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MASSACHUSETTS MARINE FISHERIES INSTITUTE

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Submitted To:
Secretary Ian Bowles of the Executive Office of Energy and the Environment and
Commissioner Mary Griffin of the Department of Fish and Game

A Report on Economic and Scientific Conditions in the Massachusetts Multispecies Groundfishery

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Executive Summary

This report demonstrates that the transition to catch shares (sector management) under Amendment 16 to the Northeast Multispecies Fishery Management Plan caused unforeseen major shifts in the distribution of quota (and income) resulting in $21 million in direct economic losses and forgone yield of $19 million for the Massachusetts groundfish fishery. Scientifically valid alternative references points have been identified which can trigger increases in annual catch limits (ACLs) without sacrificing conservation. These increases are particularly helpful with regard to raising limits for choke species. Under optimal sector operating conditions, in which ACLs would be raised to the maximum amount that would be scientifically justified while still maintaining conservation goals, we expect the increases to total 14,500 mt more fish for the Northeast Multispecies fishery.

Economic Emergency

The National Oceanic and Atmospheric Administration's review of landings and revenue data available for the first five months (May-September) of the 2010 fishing year shows that landings (and revenues) are comparable (or in some cases greater) to levels observed for this same period last year. While these data indicate potential economic health in the groundfishery as a whole, aggregate data masks unforeseen significant economic impacts that are happening at more local levels, partly through consolidation. The report finds that of 385 Massachusetts groundfish boats that have joined sectors, 56% have not yet been active in the fishery this year. This compares to 46% inactive at this time last year. The transition to catch shares has created gain for some fishing businesses, but low quota allocations represent an economic emergency for a significant portion of the fishing community. For example, a comparison of 2010 Annual Catch Entitlements (ACE) to actual landings in recent years shows as much as two thirds of fishing permits were allocated 50%-60% less than their 2007-2009 average annual harvest. This reduction in allocation represents lost revenue of $21 million for this portion of permit holders.

This information coupled with reports from Sector managers about many fewer vessels operating in the 2010 fishery as compared to last year, demonstrates that a significant shift in the distribution of income has occurred. The total revenue for vessels that landed more than $300,000 during May-September (2010) almost doubles from $14 million to $26 million, while the number of vessels in sectors that didn't fish increased about 11%. In other words, 10% of the Massachusetts sector vessels landed about 64% of total revenue from May through September of 2010. The impacts of lost revenue are compounded by the increased operating costs that go along with sector management – fees are assessed against sector landings to cover monitoring and administrative costs that can undermine the profitability of a trip.

A change in the distribution of "catch entitlement" could potentially be mitigated and the economics of catch shares improved if trading of quota between fishing operations (or sectors) were fluid; however, reports about sector activity indicate the market for catch trading and leasing is non-functioning. Additionally, many businesses are carrying past debt incurred in order to survive the 2007-2009 days-at-sea (DAS) program, leaving fishermen without equity to help finance "new" investments needed to carry added costs of the 2010 sector catch share program. The fact that so few participants are positioned to survive low ACLs, Amendment 16 allocations, and enter the quota-leasing market as "lessors" has caused the quota-trading market to be heavy with potential "buyers" who cannot afford to lease at the prices that potential "sellers" need to make business sense. "Sellers" who can afford to lease at a level low enough

for buying to make any business sense are almost absent from the market (Northeast Seafood Coalition, Vito Giacalone pers. comm.).

The cumulative economic impacts – which include high costs to operate within a sector, past debt incurred to survive the DAS program, lost harvest opportunities because of quota allocations, and added investment needed to continue in sector programs – all contribute to decreased revenue for a significant portion of the industry, rapid consolidation of fishing businesses, rise in unemployment, and reduced infrastructure.

Raising Catch Limits is Scientifically Justified

We conclude that there are alternatives within the best available science for calculating and setting higher than current ACLs for 2010. Of the three components that capture uncertainty in determining ACLs, all three used conservative methodology, sometimes "double counting" uncertainty. Specifically, use of direct estimates of F_{MSY} (overfishing definition) instead of lower proxy values ($F_{40\%MSP}$) for some stocks underestimates overfishing limits and lowers ACLs. Alternative assessments would allow increases in groundfish ACLs such as for Georges Bank yellowtail flounder. Smaller uncertainty buffers would accomplish the same increases. For some stocks, rebuilding objectives can be revised, thereby allowing increases in ACLs. In the context of the new management system, adding an uncertainty buffer to an overfishing limit that is based on an underestimate of F_{MSY} or stock size is doubly precautious. Therefore, reconsideration and raising of ACLs is justifiable, based on direct F_{MSY} and B_{MSY} estimates, alternative stock assessments, or narrower uncertainty buffers.

Combined adjustments provide ACL increases for all groundfish stocks with substantial increases for "choke" species such as Georges Bank cod and yellowtail flounder, Gulf of Maine cod and winter flounder, and southern New England winter flounder. Increased ACLs for "choke stocks" will allow the groundfish fleet to reach far more of their allocations of other stocks thereby substantially increasing mixed-stock yield within the multispecies ACLs. This analysis, in which ACLs would be raised to the maximum amount that would be scientifically justified while still maintaining conservation goals reveals that increased ACLs will allow up to an an additional 14,500 mt (about 32 million pounds) of catch.

Important effects of ACL increases were investigated using mixed-stock catch projections. Linear programming to optimize catch revealed increased ACLs reduced the number of "choke species." Catch from all stocks could increase from either 6,800 mt to 9,800 mt or 36,600 mt to 51,100 mt depending on the success of trading ACE between groundfish sectors.

