Standardized Bycatch Reporting Methodology
Sea Day Analysis and Prioritization
2011

Prepared by

Northeast Fisheries Science Center
NOAA Fisheries
166 Water Street
Woods Hole, MA 02543

and

Northeast Regional Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

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Executive Summary

This report is an analysis of the expected coverage by at-sea observers for Northeast fisheries for the April 2011 through March 2012 period using the Standardized Bycatch Reporting Methodology (SBRM). The sea days needed to achieve the precision-based performance standard (30% coefficient of variation; CV) were updated using July 2009 through June 2010 data. The New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC, respectively) and public have an opportunity to consider and provide input into decisions regarding prioritization of at-sea observer coverage allocations, if the expected available resources may not be sufficient to achieve CV-based performance standard.

A total of 19,507 sea days is needed to monitor 52 fleets. For the April 2011 to March 2012 period, current agency funding[1] is available for 10,936 sea days (10,650 sea days applicable for SBRM), along with an estimated industry-funded 3,254 sea days, for a total of 14,190 sea days. Of the 14,190 sea days, 13,904 sea days are applicable for SBRM. Thus, a funding shortfall of 5,603 sea days (19,507 – 13,904) is expected, and prioritization is required. In the prioritization process, it should be recognized that constraints exist for the funded sea days. Funding constraints relate specifically to the Congressional language that specifies the target species groups and the source (public or industry) of the funds. The prioritized sea day allocation is provided, along with two alternative allocations, as specified by the SBRM Omnibus Amendment. **NEFMC and MAFMC comments received on or before March 4, 2011,** will be considered in making sea day allocations for April 2011 through March 2012.

The analytical basis for allocation of future sea day coverage is a specified level of precision (i.e., 30% CV) and an expectation that the pattern of fishing activity observed in the prior year will be similar to that in the upcoming year. Fishing activity by fleets often changes in response to patterns of stock abundance, weather, and fishery regulations. The SBRM is designed to adapt to these changing circumstances. In particular, the changes associated with the application of annual catch limits in most fisheries, and the implementation of sectors in the Northeast multispecies groundfish fisheries, represent a fundamental challenge to the forecasting of sea day coverage.

In response to this challenge, the prioritized sea day coverage for 2011-2012 incorporates a number of changes that were implemented in 2009-2010:

- New fleets were added in response to observed changes in 2008-2009, 2009-2010, and/or potential changes in 2011.
- Monitoring requirements in the industry-funded scallop fisheries are explicitly included in the analysis.
- Coverage in New England groundfish fleets will be increased to an average of more than 30% in response to targeted agency funds for implementation of sectors.
- Coverage rates for vessels participating in US-Canada, Special Access Programs, and B-Days for groundfish will be the same coverage rates as those for vessels in sectors.

[1] As of January 3, 2011

- Fishing patterns under sector management are likely to be much different. In order to respond to these changes in real time, the pre-trip notification system will become an important determinant of fishing activity, and therefore observer sea day allocation.
- There were anticipated but unknown changes in fishing patterns, industry activity, discard rates, and variability in these rates that reduced the utility of optimization methods for 2011-2012. Formal optimization methods, apart from the application of filtering and constraints, were not applied.

Similar to the 2010 report, this report illustrates the implications of reduced funding on the anticipated CV for species groups. Failure to attain the 30% CV standard for a given fleet does not necessarily mean that the predicted precision for ALL species will exceed 30%. However, attainment of the 30% CV standard for a particular fleet implies that ALL of the species groups will be at or below 30%.

Using the 2011 prioritized sea days, the expected CV achieved for each species group was derived. Of the 49 species groups with a CV, 36 species groups (73%) would be expected to have a CV less than or equal to the SBRM performance standard of a 30% CV.

Background

As established by the Standardized Bycatch Reporting Methodology (SBRM) Omnibus amendment (NEFMC 2007; NMFS 2008), the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC, respectively) and public are provided an opportunity to consider and provide input into decisions regarding prioritization of at-sea observer coverage allocations if the expected available resources may not be sufficient to achieve the coefficient of variation (CV) based performance standard. In any year in which external operational constraints will prevent NMFS from fully implementing the required at-sea observer coverage levels, the Regional Administrator and Science and Research Director will consult with the Councils to determine the most appropriate prioritization for how the available resources should be allocated. Council comments received on or before March 4, 2011 will be considered in making prioritization decisions. If re-prioritization is undertaken, the resulting sea day allocations will be summarized in a subsequent document.

This document describes: 1) the 2011 SBRM sea day analysis to determine the number of sea days needed for each fleet[2]; 2) the information associated with prioritization of sea days; and 3) the 2011 prioritized sea day allocation for a 12-month period from April 2011 through March 2012, based on agency funding information available through January 3, 2011.

A complete summary of the Northeast Fisheries Observer Program (NEFOP) data is available in the 2011 SBRM Annual Discard Report (NEFSC 2011), a companion 2011 SBRM document.

[2] 'fleet' is synonymous with 'fishing mode'

Methods

Data Sources

The data set used includes data from NEFOP, the Vessel Trip Report (VTR, including logbooks from the surfclam and ocean quahog fishery) database, the Northeast Fisheries Science Center (NEFSC) commercial landings database, and the NOAA Fisheries Marine Recreational Information Program (MRIP) recreational landings from July 2009 through June 2010.

The same broad stratification scheme used in previous SBRM analyses was employed in the 2011 analysis, where trips were partitioned into fleets using six classification variables: calendar quarter, geographic region, gear type, mesh, access area, and trip category. Calendar quarter was based on landed date and used to capture seasonal variations in fishing activity and discard rates. Two broad geographical regions were defined: New England (NE) and Mid-Atlantic (MA) based on port of departure[3]; ports from Maine to Rhode Island constituted the NE region, and ports in states from Connecticut southward constituted the MA region. Gear type was based on Northeast gear codes (*negear)*. Some gear codes were combined: sink, anchored, and drift gillnets, and single and paired mid-water trawls. Trips for which gear was unknown were excluded. Mesh size groups were formed for otter trawl and gillnet gear types. For otter trawls, two mesh groups were formed: small (mesh less than 5.5 inches) and large (5.5 inch mesh and greater). For gillnets, three mesh groups were formed: small (mesh less than 5.5 inches), large (mesh between 5.5 and 7.99 inches), and extra large (mesh 8 inches and greater). Two access area categories were formed: access area (AA) and open (OPEN). The sea scallop fishery was divided into General (GEN) and Limited (LIM) category trips. All other fisheries were combined into a category called 'all'.

Similar to previous SBRM analyses, trips participating in the US-Canada access area, B-day category, and some of the other quota-monitored programs could not be identified in the VTR data. These trips have been grouped by the other stratification variables and have not been partitioned separately. NEFOP training trips have been included in the 2011 (similar to 2009 and 2010) SBRM analysis, which is a departure from the 2007 SBRM analysis. Additional information regarding the data sources can be found in Wigley et al. (2007). In 2011, NEFOP trips associated with coverage of a groundfish sentinel fishery (*program code* = 127) were excluded from this analysis. The analysis in this report[4] uses data collected by observers and, for two months, by at-sea monitors (ASM).

[3] Wigley et al. (2007) found that the majority (over 93%) of 2004 observed trips both originated and fished in the same region and exhibited the same general pattern as in the VTR data.

[4] A comparison of discard rates derived from observer and at-sea monitor data revealed there were generally no statistical differences in discard rates between the two data collection programs for the 14 fish species groups for four gear types (longline, large-mesh otter trawl, large-mesh gillnet and extra-large-mesh gillnet) where ASM data exist. Within the 2011 SBRM data set, only two months (May and June) contain ASM data. As more ASM data become available, it is advisable to confirm that no differences exist before pooling observer and at-sea monitor data.

