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Measures of fishing fleet diversity in the New England groundfish fishery

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ABSTRACT

After 16 years under a limited access program with effort controls, the New England groundfish fishery transitioned to a catch share management system in 2010. For much of its earlier management history, issues related to fishing capacity were paramount as effort controls were increasingly restrictive to meet biological objectives. As the size of the active fleet declined from over 1000 vessels from 1994 to 2001 to less than 400 vessels in 2012, the management concern shifted to fleet diversity. Fleet diversity has been cast in terms of vessels based on characteristics such as size, gear, and region rather than their share in landings or economic value. Measuring fleet diversity with indices commonly used in the biodiversity literature such as richness, effective diversity based on the Shannon index, and evenness appears appropriate for this context. In this paper these indices were applied to measure changes in diversity of the active New England groundfish fleet from 1996 to 2012. Fleet diversity as measured by the Shannon Index has declined by approximately 35% from 1996 to 2012, but has remained relatively stable since 2007. Forty vessel types were present in all 17 years, which accounted for about 85% of active groundfish vessels and over 90% of total groundfish landings in all years. Even though the fleet size and overall diversity have declined the "core" groundfish fleet remains stable.

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1. Introduction

The New England groundfish fishery is prosecuted in Northwest Atlantic waters of the United States EEZ by fishermen using both fixed (gillnet and hook gears including bottom longline, tub trawls, and rod and reel) and trawl gears. The groundfish resource is distributed throughout waters of the Gulf of Maine and Georges Bank and to a lesser extent Southern New England and the Mid-Atlantic bight. The overwhelming majority of landings occur in the New England states, which is why the fishery is commonly referred to as the New England groundfish fishery. Management measures for the fishery are developed by the New England Fishery Management Council (NEFMC or Council) under the Northeast Multispecies Fishery Management Plan (hereafter referred to as the Groundfish FMP) and implemented by the National Marine Fisheries Service (NMFS). The principal species managed under the Groundfish FMP include cod, haddock, Acadian redfish, pollock, and white hake, as well as several flatfish species including yellowtail flounder, winter flounder, American plaice, and witch flounder. Some of these species (cod, haddock, yellowtail flounder, and winter flounder) are further subdivided into stock areas and the Georges Bank cod, haddock, and yellowtail flounder stocks are shared between the U.S. and Canada.

The first Groundfish FMP was implemented in 1986 after having abandoned quota-based management of cod, haddock, and yellowtail flounder from 1978 to 1982 and an Interim Groundfish FMP in effect from 1982 to 1985, which was intended to provide the Council with the time to formulate a longer term approach to management of the fishery. The first FMP established a major policy that would guide management of the groundfish fishery over time [1]. This policy was based on the recognition that the fishery had always operated in an adaptive manner taking advantage of natural fluctuations in species abundance, and that management actions should be avoided that would secure benefits for a single stock. Included in the major policy were biological objectives based on minimum abundance levels defined as a level of abundance below which there is an unacceptably high risk of recruitment failure. Economic criteria were not to be considered in setting minimum abundance levels. The major policy did not include any specific social or economic benchmarks or thresholds. Rather, the policy emphasized allowing fishery operations to evolve with minimal regulatory intervention as well as freedom of choice for fishermen. The Council also sought to avoid abrupt

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economic dislocations in implementing the major policy. Notably, in doing so

> "…in no event shall continued access by individual fleet sectors, net economic impacts on individual fishermen, or impacts on quality of life be considered in framing management measures developed consistent with this policy." [1]

This statement of management approach did not necessarily mean that the Council was indifferent about matters of fleet diversity, but that management approaches would not seek to adopt measures that would create preferential treatment to explicitly affect any particular composition of the groundfish fleet.

Since its inception, the Groundfish FMP has been amended 17 times and has been modified through an abbreviated process of framework adjustments on 49 occasions. Throughout, the overriding management goal was to achieve a sustainable resource, consistent with U.S. national conservation objectives articulated in the Magnuson–Stevens Act. However, specific actions taken to achieve resource sustainability were prompted by either litigation, changes in statutory requirements, or new stock assessment information. Brodziak et al. [2] chronicle these events and the management response from a biological perspective beginning with the 1991 lawsuit filed by the Conservation Law Foundation (CLF) through 2008. The CLF lawsuit eventually led to Amendment 5 to the Groundfish Plan in 1994, which established a limited access effort control program coupled with limited vessel days at sea (DAS) that would be the primary management regime for the fishery until management transitioned to a catch share system known as sector allocation in 2010. Whereas meeting biological objectives were the primary drivers of management action, the management objectives guiding the choice of regulatory measures were not clearly articulated.