Introduction

The Massachusetts Marine Fisheries Institute (MFI) was tasked with determining if scientific and economic justifications exist to support use of emergency authority by the Secretary of Commerce (SOC) to raise annual catch limits (ACLs) in the Northeast multispecies fishery. ACLs have been established through Framework Adjustment 44 (FW 44) to the Northeast Multispecies Fishery Management Plan (FMP). Researchers from the University of Massachusetts School of Marine Science and Technology (SMAST) and Massachusetts Division of Marine Fisheries (DMF) teamed with stakeholders representing the Northeast Seafood Coalition to draft this report. The report provides an analysis and evaluation of the current economy and overall economic viability of the Massachusetts sector groundfish fleet resulting from the unforeseen consequences of unnecessarily low ACLs and market failure in trading under the new catch shares system, and what scientifically valid alternatives exist to increase ACLs. Methods of analysis and sources of information include direct comparisons of Amendment 16's 2010 Annual Catch Entitlement (ACE) to 2007-2009 Vessel Trip Report (VTR) information, optimization modeling to determine prospective harvest activity, and interviews with Massachusetts sector managers and representatives.

Background

Amendment 16, developed by the New England Fishery Management Council (NEFMC) and implemented by the National Marine Fisheries Service (NMFS), began a catch share program known as "sectors" in the Northeast multispecies fishery. Seventeen sectors were approved to operate during the 2010 fishing year and over 95% of all ACLs for 20 groundfish stocks are sequestered within these sectors; the balance being assigned to a so-called "common pool".[1]

The Lack of a detailed analysis of impacts caused by sector management on individual vessels increases potential for unforeseen circumstances[2] to jeopardize fishery performance and undermine goals of the Fishery Management Plan (FMP) and/or other related National policies.

The complexity and imprecision of the new management system is partly a factor of the sequence of events during development of Amendment 16. The NEFMC adopted Amendment 16 well before (June 22-25, 2009) it received stock assessment results from the Report of the 3rd Groundfish Assessment Review Meeting (September 3-4, 2009); the Scientific and Statistical Committee annual biological catch recommendations and the Plan Development Team's proposed ACLs weren't adopted, as part of Framework 44, by the NEFMC until November 5th & November 17-19, 2009, respectively. In addition to not knowing the ACLs at the time of adopting Amendment 16, the implications of using 1996-2006 landings history to calculate PSCs were unknown as were final participation levels in sectors and the common pool. The Public Hearing Document for Amendment 16 reads: *"Estimating the impacts that will result from the proposed measures is difficult. The number of vessels that will join sectors will not be known until after passage of the Amendment, so there is uncertainty over what the actual impacts will*

[1] Individuals not enrolled in a sector become part of the common pool.
[2] Low Potential Sector Contributions (PSC) and consolidation impacts, the introduction of hard quota management to this Multispecies fishery, and the lack of transparent sector operations.

be…" Too many decisions were made without benefit of detailed analyses. This lack of understanding and identification of potential economic impacts in this context is in striking contrast to how other federal agencies tasked with environmental regulation proceed with major regulatory changes. The Environmental Protection Agency (EPA), for example, completes extensive and robust economic analyses that predict economic impacts on different segments of the economy that may be impacted by new regulations.

In the Amendment 16 final rule NMFS recognized that potential problems may have been caused by the allocation effects of the sector program as well as individual permit holders acquiring excessive control of fishing privileges. In a letter to the NEFMC, NMFS indicated that it would work with the NEFMC to resolve potential problems, "*…NMFS will work with the Council's Interspecies Committee to consider developing measures that would address the issue of sector ACEs as they relate to the FMP's social and economic objectives, the Council's sector management policy, the national policy on catch share management, the and the requirements of National Standard 4…"*

No one appreciates the socioeconomic impacts of sector management on the industry more than the industry itself. In January 2010 the Northeast Seafood Coalition commenting on 2010 sector operation plans and contracts said: *"…Regrettably, the allowable catches have been greatly constrained by multiple applications of the precautionary principal in the setting of ACLs and MSRA rebuilding mandates. The accumulative impacts of these applications are stripping the fishery from any hope of avoiding colossal consolidation…We feel compelled to express our profound concern for the eminent loss of hard working independent operators from our industry. NSC contends that these losses will be the direct result of the setting of ACLs. Unfortunately, most will believe it was the transition to sector management that caused their demise…"*

Recognizing the potential for sector management to be complex and imprecise, in 2009 the Commonwealth commissioned a report to provide an "outside" consideration of the policy process regarding sectors. The authors of that June 2009 report[3], Seth Macinko and William Whitmore, began by noting that "*management of New England groundfish fisheries appears to be in crisis and at a crossroads*." Among many conclusions and recommendations these authors note the Council contradiction between desiring consolidation yet fearing its impacts on the existing structure of the industry.

Economic Impacts

Background

Catch share management programs, when designed correctly[4], may help to prevent overfishing, eliminate the race to fish, reduce overcapacity and bycatch, and improve economic efficiency. However, catch share

[3] "*A New England Dilemma: Thinking Sectors Through*."

[4] Catch share systems as with any market based system require significant institutional support for information, transparency, secondary markets, and in the case of highly regulated resource use, monitoring the effects on participants.

programs may also result in the consolidation of fishing effort, reduce community involvement in local fishing, decrease access by small-scale fishermen to local fishery resources, create barriers to entry into the fishery by increasing the demand for capital to participate, and create competition among fishermen for access privileges.

The National Oceanic and Atmospheric Administration's review of landings and revenue data available for the first five months (May-September) of the 2010 fishing year shows that landings (and revenues) are comparable (or in some cases greater) to levels observed for this same period last year, prior to the implementation of catch shares. While these (aggregated) data show potential economic health in the groundfishery as a whole, aggregating the data masks significant economic impacts that are happening to individual fishermen or classes of permit holders at the local levels.

Results

The NMFS Vessel Trip Report (VTR) database provides a basic characterization of the Massachusetts groundfishing fleet. The fleet is defined here as sector vessels that have a principal port in Massachusetts and also have ACE in at least one groundfish stock. The fleet is comprised of 500 vessels and some accounting of their activity during 2010 is provided in Tables 1 and 2. More than 50% of sector boats are 45 feet and smaller; 40% hail from Gloucester, 20% from New Bedford and a combined 25% from Chatham, Boston and Scituate.

Table 1. Number of vessels in the Massachusetts groundfish fleet by length category.

