compete in a system that requires higher investments?
- can the cooperative nature of sectors allow their members to capitalize on a shared allocation to grow profitability?
- can the system both reward innovative owners who invest wisely while maintaining opportunity for new businesses or isolated communities? and
- what lies ahead as the nation moves toward management systems that reflect the complex interactions of the marine ecosystem rather than treating individual stocks in isolation?

The answers to these questions lie along a spectrum of individual entrepreneurship through democratic political engagement in the Council process. Sector management now defines the arena in which these questions will be answered for the groundfish fishery. As industry members, managers, scientists, and the public grapple with the dramatic changes the new system has created, they will need to work together to overcome remaining obstacles to success while capitalizing on the opportunities that sector management offers.