A list of the 15 SBRM species groups analyzed, and the species comprising each species group, is given in Table 1. A summary of the data used, in terms of number of trips and number of sea days, by fleet and data source, is given in Table 2 and 3, respectively. Due to the sampling protocol differences within the NEFOP, the data set used for fish is summarized separately from the data set used for protected species (sea turtles). Briefly, sampling protocols for protected species often preclude the collection of fish discard data; for further details see the NEFOP's Fisheries Observer Program Manual (NEFOP, 2010).

In addition to the new fleets that were included in the 2010 SBRM analysis (MA AA GEN and LIM scallop trawl, MA and NE floating trap, MA and NE conch pots, MA and NE hagfish pots, MA and NE beam trawl, NE Ruhle trawl, NE shrimp pot, and MA other dredge), there is one new fleet in the 2011 SBRM analysis: NE Haddock Separator trawl (Table 2).

Of the 52 fleets examined in the 2011 analysis, 29 fleets (30 fleets in the fish data set) had little or no observer data (all quarterly cells were missing for a fleet, or sparse observer coverage existed across all quarters for a fleet). These fleets are primarily pot and trap fisheries targeted for particular species (e.g., lobster, crab, conch, shrimp, and hagfish). No discard estimation was performed for these fleets, which were designated as fleets in need of pilot coverage (Tables 2 and 3). Pilot coverage is defined as a minimum level of observer coverage necessary to acquire bycatch information with which to calculate variance estimates that in turn can be used to further define the level of sampling needed (NMFS 2004). For each of the remaining fleets, estimates of discards and its associated variance were derived to determine the sample sizes needed for a 30% CV.

Sample Size Analysis

The 2011 sea day analysis used the discard estimation methods described in the SBRM analysis for the Omnibus amendment (Wigley et al. 2007). Total discards of each of the 15 SBRM species groups from July 2009 through June 2010 were estimated using a combined d/k ratio estimator (Cochran 1963), where d = discarded pounds of a given species group, and k = the kept pounds of all species. Total discards (in weight for fish, in numbers for turtles) were derived by multiplying the estimated discard rate of each fleet by the corresponding fleet landings in the VTR database, and then summing over fleets. The variances of the discards were also derived. In this document, CV is defined as the ratio of the standard error of the total discards divided by the total discards. Appendix 1 presents the equations used in the analysis.

The 2011 SBRM sea day analysis was conducted to estimate the number of baseline trips and sea days needed to monitor the 15 species groups in each fleet. As described in the SBRM analysis for the Omnibus amendment (and given in Appendix 1), the number of trips and sea days needed to achieve a given precision level was based on the variance of the total discard estimate for a species group. Sample size (trips and sea days) associated with the SBRM precision standard for discard estimates (30% CV) were derived. The

sample size analysis was performed using trips as the sampling unit, and then converting the number of trips to sea days by multiplying by the weighted mean trip length, where the weighting factor was the quarterly number of VTR trips.

When total discards could not be estimated due to little or no observer coverage (no data), or when total discards were zero (no variance), the sample size (number of trips) was determined using a pilot coverage level set to 2% of the quarterly VTR trips for a fleet, with a minimum of 3 trips per quarter (12 trips per year) and a maximum of 100 trips per quarter (400 trips per year). The 2% pilot coverage level is the same as used in previous SBRM analyses. The quarterly trips were then multiplied by the quarterly mean VTR trip length to derive quarterly sea days. The quarterly trips and quarterly sea days were then summed for annual number of trips and sea days. Pilot coverage may result in too much coverage in cases where little or no observer coverage may actually be needed.

The SBRM Omnibus Amendment calls for attainment of CVs of no more than 30% in each fleet/species combination. Thus, for each fleet, a CV of 30% or less is to be attained for each species within that fleet. Some fleet/species combinations contribute very little to the total mortality or discard of the species, but may require significant resources to characterize the precision of the estimate. For example, a high variance estimate for a rare event within a fleet would require high levels of sampling, even though the total discard in that fleet was unimportant with respect to either the total discard or total mortality on the resource.

As in previous SBRM analyses, importance filters were used to provide a standardized protocol to further refine the number of baseline sea days based on: (a) the importance of the discarded species relative to the total amount of discards by a fleet, and (b) the total fishing mortality due to the discards. Three filters (i.e., unlikely cell filter, fraction of discard filter, and fraction of total mortality due to discards filter[5]) are applied simultaneously. The unlikely cell filter eliminates sea days associated with fleets where species and gear combinations are considered, *a priori*, as unlikely or infeasible. The unlikely cell filter can act as an 'override' mechanism in situations where pilot coverage is evoked due to no variance (observer coverage indicates zero discards). A detailed description of the SBRM importance filters is given in Wigley et al. (2007).

Consistent with previous SBRM analyses, the 2011 baseline sea days were filtered using a 95% cut-point in the discard filter, and a 98% cut-point for the total mortality filter due to discards. In other words, estimates of sea day coverage for a given species or species group were derived for those fleets where discards constituted 95% of the discard mortality and 98% of the total mortality. In the 2011 analysis (similar to the 2010 analysis), the unlikely cell filter was not updated for the new fleets with regard to the 14 fish species groups; 'likely' was assumed for the new fleets. It is anticipated that the unlikely filters will be re-evaluated during the SBRM 3-year evaluation, scheduled to take place in late 2011. For sea turtles, unlikely filters for all fleets in the 2010 SBRM were updated based on review of the NEFOP data (H. Haas, pers. comm.); the new 2011

[5] Fraction of total mortality due to discards is defined as the ratio of discards of species group *j* in fleet *h* (D_{jh}) to the sum of commercial landings (L_{jh}), recreational landings (R_{jh}), and discards (D_{jh}) summed over *h*.

fleet (NE Haddock Separator trawl) was assumed 'likely' for sea turtles. As in the 2010 SBRM analysis, the fraction of discard filter and the fraction of total mortality due to discards filter were employed for sea turtles in the 2011 analysis.

To determine the number of sea days (referred to as the '2011 SBRM standard sea days') and trips needed to achieve a 30% CV within a fleet, the maximum number of sea days for the 15 species groups (i.e., the maximum number of sea days in a row) is used. This ensures that all species groups will have a 30% CV or less. In the event that sea days for each species group within a fleet are filtered out, then the number of sea days for the fleet will be based on pilot coverage to maintain monitoring coverage for that fleet. If the fleet is designated as a pilot fleet, then pilot sea days are used.

Funding available for April 2011 through March 2012

There are two funding source categories: agency-funded and industry-funded. Within the agency-funded category, there are five sub-categories.

- **Agency-funded**: The NEFSC anticipates having funds for 10,936 sea days. The funding sources for these sea days include: Atlantic Coast (544 sea days), New England Groundfish [3,829 NEFOP sea days and 6,150 At-Sea Monitoring (ASM) days partially funded by the National Observer Program], Reducing Bycatch (127 sea days), and Marine Mammal Protection Act (MMPA; 286 sea days). Each funding source has funding constraints (days targeted for specific species and/or data category). The regional orientation of the funding is also important. ASM days are targeted towards NE groundfish and implementation of sectors. NEFOP sea days are targeted toward groundfish but are also used for trips that may catch other species.
    - The 286 MMPA sea days have been excluded from SBRM due to sampling protocols that are specific to protected species and are not applicable for fish. However, these days will provide observer coverage for sea turtles above that which is allocated within SBRM.
    - Thus, 10,650 agency-funded sea days are applicable for SBRM.
- **Industry-funded**: The number of industry-funded sea days available for monitoring depends upon the Research Set Aside Program and the increase in landings allowed for vessels carrying observers. The nine industry-funded fleets are Rows 9, 10, 12, 27, 28, 29, 30, 33, and 34 (Tables 2 and 3).
    - Based on the preliminary compensation rate analysis[6] conducted on January 14, 2011, an estimated total of 3,254 sea days can be funded (1,613 sea days for Open areas and 1,641 sea days for Access Areas).