	Active Vessels (landing catch)			All MA Sector
Length	May-Aug FY2008	May-Aug FY2009	May-Aug FY2010	Vessels
<15'	0	1	0	115
15-30'	1	3	1	48
31-45'	88	94	78	152
46'-60'	25	25	21	34
61-75'	28	25	22	37
76-90'	46	47	34	66
90'+	13	10	12	17
?	3	3	1	31
Total	204	208	169	500

Table 2. Number of vessels in the Massachusetts groundfish fleet by port.

Primary Port	Active Vessels (landing catch) May-Aug FY2008	May-Aug FY2009	May-Aug FY2010	All MA Sector Vessels
GLOUCESTER	78	84	68	188
NEW BEDFORD	51	46	33	98
CHATHAM	18	21	18	69
BOSTON	16	14	14	33
SCITUATE	11	12	10	22
HARWICH	4	4	5	16
GREEN HARBOR	4	3	3	7
NEWBURYPORT	3	3	3	6
PROVINCETOWN	3	2	3	5
MANCHESTER	1	1	2	4
PLYMOUTH	4	4	2	4
ROCKPORT	4	5	2	7
WOODS HOLE	2	2	2	2
FAIRHAVEN	0	1	1	2
MARBLEHEAD	0	1	1	4
SALISBURY	1	1	1	2
WESTPORT	1	1	1	1
OTHERS	3	3	0	30
TOTAL	204	208	169	500

The Standard Atlantic Fisheries Information System (SAFIS) was used to compare landings and revenue data for the first five months (May-September) of the fishing year for 2005-2010 (Tables 3 & 4, Figure 1). The SAFIS data show that total revenue from all species remained roughly constant from 2005 to 2009 at about $40 million for the first five months (May through September) of each fishing year (Table 4). Adjusting for inflation using the CPI-U, total revenue fell by about 15% over this period. For these same five months in 2010, total revenue increased by 21% over the average revenue for the first five months of the fishing year from 2005 through 2009 to $47 million for these 500 vessels, about $44 million after accounting for inflation.[5] The distribution of income among the vessels, however, changed significantly in 2010.

Revenues are concentrated among a relatively small number of vessels. During the first five months of the 2010 fishing year two-thirds of the Massachusetts groundfish fleet were inactive in the groundfishery while more than half of the fleet (253 vessels) had not fished at all, collecting zero fishing revenue from landings of any finfish. The number of inactive vessels in 2010 increased by 17 vessels over the average number of inactive for the first five months of the fishing year from 2005 through 2009 (Fig. 1).

[5] The Consumer Price Index (CPI) program produces monthly data on changes in the prices paid by urban consumers for a representative basket of goods and services. There are separate indexes for two groups or populations of consumers: the CPI for All Urban Consumers (CPI-U) is the index most often reported by the national media.

Table 3. Number of permits within the Massachusetts groundfish fleet grouped by total May-Sep revenue from all species.

Landings Value	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
$0	240	238	243	230	227	253
$1-50K	78	75	77	72	66	69
$51-100K	52	74	54	56	88	53
$101-150K	39	30	41	50	47	27
$151-200K	30	32	22	28	17	24
$201-250K	21	18	22	25	22	19
$251-300K	14	10	17	16	12	14
$300K+	26	23	24	23	21	41
Total w/ Landings	260	262	257	270	273	247

(Source: SAFIS dealer reports)

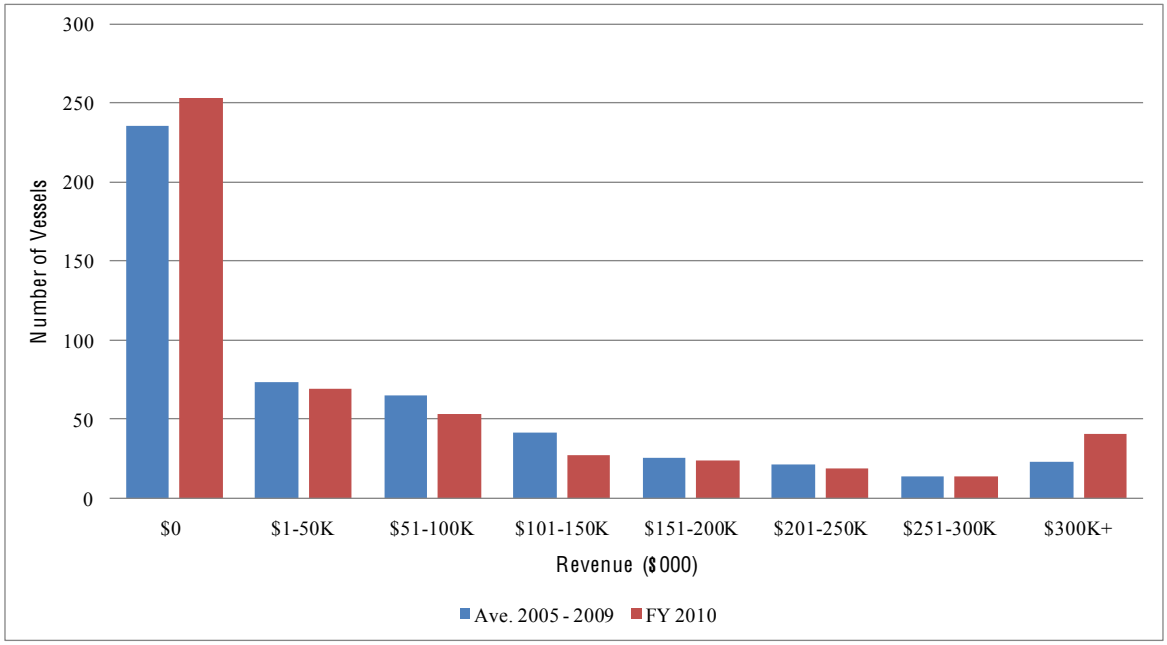

Figure 1. Comparison of 2010 revenue distribution from all species (May through September) among active vessels in the Massachusetts groundfish fleet to the 2005-2009 average.

Table 4. Sum of May-Sep revenue from landings value of all species by permit groups.

