Fleet Diversity, Allocation, and Excessive Shares in the Northeast Multispecies Fishery

White Paper

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Introduction

The New England groundfish fleet is in the process of a major transition. Not only have massive declines in stock biomass, witnessed in the 1980's and 1990's, slowed and even begun to reverse, but the fishery is also transitioning from an effort control system to catch share management. This process is expected to lead to changes in fleet diversity and possible consolidation of the existing fleet. Such consolidation, or the concentration of quota (or access to quota) in the hands of fewer entities, can occur either through unregulated economic channels or in a more planned fashion.

On June 23, 2010, the New England Fishery Management Council passed a motion stating the following goals related to the issues of diversity and consolidation:

1) Maintain inshore and offshore fleets;
2) To the extent possible, maintain a diverse groundfish fishery, including different gear types, vessel sizes, geographic locations, and levels of participation;
3) Maintain a balance in the geographic distribution of landings to protect fishing communities and the infrastructure they provide; and
4) Prohibit any person from acquiring excessive access to the resource, through in order to prevent extraction of disproportionate economic rents from other permits holders.

This paper is intended to provide background and guidance for pursuing those goals.

Fleet diversity and issues associated with consolidation are two distinct, but closely related topics, and it is important to distinguish between the two. The term "diversity" encompasses many different aspects of a fleet in addition to the number of active permits. A reduction in the diversity of the fleet over time may indicate that the fleet characteristics are changing in response to economic, regulatory, or ecological factors. Changes in the characteristics of a fleet may be adaptive, desired, and not necessarily an indication of poor conditions in the fishery that should be corrected. However, changes in the diversity of the fleet over time may also indicate that consolidation or excessive control is occurring, and may be socially or politically undesirable.

Groundfish Fleet Diversity

Definitions of Fleet Diversity

Background

According to the Food and Agricultural Organization of the United Nations, the term fishery fleet "…refers to mobile floating objects of any kind and size, operating in freshwater, brackish water and marine waters which are used for catching, harvesting, searching, transporting, landing, preserving and/or processing fish, shellfish and other aquatic organisms, residues and plants."[1] It can clearly be said that a given fishery's fleet is made up of the vessels that fish for certain species in a geographic region. However, generalizations beyond that elementary statement are much more difficult to devise.

Several terms related to this activity have been used by the Council and its Groundfish Committee, and will be used throughout this paper. As mentioned above, the *fleet* can be considered to include any vessels that land groundfish or, if so stated, that have historically landed groundfish. The Committee has sought to define *diversity* for its fleet, and is interested in definitions used in other multispecies fisheries. A related term is *vision*, which in this context would be a statement about the desired makeup of the fleet at some point in the future using a chosen set of indicators. Additionally, much discussion has been generated around the *goals* of any management action that might include diversity or consolidation engineering such as accumulation limits for quota. Analyses of past environmental management actions have indicated that goals must be clearly articulated and appropriate to the problem being addressed in order for these types of actions to be effective.[2]

New England Proposals

To date, New England has not adopted a vision or goals for the diversity of its groundfish fleet. There is general agreement that the fleet is currently "diverse", but what exactly that means is unclear.[3] Groups that are involved in the fishery in varying capacities have presented managers with several ideas for identifying or preserving diversity in the groundfish fleet.[4]

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[1] FAO Coordinating Working Party on Fishery Statistics (CWP). "CWP Handbook of Fishery Statistical Standards: Section L, Fishery Fleet" (2010). Available at: http://www.fao.org/fishery/cwp/handbook/L/en (last accessed July 16, 2010).

[2] Several articles have emphasized the importance of goal-defining in natural resource management. For a thorough description, see, e.g., Wondelleck, JM and SL Yaffee. 2000. Making Collaboration Work: Lessons from Innovation in Natural Resource Management. Washington, D.C.: Island Press.

[3] Refer to the following section of this paper, "Baselines for the Northeast Groundfish Fishery", for a description of recent fleet characteristics.

[4] Not all presentations meet the Council's policy for peer-reviewed proposals.

The Social Sciences Branch (SSB) of NOAA Fisheries/Northeast Fisheries Science Center developed catch share performance measures in order to provide metrics to gauge how well catch share programs perform for managers and stakeholders. These measures were presented to the Council at its January 2010 meeting.[5] The presenters described five emerging themes for draft performance measures: financial viability, distributional outcomes, well-being, governance, and stewardship. While all are important to understanding the effects of catch shares on communities, the second – distributional outcomes – is most directly relevant to fleet diversity. The factors that will be considered under this metric include whether there has been a concentration of quota ownership, how employment opportunities have changed, and whether certain groups, communities, or regions are excluded. Example indicators may be industrial concentration indices, revenue by community/region/fishery/vessel type (e.g., small owner-operated vessels), and annual crew days.

Another report that was presented to the Council through its Interspecies Committee was the Fleet Visioning Report drafted by the Northwest Atlantic Marine Alliance (NAMA) in 2005.[6] The report was the result of a survey NAMA conducted of 250 stakeholders from the New England groundfish fishery and also incorporated several workshops. The intent of the project was to propose a vision for the future of the fishery. Four main topics were identified as the vision: diversity, economic viability, governance, and environmental resilience. Although this report was developed outside of the management process, it is unique in that it attempted to define what is meant by "diversity". It was described as "a geographically distributed commercial and recreational fleet that includes all gear types and boat sizes."[7]

West Coast Allocation Programs

Many catch share fisheries in Alaska and the Pacific U.S. were allocated in a way to preserve different parts of the fleet, but it cannot be determined that the management bodies adopted a unified vision for doing so. Indeed, there is no definition of "diversity" in any of the West Coast management plans. In the North Pacific, for example, when many of the catch share allocations were made, a certain amount of quota was reserved for inshore and offshore fishing and different types of vessels and processors. In addition to those allocations, the Western Alaska Community Development Quota (CDQ) Program was created which allocates a percentage of groundfish and other quota to eligible communities in order to provide eligible western Alaska villages with the opportunity to participate and invest in

[5] Kitts, D and P Pinto da Silva. "Identifying Social and Economic Performance Measures and Research Objectives for Catch Share Programs". Presentation to the New England Fishery Management Council (January 26, 2010).

[6] The Fleet Visioning Project. "The Northeast Region's Vision for the Future of the Groundfish Fleet: A Comprehensive Report" (2005). Available at http://namanet.org/files/documents/ComprehensiveFleetVisioningReport.pdf (last accessed July 16, 2010).

[7] Ibid., p. 9.

fisheries in the management area, among other goals.[8] Six non-profit groups representing 65 native Alaskan communities make up the eligible CDQs.

Similarly, the Pacific groundfish fleet is also undergoing a switch to catch share management that includes allocations to different portions of the fleet, including a community set-aside. Analyses performed by the Pacific Fishery Management Council on diversity impacts to the fleet generally chose a baseline year and looked at changes in gear and landing-port makeup.

European Union

In 2009, the European Union began a review of fisheries issues. A green paper prepared by the Commission for European Communities presented the following vision for fisheries by 2020:

> *"Europe's fishing industry has become far more financially robust. The industrial segment of the fleet is efficient and independent from public financial support. It operates with environmentally friendly boats and its size is commensurate with the fish it is authorized to catch. At the other end of the spectrum, small-scale fisheries continue to produce high quality fresh fish consumed locally and marketed under labels of quality and origin that give higher value to fishermen."*[9]

Capacity problems are among the issues being addressed in the current reform of the Common Fisheries Policy.[10] Although definitive action has not been taken on the topic of fleet diversity, the green paper proposes consideration of differentiated management regimes for large- and small-scale fleets as one solution. Although the structure of governance and the management rules themselves are different in Europe than in New England, there are notable similarities that will make it interesting to track the development of rules to protect diversity there. The European fleets are highly localized and represent a huge range of geographic, vessel size, gear, and socioeconomic diversity. For example, the twelve largest Spanish ships are reported to be bigger than the entire Swedish fleet.[11] However, the individual nations' sovereignty will require the preservation of all types of fleets across the region.

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[8] NOAA Fisheries. "Community Development Quota (CDQ) Program". http://www.fakr.noaa.gov/cdq/ (last accessed September 2, 2010). Other goals of the program include "…to support economic development in western Alaska; to alleviate poverty and provide economic and social benefits for residents of western Alaska; and to achieve sustainable and diversified local economies in western Alaska."

[9] "A vision for European Fisheries by 2020", from: Commission of the European Communities. "Green Paper: Reform of the Common Fisheries Policy". COM (2009) 163 final. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0163:FIN:EN:PDF (last accessed July 16, 2010).

[10] "*Fisheries with their large share of small- and medium-sized companies play an important role in the social fabric and the cultural identity of many of Europe's coastal regions. Many coastal communities remain dependent on fisheries for their income, some of them with limited potential for economic diversification. It is therefore essential to secure a future for coastal, small-scale, and recreational fishermen taking fully into account the particular situation of the small- and medium-sized enterprises."* Ibid., p. 14.

[11] Brand K, Jepessen H. and H Böhme. "EU Pushes for Sustainable Fishing Quotas". Deutsche Welle May 20, 2010. Available at: http://www.dw-world.de/dw/article/0,,5586850,00.html (last accessed July 16, 2010).

Summary

Although several regions in the U.S. and abroad have faced the issue of preserving fleet diversity in the face of consolidation, there do not appear to be any management actions that formally define diversity. The major three types of "diversity" that were most often explicitly addressed were gear type, geographic area, and boat size. However, these are not the only types of diversity that exist. Researchers have pointed out other components that contribute to a diverse fleet in addition to those that have been recognized in management.[12] One example is diversity of fishing strategies: mobile vs. stationary, resident vs. non-resident, full-time vs. part-time, and high capital-input vs. low capital-input. There are also differences in output, or product type and quality, which may contribute to a diversified fleet.

An additional factor that makes consideration of fleet diversity difficult is the fact that changes in fleet characteristics/diversity may reflect adaptation to changing economic, regulatory or ecological conditions. In other words fishermen may be changing their fishing practices in order to optimize their business. The option of adapting to changing biological and economic indicators in a system with high biocomplexity can be an important contributor to stabilizing total productivity. Such adaptation, or fluidity in practices, can make it extremely difficult to measure baselines and outline goals. Regulations determine how many and what type of fishing takes place, and necessarily impose constraints on the ability to adapt. It is necessary to carefully consider the effect of diversity regulations on the ability of the fleet to adapt.