[6] The preliminary compensation rate analysis used 180 pounds and 0.08 Days-At-Sea based on costs and expected revenue from scallops. A Small Entity Compliance Guide will be forthcoming.

- The industry-funded schedule is identical to the scallop fishing year (March to February); this 12-month period is one month ahead of the NEFOP annual sea day schedule (April to March).
- Consideration of the proposed Scallop Framework 22 measures will add additional complexities to the 2011–2012 sea day schedule. The access areas that will be open at the start of FY 2011 may not be the same as those that would be open under Framework 22 proposed measures. For example, at the start of the 2011 scallop fishing year, the Elephant Trunk Access Area (ETAA) will continue as an access area. However, the ETAA would revert to an open area after implementation of Framework 22 management measures, if approved. To account for these discrepancies, NEFOP and Northeast Regional Office (NERO) staff will coordinate to ensure that sea days are appropriately distributed between open and access areas.

- Coverage of the nine fleets depends on industry activity within these fleets.

- Limited Access General Category (LAGC) Open area fleets (Rows 11, 31, and 32; Tables 2 and 3) are not industry-funded fleets.

- **SBRM Total**: 13,904 sea days (10,650 agency-funded + 3,254 industry-funded)

Prioritization

As specified in the SBRM Omnibus Amendment, when a funding shortfall occurs, a prioritized sea day allocation is made. This allocation uses a combination of statistical and ad-hoc methods to assign sea days while keeping within the funded constraints. It is important to state that changes in management regulations have resulted in the expanded use of the pre-trip notification system (PTNS). Several factors reduced the applicability of optimization methods for 2011. These factors included: the expansion of coverage by the PTNS, increased overall coverage rates in groundfish and trips directing on *Loligo*, potential changes in the discarding rates in sector fleets, and unknown changes in activities by fleets. Instead, projected sea day coverages based on proportional allocation among fleets based upon VTR days during the July 2009 through June 2010 period were used to assign sea days for fleets that are associated with the PTNS/Call-In regulations (industry-funded fleets, directed *Loligo* fleets, and New England groundfish fleets). These sea day assignments should be considered as provisional. Actual coverage will depend on industry activity among fleets within these funding categories. A comparison between the prioritized sea day allocation and the 2011 SBRM standard sea days is made by calculating the difference and percent difference between 2011 SBRM standard sea days and prioritized sea day allocation, by fleet.

Using the prioritized sea day allocation, the expected achieved CV is derived for species groups in fleets with prioritized sea days where the species group has discard estimates and variances that were not filtered out (see Eqs. 10 and 11 in Appendix 1).

Two alternative allocations were also made: proportional and proportional with funding constraints. In the proportional allocation, the funded sea days were allocated using two categories: agency-funded (10,650 sea days) and industry-funded (3,254 sea days) for the April 2011 through March 2012 period. Although the agency-funded category has specific constraints for fish/protected species/data category targets associated within this category, those restrictions were not considered in this allocation. Thus, funding earmarked to observe New England groundfish bycatch was assumed to be transferable to any fleet, regardless of region, for example. The funded sea days for each category were distributed according to the proportion (the same proportion as the corresponding category) of the 2011 SBRM standard sea days within each category.

The proportional allocation with funding constraints for 2011 SBRM prioritization reflects the obligations of the funding sources. Within the agency-funded category, there are two funding subcategories for SBRM: Atlantic Coast and New England Groundfish. New England Groundfish funds are the sum of sea days for NEFOP and for ASM. The industry-funded category has three subcategories: Open area, New England Access areas, and Mid-Atlantic Access areas. The funded sea days for the three industry-funded subcategories and the two agency-funded subcategories were distributed according to the proportion (the same proportion as the corresponding category or subcategory) of the 2011 SBRM standard sea days within each category or subcategory.

Results

At-sea Observer Coverage Levels Required to Attain SBRM Performance in Each Applicable Fishery

The number of sea days needed to achieve at 30% CV for each of the 15 species groups by fleet is given in Table 4. The 2011 SBRM standard sea days for each fleet are given in Tables 4 and 5. There are 29 fleets (30 fleets in the fish data set) with 2011 SBRM standard sea days based on pilot coverage, 23 fleets (22 fleets in the fish data set) with sea days based on the discard variances, including six fleets with sea days based on pilot coverage to maintain minimal coverage (these fleets require no sea days based upon the SBRM importance filters and thus are not denoted with a 'P'; Rows 4, 13, 14, 26, 32, and 42; Table 4).

The total 2011 SBRM standard sea days (19,507) needed for the 52 fleets (Tables 4 and 5) exceed the total anticipated funded sea days (10,650 agency-funded + 3,254 industry-funded = 13,904) for the April 2011 through March 2012 period. By funding category, 2011 SBRM standard sea days associated with the agency-funded fleets (16,843) is more than the anticipated agency-funded sea days (10,650), while the 2011 SBRM standard sea days associated with the industry-funded fleets (2,664) is less than the estimated industry-funded sea days (3,254). As described below, funding shortfalls, by fleet, occur when sea days are allocated according to funding constraints within the agency-funded and industry-funded categories.

Coverage Levels Available If Available Resources Were Allocated Proportionately Across All Applicable Fisheries

The total of 13,904 sea days (10,650 agency-funded and 3,254 industry-funded) was proportionally allocated for the 12-month period from April 2011 through March 2012 for the two funding categories. These allocations reflect agency funding information available through January 3, 2011.

Elements in the Table 5 column labeled "*Available Coverage with shortfall applied proportionally*" were obtained by multiplying the column "*2011 SBRM Standard Sea Days*" by 0.6323 (10,650/16,843) for the fleets in the agency-funded category, and by 1.2215 (3,254/2,664) for the fleets in the industry-funded category. This achieves the same relative distribution of sea days as the SBRM standard sea days for the two funding categories, although the CVs of estimates for each species in each fleet will not be affected equally. This allocation results in coverage below the 2011 SBRM standard coverage for all fleets associated with agency-funding. However, for industry-funded fleets, all fleets have more coverage than the 2011 SBRM standard coverage.

Coverage Levels Available If Available Resources Were Allocated Proportionally Across All Applicable Fisheries <u>with funding constraints applied</u>

The total of 13,904 sea days (10,650 agency-funded and 3,254 industry-funded) was proportionally allocated for the 12-month period from April 2011 through March 2012 using two agency-funded sub-categories (NE and MA) and the three industry-funded subcategories (Open areas, NE Access areas, and MA Access areas). These allocations reflect agency funding information available through January 3, 2011, and represent some of the obligations of the funding sources and the classifications used in the preliminary compensation rate analysis. It does not make the distinction between NEFOP common pool and sector fleets and ASM funds for sectors fleets. Groundfish fishing activity by fleet is unknown for the upcoming fishing year beginning on May 1, 2011.