Landings Value	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
$0	-	-	-	-	-	-
$1-50K	$1,795,477	$1,656,624	$1,838,207	$ 1,727,078	$ 1,564,595	$ 1,658,755
$51-100K	$3,768,407	$5,428,811	$4,014,619	$ 4,149,512	$ 6,321,359	$ 3,890,524
$101-150K	$4,841,557	$3,779,581	$5,195,181	$ 6,078,128	$ 5,811,399	$ 3,277,228
$151-200K	$5,273,539	$5,615,853	$3,784,722	$ 4,802,112	$ 2,960,948	$ 4,145,155
$201-250K	$4,767,501	$3,975,342	$4,844,529	$ 5,612,335	$ 4,908,395	$ 4,222,571
$251-300K	$3,840,786	$2,750,597	$4,670,644	$ 4,395,020	$ 3,314,354	$ 3,827,156
$300K+	$14,984,380	$13,648,547	$14,339,143	$14,170,636	$14,185,705	$26,241,552
Total Value	$39,271,648	$36,855,355	$38,687,045	$ 40,934,822	$39,066,756	$47,262,941

(Source: SAFIS dealer reports)

In addition to an increase in the number of inactive vessels, the number of vessels that earned more than $300,000 for this period in 2010 increased from 21 vessels to 41 vessels. These forty-one vessels account for roughly 55% of the total revenues. The remaining revenues are distributed among 206 vessels, the majority of which made less than $100,000. Stated in different terms, the share of total revenues earned by the top 10% of vessels increased from 57% of the total in 2009 to 64% of the total in 2010 (Figure 2). Conversely, the share of total revenues earned by the bottom 75% of vessels decreased from 20% in 2009 to 12% in 2010 (Figure 3).

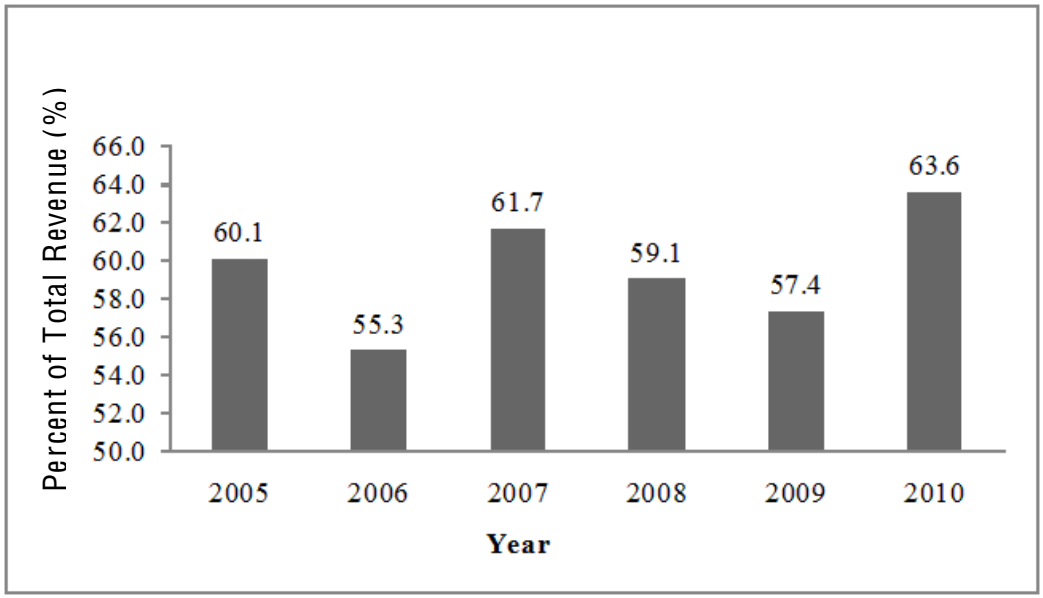

Figure 2. Total revenues from all species earned by the top 10% of vessels in the Massachusetts groundfish fleet for 2005-2010
(May – September).

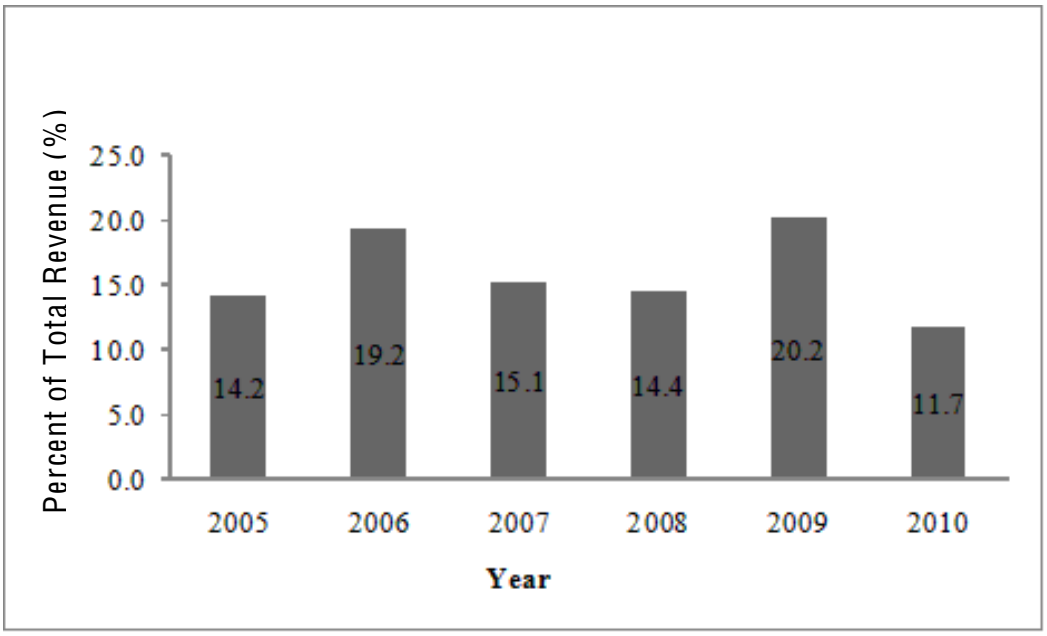

Figure 3. Total revenues from all species earned by the bottom 75% of vessels in the Massachusetts groundfish fleet for 2005-2010 (May – September).

