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A cost-effective discards-proportional at-sea monitoring allocation scheme for the groundfish fishery in New England

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ABSTRACT

Discards can account for a large proportion of a fishery's total catch and have a significant impact on the condition of stocks, so many fisheries implement management measures to estimate discards, including at-sea monitors. Currently, at-sea monitors for the United States Northeast multispecies (groundfish) fishery, located in the northwest Atlantic Ocean, are allocated to meet a 30% coefficient of variation (CV30) standard to estimate the discards of 22 groundfish stocks by sector, gear type, and broad stock area on a trip basis. CV30 is a relative standard deviation precision measurement that deploys observers at an equal coverage rate across strata, regardless of their volume of landings or discards. As a result, at-sea monitors have not been cost-effectively allocated to observe the majority of the catches and discards or the catches and discards of highly utilized stocks to ensure accurate accounting of annual catch entitlement (ACE) utilization. Although some sectors and gear types are responsible for a relatively large percentage of landings and discards, they are allocated observers at the same coverage level as those that discard less. This has resulted in a disparity between monitoring effort and groundfish landings and discards, and the incentive to reduce discards is now misaligned with the utilization of ACE. Given that at-sea monitoring funding is limited and that the industry will soon have to bear this cost, this analysis proposes a discards-proportional observer allocation scheme that weights stocks with high ACE utilization rates more heavily. Results show that, in FY 2013, this allocation method could have reduced observer sea days by 1892 days, resulting in a $1.3 million total cost savings for the industry, while still observing the same amount of weighted discards as under current monitoring standards. This proposed approach could also provide an incentive to reduce discards for sectors faced with disproportionate and daunting at-sea monitoring costs.

1. Introduction

1.1. Background

In 2010, the groundfish fishery transitioned from days-at-sea to sector-based catch share management. Under this system, annual catch entitlement (ACE) is allocated to sectors—groups of voluntarily affiliated vessels—based on the catch history of the sector's members. The sector bears responsibility for allocating ACE to its member vessels. ACE may then be traded and leased within and between sectors. As of Fishing Year (FY) 2013, there were 19 sectors in the fishery, four of which functioned as lease-only sectors that did not conduct fishing activities [12].

Vessels fishing in sectors are required to carry at-sea observers on a portion of their trips to monitor their discards and ACE utilization. Discards account for about 18% of total catch in United States fisheries, and insufficiently monitored and regulated discards can play a substantial role in fisheries depletion [3,9]. In the groundfish fishery, discards include both non-target species and groundfish discarded due to minimum size restrictions or other regulations. Previous research has suggested that the ratio of discards of both groundfish and non-groundfish species to groundfish landings is roughly 1.79 [9]. This analysis focuses on discards of groundfish species that accounts for ACE utilization; in Fishing Year 2013, discards accounted for 0.3%-29.7% of the total catch of each groundfish stock and 0.2–11.1% of the ACE for each stock. The majority of these discards are not directly measured, but an estimated quantity of discards by stock is counted against a sector's ACE [8]. At-sea monitoring of a portion of trips is necessary to estimate discard rates, monitor the utilization of ACE as the

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fishing season progresses, and limit the adverse effect of poorly estimated discards on fisheries sustainability and profitability.

The stated objective for this at-sea monitoring (ASM) program in Amendment 16 to the Northeast Multispecies Fishery Management Plan is to "verify area fished, catch, and discards by species, by gear type" [2]. Observers are randomly assigned to vessels within strata determined by sector, gear type, and area fished on a trip basis, at a constant coverage rate determined by the National Marine Fisheries Service (NMFS) for each fishing year. The current monitoring coverage rate is calculated based on the CV30 precision standard (see Section 1.3); the rate selected is the lowest required to meet the CV30 for each of the 22 stocks in the groundfish fishery or, at a minimum, to ensure that 80% of discards by weight can be estimated with a CV of 30% or lower [8].

Since implementation of sector management, the cost of at-sea monitoring coverage has been paid by the National Oceanic and Atmospheric Administration (NOAA), but multiple efforts have been undertaken to shift the program to industry funding. While Framework Adjustment 48 to the Northeast Multispecies Fishery Management Plan (FW 48) deferred industry funding of ASM in FY 2013, the industry is expected to cover the salary costs of at-sea monitors—roughly $710 per observed day—beginning in Winter 2015, and will still be required to meet CV30 standards for monitoring [4]. For many fishermen in New England groundfish sectors, this expense could signal financial ruin for their fishing businesses. In fishing year (FY) 2013, the total expected ASM cost to be paid by sectors would have been $2.7 million if the infrastructure and overhead costs for administration of the program were covered under the Northeast Fisheries Observer Program (NEFOP), but no observer salaries were paid by NOAA [4,7]; this is equivalent to more than 4.8% of the $55.2 million groundfish landings value by sectors in FY 2013 [12].