Elements in the Table 5 column labeled *"Available Coverage with shortfall applied proportionally within funding constraints"* were obtained by multiplying the column "*2011 Standard Sea Days*" by 0.9103 (10,106/11,102) for agency-funded New England fleets, by 0.0948 (544/5,741) for agency-funded Mid-Atlantic fleets, and by 0.7433 (1,613/2,170), 4.3583 (815/187), and 2.6905 (826/307) for the three industry-funded sub-category fleets, Open area, NE Access areas, and MA Access areas, respectively. This achieves the same relative distribution of sea days as the SBRM standard sea days for the funding categories and sub-categories, although the CVs of estimates for each species group in each fleet will not be affected equally. For agency-funded fleets, this allocation results in coverage substantially below the 2011 SBRM standard coverage for MA fleets and only slightly below the 2011 SBRM standard coverage for the NE fleets. For industry-funded fleets, this allocation results in coverage that exceeds the 2011 SBRM

standard sea days for MA and NE Access area fleets, but less coverage for Open area fleets.

Coverage Levels That Incorporate the Recommended Prioritization; Justification for Prioritization

Elements in the Table 5 column labeled "*Prioritized April 2011 – March 2012 Coverage*" represent the 2011 prioritized sea days based on the criteria given below.

New England groundfish funding is primarily used to support two objectives in the New England region:

> 1) To ensure that program-specific and negotiated TACs are not exceeded. This entails relatively intense monitoring (9,559 sea days) of Special Access Program/B day, US-Canada sharing fisheries, and New England groundfish fisheries (including common pool and sector catch shares). These sea days cannot be allocated to specific fleets *a priori*, because coverage depends on real-time industry use of DAS categories or available annual catch entitlements (ACEs).
>
> 2) To monitor bycatch of groundfish in the Atlantic herring fishery. This entails an allocation of 547 sea days to cover mid-water trawl and purse seine components of the fishery, with statistical performance standards for that specific objective (420 sea days and 127sea days associated with Herring Closed Area I).

Atlantic Coast funding provides the basis for the estimation of fish and sea turtle bycatch in MA trawl fisheries (544 sea days), supporting fish stock assessments, biological opinions, and planned rulemaking. The optimization tool was not used to allocate coverage among fleets to estimate discards of summer flounder, scup, black sea bass and monkfish to support fish stock assessments.

Coverage for the trips directing on *Loligo* squid are included in the totals for NE and MA small-mesh otter trawl fleets. Allocations include both stratified-random and PTNS sampling designs.

Discovery days are usually held in reserve to address emerging questions of scientific and management interest as the year progresses to minimize disruption to statistically designed on-going coverage; however, this year no sea days were assigned .

Using the 2011 prioritized sea days (Table 5 column labeled "*Prioritized April 2011 – March 2012 Coverage*"), the expected CV achieved for each species group is given in Table 6. There are 21 fleets with sufficient data to support sample size analysis based on the variance of the discard estimates. The fleets designated as in need of pilot coverage can not be evaluated, and the fleets with no prioritized sea days are not evaluated. It is important to note that some species groups have been filtered out through the importance filter process and thus do not have an achieved CV; these species groups have been denoted with an '*' in Table 6. Of the 49 species groups with an achieved CV, 36

species groups (73%) maintained a CV less than or equal to the SBRM performance standard of a 30% CV (Table 6).

For several fleets associated with the New England groundfish fisheries (NE longline, NE handline, and NE gillnets), more sea days than required by SBRM have been assigned through the prioritization process to address compliance monitoring needs. In these fleets, and other fleets where the prioritized days exceed the SBRM standard days, the expected achieved CVs are lower than the 30% CV for all species groups (Table 6).

The usefulness of Table 6 is demonstrated in rows where the prioritized sea days are less than the SBRM standard coverage. For example, the NE large-mesh otter trawl fleet has 5,183 SBRM standard sea days and 4,235 prioritized sea days, indicating that 82% of the 2011 SBRM standard sea days have been allocated to this fleet (Table 6, Row 8). The impact of not funding the remaining 948 days results in achieved CVs that are less than the SBRM performance target for six of the seven species groups (Table 6, Row 8). Red crab (RCRAB) has an expected 35% CV. It would require the additional 948 sea days to lower the CV of this species group by 5%. This information is useful when evaluating the prioritized sea days when a shortfall in resources has occurred.

Four of the nine industry-funded fleets have been assigned fewer days than would be required by SBRM (Table 6; Rows 10, 12, 33 and 34). For two of these fleets, the MA LIM scallop trawl (Open and AA; Rows 10 and 12), there is only one active limited access scallop trawl vessel. This vessel will likely fish less than 40 days each in Open and Access areas; however, the SBRM standard sea days for these fleets has been based on pilot coverage. To prevent 100% coverage of this vessel, fewer sea days have been assigned then required based on pilot coverage. For two other fleets, MA and NE LIM OPEN scallop dredge fleets (Table 6; 33 and 34), the CV performance standard is attained for six of the eight fish species groups. Fluke-Scup-Black Sea Bass (FSB) and large-mesh groundfish species group (GFL) nearly attain the performance standard with 30.3% CV and 30.8% CV, respectively. The performance standard for sea turtles (TURS) is not met for the MA LIM OPEN scallop dredge fleet (Row 33), where 935 sea days have been assigned, 66% of the 1,417 sea days required. A model of loggerhead turtle interactions included depth, sea surface temperature, and chainmat use, none of which are expected to differ considerably between open and access areas (Murray 2011). Thus, for sea turtles, the 3,060 pooled prioritized sea days associated with the MA and NE LIM OPEN and AA scallop dredge fleets (Table 6; Rows 29, 30, 33, and 34) exceed the 2,423 SBRM standard sea days. The expected achieved CV analysis has not been expanded to accommodate sea turtles under a broader stratification.

The expected achieved CV for species groups, given the shortfall and surplus of sea days across fleets, is provided for illustrative purposes only due to the provisional nature of the 2011 prioritized sea days.

Note on Projected Costs

For the SBRM standard sea days and the two proportional allocations:

- Agency-funded fleets used $1,200/day
- Industry-funded fleets used $775/day

For the SBRM sea day prioritization:

- Agency-funded used $1,200/day for NEFOP days and $900/day for ASM days
- Industry-funded fleets used $775/day

Thus the differences in projected costs (Table 5) are not truly comparable between 2011 SBRM standard sea days and funded sea days.

Discussion

The analytical basis for allocation of future sea day coverage rests on a specified level of precision (i.e., 30% CV) and an expectation that the pattern of fishing activity observed in the prior year will be similar to the upcoming year. Fishing activity by fleets often changes in response to patterns of stock abundance, weather, and fishery regulations. The SBRM is designed to adapt to these changing circumstances. In particular, the changes associated with application of Annual Catch Limits in most fisheries, the bycatch cap in the directed *Loligo* fleet, and the implementation of sectors in the Northeast multispecies groundfish fisheries represent a fundamental challenge to the forecasting of sea day coverage.

- New fleets were added in response to observed changes since 2009. The Ruhle Trawl (*negear* code 054) and Haddock Separator Trawl (*negear* code 057) were authorized as new gear and appear in the Quarter 2 data (Tables 2 and 3). These gear types are required in the US/CAN resource sharing area and their use is expected in non-access areas to reduce discards of New England groundfish under sector management. These fleets are covered as part of the NE groundfish sector and common pool fleets, where observer coverage is applied via the PTNS. Due to the low number of VTR trips reported for these fleets in the July 2009 through June 2010 period, the number of prioritized sea days assigned is lower than what may be realized. Additional outreach and education via permit holder letters to industry members have emphasized the proper use of these two gear codes.

- There are several rows (i.e., Rows 5, 6, 7, and 33) with high SBRM standard sea day requirements (> 1,000 sea days) based on sea turtle analysis. These requirements may not necessarily match the needs of the next year's data analysis because sea turtle bycatch is statistically rare, and observations of sea turtle bycatch vary from year to year based on random sampling within strata. We expect that SBRM sea days may be highly influenced by rare events because SBRM has many strata (fleets) and the analysis is based on only 12 months of data. In some instances, the SBRM requires drastically different observer coverage in fleets that likely have similar sea turtle bycatch patterns

over a longer time scale (but dissimilar patterns on an annual scale). Hence, a more even distribution of sea days across fleets may be warranted, especially for fleets with similar sea turtle bycatch characteristics.