[12] *See, e.g.* Hilborn, R, Quinn, T, and D Schindler. "Biocomplexity and Fisheries Sustainability". Presentation. Available at: www.fish.washington.edu/people/rayh/biocomplexity.ppt (last accessed July 16, 2010).

Baselines for the Northeast Groundfish Fishery

The following sections describe the distribution of groundfish landings over time for three different characteristics of the fishery: landing port, vessel size, and gear. It also describes distribution of active permits by state (and port, if available) over time. Finally, indices of diversity and richness are calculated for each characteristic to show changes over time.

Landings data were extracted from NMFS databases for specific years between 1982 and 1992, and then a time series for the period 1994 – 2008. The specific years chosen in the 1980's were selected to highlight several management changes:

> 1982: the first year after the quota system was abandoned
> 1985: first year after the Hague Line decision reduced the fishing area available to U.S. fishermen
> 1986 and 1987: First two years under the Northeast Multispecies FMP
> 1990 and 1992: Several management changes coupled with deteriorating stock conditions

Prior to 1994, landings were collected using port agents and a dealer weighout system. There have been concerns in the past that this system did not accurately collect landings from small vessels in outlying ports. In 1994 a new system adopted mandatory vessel and dealer reporting. Data are reported for calendar years prior to 1994, and for fishing years from 1994 through 2008. The data for 1994-2008 report landings by a vessel that held any type of groundfish permit, and thus exclude small amounts of landings from state-permitted vessels.

It is possible that the use of data from two different reporting systems may introduce minor errors into these analyses and make comparisons over the time period difficult.

Concentration and Diversity Indices

Ecological studies often measure the number of species in an area and the number of individuals for each species. Various indices have been developed to characterize the diversity of the species in an area. Similar indices have been developed for sociological, management, and economic studies. Two of these indices are used, with minor modifications, to summarize changes in the multispecies fishery in this paper.

A simple diversity measure is the concept of species richness. It is merely the count of the number of distinct species in the sample or study area without regard to the number of individuals. In this paper, this measure is used to track the changes in groundfish landings by gear, landing port, and vessel length class. Each possible combination of gear, landing port, and length class is treated as an individual "species". A species is considered present in a year if a groundfish landing can be attributed to a particular combination. The focus is on the primary groundfish gear groups (handline, longline, sink gillnet, and trawl), five vessel size classes (including an unknown category), and the landing port groups first identified in

Amendment 13. Note that there is no weighting for the size of landings: if in a given year one pound is landed by a handline vessel in Downeast Maine it is counted the same as 13 million pounds landed by trawl vessels in Gloucester and the North Shore.

A more complex diversity measure is Simpson's diversity index. This measure takes into account not only the number of species but the number of individuals in each species. There are a number of different ways to express this index. One version of the index returns values between 0 and 1. A low value represents a heterogonous population; a high value represents less diversity. If there are no species present, an index of 0 is possible. In economics and management, a similar index is used to measure the concentration of market share across firms. Called the Hirschman-Herfindahl index (HHI), higher values of the formula imply more concentration of market power. The HHI, however, does not have a minimum value of 0 - if there are no firms, there isn't a market and the index does not exist. The minimum value for this index is 1/*N*, where N is the number of firms in a market. Conceptually, this is easy to understand: if there are four firms and each has the same market share, they each must have ¼ of the market share and the HHI would be 0.25.

This paper builds on both the Simpson's diversity index and the HHI. Within categories of gear, length group, or port group, an index is calculated based on the two formulas as:

$$\text{SDI} = \sum_{i=1}^{N} s^2$$

In this formula, *s* is the share of groundfish landings and *N* is the number of categories. Note that unlike the species richness measure, in this case the categories of gear, length group, and port group are evaluated individually. This is so specific changes within a group are easier to identify.

An increase in the index indicates groundfish landings are more concentrated while a decrease means they are less concentrated. The minimum value of the index is 1/N – if all groups have an even share of landings, then the index will be 1/N. The index can be used to detect relative changes within a group but the value for one group (e.g. gear) cannot be compared to the value for another group (e.g. port group). While computing the index over time may show changes in concentration, it does not necessarily detect other changes that may occur. For example, the index will not detect if two firms or categories exchange market share if the share held by all other firms remain unchanged. If changes in the index are noted, then further work is needed to identify the specific changes that affected the index.

Discussion

Distribution of Active Permits

Permit holders list a homeport state on their application for a multispecies permit. The permit application states that this should be the city and state where the vessel is moored. This may not be the same location where landings take place, but is considered an indicator of the

location where the vessel's profits benefit a community. Table 1 shows the number of multispecies vessels that were active in the groundfish fishery by each home port state from 1996 to 2008. A vessel was considered to be active if it landed at least one pound of regulated groundfish in a given year. All permit categories were included for this table – it is not limited to the limited access categories that land most of the groundfish. Some of these landings may have taken place in state waters, outside the federal management plan.

The numbers varied from year to year in most states through about 2001, and then generally declined from 2001 through 2008. States with relatively small numbers of active vessels (such as Connecticut, New Jersey, Maryland, and Delaware) seemed to experience more variability in increases and decreases, while more states with more vessels (including Maine, New Hampshire, Massachusetts, Rhode Island, and New York) experienced overall declines in number of active vessels throughout the time series.

Table 1 – Number of multispecies vessels active in the groundfish fishery by home port state, 1996-2008

State	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
MA	716	655	639	638	652	687	648	604	525	454	393	363	324
ME	188	179	158	140	153	163	121	120	103	99	99	84	77
NY	123	135	134	128	123	116	116	113	95	76	91	84	80
RI	122	124	132	138	126	137	97	91	90	93	90	90	86
NJ	86	80	80	94	84	58	39	53	41	45	53	47	40
NH	75	65	74	70	90	90	77	67	61	53	45	46	46
VA	15	21	24	26	18	9	8	7	4	2	0	4	3
NC	13	16	20	17	18	27	20	20	14	15	7	9	8
DE	4	4	3	5	4	2	2	2	3	5	5	4	5
CT	3	3	6	2	17	17	3	7	4	4	7	8	13
MD	3	4	6	5	8	7	7	5	7	4	4	2	4
FL	2	1	1	2	3	0	2	2	0	0	0	0	0
Other	4	2	1	0	0	1	3	2	2	0	1	0	0
Total	**1354**	**1289**	**1278**	**1265**	**1296**	**1314**	**1138**	**1086**	**944**	**846**	**786**	**734**	**684**

Vessels with multispecies permits can also participate in other fisheries if they hold a valid permit. Table 2 below shows the number of multispecies permits (any category) that sold any species. As shown in Table 1, the number of permits that land groundfish has steadily declined over time, but a similar trend is not seen in the number of permits that landed any species. This comparison, however, can be misleading because most groundfish is landed by limited access permit holders; as a result Table 1 in large measure reflects changes in the number of limited access permits active in the groundfish fishery. Because most permits active in other fisheries hold at least a open access groundfish permit, Table 2 tends to show trends in all fisheries rather than the groundfish fishery.

Table 2 - Number of multispecies vessels active in any fishery by home port state, FY 1996-2008

State	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
MA	1051	1009	939	915	865	940	857	877	914	942	868	843	807
ME	221	179	180	186	171	194	190	164	161	168	197	255	248
NY	207	242	238	242	247	218	210	200	182	181	179	178	168
RI	120	120	135	142	152	170	148	150	162	159	169	164	159
NJ	106	118	132	157	182	177	174	191	204	241	263	262	255
NH	79	74	75	77	84	91	84	72	91	94	92	89	85
VA	71	72	79	81	84	75	78	72	74	68	70	57	55
NC	123	56	57	59	67	75	72	73	80	91	93	75	66
DE	6	6	9	9	9	5	6	7	9	10	9	8	5
CT	10	11	9	6	10	15	12	21	19	22	19	32	36
MD	10	13	13	12	16	16	14	14	14	20	23	21	19
FL	8	8	9	6	4	6	8	6	7	6	8	4	7
Other	182	77	53	49	33	25	15	16	15	17	20	12	9
Total	2035	1985	1928	1941	1924	2007	1868	1863	1932	2019	2010	2000	1919

Species Richness

As discussed earlier, this analysis builds on a measure used in ecological studies. In this application, a "species" is a single combination of gear, port group, and vessel size; for example, handline gear/Downeast Maine/less than 30 feet is one "species." The total possible categories within the groupings of gear (handline, longline, gillnet, and trawl), port group of landing, and vessel size class (four size groupings plus an unknown category) was 460. The results are shown in Table 3. Species richness was constant in the 1980's before increasing in 1992. Values since 2001 are more variable, with declines in 2006 and 2007 followed by an increase in 2008.

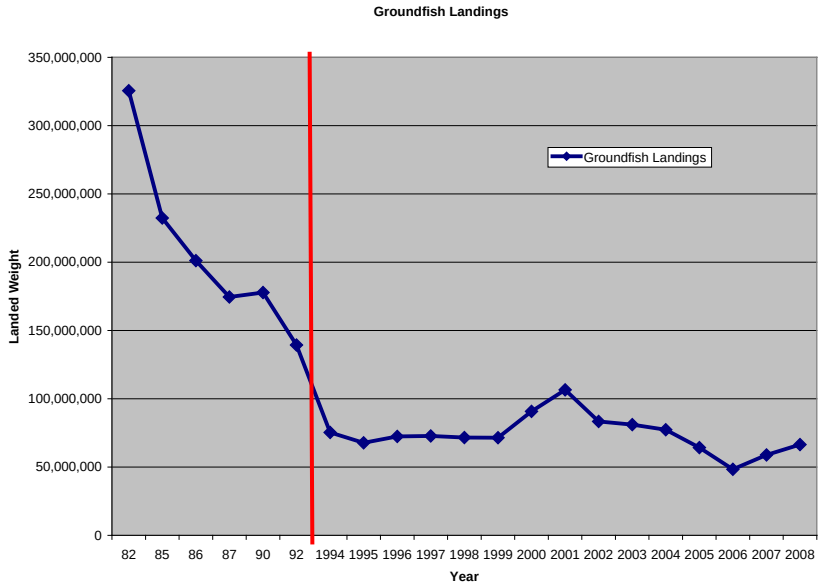
Table 3 – Species richness for multispecies fishery

CY	82	111
	85	111
	86	111
	87	117
	90	114
	92	147
FY	2001	114
	2002	109
	2003	107
	2004	124
	2005	117
	2006	98
	2007	93
	2008	101

Distribution of Landings and Concentration Indices

Figure 1 shows the decline in landings from about 325 million pounds in 1982 to about 66 million pounds in 2008. The remaining tables focus on the percentage distribution of landings. Given the dramatic changes in overall groundfish landings, it is unrealistic to expect that changes would not have occurred in the fishery. The change in distribution of landings among gear types and port groups should be considered in light of the absolute decline in landings.