Furthermore, distribution of allocation resulted in direct economic losses to two-thirds of permit holders totaling $21 million (Table 5).

Table 5. Comparison FY2010 ACE and FY2009 VTR groundfish landings for Massachusetts groundfish fleet.

STOCK	Number of Permits			Sum of Losers Deficits in Pounds	Value of Losers Deficits
	FY10-ACE > FY09-VTR	FY10-ACE < FY09-VTR	No FY09 VTR Lbs		
Georges Bank Cod	64	84	352	1,425,057	$ 2,078,629
Gulf of Maine Cod	38	131	331	5,249,153	$ 7,656,564
Georges Bank Haddock	114	11	375	279,129	$ 308,567
Gulf of Maine Haddock	95	55	350	332,255	$ 367,297
Georges Bank Yellowtail Flounder	24	59	417	773,723	$ 1,013,660
SNE/MA Yellowtail Flounder	7	15	478	14,959	$ 19,598
CC/GOM Yellowtail Flounder	54	106	340	496,743	$ 650,787
Plaice	124	66	310	763,663	$ 1,037,276
Witch Flounder	76	112	312	705,564	$ 1,411,003
Georges Bank Winter Flounder	31	49	420	1,028,636	$ 1,699,616
Gulf of Maine Winter Flounder	54	77	369	213,753	$ 353,184
Redfish	106	39	355	791,708	$ 375,192
White Hake	84	61	355	400,613	$ 493,835
Pollock	73	142	285	4,602,257	$ 3,604,083
TOTAL				17,077,212	$ 21,069,290

Interviews with some sector managers and administrators of the Northeast Seafood Coalition (NSC) were conducted to determine 2010 fisheries performance under the sector program. The NSC offered a perspective provided by industry leader Vito Giacalone. Mr. Giacalone has been very involved in sector management especially in Massachusetts by virtue of his organization's (NSC) initiative to anticipate

hard-quota management for groundfish by avoiding common pool derby fishing and encouraging fishermen to form and join sectors.

Twelve sectors have NSC affiliation and assistance in one form or another. They are termed "Northeast Fishery Sector II-XIII" with approximately 260 active vessels. These vessels have been allocated about 69% of Gulf of Maine cod ACE, for example.

The relatively narrow distribution of ACE that resulted from the allocation, based only on catch history (1996-2006), has caused a substantial number of fishermen who were active in the fishery in 2009 to become insolvent. This is due to the fact that their 2010 allocations are well below their 2009 catches and to varying degrees, below a level that would allow break-even fishing revenues.

While this general result was arguably foreseeable and the Amendment 16 analysis recognized this mathematical reality, the fact that these permit holders would have little chance to acquire additional quota sufficient to meet a break-even point was definitely unforeseen. The NEFMC approved the management system and allocation baselines without knowledge of the ACLs. For example, the Gulf of Maine Cod ACL was estimated to be approximately 11,000 mt during the Amendment process. The final ACL figure was approximately 8,000 mt which resulted in individual allocations far below those anticipated by fishing stakeholders. The real-world implications of sector management were unforeseeable until after implementation of final ACLs in Framework 44. Little could be known about how the fishery would react/adjust to this radical change in management approach, without the context of Framework 44.

For the intended economic efficiencies and profitability of catch shares to be realized as forecasted in Amendment 16, a high level of quota movement would need to occur from those who were allocated below a break-even point to those who were close to or above the break-even point. For this to happen there would have to be an extraordinary level of liquidity within the fishery. A large number of previously active participants would have to be capable of freezing or liquidating their fishing operations and leasing their quota to someone else. What was not adequately studied (if at all) was the capability of the fishery to do this. The result is a non-functioning market for trading and leasing quota.

The reality is that most fishermen active in the fishery in 2009 were small businessmen who had endured a severe period of consolidation and recapitalization which ensued following Amendment 13 days-at-sea cuts and days-at-sea leasing. Those who survived and still actively fished in 2009 were those who fully expected to continue as active participants in the fishery. This reality was immensely underestimated during the Amendment 16 process and is heavily contributing to the unforeseen result of "trapped" quota. Previously (2009) active fishermen are paralyzed by the lack of quota available for lease because it is not easy to liquidate a vessel and all the associated financial obligations related to a small fishing business. It is not financially feasible for these small businessmen to simply lease their quota to cover expenses let alone earn a living.

The fact that so few participants are positioned to survive low ACLs and Amendment 16 allocations and to enter the quota-leasing market as "leasers" has caused the quota-trading market to be heavy with potential "buyers" who cannot afford to lease at the prices that potential "sellers" need to make business

sense. "Sellers" who can afford to lease at a level low enough for buying to make any business sense are almost absent from the market. The market crafted by government regulation has failed to develop as predicted by Amendment 16 to the economic detriment of the industry. This overlooked, unforeseen, outcome is contributing to a leasing market that is inadequate for most of these *recently crippled* fishing operations to secure enough additional quota to meet break-even margins.

Simply put, too many fishermen who were very active in the 2009 fishing year cannot afford to buy and they cannot afford to sell. The fact that so many fishermen have been placed in this paralyzed state is not only an emergency, but is clearly a result not adequately considered or foreseen by managers and the agency.

It is misleading to look at gross revenues as a measure of success or failure in these first six months of sector management. What must be understood is that net revenues are now drastically reduced as the costs of renting fish have become the highest percentage of fishing expenses of any expense realized in the past. Only those who have secured enough of the initial allocation are able to rationalize the high lease costs by cost averaging, yet they are working at unsafe margins due to a market that is financially incapable of leasing for less. Such market conditions may reduce industry participation to levels too low to maintain current dimensions of fishing communities and infrastructure.

Increasing the ACLs will move the break-even line down the quota-disabled list resulting in fewer business failures. This will result in further leveraging of any additional quota made available through increasing the ACLs.

Best Available Science Supporting Adjustment of ACLs

Background

National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act[6] (MSA) requires that "*conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry*" (US DOC 1976). The 2007 reauthorization of the MSA introduced the requirement for annual catch limits and accountability measures: "*Each Council shall… establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability*" (US DOC 2007). Overfishing is defined in the Magnuson Act as the "*rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis*" (i.e., F_{MSY}).