- Monitoring requirements in the industry-funded scallop fisheries are explicitly included in this analysis[7].

- Coverage in New England groundfish fleets will be at an average of more than 30% in response to targeted agency funds for implementation of sectors. The SBRM does not address the coverage rates necessary for individual sectors. Several of the sectors are relatively small (in terms of number of vessels and/or catch shares), and the expected number of trips, even with high percentage of observed days, may also be small. While the aggregate coverage rates should be sufficient to achieve a 30% CV, the level of precision within sectors could be high. Seventeen sectors have been formed from the New England otter trawl, longline, and gillnet fleets. The effects of increased stratification on the precision of discard rates are unknown. Actual fishing patterns will be governed primarily by economic decisions within each sector, so previous year's catch patterns may not be a sufficient basis for inferring activity in the 2011 fishing year, when 19 sectors are anticipated.

- Coverage rates in vessels participating in US-Canada, Special Access Programs, and B-Days for groundfish will be the same coverage rates as those for vessels in sectors. Unlike in previous years, there will be no separate program for monitoring.

- Fishing patterns under recently implemented sector management are likely to be much different. In order to respond to these changes in real time, the pre-trip notification system will become an important determinant of realized coverage rates across sectors.

- Anticipated but unknown changes in fishing patterns, industry activity, changes in discard rates, and variability of these rates combined to reduce the utility of optimization methods for 2011-2012. Formal optimization methods, apart from the application of filtering and constraints, were not applied. However, the prioritized sea days were proportionally distributed among fleets using VTR sea days with funding constraints, even though future behavior is unknown. Actual coverage will depend upon fishing activity among the fleets. Higher or lower sample sizes are now required for some components depending on changes in variability within a fleet over time. As indicated in Table 5, the fleets that lacked observer coverage from July 2009 through June 2010 were allocated sea days at the 'pilot' coverage level (2% of trips with a cap of 100 trips per calendar quarter) in the SBRM report.

[7] The 2009 SBRM analysis for anticipated coverage did not include necessary coverage rates of industry-funded fleets.

There is a 5,360 sea day increase in SBRM standard sea days between 2010 (14,147 sea days; NEFSC 2010) and 2011 (19,507 sea days). The three fleets with the largest change in sea days between 2010 and 2011 are: NE small-mesh otter trawl (Row 7), NE large-mesh otter trawl (Row 8) and MA LIM OPEN scallop dredge (Row 33). For the NE small-mesh otter trawl fleet, there was an increase of 2,082 sea days. The species group determining the sea days for this fleet changed from Fluke-Scup-Black Sea Bass (FSB), with 2,192 sea days in 2010, to sea turtles (TURS), with 4,274 sea days in 2011. For NE large-mesh otter trawl, there was an increase of 4,515 SBRM standard sea days. The species group determining the sea days for this fleet changed from small-mesh groundfish (GFS), with 668 sea days, to red crabs (RCRAB), with 5,183 sea days. Exploration of the underlying data revealed that this was not based on a spurious observed trip. For MA LIM OPEN scallop dredge, there was a decrease of 2,026 sea days between 2010 and 2011, and the species group (TURS) did not change.

Relatively small changes in SBRM standard sea days (a decrease of 123 sea days) are associated with 'pilot' fleets, indicating only minor changes in effort. The new 2011 fleet, NE Haddock Separator trawl (Row 14), contributed only a 21 sea day increase. It is anticipated that changes in the SBRM standard sea days will be examined during the SBRM three year evaluation scheduled to take place in late 2011.

Important Caveats for 2011 SBRM prioritization

- Funding constraints remain an issue in sea day allocation, and shortfalls by fleet resulted. The Mid-Atlantic fleets and the small-mesh fleets remain under-funded.

- Changes in management regulations will result in different fishing practices such that previous year's data can not be used to inform the prioritization of 2011 sea days. The sea day allocation should be considered approximate for the fleets associated with New England groundfish and the sub-fleet of the NE and MA small-mesh otter trawl that directs on *Loligo* squid.

- The high level of observer coverage for fleets that catch New England groundfish should provide a better basis for allocation of observer coverage in future years. However, in view of the uncertainty in fishing patterns in 2011-2012, fleet coverage rates will rely more heavily on proportional allocations and systematic sampling of trips governed by the actual patterns of fishing activity.

- The pre-trip notification system will dynamically assign sea day coverage according to industry activity for common pool and sector fleets by gear type and access area. The PTNS has been expanded to include the trips directing on *Loligo* squid.

- Industry-funded coverage in the various scallop fleets is the subject of ongoing analyses. Analyses herein have assumed a coverage rate comparable to the base

period. Actual coverage will be based on the outcome of the Council approval (Framework 22).

- Allocation decisions are based on the attainment of precision standards for the set of species under federal FMPs. River herring, comprising both alewife and blueback herring, is not a federally managed species group, and is not one the 15 species groups included in the SBRM FMP. The river herring species group is indeed monitored, along with all the other individual species, as part of the sampling protocols of the Northeast Fisheries Observer Program. If river herring were included as a species group with the 2011 SBRM analysis, then the total 2011 SBRM standard sea days would be 20,418 sea days instead of 19,507 sea days, and the sea day standard for NE large-mesh otter trawl (Row 8) would be 6,094 sea days instead of 5,183 sea days. With the 4,235 prioritized sea days for this fleet, river herring has an expected achieved CV of 38%.

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Table 1. List of the 15 SBRM species groups (in bold), with species group abbreviations in parentheses, and the species comprising these groups, corresponding to the 13 federally managed fishery management plans in the Northeast region.

ATLANTIC SALMON[8] (SAL)
BLUEFISH (BLUE)
FLUKE - SCUP - BLACK SEA BASS (FSB)
Black Sea Bass
Fluke
Scup
HERRING, ATLANTIC (HERR)
LARGE MESH GROUNDFISH (GFL)
American Plaice
Atlantic Cod
Atlantic Halibut
Atlantic Wolffish
Haddock
Ocean Pout
Pollock
Redfish
White Hake
Windowpane Flounder
Winter Flounder
Witch Flounder
Yellowtail Flounder
MONKFISH (MONK)
RED CRAB (RCRAB)
SEA SCALLOP (SCAL)
SKATE COMPLEX (SKATE)
Barndoor Skate
Clearnose Skate
Little Skate
Rosette Skate
Smooth Skate
Thorny Skate
Winter Skate
SMALL MESH GROUNDFISH (GFS)
Offshore Hake
Red Hake
Silver Hake
SPINY DOGFISH (DOG)
SQUID - BUTTERFISH - MACKEREL (SBM)
Atlantic Mackerel
Butterfish
Illex Squid
Loligo Squid
SURFCLAM - OCEAN QUAHOG (SCOQ)
Surfclam
Ocean Quahog
TILEFISH (TILE)

SEA TURTLES (TURS)
Green Turtle
Hawksbill Turtle
Kemp's Ridley Turtle
Leatherback Turtle
Loggerhead Turtle
Olive Ridley Turtle
Turtles, unk.[9]
Turtles, unk hard-shell[10]

[8] No Atlantic salmon caught from July 2009 through June 2010.
[9] Turtle, unk. is an unknown species of any sea turtle.
[10] Turtle, unk hard-shell is an unknown species of sea turtle other than a leatherback turtle.