Even though management objectives may not be formally articulated or written down, they are often revealed through Council deliberations over management program design. Major actions developed by the Council may take several years and involve a large number of Council-related meetings (full Council, Oversight or Ad-Hoc Committees of the Council, Plan Development Teams, Industry Advisory Panels, or Scientific and Statistical Committee), all of which must be announced in the Federal Register (FR). In each FR announcement the type of meeting, date, location, and a meeting summary are provided, where the meeting summary describes the general topics that may be discussed. This does not necessarily mean that all topics included in the meeting summary have to be discussed, nor does it limit the possibility that issues or topics not listed in the FR may come up. However, substantive action or votes cannot be taken on topics that have not been included in the FR meeting announcement. This means that the FR meeting summaries are limited to management objectives that have typically been under development over multiple meetings, around which, some consensus has been reached. For this reason, the FR meeting summaries were used as an indicator of revealed management objectives. Since the interest in this study is on management objectives related to fleet size and/or fleet diversity and how these objectives may have changed over time, the focus was on FR meeting summaries that addressed these or related topics. Procedurally, the meeting summary from each of 98 FR meeting announcements from calendar years 1996 through 2013 was reviewed for any topic or key word related to either fleet size or diversity. These keywords were then grouped into sub-topics. For fleet size the sub-topics included capacity, buybacks, latent effort, and consolidation, whereas the fleet diversity sub-topics included fleet visioning, diversity, and accumulation limits. The frequency counts for each sub-topic were summed over six-month intervals beginning in January, 1996 and ending in December, 2013 as depicted in Fig. 1.

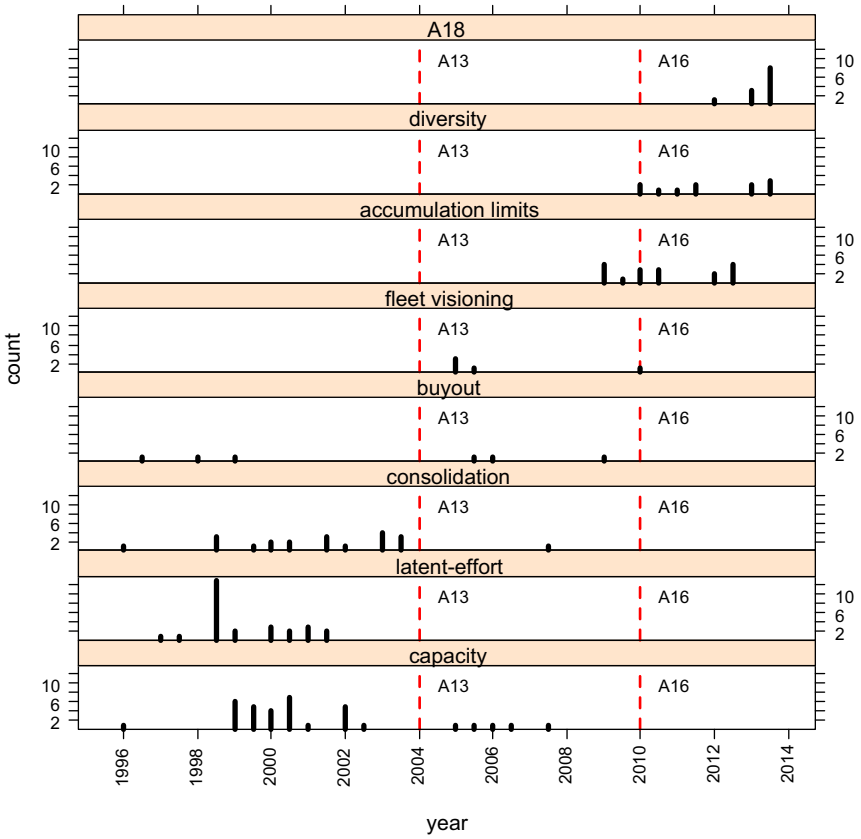

Fig. 1. Topics appearing in Federal Register meeting summaries 1996–2013.