[6] As amended through January 12, 2007 [P.L. 109-479].

National Standard Guidelines suggest: a) that ACLs be based on an estimate of the magnitude of catch that will result in overfishing and associated uncertainty in the estimate, and b) ACL cannot exceed Acceptable Biological Catch (Figure 4). [7]

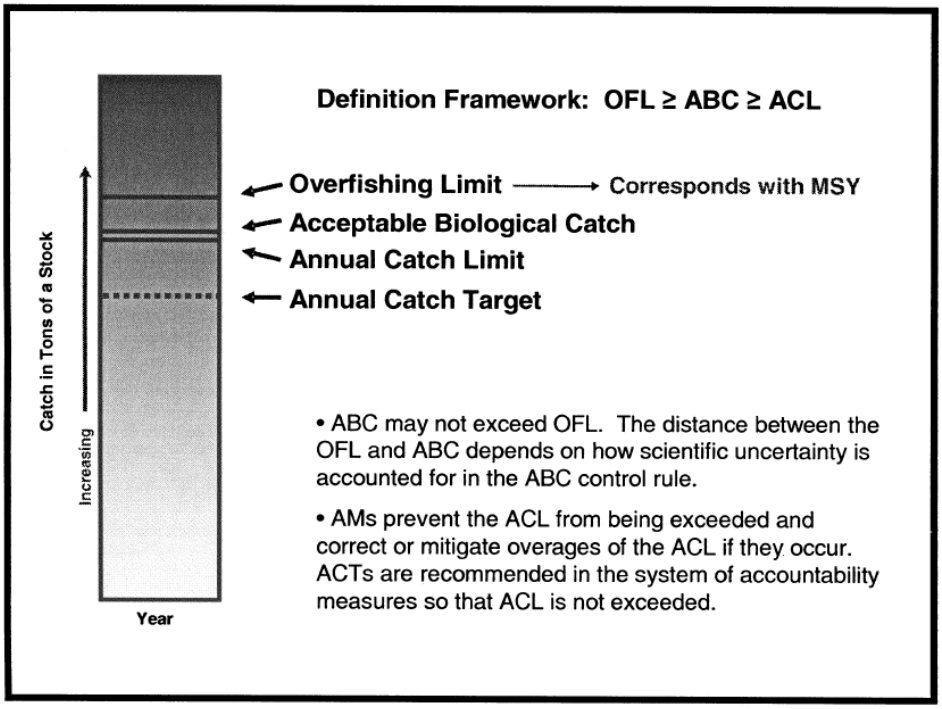

Figure 4. Relationship between the overfishing limit, acceptable biological catch and the annual catch limit (from National Standard Guidelines, NOAA 2009)

In practice, Acceptable Biological Catch is derived from three components:

1. the overfishing reference point,
2. the projected estimate of stock size, and
3. a buffer to account for scientific uncertainty.

Additionally, Acceptable Biological Catch needs to allow rebuilding objectives to be achieved. Fishing mortality needs to be reduced to less than F_{MSY} to allow 'overfished' stocks to rebuild.

Existing Information to Support Increased ACLs

Scientifically valid alternatives may be available for each component of Acceptable Biological Catch to allow increases in ACLs:

Direct estimates of F_{MSY} would allow several increases in groundfish ACLs. In 2002, F_{MSY} was estimated for all New England groundfish stocks using several modeling approaches, and the 'best model' was determined using conventional model selection methods (NEFSC 2002). Although a direct estimate of F_{MSY} was determined for some stocks, a proxy for F_{MSY} ($F_{\%MSP}$, the fishing mortality associated with a percentage of maximum spawning potential) was used for most stocks. All F_{MSY} estimates were replaced with $F_{\%MSP}$ at the 3rd Groundfish Assessment Review Meeting (NEFSC 2008). Considering that F_{MSY} is

[7] National Standard Guidelines (NOAA 2009) do not have the force and effect of law

the legal definition of overfishing, the overfishing limits of Gulf of Maine cod, Georges Bank cod, Georges Bank yellowtail, southern New England yellowtail, Gulf of Maine winter flounder, southern New England winter flounder, and white hake are underestimated, and associated ACLs can be justifiably increased.

Alternative assessments would allow further increases in groundfish ACLs. Several alternative stock assessment approaches were developed for the 3rd Groundfish Assessment Review Meeting (NEFSC 2008). Several models had substantial uncertainty manifest by retrospective inconsistency. The Review Panel chose some models that either adjusted estimates for retrospective inconsistency or reduced retrospective inconsistency by assuming that survey efficiencies changed in the mid 1990s. 'Base case' models (with no retrospective adjustment or revised survey assumptions) estimated greater stock sizes. For example, if 'base case' stock assessments were used to determine stock status of Gulf of Maine winter flounder, the stock would not be considered overfished. Although 'base case' models have diagnostic problems, they are the simplest analyses of all available data, and they were the method used to assess principal groundfish stocks for decades. By comparison, split survey models imply substantial increases in survey efficiencies (some greater than 100%); and adjusted models account for a potential bias that is not understood and may not persist. Retrospective adjustments are justified by some persistent retrospective patterns that caused management errors (e.g., Georges Bank yellowtail flounder). Conversely, retrospective patterns of other stocks have ceased or reversed direction (e.g., southern New England yellowtail and Cape Cod yellowtail), in which case a retrospective adjustment would have been inappropriate. Other alternative estimates of stock size are also available for some stocks that would justify increases in ACLs. For example, the alternative assessment of Georges Bank yellowtail that includes large survey tows provides an estimate of stock size that is nearly twice as large as the split survey series model (Legault et al. 2010). Similarly, swept-area survey estimates of the Gulf of Maine winter stock provide a method for deriving greater catch limits (Groundfish PDT 2010).