Table 2. Number of Northeast Fisheries Observer Program (NEFOP) and Vessel Trip Report (VTR) **trips**, by fleet and calendar quarter (Q) from July 2009 through June 2010.

		Access	Trip			NEFOP Fish set					NEFOP Protected Species set					VTR set					
Row	Gear Type	Area	Category	Region	Mesh	Q3	Q4	Q1	Q2	TOTAL	Q3	Q4	Q1	Q2	TOTAL	Q3	Q4	Q1	Q2	TOTAL	Pilot
1	Longline	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	30	30	42	49	151	P
2	Longline	OPEN	all	NE	all	32	23	24	40	119	32	23	24	40	119	452	156	208	227	1,043	
3	Hand Line	OPEN	all	MA	all	.	.	.	.	.	1	.	.	.	1	1,596	703	146	1,040	3,485	P
4	Hand Line	OPEN	all	NE	all	4	1	3	5	13	4	1	3	7	15	1,113	313	462	407	2,295	
5	Otter Trawl	OPEN	all	MA	sm	44	69	63	101	277	45	71	64	102	282	1,108	907	560	1,230	3,805	
6	Otter Trawl	OPEN	all	MA	lg	43	32	54	72	201	43	32	54	75	204	1,936	1,047	1,141	1,565	5,689	
7	Otter Trawl	OPEN	all	NE	sm	80	77	26	85	268	81	78	26	86	271	1,001	893	550	1,224	3,668	
8	Otter Trawl	OPEN	all	NE	lg	282	183	123	241	829	286	185	123	241	835	3,222	2,206	2,987	1,980	10,395	
9 +	Scallop Trawl	AA	GEN	MA	all	.	.	.	.	.	.	.	.	.	.	.	.	5	119	124	P
10 +	Scallop Trawl	AA	LIM	MA	all	.	.	.	.	.	.	.	.	.	.	3	3	3	2	11	P
11	Scallop Trawl	OPEN	GEN	MA	all	.	.	.	6	6	.	.	.	6	6	280	21	15	139	455	P
12	Scallop Trawl	OPEN	LIM	MA	all	.	.	.	.	.	.	.	.	.	.	16	7	9	4	36	P
13 +	Otter Trawl, Ruhle	OPEN	all	NE	lg	1	1	3	22	27	1	1	3	22	27	.	.	.	9	9	
14 +	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	1	12	11	30	54	1	12	11	31	55	.	.	.	13	13	
15	Shrimp Trawl	OPEN	all	MA	all	.	.	.	1	1	.	.	.	1	1	288	111	18	26	443	P
16	Shrimp Trawl	OPEN	all	NE	all	.	5	11	.	16	.	5	11	.	16	24	219	2,089	201	2,533	
17 +	Floating Trap	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	.	.	.	16	16	P
18 +	Floating Trap	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	15	4	.	92	111	P
19	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	.	2	.	4	6	40	45	36	48	169	783	390	403	307	1,883	P*
20	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	2	3	1	21	27	29	54	16	48	147	359	634	159	354	1,506	
21	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	1	16	5	37	59	2	28	19	54	103	142	529	432	994	2,097	
22	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	.	.	.	.	.	.	.	.	.	.	4	1	4	19	28	P
23	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	129	56	29	198	412	146	95	60	205	506	3,709	2,257	2,422	1,080	9,468	
24	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	26	16	7	186	235	30	22	21	198	271	1,081	620	419	1,279	3,399	
25	Purse Seine	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	141	26	.	47	214	P
26	Purse Seine	OPEN	all	NE	all	20	2	.	3	25	31	2	.	5	38	172	10	.	34	216	
27	Scallop Dredge	AA	GEN	MA	all	1	1	2	.	4	1	2	2	.	5	26	16	7	26	75	P
28	Scallop Dredge	AA	GEN	NE	all	.	.	.	.	.	.	.	.	.	.	.	2	.	1	3	P
29	Scallop Dredge	AA	LIM	MA	all	6	6	7	9	28	6	6	7	9	28	122	43	74	111	350	
30	Scallop Dredge	AA	LIM	NE	all	2	7	9	12	30	2	7	9	12	30	17	30	43	47	137	
31	Scallop Dredge	OPEN	GEN	MA	all	10	5	7	20	42	10	5	7	20	42	1,262	400	540	857	3,059	
32	Scallop Dredge	OPEN	GEN	NE	all	3	2	1	9	15	3	2	1	9	15	699	241	701	687	2,328	
33	Scallop Dredge	OPEN	LIM	MA	all	17	7	7	18	49	19	7	7	20	53	283	124	233	475	1,115	
34	Scallop Dredge	OPEN	LIM	NE	all	32	5	8	18	63	32	5	8	18	63	334	139	190	374	1,037	
35	Mid-water Paired & Single Trawl	OPEN	all	MA	all	.	.	3	.	3	.	.	4	.	4	.	.	23	2	25	P
36	Mid-water Paired & Single Trawl	OPEN	all	NE	all	23	36	13	27	99	29	47	16	33	125	66	119	80	45	310	
37	Pots and Traps, Fish	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	327	282	22	419	1,050	P
38	Pots and Traps, Fish	OPEN	all	NE	all	.	1	.	4	5	.	1	.	4	5	271	48	.	160	479	P
39 +	Pots and Traps, Conch	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	54	383	27	287	751	P
40 +	Pots and Traps, Conch	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	318	231	.	215	764	P
41 +	Pots and Traps, Hagfish	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	P
42 +	Pots and Traps, Hagfish	OPEN	all	NE	all	4	3	2	1	10	4	3	2	1	10	36	12	15	26	89	
43 +	Pots and Traps, Shrimp	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	.	.	231	1	232	P
44	Pots and Traps, Lobster	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	1,226	476	219	602	2,523	P
45	Pots and Traps, Lobster	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	12,156	7,961	2,241	5,636	27,994	P
46	Pots and Traps, Crab	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	2	24	3	83	112	P
47	Pots and Traps, Crab	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	74	41	26	62	203	P
48 +	Beam Trawl	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	97	28	27	8	160	P
49 +	Beam Trawl	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	54	18	40	22	134	P
50 +	Dredge, Other	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	18	91	330	18	457	P
51	Ocean Quahog/Surf Clam Dredge	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	728	634	167	183	1,712	P
52	Ocean Quahog/Surf Clam Dredge	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	511	443	89	107	1,150	P
					Total	**763**	**571**	**419**	**1,170**	**2,923**	**878**	**739**	**534**	**1,295**	**3,446**	**36,156**	**22,873**	**17,402**	**22,912**	**99,343**	

P= pilot coverage; P*= pilot coverage for fish only; + = new fleet in 2010 and 2011; see text for fleet abbreviations.

Table 3. Number of Northeast Fisheries Observer Program (NEFOP) and Vessel Trip Report (VTR) **sea days**, by fleet and calendar quarter (Q) from July 2009 through June 2010.