Figure 1 – Groundfish landed weight, 1982 – 2008 (red line indicates a change in reporting systems)



Port Group

Figure 2 and Figure 3 summarize landings by the port of landing. The data are grouped according to the port groups first identified in Amendment 13 and used in all multispecies actions since then. Over time, the percentage of weight landed in Massachusetts ports has increased to about 80 percent of the total. The percentage of landings in Maine port groups declined, while those in New Hampshire remained nearly constant. The diversity index shows that concentration increased from 1998 to 2004, then declined slightly before increasing again between 2006 and 2008.

This first figure illustrates the notation used in this section. The red line indicates when the reporting system changed. Years before this change are calendar years and are labeled with two digits; after this line the years are fishing years and are labeled with four digits.

Length Group

Figure 5 and
Figure 6 summarize landings by length group. Prior to 1994, landings by "undertonnage" vessels were often aggregated; this accounts for the relatively large percentage of landings with "unknown" length groups. The percentage of landings by vessels 75 feet and over declined after 1994: prior to that year it was often over 40 percent, while since then it has between 30 and 40 percent. Vessels between 30 and 50 feet increased their share and in 2008 accounted for nearly 30 percent of the landings. The diversity index has remained relatively constant and reflects the fact that there are really only three length groups that account for most of the landings.

Gear

Figure 8 and Figure 9 summarize the distribution of landings by gear. There are three primary gears that account for most of the landings: trawls, bottom longlines, and sink gillnets. The share of landings from trawl gear declined from 1982 to 1994, increased to

2003, and then declined again. Sink gillnets saw their share increase until 1995, decline until 2004, and then increase again. Since 2004 the amount of landings that cannot be assigned to a specific gear has increased, which affects the interpretation of the level of concentration. The diversity index declined from 2003 to 2004, but this is in part due to the increase in the "unknown" gear category.

Figure 2 – Distribution of groundfish landings by port group

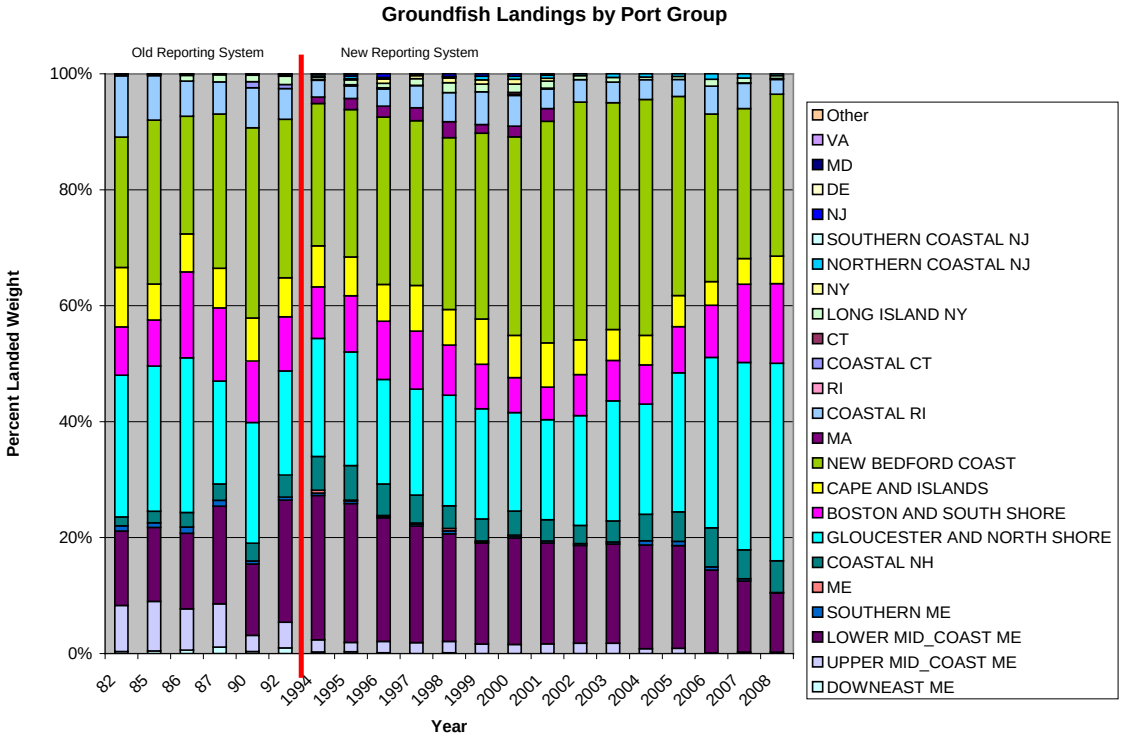


Figure 3 – Diversity index for groundfish landings by port group

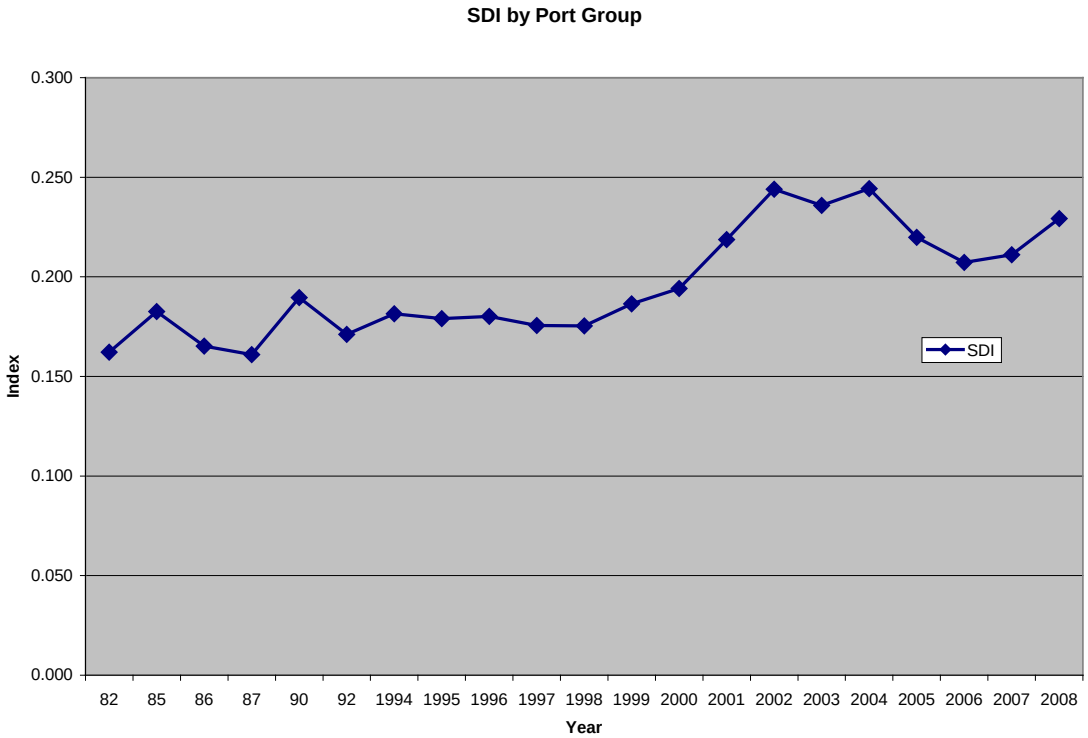


Figure 4 - Groundfish landings by Port group as a percentage of total groundfish landings. Red line is time series median for Port group. Dashed gray line indicates change in reporting system in 1994. Port groups are ordered by median percentage