Smaller buffers would allow further increases in groundfish ACLs. Acceptable Biological Catch for most New England groundfish stocks is based on $75\%F_{MSY}$, because uncertainty could not be reliably estimated by groundfish stock assessments, providing a 25% buffer between the overfishing limit and the Acceptable Biological Catch to account for scientific uncertainty. A recent $75\%F_{MSY}$ projection analysis found that probability of overfishing was less than 10% (pollock, NEFSC 2010, Groundfish PDT 2010), which is less than the acceptable range of risk determined by several regional management Councils (Witherell 2010). Similar analyses for other groundfish stocks should be investigated to determine the probability of overfishing at $75\%F_{MSY}$. Smaller buffers may have more acceptable levels of risk, and Acceptable Biological Catches based on $75\%F_{MSY}$ can be increased up to 33%, and still conform to the maximum sustainable yield definition in the Magnuson Act. Although uncertainty buffers are recommended by NS1 guidelines, NMFS has supported minimal buffers in other regions (e.g., <1% buffer for Alaskan crabs supported by the Northwest Regional Office; NPFMC 2010).

Revised rebuilding objectives would allow increases in groundfish ACLs. Acceptable Biological Catch of some stocks is based on rebuilding objectives. As illustrated for Georges Bank yellowtail flounder, Acceptable Biological Catch can increase if rebuilding objectives are revised (Groundfish PDT 2010). Rebuilding plans can be revised by increasing the rebuilding period, using a direct estimate of B_{MSY} rather than a proxy, or reducing the expected probability of achieving objectives to 50%. The best

estimates of B_{MSY} (i.e., those associated with the best estimates of F_{MSY}) are less than the rebuilding target for Georges Bank yellowtail, southern New England yellowtail, southern New England winter flounder, and white hake. Additionally, if 'base case' stock assessments were used to determine stock status of Georges Bank yellowtail and southern New England winter flounder, Acceptable Biological Catch associated with rebuilding would be much greater. Determining the magnitude of ACL increases allowed by revised stock size or rebuilding targets would require revised projection analysis.

An important consideration in selecting the most appropriate scientific information to derive ACLs is the chronological development of scientific information in the context of revised mandates and guidelines. The 2002 re-evaluation of overfishing definitions and the 2008 stock assessments were completed before National Standard guidelines were published, and the system for incorporating scientific uncertainty could not be considered by the 2002 working group or the 2008 review panel. The new ACL system requires that a) the estimate of catch associated with overfishing should be risk-neutral (i.e., neither risk-averse nor risk-prone); and b) scientific uncertainty and fishery managers' consideration of risk should be accounted for in the Acceptable Biological Catch (NOAA 2009).

Some analytical choices associated with F_{MSY} and stock assessment models may be risk-averse rather than risk-neutral (e.g., choice of $F_{\%MSP}$ as a F_{MSY} proxy, retrospective adjustments, split survey series, exclusion of large survey tows). In the context of the new management system, adding an uncertainty buffer to an overfishing limit that is based on an underestimate of F_{MSY} or stock size is doubly precautious. Therefore, reconsideration of ACLs may be justifiable, based on direct F_{MSY} and B_{MSY} estimates, alternative stock assessments, or narrower uncertainty buffers.

Results

Although the potential increases from each component of Acceptable Biological Catch should be considered separately, the mathematical relationship between the overfishing definition, stock size estimate, and uncertainty buffer in deriving Acceptable Biological Catch implies that multiple sources of increase are multiplicative. Combined adjustments justify increases in ACLs for all New England groundfish stocks, with substantial increases for 'choke stocks' such as Georges Bank yellowtail flounder, Georges Bank cod, Gulf of Maine winter flounder, and southern New England winter flounder (Table 7). Increased ACLs for 'choke stocks' are expected to allow the fleet to achieve their allocation of other stocks, thereby substantially increasing the mixed-stock yield within the multispecies ACLs. Preliminary analysis of mixed-stock catches suggests that the increased ACLs would allow 14,500 tons more than the current ACLs.

Table 7. Alternative ACLs for New England groundfish stocks raised to the maximum amount that would be scientifically justified while still maintaining conservation goals.

	Overfishing Reference Point			*Stock Size Estimate*			*Uncertainty Buffer*		Combined	*Acceptable Catch*	
	Fmsy proxy	Fmsy	%difference	GARMIII	base case	%increase	ABC method	%increase	Increases	2010	Revised
GOMcod	0.17	0.225	29%	33878	33878	0%	75%Fmsy	31%	69%	8530	14380
GBcod	0.17	0.175	3%	17672	25377	44%	75%Fmsy	31%	93%	3800	7324
GBhaddock	0.35	unknown	?	315975	315975	0%	75%Fmsy	28%	28%	44903	57519
GOMhaddock	0.43	unknown	?	5850	5850	0%	75%Fmsy	27%	27%	1265	1607
GByellowtail	0.25	0.32	24%	9527	18248	92%	Frebuild	?	>92%	1200	>2298
SNEyellowtail	0.22	0.32	39%	3508	3508	0%	Frebuild	?	?	493	?
CCyellowtail	0.24	unknown	?	1922	1922	0%	75%Fmsy	30%	30%	863	1119
Plaice	0.19	unknown	?	11106	15659	41%	75%Fmsy	30%	84%	3156	5802
Witch	0.20	unknown	?	3434	7354	114%	75%Fmsy	30%	179%	944	2632
GBWflounder	0.26	unknown	?	4964	4964	0%	75%Fmsy	29%	29%	2052	2655
GOMWflounder	0.28	0.43	43%	1100	2765	151%	75%catch	?	236%	238	800
SNEWflounder	0.21	0.32	45%	3368	4565	36%	bycatch	?	>36%	644	>873
Redfish	0.04	unknown	?	172342	234609	36%	75%Fmsy	33%	81%	7586	13701
White Hake	0.13	0.19	42%	19800	19800	0%	Frebuild	?	?	2832	?
Pollock	0.25	unknown	?	196000	196000	0%	75%Fmsy	30%	30%	19800	25643
Nwindowpane	0.50	unknown	?	0.24	0.24	0%	75%Fmsy	33%	33%	169	225
Swindowpane	1.47	unknown	?	0.19	0.19	0%	75%Fmsy	33%	33%	237	316
Oceanpout	0.76	unknown	?	0.48	0.48	0%	75%Fmsy	33%	33%	271	361
Halibut	0.07	unknown	?	1300	1300	0%	75%Fmsy	32%	32%	71	94

- F_{MSY} values and F_{MSY} proxies are from NEFSC (2002) to compare estimates with the same input data.
- % difference in overfishing definition is based on the difference in exploitation rates calculated as $(F/Z)(1-e^{-Z})$, where Z is the total mortality and M is natural mortality rate.
- Stock size estimates are from Table 4 of NEFSC 2008.
- Increased $F_{rebuild}$ allowed by greater stock size or lower B_{MSY} estimates require projection analyses (indicated as '?').
- Pollock estimates are from NEFSC 2010.
- The Gulf of Maine winter flounder ABC is from Groundfish PDT (2010).