		Access	Trip			NEFOP Fish set					NEFOP Protected Species set					VTR set					
Row	Gear Type	Area	Category	Region	Mesh	Q3	Q4	Q1	Q2	TOTAL	Q3	Q4	Q1	Q2	TOTAL	Q3	Q4	Q1	Q2	TOTAL	Pilot
1	Longline	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	275	132	306	264	977	P
2	Longline	OPEN	all	NE	all	45	38	26	80	189	45	38	26	80	189	516	246	250	377	1,389	
3	Hand Line	OPEN	all	MA	all	.	.	.	.	.	8	.	.	.	8	1,712	741	190	1,054	3,697	P
4	Hand Line	OPEN	all	NE	all	5	2	3	8	18	5	2	3	15	25	1,192	372	467	420	2,451	
5	Otter Trawl	OPEN	all	MA	sm	103	223	267	193	786	108	225	270	194	797	2,053	1,976	2,152	1,983	8,164	
6	Otter Trawl	OPEN	all	MA	lg	75	85	244	108	512	75	85	244	111	515	2,896	2,102	4,051	2,420	11,469	
7	Otter Trawl	OPEN	all	NE	sm	229	203	149	145	726	230	204	149	146	729	2,510	1,941	1,820	2,071	8,342	
8	Otter Trawl	OPEN	all	NE	lg	996	693	772	1,280	3,741	1,005	695	772	1,280	3,752	6,480	5,196	7,179	5,949	24,804	
9 +	Scallop Trawl	AA	GEN	MA	all	.	.	.	.	.	.	.	.	.	.	.	.	12	203	215	P
10 +	Scallop Trawl	AA	LIM	MA	all	.	.	.	.	.	.	.	.	.	.	24	23	24	11	82	P
11	Scallop Trawl	OPEN	GEN	MA	all	.	.	.	6	6	.	.	.	6	6	515	48	31	256	850	P
12	Scallop Trawl	OPEN	LIM	MA	all	.	.	.	.	.	.	.	.	.	.	100	33	88	44	265	P
13 +	Otter Trawl, Ruhle	OPEN	all	NE	lg	6	4	24	167	201	6	4	24	167	201	.	.	.	65	65	
14 +	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	10	88	90	224	412	10	88	90	233	421	.	.	.	90	90	
15	Shrimp Trawl	OPEN	all	MA	all	.	.	.	5	5	.	.	.	5	5	1,519	610	61	147	2,337	P
16	Shrimp Trawl	OPEN	all	NE	all	.	5	11	.	16	.	5	11	.	16	24	245	2,116	276	2,661	
17 +	Floating Trap	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	.	.	.	16	16	P
18 +	Floating Trap	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	15	4	.	97	116	P
19	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	.	2	.	4	6	43	47	37	55	182	820	398	422	324	1,964	P*
20	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	2	3	1	21	27	29	54	16	48	147	366	647	203	430	1,646	
21	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	1	19	6	44	70	2	32	26	61	121	165	645	599	1,175	2,584	
22	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	.	.	.	.	.	.	.	.	.	.	4	1	4	20	29	P
23	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	135	76	49	263	523	152	116	83	271	622	4,037	2,505	2,759	1,370	10,671	
24	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	31	19	14	255	319	37	27	45	277	386	1,310	746	728	2,090	4,874	
25	Purse Seine	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	141	26	.	48	215	P
26	Purse Seine	OPEN	all	NE	all	63	4	.	11	78	96	4	.	17	117	459	23	.	79	561	
27	Scallop Dredge	AA	GEN	MA	all	3	3	6	.	12	3	6	6	.	15	49	43	19	59	170	P
28	Scallop Dredge	AA	GEN	NE	all	.	.	.	.	.	.	.	.	.	.	.	5	.	3	8	P
29	Scallop Dredge	AA	LIM	MA	all	43	44	53	92	232	43	44	53	92	232	890	286	580	922	2,678	
30	Scallop Dredge	AA	LIM	NE	all	15	74	95	133	317	15	74	95	133	317	160	307	434	516	1,417	
31	Scallop Dredge	OPEN	GEN	MA	all	13	6	10	21	50	13	6	10	21	50	1,779	638	782	1,093	4,292	
32	Scallop Dredge	OPEN	GEN	NE	all	5	6	1	9	21	5	6	1	9	21	1,225	370	907	916	3,418	
33	Scallop Dredge	OPEN	LIM	MA	all	158	49	54	188	449	178	49	54	203	484	2,492	972	1,991	4,734	10,189	
34	Scallop Dredge	OPEN	LIM	NE	all	385	46	82	234	747	385	46	82	234	747	3,768	1,430	2,105	4,570	11,873	
35	Mid-water Paired & Single Trawl	OPEN	all	MA	all	.	.	10	.	10	.	.	13	.	13	.	.	100	11	111	P
36	Mid-water Paired & Single Trawl	OPEN	all	NE	all	89	125	55	108	377	113	157	67	132	469	244	406	352	172	1,174	
37	Pots and Traps, Fish	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	339	291	22	431	1,083	P
38	Pots and Traps, Fish	OPEN	all	NE	all	.	1	.	4	5	.	1	.	4	5	287	48	.	161	496	P
39 +	Pots and Traps, Conch	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	54	385	29	288	756	P
40 +	Pots and Traps, Conch	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	318	232	.	215	765	P
41 +	Pots and Traps, Hagfish	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	P
42 +	Pots and Traps, Hagfish	OPEN	all	NE	all	13	18	12	5	48	13	18	12	5	48	160	60	93	111	424	
43 +	Pots and Traps, Shrimp	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	.	.	231	1	232	P
44	Pots and Traps, Lobster	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	1,511	680	337	785	3,313	P
45	Pots and Traps, Lobster	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	14,531	9,766	3,864	7,456	35,617	P
46	Pots and Traps, Crab	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	2	24	3	83	112	P
47	Pots and Traps, Crab	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	218	135	208	212	773	P
48 +	Beam Trawl	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	183	92	69	16	360	P
49 +	Beam Trawl	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	59	24	40	29	152	P
50 +	Dredge, Other	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	39	94	340	29	502	P
51	Ocean Quahog/Surf Clam Dredge	OPEN	all	MA	all	.	.	.	.	.	.	.	.	.	.	1,180	1,034	353	456	3,022	P
52	Ocean Quahog/Surf Clam Dredge	OPEN	all	NE	all	.	.	.	.	.	.	.	.	.	.	523	450	190	211	1,375	P
					Total	**2,425**	**1,836**	**2,034**	**3,608**	**9,903**	**2,619**	**2,033**	**2,189**	**3,799**	**10,640**	**57,144**	**36,432**	**36,511**	**44,760**	**174,847**	

P= pilot coverage; P*= pilot coverage for fish only; + = new fleet in 2010 and 2011; see text for fleet abbreviations.

Table 4. The number of sea days needed to achieve a 30% CV based on the variance of the total composite discard for each the 15 SBRM species groups, the number of pilot sea days, and 2011 SBRM standard sea days (the maximum number of sea days needed for each fleet) based on July 2009 through June 2010 data. Red font indicates basis for fleet sea days; species group abbreviation are given in Table 1.