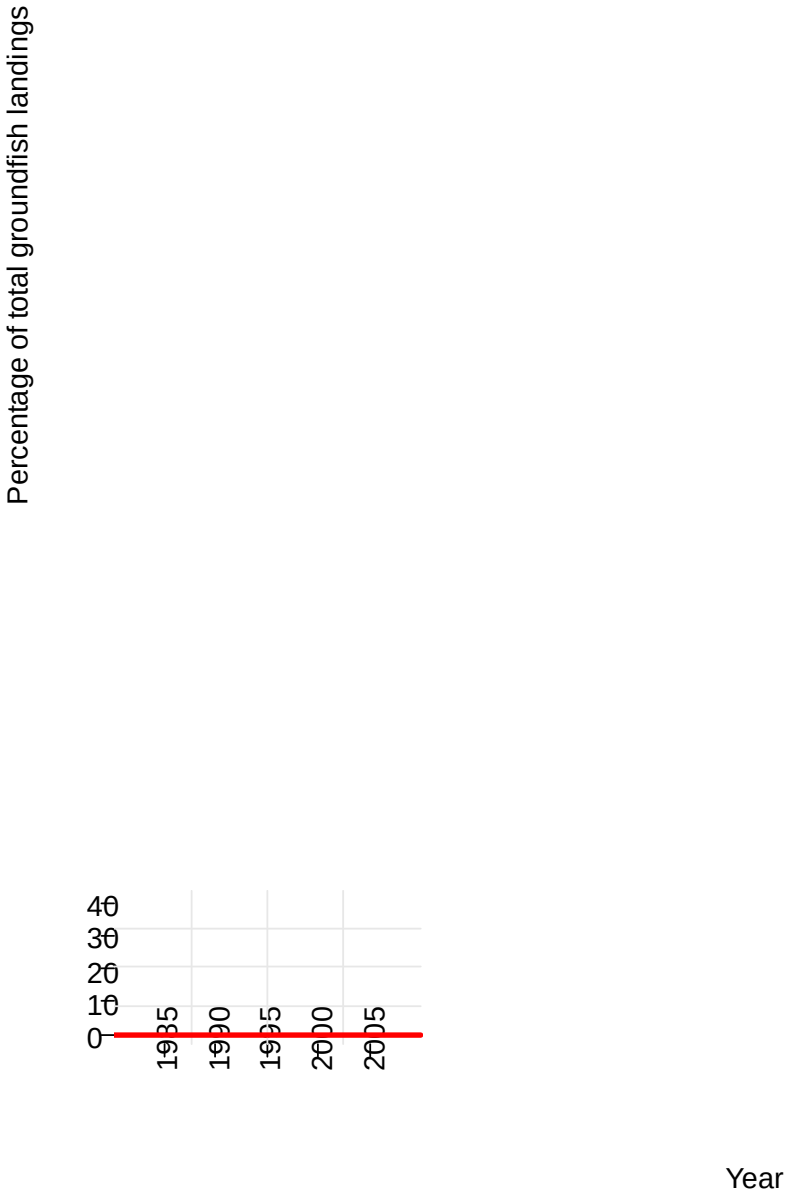


Figure 5 – Distribution of groundfish landings by length group

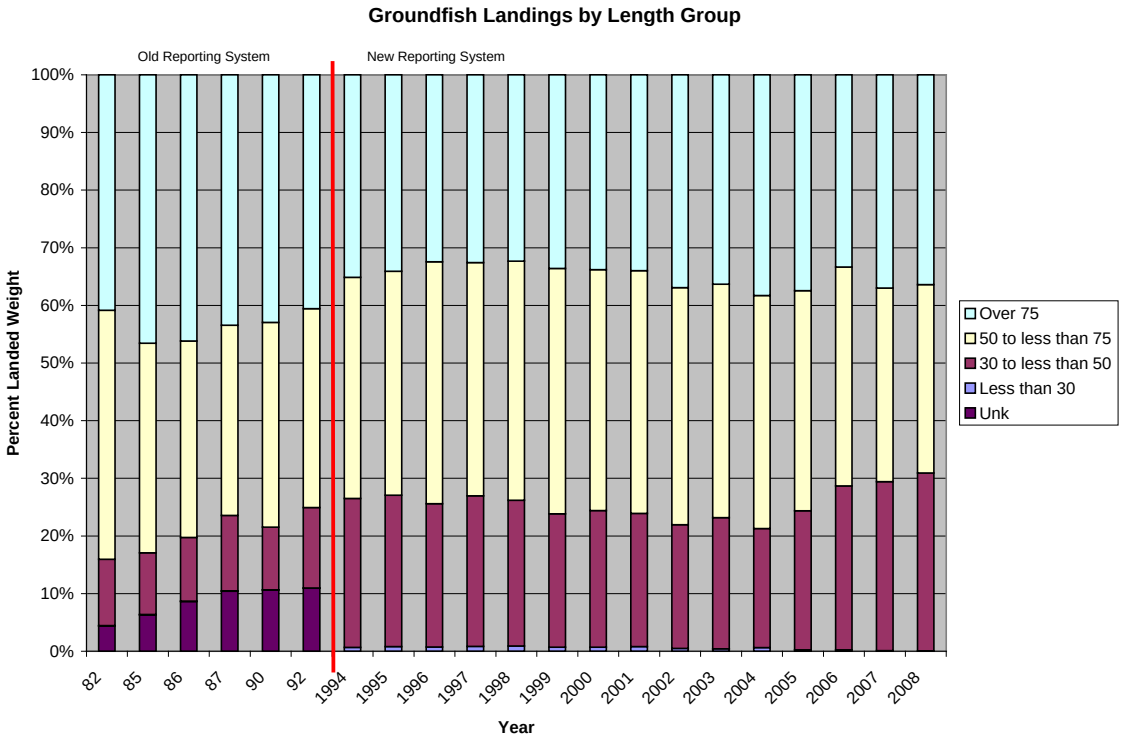


Figure 6 – Diversity index for groundfish landings by length group

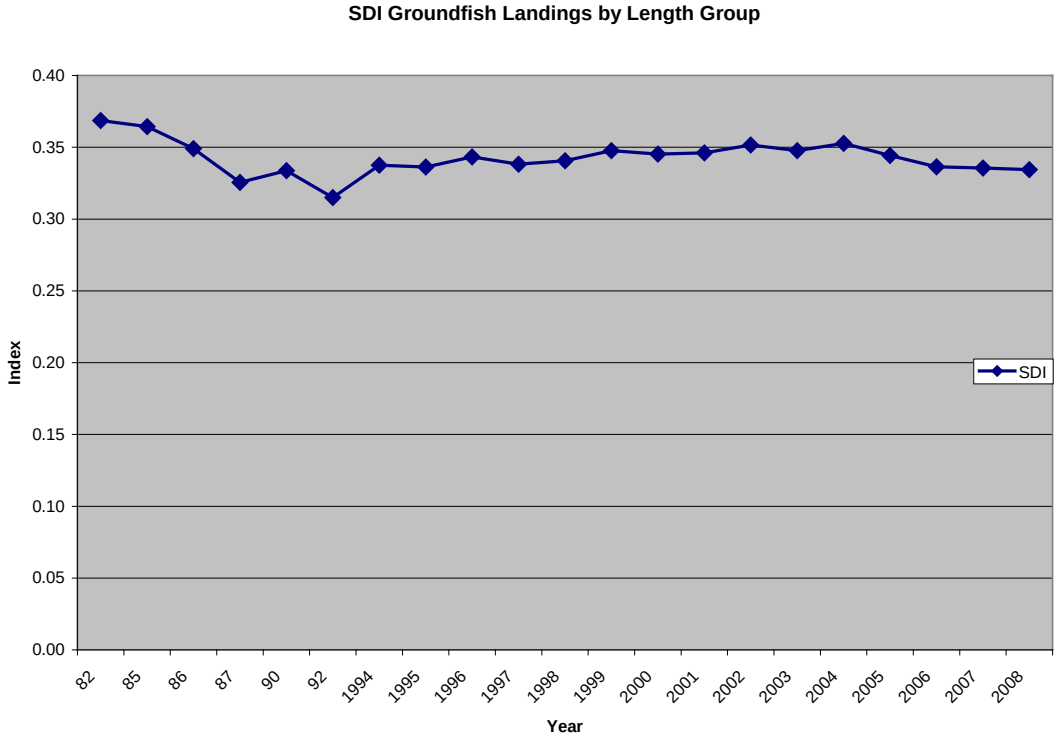


Figure 7 - Groundfish landings by length group as a percentage of total groundfish landings. Red line is time series median for length group. Dashed gray line indicates change in reporting system in 1994.