Table 7 provides examples of how overfishing limits, Acceptable Biological Catch and ACLs can be increased using reference point estimates and stock size estimates from existing scientific documents. Other alternative estimates of F_{MSY} or stock size are also possible, and may allow further increases in ACLs. Similar investigations of scientific information available to increase ACLs can be applied to other fishery management plans in New England. For example, the recent determination that winter and little skates are rebuilt suggests that the 20,000-lb trip limit allowed recovery of the two target skate species, and the current 500-lb trip limit can be relaxed to increase landings and decrease skate discards. The current ACLs pose substantial economic costs and losses to fishing communities (NEFMC 2009, NOAA 2010), and these losses can be mitigated by increasing ACLs within the limits of sustainability and sound scientific information that exists today.

Inconsistency with National Catch Share Policy

NOAA released its National Catch Share Policy on November 4th, 2010. Given that Amendment 16 was approved *prior* to NOAA finalizing the National Catch Share Policy, we note that implementation of Amendment 16, especially with regards to the *transition* to a new regulatory regime, would have benefited from this type of guidance during the creation of the catch share program.

(1) a fishing community is defined as one which is "substantially dependent on or (emphasis added) substantially engaged in the harvest or processing of fishery resources to meet social

and economic needs, and includes fishing vessel owners, operators, and crew and United States processors that are based in such community" (Magnuson-Stevens Fishery Conservation and Management Act as Amended through January 12, 2007), and

(2) the NOAA National Catch Share Policy (2010) indicates:

(a) NOAA will work in partnership with Councils, other federal agencies, and coastal states (emphasis added) to promote sustainable fishing communities, resource access, and co-management principles….,

(b) …Councils should develop policies 'to assure continuation of working fishery waterfronts, fishery infrastructure, diverse fishing fleets…,' and

(c) NOAA will collaborate with state and local governments to help communities address problems associated with long-term fishery and community sustainability.

Consequently, we submit that a marked inconsistency exists between the National Catch Share Policy and implementation of Amendment 16's sector fishery. The FMP has implemented unnecessarily low and precautionary ACLs for the multispecies fishery without sufficient and adequate analyses or consideration of those ACLs on sustaining Northeast fishing communities, especially in the Commonwealth.

Recognizing (1) Amendment 16's lack of socioeconomic analyses and troubling trends in catch and fishermen's behavior during the first six months of the Amendment's implementation and (2) the Catch Share Policy's intent for there to be a partnership and collaboration with coastal states to assure continuation of working fishery waterfronts, infrastructure, and diverse fishing fleets, higher ACLs within bounds of conservation limits would respond to those trends and industry behavior with the expressed purpose of minimizing adverse socioeconomic impacts on the Commonwealth's fishing communities and maximizing prospects for success of Amendment 16 sector management. Increasing catch limits would build a "strong foundation for widespread consideration of catch shares" and would be consistent with the National Catch Share Policy.

Summary and Recommendations

Federal management of the groundfish fishery now relies on the sector framework to mitigate economic impacts of low ACLs. Yet, this report shows the transition to catch shares (sector management) under Amendment 16 to the Northeast Multispecies Fishery Management Plan caused shifts in the distribution of quota (or income) worth $21 million in direct economic losses and forgone yield worth $19 million for the Massachusetts groundfish fishery. Raising federal catch limits may be the only solution to the fishery's crisis since many participants can't afford to purchase more quota and do not want the fishery to opt out of the current sector management system.

Scientifically valid alternative references points have been identified which trigger significant increases in annual catch limits (ACLs). As a mitigating factor, these increases are particularly helpful with regard to raising limits for choke species. Under optimal sector operating conditions, in which ACLs would be raised to the maximum amount that would be scientifically justified while still maintaining conservation goals, we expect the increases to total 14,500 mt more fish for the Northeast Multispecies fishery.

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- We recommend Secretarial action to immediately increase ACLs consistent with guidelines provided in this report.

- Alternative scientific decisions would support increases in ACLs for all New England groundfish stocks, with substantial increases for 'choke stocks' such as Georges Bank yellowtail flounder, Georges Bank cod, Gulf of Maine winter flounder, and southern New England winter flounder

Increasing ACLs will provide significant economic benefits by being risk averse for the fishing industry, enhancing the ability of sectors to mitigate economic impact, and increasing mixed yield as a portion of catch entitlements by reducing the influence of "choke" species. All of these outcomes promote the effective continuation of the sector program in New England, while minimizing actual adverse socio-economic impacts on fishing communities and fishing businesses that are attributable to this catch share program. Swift action will mitigate the effects of fishing effort consolidation and help ensure fishing communities maintain stable access to local fishery resources.

Glossary

Acceptable Biological Catch (ABC): a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and should be specified based on the ABC control rule.

Accountability Measures (AMs): management controls that prevent ACLs or sector ACLs from being exceeded (in-season AMs), where possible, and correct or mitigate overages if the occur.

Annual Catch Limit (ACL): the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures.

Annual Catch Target (ACT): an amount of annual catch of a stock or stock complex that is the management target of the fishery. A stock or stock complex's ACT should usually be less than its ACL and results from the application of the ACT control rule. If sector ACL's have been established each one should have a sector ACT.

Optimum Yield (OY): The term "optimum", with respect to the yield from a fishery, means the amount of fish which -

> (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
>
> (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
>
> (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

"Overfishing" **and "Overfished"**: a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

Overfishing Limit (OFL): the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers of weight of fish.

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