The New England Fishery Management Council (NEFMC) revised certain elements of the groundfish monitoring program through Framework Adjustment 48 to the Northeast Multispecies Fishery Management Plan; these measures were voted on during the December 2012 meeting and were implemented by the National Marine Fisheries Service (NMFS) in FY 2013. Throughout summer and fall of 2012, the groundfish Plan Development Team (PDT) vetted setting observer coverage rates proportional to discards across vessel category, but this alternative analysis was not completed in time for further consideration in FW48.

In anticipation of the shift to industry funding of ASM, discussion regarding the program resumed in April 2015. At its April meeting, the New England Fishery Management Council requested that the agency estimate the costs of the ASM program relative to industry revenues and initiate action to address the economic viability of the groundfish fleet in light of these costs. In June 2015, the Council voted in favor of several motions related to ASM. First, the Council requested an agency emergency action suspending the ASM program; second, it asked NMFS to conduct an analysis of the effectiveness of the program; and third, it tasked the PDT to investigate ways to improve its efficiency and cost-effectiveness. The analyses requested by the Council provide a timely opportunity to consider and improve the cost-effectiveness of the program and ensure that efficient distribution of observer coverage can support the concurrent goals of economic viability and accurate discard estimates.

In response to this discussion, the PDT's meetings in May–August 2015 focused on possibilities for evaluating and revising the ASM program, including the analysis presented here. Options noted by the PDT included altering the method by which CV30 is used to determine the coverage rate, prioritizing coverage based on stock status or ACE utilization, and redesigning and restratifying the system to be proportional to landings and discards.

This analysis attempts to identify the distribution of monitoring effort by estimating the average landings and discards that were observed on each observer sea day among different vessel categories (sector and gear) to determine whether these categories could serve as appropriate strata for developing an alternative cost-effective allocation scheme for ASM observer coverage.

1.2. Previous research

Discussion of ASM coverage distribution within a fleet is not abundant in fisheries literature. Most studies focus primarily on the total observer coverage rate rather than its distribution across vessel sizes, gear types, and other categories. [11] gives an extensive overview of effective monitoring programs. Guiding principles for setting overall observer coverage levels include a formal threat assessment and/or a cost-benefit analysis and consideration for the needs of industry. Guiding principles for program costs include shifting the burden of responsibility to the industry, which is intended to incentivize vessel operators to fish cleaner. Furlong and Martin [6] focus on the optimal level of observer coverage in a fishery through which maximum net benefits are realized; the benefits of reduced illegal and underreported fishing are weighed against the costs of observer coverage. Allard and Chouinard [1] show the importance of a cost-efficient strategy in enforcing regulations against discarding. Rossman [18] highlights the importance of differentiating observer coverage and relative bycatch of marine mammals for each stratum in the Northeast and Mid-Atlantic bottom trawl and gillnet fisheries. Those vessels responsible for higher marine mammal mortality, particularly for threatened species, are deemed a priority in receiving observer coverage.

ASM costs have been a major concern for the groundfish industry since the implementation of sectors over four years ago, as indicated in Section 1.1. This discards-proportional approach, suggested by Sun,was presented to the PDT as an alternative allocation scheme to improve the situation in 2012. An updated study was also presented at the Massachusetts Marine Fisheries Institute Monitoring Workshop on February 24–26, 2013 and was cited by former NEFMC Council member David T. Goethel in public comments on the Draft Standardized Bycatch Reporting Methodology (SBRM) Amendment.

In addition, the University of Massachusetts Dartmouth's School for Marine Science and Technology (SMAST), in partnership with the Northeast Sector Service Network (NESSN), examined the utility of a fixed discard rate for the groundfish fleet based on analysis of NEFOP data collected in 2010–2011 [16]. Discard to kept ratios (*D*:*K*) and coefficients of variation (CV) across strata for two gear types, four species and three stock areas were analyzed to examine the utility of using 2010 NEFOP data to predict discard rates for 2011. Results indicated no significant differences in discard rates between 2010 and 2011 for three of the four species analyzed in all stock areas. Numerical differences in the discard rates between the years may have been the result of changes in fishing behavior related to adaptation to the catch share management system.

This analysis expands on these previous studies in demonstrating that, in addition to an optimal level of observer coverage within a fishery, there is also an optimal way to disperse those observers among fleet members to effectively enforce quota controls while minimizing costs.

1.3. The CV30 standard

Currently, coverage rates for the ASM program are set to meet a CV30 standard for discard measurements (a coefficient of variation of 30%). The CV30 standard is a precision measurement calculated as the ratio of the sample standard error to the sample mean. This