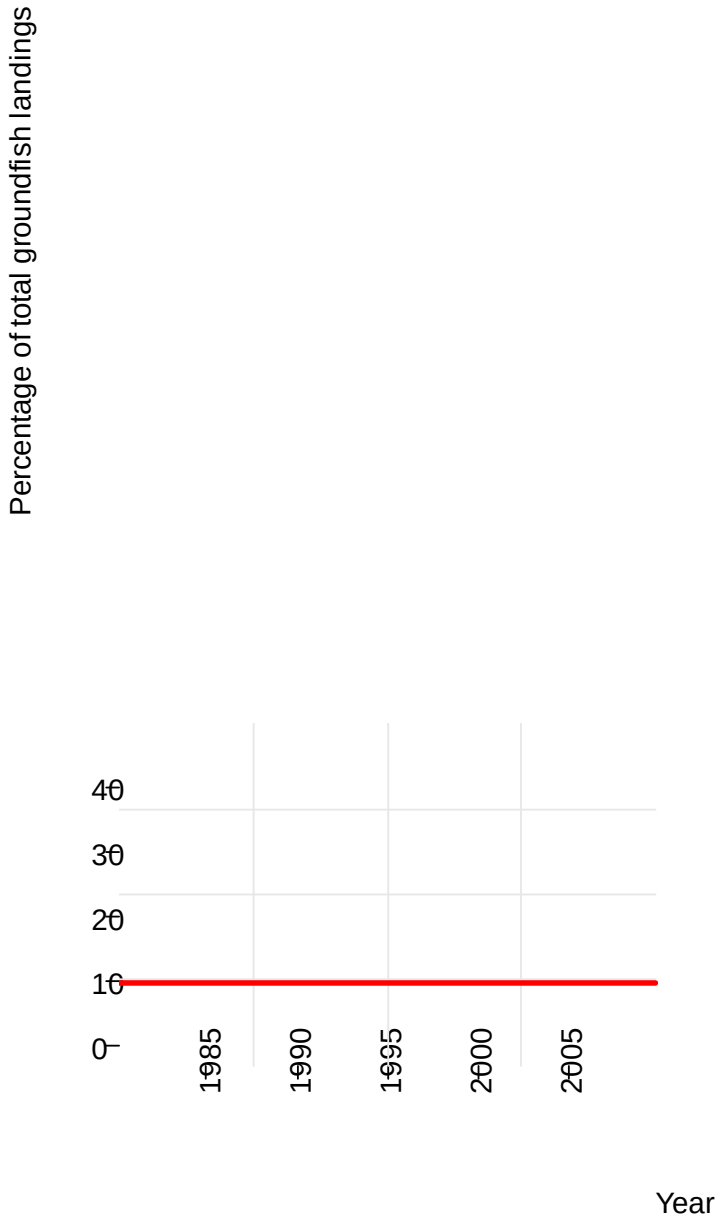


Figure 8 – Distribution of groundfish landings by gear

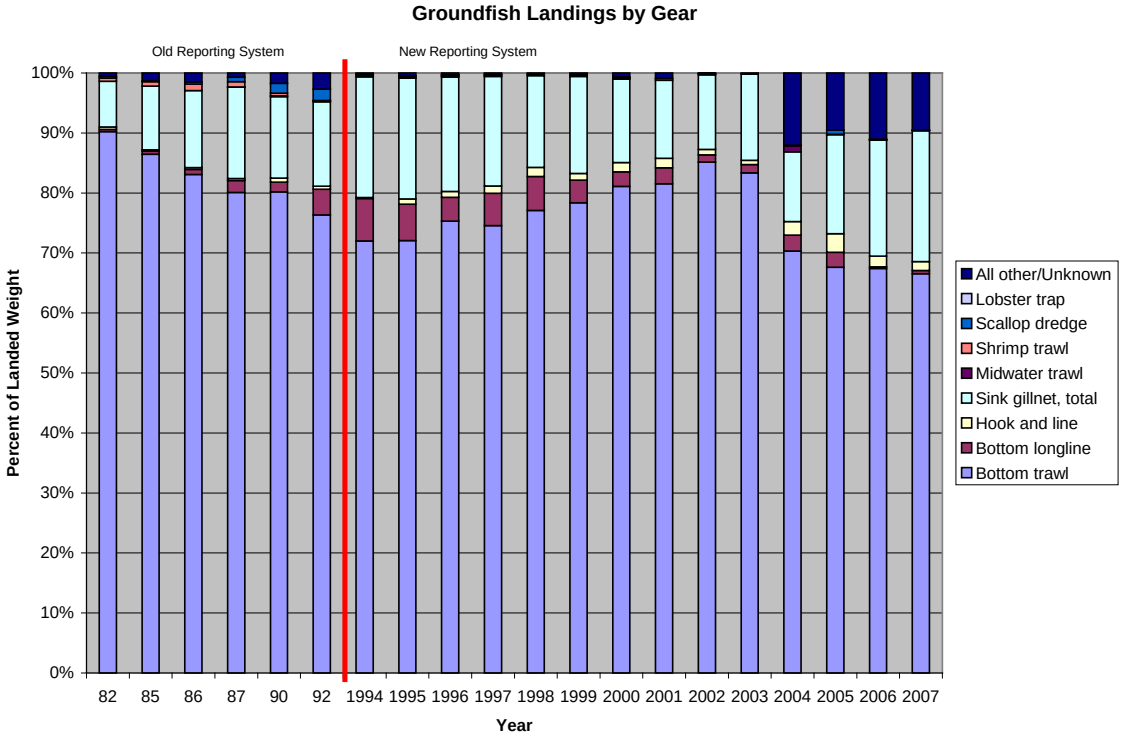


Figure 9 – Diversity index for groundfish landings by gear

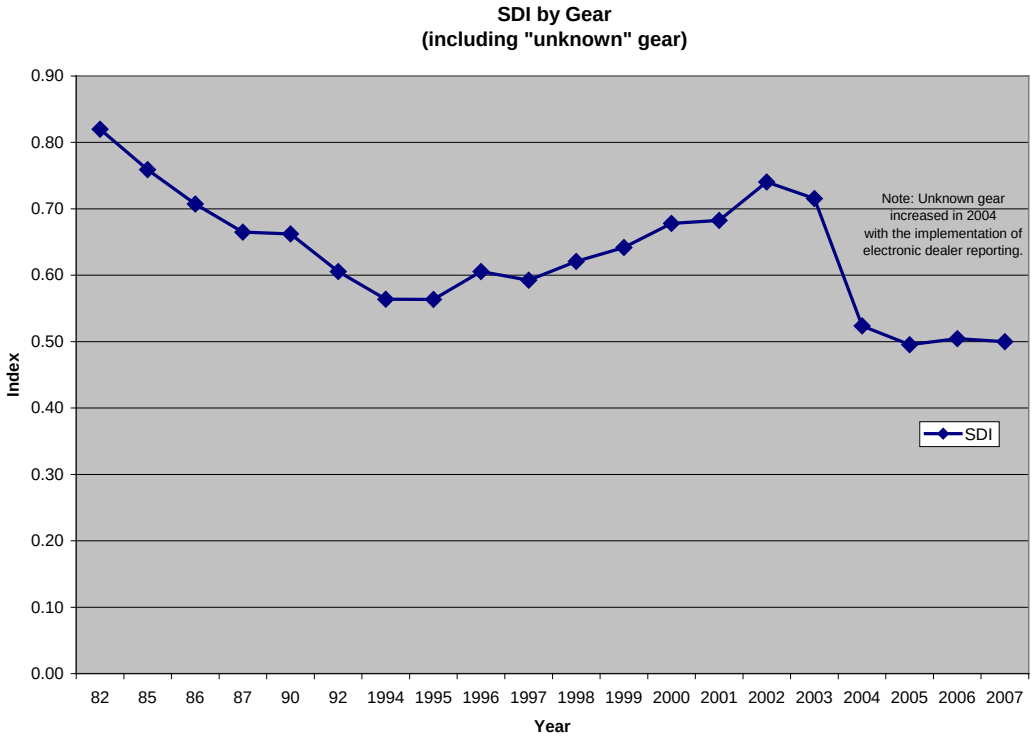
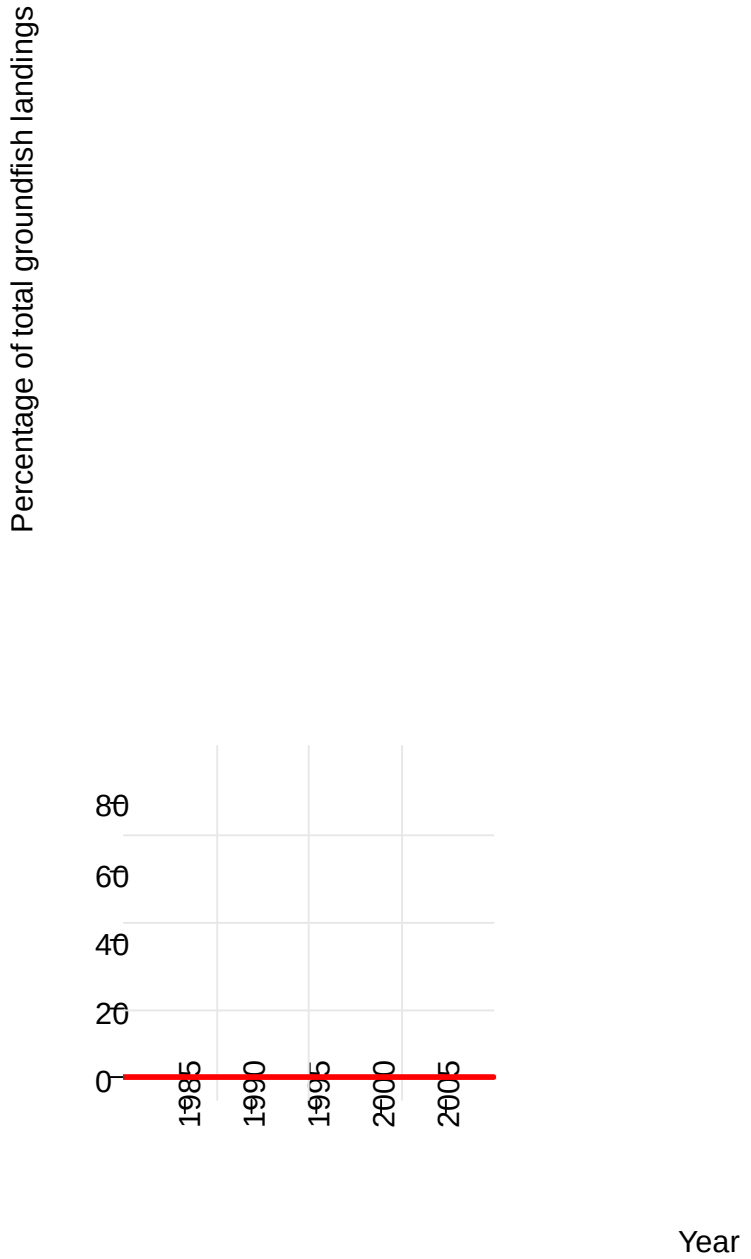


Figure 10 - Groundfish landings by gear type as a percentage of total groundfish landings. Red line is time series median for gear type. Dashed gray line indicates change in reporting system in 1994. Gear types are ordered by time series median



The diversity indices for port group, length group, and gear show changes over time. A simple statistical test was used to determine if there were trends in the time series or if the changes were random. Randomness of the time series indices was tested using a runs test to detect runs above and below the median. The test works on sign and not magnitude. A two-sided test was used (runs may either be negatively or positively correlated with time). Significant results indicate that the time series are not random fluctuations around the median and that a trend or trends exists in time series for each diversity index. These results may be influenced by changes in data collection over time – particularly in the case of the gear group, where the amount of landings that could not be attributed to a specific gear increased with the implementation of electronic dealer reporting in 2004.

Type	Standardized Runs Statistic	Probability that series is random	Overall Trend
Port Group	-3.3557	P< 0.001	Increasing
Gear Group	-3.2163	P< 0.010	Decreasing
Length Group	-3.3557	P< 0.001	Increasing

Inshore/Offshore Fleet Analysis

The Council expressed an interest in maintaining an "inshore" and "offshore" fleet. The VTR and permit databases were queried to identify groundfish permits (any groundfish permit category) that landed at least one pound of groundfish in any calendar year from 1996 – 2009. Permits were identified as to whether they reported landing groundfish only from inshore areas, only from offshore areas, or from both inshore and offshore areas. Generally, statistical areas adjacent to the coast were designated "inshore" and those that are not adjacent were designated "offshore." The exception is statistical area 526, which was designated "offshore" since only a small part of the area is adjacent to Nantucket Island. See Figure 12 for how statistical areas were categorized as inshore or offshore. Permits were grouped into one of four size classes (the same as have been used since A13 to describe the fishery).

Permits less than 30 feet in length fish inshore almost exclusively with a small number fishing in both areas; permits 30 to 50 feet fish inshore but with a larger percentage fishing in both areas; permits 50 to 75 feet tend to fish more often in both areas but about one third fish inshore only; and permits in the largest size class tend to fish either in both areas or exclusively offshore (Table 4). Over the entire time series, the area fished is not independent from the permit's size class (Table 5).

Table 4 – Percent of vessels that reported landing groundfish only from inshore areas, only from offshore areas, or in both areas, by length group, FY1996 – FY 2009

	30 to LESSTHAN 50	50 TO LESS THAN 7	75 AND OVER	LESS THAN 30	Total	N
BOTH	24.704	55.931	61.837	10.400	36.871	6,260.000
INSHORE	73.987	35.908	9.748	88.422	55.837	9,480.000
OFFSHORE	1.309	8.161	28.416	1.178	7.292	1,238.000
Total	**100.000**	**100.000**	**100.000**	**100.000**	**100.000**	
N	**8,019.000**	**4,350.000**	**2,657.000**	**1,952.000**		**16,978.000**

Table 5 – Results of test for independence of area fished and vessel length group

Test Statistic	Value	df	p-Value
Pearson Chi-Square	5,859.241	6.000	0.000
Likelihood Ratio Chi-Square	5,958.763	6.000	0.000

The following figure (Figure 11) shows the time series trend in area fished for the four length groups as a percentage of the permits in the group that reported landing groundfish. For the smallest size class, the percent of permit that fish only inshore has increased slowly from 1996 to 2009. The same appears to be true for the vessels in the 30 to 50 ft. class, with a smaller percentage fishing in both areas. For vessels in the 50 to 75 ft. class, there has been an increasing trend in the percentage of permits that fish only offshore, a decline in permits that fish in both areas, and the percentage of permits fishing only inshore has fluctuated – showing a declining trend at the start of the time series and an increasing trend in recent years. Permits in the 75 ft. and over class have increased in percentage of those that only fish offshore, with a corresponding decline in the percentage of these permits that fish in either both areas or only inshore.

Further evidence that larger vessels fish in either both areas or only offshore is found by considering both the area fished (inshore, both, offshore) and vessel length group as ordered categories. The Goodman-Kruskal Gamma test statistic tests for correlation between ordered pairs, with a value of -1 indicating a perfect negative correlation and +1 indicating a perfect positive correlation. Over the entire time period, the value of gamma is 0.747, indicating a positive correlation between area fished and vessel size. This suggests that one way to address the desire for an inshore and offshore fleet may be maintaining a mix of vessel sizes in the fishery.

To summarize, within each size class, the percentage of vessels fishing both inshore and offshore have declined. Within the smaller size classes, an increasing percentage have fished inshore only, and within the larger size classes an increasing percentage have fished offshore only. This could be interpreted as vessels fishing in a slightly more specialized manner, with small vessels inshore and larger vessels offshore.

Figure 11 – Trends in percent of permits fishing inshore only, offshore only, or in both areas.

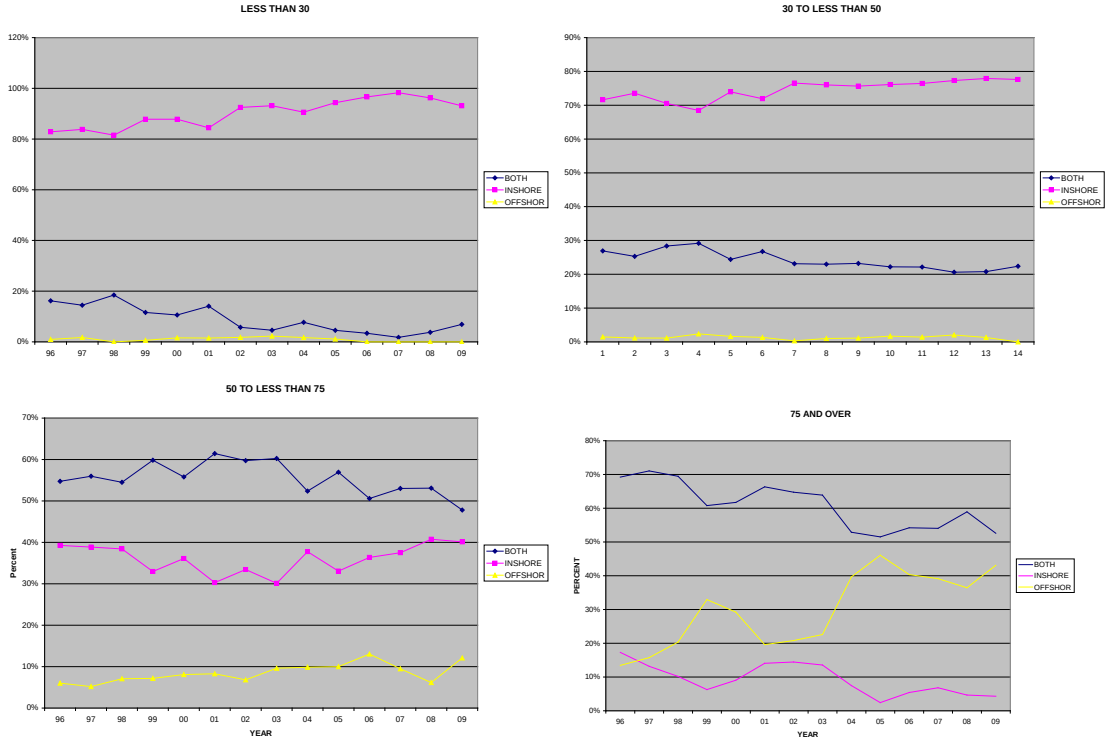
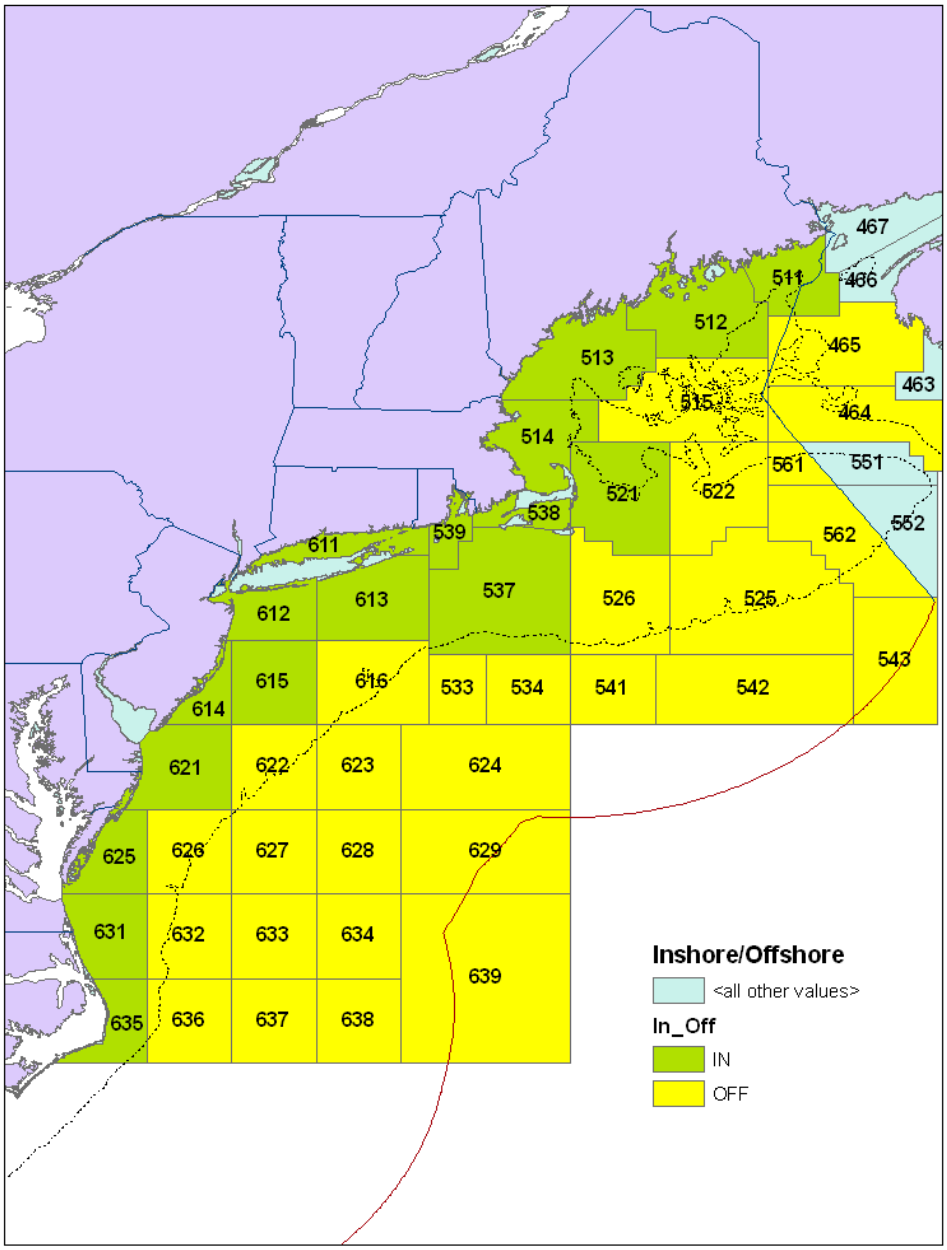


Figure 12 – Statistical area designation as inshore or offshore



Design Considerations for Accumulation Limits

Accumulation limits have been adopted in many fisheries managed with catch shares. The Magnuson-Stevens Act provisions for LAPPs require the Council to set such limits in any LAPP fishery in order to ensure that no person acquires an excessive share of the fishery, and to prevent an inequitable concentration of fishing privileges.[13] In fisheries that are not LAPPs, but that operate using catch shares, concentration caps may also be appropriate. National Standard 4 states, "If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be… carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."[14] That standard has been interpreted to be applicable to any fishery with an allocation scheme, including sector management.

In general, there are two major reasons for the adoption of caps: to prohibit small groups of resource users from gaining market control, and to achieve management objectives (such as maintenance of fleet diversity).[15] In New England, market control is not a concern because of the ready availability of substitute products, so accumulation limits should only be considered to meet the Council's management objectives if appropriate.[16]

There are several ways to design accumulation limits for catch share fisheries to meet management objectives. These include control (ownership) limits, vessel (usage) limits, and sector limits. As with other aspects of fisheries management design, each is suited to achieve different management goals and will provide varying outcomes.[17] It is important in choosing a type of cap to consider what goals are being sought. Is the purpose to provide a vision for the fishery and tailor methods to achieve it, to freeze the makeup of and participation in the fleet, or something else? What caps are chosen depends heavily upon what outcomes are desired, and upfront definition of those goals enables review of the effectiveness of any limits that are imposed. The types of goals most commonly associated with accumulation limits can be divided into three groups: those that seek to rationalize the fleet to provide greater economic returns to participants, those that promote fleet diversity and a wide range of participation, and those that deal with ownership issues in order to prevent a small number of individuals to achieve high economic gains.

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[13] 16 U.S.C §1853a

[14] 16 U.S.C. §1851

[15] Kitts, D. "Sector Policy Issues". Presentation to NEFMC Sector Committee. April 26th, 2007.

[16] See Appendix X (forthcoming) for an analysis of market price-setting considerations in New England.

[17] Commission on Geosciences, Environment and Resources. 1999. "Sharing the Fish: Toward a National Policy on Individual Fishing Quotas." p. 209. *"Issues such as concentration of quota among firms or communities can be addressed through setting upper limits on accumulation of quota share and instituting measures such as compensating disadvantaged communities. If, on the other hand, important objectives include maintaining owner-operated fisheries and fishery-dependent coastal communities, transferability may have to be constrained and greater attention given to equity considerations in setting upper limits on accumulation, boundaries to transfer of quota share among communities, and other restrictions."*

It is important to note what the alternatives to accumulation limits are. In the absence of caps, antitrust laws would dictate what would constitute excessive concentration in the fishery. The purpose of these doctrines is to protect consumers from anti-competitive conduct that increases prices for consumers. The main federal antitrust law is the Sherman Act of 1890.[18] It prohibits combinations in restraint of trade and monopolization or attempted monopolization. Price need not be controlled in order to constitute an antitrust violation: agreements that constrain output are also forbidden. In recent history, judges have been tolerant of harvesting cooperatives under the Sherman Act when an overall catch limit on the fishery is in place, largely due to conservation benefits from such arrangements.[19] Similarly, in ITQ systems, challenges based on antitrust principles have generally been disregarded by courts as left to the discretion of NMFS.[20] Currently, antitrust violations are not enforced "under circumstances where a discrete fishery quota is fully utilized, the participating producers can demonstrate that a joint harvesting arrangement will increase product recovery, and where joint activity is limited to allocating harvesting rights among association members."[21] However, there is disagreement as to whether harvesting cooperatives and allocations might be subject to antitrust violations for dividing catch between members and determining output,[22] and the Council has not received legal advice on the issue. Clearly, limits on the amount of quota each cooperative controlled would be one solution to any potential antitrust issue. While it is unclear whether antitrust issues may be taken into consideration by courts in the future, lawsuits are costly and judges are often not in the best position to determine what agreements are anti-competitive and what are simply increasing efficiency.

In addition to accumulation limits and antitrust laws, there are other measures that may be used to control consolidation. Some that have been adopted in U.S. fisheries to protect fleet diversity include Community Development Quotas (CDQs), owner-onboard requirements, separate inshore and offshore quotas, set-asides for new entrants, and size-horsepower restrictions, among others.

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[18] 15 U.S.C.A. §1 *et seq.*

[19] See, e.g., "Justice Department Approves Proposal by the Pollock Conservation Cooperative" U.S Department of Justice, 2000. Available at: http://www.justice.gov/atr/public/press_releases/2000/4236.htm (last accessed July 8, 2010).

[20] See, e.g., Sea Watch Int'l. v. Mosbacher, 762 F.Supp. 370..

[21] Sullivan, Joseph. Harvesting Cooperatives and U.S. Antitrust Law Recent Developments and Implications. Oregon State University: International Institute of Fisheries Economics and Trade 2000. Available at http://oregonstate.edu/dept/IIFET/2000/papers/sullivan.pdf (last access July 20, 2010).

[22] For a discussion of antitrust principles as they may apply to fisheries management, see: Adler, Jonathan. Conservation through Collusion: Antitrust as an Obstacle to Marine Resource Conservation. Washington & Lee Law Review, Vol. 61, 2004. Available at http://ssrn.com/abstract=436481 (last accessed July 19, 2010).

Types of Accumulation Limits

There are three main types of accumulation limits that may be considered. Each accomplishes different goals and can have significantly different implications for the fishery. They can be implemented individually or concurrently. Considerations for each are described below.

Ownership (Control) Limits

Control limits are caps on the amount of quota (or total catch) that an individual owner can access. They are usually expressed as percentages of the total ACL of a fishery. In the most general terms, these are meant to ensure that no person captures an unreasonable share of a public resource and, like the other types of limits, provide a buffer against potential anticompetitive effects of concentrated ownership.

One problem with the design of control limits is determining what constitutes ownership of a share. If the limits are adopted in order to prevent individual people from gaining too much from the prosecution of the fishery, it is important to consider what role corporations play as permit holders, or how to address proportional ownership. There are several ways to approach this issue. If a person owns shares in a corporation, any permit ownership by the corporation could be imputed upon the person. Conversely, a person's share in a corporation could be used as a multiplier for the quota they are considered to control in a company-owned permit. To illustrate: in the former case, if a person had a 5% share in a corporation, who in turn owned permits representing 50% of the quota for a given stock, that person would be considered to control 50% of the quota. In the latter case, the person in the example would be considered to control 5% times 50%, or 2.5%, of the quota for the stock. Another strategy would be to take a minimum common ownership standard. That would mean that any person who owned more than the chosen percentage of a corporation would be considered to control the entire quota associated with it.

A related question that arises when considering control limits is whether such limits should apply to leased shares (or, in the case of sector management, transferred ACE). Control caps can be applied on an annual or a more permanent basis. The ability to purchase yearly quota in excess of the cap would undermine the purpose of having a cap, since an owner could be considered to "control" any quota they have access to during a year. However, capping the amount of ACE that can be transferred would be antithetical to the spirit of self-management for sectors.

Ownership records in New England are currently being compiled by the Regional Office of NMFS and are expected to be available in the coming months.

Vessel (Usage Limits)

Usage limits, as the name implies, are caps on the amount of fish that any given vessel can harvest. As with control limits, they are usually expressed as a percentage of the total ACL for a fishery. They are also generally stated on an annual basis. The purpose of such caps is to keep a minimum number of vessels in a fleet, and they can be designed in such a way as to dictate some of the character and geography of the fleet. Usage caps can be extremely effective in limiting consolidation because they explicitly limit efficiency in favor of a larger fleet. However, the limiting of efficiency by forcing a greater number of vessels to fish is a serious concern.

Although they are used less frequently than control limits, usage caps do have certain advantages. Because there are no ownership issues associated with vessel use, designing these types of measures can be a lot simpler. Also, since the caps are generally a blanket restriction on what amount of fish each vessel can catch, the question of whether leased quota should apply becomes moot. Usage limits are most often applied on a fleet-wide basis, but could be tailored to apply different caps to various sizes of boats.

Sector Limits

A final type of accumulation limit that could be implemented in New England is a sector limit. There is no comparable limit in other fisheries, so any cap on sector controls would have to be carefully designed in order to be effective.

Currently, there is no upward limit on the amount of ACE that a sector can fish, nor on the number of participants that can join each sector. In theory, this means that the entire fishery could organize into one large sector if consensus was reached to do so. While this clearly suggests the possibility that some members of the public could unjustly benefit from such an arrangement, an overall limit on the amount of ACE a sector can hold would probably accomplish nothing. Under Amendment 16, sectors are not required to have discrete policies or managers, so any sector that were to risk exceeding a cap could simply splinter into two sectors in name only.

In order for a sector cap to be effective, additional rules would need to be implemented that addressed sector management and membership. A cap on sector ACE would also not be likely to force geographic or fleet diversity under the current rules, so sectors may be required to accept members from only certain areas or with certain sizes of vessels.

A different type of sector cap that could be implemented would be a usage cap within a sector, such as a percentage of sector ACE that one vessel is allowed to fish. Such a limit would ensure a minimum number of active vessels within a sector, and may lead to the creation of sectors with similar types of vessels or with greater geographic affinity.

Cooperative caps have been considered,[23] but might not make sense as applied to sectors given the current lack of restrictions on sectors. Forcing a large number of sectors could lead to retention of processing facilities and infrastructure, but only if geographically or otherwise discrete.

[23] See, e.g., North Pacific Fishery Management Council. 2010. Regulatory Impact Review, Environmental Assessment, and Initial Regulatory Flexibility Analysis for Proposed Amendment to the Gulf of Alaska Fishery Management Plan: Central Gulf of Alaska Rockfish Program (Initial Review Draft). p. 137. Available at http://www.fakr.noaa.gov/npfmc/current_issues/groundfish/Rockfish410.pdf (last accessed July 20, 2010).

Other considerations for accumulation limits

In addition to the complexity involved with choosing an appropriate type of accumulation limit (if any) for a fishery, there are ancillary factors that may arise.

Grandfathering

Depending on the goals set for accumulation limits, such limits may be chosen at levels that are below the quota currently controlled by some individuals (or, if applicable, vessels or sectors) in the fishery. In such a case, a determination must be made whether those entities with excess shares will be "grandfathered in" or forced to divest of the amount that exceeds the cap.

If a grandfathering clause is issued, it should be clearly stated whether the excess shares remain with a permit in perpetuity, or for the life of the individual holder (or vessel or sector). Also, if a permit with excess shares has its quota fall below the grandfathered percentage, can it reinstate shares until it reaches the original amount?

Another consideration when opting for a grandfathering clause is whether "resource stuffing" will occur. That would enable some participants to be grandfathered in at much higher levels than they otherwise would be because of a dash to acquire quota before the date the cap is implemented. In cases where a cap that includes a grandfather clause is to be set on a date certain, it is advisable to issue a control date for the fishery beyond which any shares that are acquired will not be considered in determining allowable excess.

Permit Bank/Community Association Relation to Accumulation Limits

Much recent discussion, both in New England and across the country, has focused on user groups that hold permits other than individual fishermen. Such groups include permit banks, which can be state-sponsored, private, or public, community fishing associations, and community development corporations, among others. These permit holders can be treated the same as other entities in terms of applicability of accumulation limits, or they can have separate rules. The treatment of such groups should be specified in the design of limits.

Stock-Specific v. Aggregate Caps

Setting accumulation limits in a multispecies fishery has specific complications. One of these is whether caps should apply to each stock in a complex, only certain stocks, or the aggregate catch in the fishery. In U.S. fisheries, caps have been set to be stock-specific. However in some jurisdictions, including New Zealand, they are more often set as aggregate limits.

Summary

Caps on quota can be used to prevent market control by a small group of individuals, or to achieve management objectives. In the New England multispecies fishery, it is not possible for one group to gain market control, so any potential accumulation limits should be considered in light of meeting objectives for the fleet.

The design of accumulation limits, and whether to adopt them at all, is highly dependent on the fishery in which they will be used. There is a practically unlimited range of measures that can be adopted to suit purposes related to consolidation and fleet diversity. The types of problems solved can range from the need for economic rationalization, to promoting fleet diversity, to providing for diffuse ownership. Each type of measure will achieve different outcomes. For example:

Problem category	***Management objective*:**	***Appropriate measures may include:***
Rationalization	Reduce excess capacity	Use allocation criteria, not accumulation limits
	Allow market to determine participation	Absence of accumulation caps
Diversity	Comply with NS 4	Vague; Any limits could be used
	Provide opportunity for entry	Control limits; New entrant set-aside
	Ensure geographic diversity of fleet	Control limits; Usage limits; Sector limits with area-based membership rules
	Protect rural communities	Community development set-asides
	Preserve historic access	Vague; Usage limits; Size-horsepower restrictions
	Protect shoreside infrastructure	Measures to promote geographic diversity; Processor/dealer quotas
Ownership	Ensure access to reasonable number of participants	Control limits; Owner-onboard requirements; Usage limits
	Prevent windfall to small number of individuals at expense of others	Sector limits; Control limits
	Prevent market control and price-fixing by small number of owners	N/A: not a concern in the multispecies fleet

Accumulation limits and management measures that control quota usage in catch share systems are most effective when they are closely tailored to goals for the fleet.

Accumulation Limits in Other Fisheries

Existing Limits

Many United States fisheries that are currently operated using catch share management have accumulation caps in place. Some were implemented in the original amendment that adopted catch share management, while others had caps imposed in later amendments. Because every catch share fishery in the U.S. is different, it is difficult to make side-by-side comparisons of design features. Table 6 provides a snapshot glance of catch share fisheries and their respective caps on concentration.[24] Blank squares represent information that is not yet available in this draft.

The fisheries use a combination of vessel and ownership limits, combined with other requirements, to achieve management goals. Ownership limits in the fisheries range from 0.5% of area-specific quota shares in the Alaskan sablefish and halibut IFQ fishery to 49% in the Mid-Atlantic's golden tilefish fishery. Many fisheries do not impose vessel limits, but some do; they range from 0.5% of the total IFQ in the Alaskan sablefish and halibut fishery, to 2% of the TAC allocated to the portion of the fleet with IFQs in the Atlantic sea scallop fishery, to 20% of the initial annual TAC in the Bering Sea/Aleutian Islands non-pollock cooperatives.

In several of the fisheries, the cap was set to equal the maximum quota any individual held at the time of allocation, precluding the need for grandfathering. In others, some chose grandfather clauses while others forced participants who held quota in excess of the limit to divest. Most of the caps are species-specific. Some of the caps apply to leasing but others do not, allowing participants to effectively fish an allotment higher than the cap on an annual basis.

It was difficult to determine how ownership is identified across the fisheries, but there is wide variance among the plans, including absolute imputation, percentage ownership imputation, and a minimum common ownership standard.

There are also several fisheries that carry different requirements on quota control than vessel and ownership limits. The Pacific groundfish program has a 10% community set-aside that can be used for several purposes, and the Bering Sea/Aleutian Islands non-pollock cooperatives and Alaskan sablefish and halibut plan have a similar 10.7% community development quota. The latter has several additional requirements, including that the permit holder be a U.S. citizen and be onboard while fishing (unless granted an exemption under limited circumstances).

[24] Brief overviews of key design elements in U.S. catch share fisheries can be found on NOAA Fisheries Office of Sustainable Fisheries website at http://www.nmfs.noaa.gov/sfa/domes_fish/catchshare/index.htm (last accessed July 21, 2010).

Table 6 – Existing Accumulation Limits for Catch Shares Fisheries*

Region	Plan	Approx Permits	Individual caps	Vessel caps	Grandfathering	Ownership determination	Species or aggregate?	Does cap apply to leasing?	Other requirements
GMFMC	**Red Snapper (2007)**	429 (shareholders, 2010)	6.02%	No	N/A		Species	No	N/A
GMFMC	**Grouper and Tilefish (2010)**	758 shareholders; 948 permit holders for complex (2010)	2.29% - 14.28% depending on species	No	N/A		Species	Yes – limits amount that can be "purchased or held" in a year	
MAFMC	**Golden Tilefish (2009)**	8 full-time, 22 part-time, 2300 incidental (2006, vessels)	49%	No	No	*Interest in an IFQ allocation* means: An allocation permanently or temporarily held by an individual; or by a company in which the individual is an owner, part owner, officer, shareholder, or partner; or by an immediate family member (an individual's parents, spouse, children, and siblings). Interest is absolute, i.e., any interest in an allocation conveys the full value of the allocation.	Species	Yes - The cap is applied at any time a transfer or lease is processed.	N/A
MAFMC	**Surf Clam/Ocean Quahog (1990)**		No	No	N/A				
NEFMC	**Atlantic Sea Scallop IFQ (2010)**	322 (IFQ-only permits) and 40 LA vessel with IFQ permits (2010); 149 active so far	5% of fleet-wide TAC	2% of TAC allocated to portion of fleet with IFQs			Species		N/A
NPFMC	**BSAI Non-Pollock Cooperatives (2008)**		30%	20% of the initial TAC each year	Yes				Community Development Program (10.7% of each of the target species) off the top of yearly allocation

NPFMC	**Central GOA Rockfish Pilot (2007)**	15 catcher processors, 47 catcher vessels (2008)	5% of catcher vessel or 20% of catcher/processor quota; 30% harvesting and processing for cooperatives	No		Quota held by corporation calculated by % ownership in corporation	Aggregate of "primary species"		
NPFMC	**Sablefish and Halibut (1995)**	5843 (2008, permits)	0.5 – 1.5% of area-specific quota shares	0.5 – 1.5% of total IFQ	If initial allocation exceeds cap; Initial owners may fish entire IFQ on one vessel	Quota held by corporation calculated by % ownership in corporation	Species-, area-, and vessel class-specific		Owner must own or lease share, be U.S. citizen, be crew member, be onboard during fishing, and sign fish ticket upon landing; can hire skippers in certain circumstances (e.g. medical); CDQ to address affected western Alaska communities
NPFMC	**BSAI Crab Rationalization (2005)**	170 (2005/6)	1% - 10% for harvest (varies by fishery); 30% for processing	No		10% ownership reporting threshold	Species		
NPFMC	**BSAI Pollock Cooperatives (1995)**		17.5% for harvest; 30% for processing	No	No	Minimum common ownership standard	Species		10% CDQ set-aside; Seasonal allowances on pollock and by gear category/region
PFMC	**Groundfish (2011)**	159 trawl vessels (2007)	2.7% through 20% depending on species	3.2% through 20% percent; 30% for Pacific whiting motherships	Yes, but full divestiture required in years 3 and 4	2% minimum ownership reporting threshold	Species		10% community set-aside; vessel unused quota limit from 4.0% through 17.7% for certain stocks
SAFMC	**Wreckfish (1991)**	5 vessels; 25 shareholders (2010)	10% initial cap; none thereafter	No			Species		

*This table lists only catch share fisheries in the United States. There are other plans, including that for the limited access scallop fleet in New England, that impose caps on fisheries that are not managed with catch shares.

Development of Limits in Other Fisheries

In each catch share fishery that has accumulation limits, the process for setting those limits proceeded in a unique way. In most cases, no goals or vision were explicitly stated in the management documents. The most common reason for adopting ownership caps seemed to be compliance with the Magnuson-Stevens LAPP provisions. Table 7 shows some examples of catch share plans with stated goals as well as the methodologies used to develop different cap levels. Preserving fleet diversity did not seem to be a motivating factor in any fishery except where community set-aside programs were developed.

Table 7 – Development Process for Accumulation Limits

Plan	Goals	Methodology/analysis
Grouper and Tilefish		Determined by maximum IFQ share issued to a person, corporation, or other entity at the time of initial allocation for each stock; Was determined by maximum IFQ shares at time of allocation
Golden Tilefish	Reduce excess capacity	Eliminate excess capacity through the allocation criteria.
Surf Clam/Ocean Quahog		Allocated quota to everyone and let the market eliminate excess capacity. Although ~1,900 permits issued each year, only ~30 or so vessels actually are allocated cage tags to actually land the available catch each year. Number has been gradually reduced since ITQ program began in 1991
Red Snapper	Reduce overcapacity, achieve OY, comply with NS4 on excessive shares, prevent market power used to influence ex-vessel price, wages, working conditions, limit windfalls to original IFQ owners, provide opportunity for entry, ensure fishery supports a reasonable number of participants	Compared 3 alternatives: no cap, various percentages, and a percent "not to exceed the largest shares of the initial allocation"; latter chosen to equal 6.02%
Fixed Gear Sablefish and Halibut	Excess harvesting capacity; rural coastal community development of the small boat fishery; IFQ goal of efficiency	Compared effects to pre-IFQ fleet composition; did not analyze variety of caps or justify number chosen
BSAI Pollock Cooperatives		Initial allocation divided 50% inshore, 40% offshore, and 10% motherships
Wreckfish	Develop mechanism that allows the marketplace to drive harvest strategies and product forms in order to maintain product continuity and increase total producer and consumer benefits from the fishery; Minimize tendency for overcapitalization in the harvesting and processing/ distribution sectors; Provide a reasonable opportunity for fishermen to make adequate returns from commercial fishing by controlling entry so that returns are not regularly dissipated by open access, while also providing avenues for fishermen not initially included in the limited entry program to enter the program.	