Row	Gear Type	Access Area	Trip Cat.	Region	Mesh	BLUE	HERR	SAL	RCRAB	SCAL	SBM	MONK	GFL	GFS	SKATE	DOG	FSB	SCOQ	TILE	TURS	Pilot days	2011 SBRM Standard Sea Days	Pilot
1	Longline	OPEN	all	MA	all	0	0	0	0	0	0	79	79	0	79	79	0	0	79	79	**79**	79	P
2	Longline	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	**184**	0	0	0	0	28	184	
3	Hand Line	OPEN	all	MA	all	0	0	0	0	0	0	0	74	0	0	0	0	0	0	74	**74**	74	P
4	Hand Line	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**49**	49	
5	Otter Trawl	OPEN	all	MA	sm	0	0	0	0	0	937	0	0	709	467	553	577	0	0	**1,449**	163	1,449	
6	Otter Trawl	OPEN	all	MA	lg	0	0	0	0	0	0	128	161	0	96	139	128	0	0	**2,835**	229	2,835	
7	Otter Trawl	OPEN	all	NE	sm	0	0	0	0	0	655	0	0	762	697	520	529	0	0	**4,274**	167	4,274	
8	Otter Trawl	OPEN	all	NE	lg	0	0	0	**5,183**	0	0	154	97	433	105	122	294	0	0	0	496	5,183	
9 +	Scallop Trawl	AA	GEN	MA	all	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	**12**	12	P
10 +	Scallop Trawl	AA	LIM	MA	all	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	**88**	88	P
11	Scallop Trawl	OPEN	GEN	MA	all	29	0	0	0	29	29	29	29	29	29	29	29	0	0	29	**29**	29	P
12	Scallop Trawl	OPEN	LIM	MA	all	95	0	0	0	95	95	95	95	95	95	95	95	0	0	95	**95**	95	P
13 +	Otter Trawl, Ruhle	OPEN	all	NE	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**22**	22	
14 +	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**21**	21	
15	Shrimp Trawl	OPEN	all	MA	all	0	74	0	0	0	74	74	74	74	74	0	74	0	0	74	**74**	74	P
16	Shrimp Trawl	OPEN	all	NE	all	0	0	0	0	0	0	0	0	**18**	0	0	0	0	0	0	56	18	
17 +	Floating Trap	OPEN	all	MA	all	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	**3**	3	P
18 +	Floating Trap	OPEN	all	NE	all	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	**9**	9	P
19	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	39	39	0	0	0	39	39	39	0	39	39	39	0	0	0	**39**	39	P*
20	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	0	0	0	0	0	0	0	0	0	0	59	0	0	0	**755**	33	755	
21	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	0	0	0	0	0	0	**86**	0	0	0	0	0	0	0	0	52	86	
22	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	12	12	0	0	0	12	12	12	12	12	12	12	0	0	12	**12**	12	P
23	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	0	0	0	0	0	0	0	94	0	0	**147**	0	0	0	0	213	147	
24	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	0	0	0	0	0	0	**256**	0	0	77	194	0	0	0	0	98	256	
25	Purse Seine	OPEN	all	MA	all	9	9	0	0	0	9	0	9	9	9	9	9	0	0	9	**9**	9	P
26	Purse Seine	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**23**	23	
27	Scallop Dredge	AA	GEN	MA	all	0	0	0	0	29	0	29	29	29	29	29	29	0	0	29	**29**	29	P
28	Scallop Dredge	AA	GEN	NE	all	0	0	0	17	17	0	17	17	17	17	17	17	0	0	17	**17**	17	P
29	Scallop Dredge	AA	LIM	MA	all	0	0	0	0	0	0	124	0	0	**178**	0	0	0	0	0	90	178	
30	Scallop Dredge	AA	LIM	NE	all	0	0	0	0	0	0	**170**	0	0	0	0	0	0	0	0	122	170	
31	Scallop Dredge	OPEN	GEN	MA	all	0	0	0	0	0	0	0	0	0	**43**	0	0	0	0	0	86	43	
32	Scallop Dredge	OPEN	GEN	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**68**	68	
33	Scallop Dredge	OPEN	LIM	MA	all	0	0	0	0	0	0	175	983	0	230	0	0	0	0	**1,417**	208	1,417	
34	Scallop Dredge	OPEN	LIM	NE	all	0	0	0	0	415	0	146	285	0	239	0	**658**	0	0	0	240	658	
35	Mid-water Paired & Single Trawl	OPEN	all	MA	all	30	30	0	0	0	30	30	30	30	0	30	0	0	0	30	**30**	30	P
36	Mid-water Paired & Single Trawl	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	**190**	0	0	0	0	46	190	
37	Pots and Traps, Fish	OPEN	all	MA	all	0	24	0	24	0	0	0	24	24	24	0	24	0	24	24	**24**	24	P
38	Pots and Traps, Fish	OPEN	all	NE	all	0	12	0	12	0	0	0	12	12	12	0	12	0	12	12	**12**	12	P
39 +	Pots and Traps, Conch	OPEN	all	MA	all	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	**20**	20	P
40 +	Pots and Traps, Conch	OPEN	all	NE	all	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	**15**	15	P
41 +	Pots and Traps, Hagfish	OPEN	all	MA	all	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	**3**	3	P
42 +	Pots and Traps, Hagfish	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**60**	60	
43 +	Pots and Traps, Shrimp	OPEN	all	NE	all	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	**8**	8	P
44	Pots and Traps, Lobster	OPEN	all	MA	all	0	0	0	66	0	0	0	66	0	0	0	0	0	0	66	**66**	66	P
45	Pots and Traps, Lobster	OPEN	all	NE	all	0	0	0	452	0	0	0	452	0	0	0	0	0	0	0	**452**	452	P
46	Pots and Traps, Crab	OPEN	all	MA	all	0	0	0	12	0	0	0	0	0	0	0	0	0	0	12	**12**	12	P
47	Pots and Traps, Crab	OPEN	all	NE	all	0	0	0	53	0	0	0	0	0	0	0	0	0	0	53	**53**	53	P
48 +	Beam Trawl	OPEN	all	MA	all	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	**29**	29	P
49 +	Beam Trawl	OPEN	all	NE	all	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	**14**	14	P
50 +	Dredge, Other	OPEN	all	MA	all	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	**21**	21	P
51	Ocean Quahog/Surf Clam Dredge	OPEN	all	MA	all	0	0	0	0	61	0	61	0	0	0	0	0	61	0	61	**61**	61	P
52	Ocean Quahog/Surf Clam Dredge	OPEN	all	NE	all	0	0	0	0	32	0	32	0	0	0	0	0	32	0	32	**32**	32	P
					Total	**436**	**422**	**222**	**6,041**	**900**	**2,102**	**1,958**	**2,883**	**2,475**	**2,773**	**2,669**	**2,748**	**315**	**337**	**11,660**	**3,991**	**19,507**	

P= pilot coverage; P*= pilot coverage for fish only; + = new fleet in 2010 and 2011; see text for fleet abbreviations.

Table 5. Standardized Bycatch Reporting Methodology 2011 prioritization information for April 2011 through March 2012, based on July 2009 through June 2010 data.

Row	Gear Type	Access Area	Trip Cat.	Region	Mesh	2011 SBRM Standard Sea Days	Available Coverage with shortfall applied proportionally	Available Coverage with shortfall applied proportionally **within funding contraints**	Prioritized April 2011-March 2012 Coverage (January 2011)	April 2011 - March 2012 Difference from SBRM Standard	April 2011 - March 2012 Percentage of SBRM Standard	Justification	Basis for 2011 SBRM Standard Coverage
1	Longline	OPEN	all	MA	all	79	50	7	44	-35	56%	Fish stock assessment support[1]	P
2	Longline	OPEN	all	NE	all	184	116	167	237	53	129%	Fish stock assessment support[1]	
3	Hand Line	OPEN	all	MA	all	74	47	7	0	-74	0%		P
4	Hand Line	OPEN	all	NE	all	49	31	45	419	370	854%	Fish stock assessment support[1]	
5	Otter Trawl	OPEN	all	MA	sm	1,449	916	137	616	-833	42%	Fish stock assessent and turtle bycatch support	
6	Otter Trawl	OPEN	all	MA	lg	2,835	1,793	269	820	-2015	29%	Fish stock assessent and turtle bycatch support	
7	Otter Trawl	OPEN	all	NE	sm	4,274	2,702	3,891	529	-3745	12%	Fish stock assessment support[1]	
8	Otter Trawl	OPEN	all	NE	lg	5,183	3,277	4,718	4,235	-948	82%	Fish stock assessment support[1]	
9 +	Scallop Trawl	AA	GEN	MA	all	12	15	32	30	18	250%	Industry funded, coverage is dependent on industry activity	P
10 +	Scallop Trawl	AA	LIM	MA	all	88	107	237	34	-54	39%	Industry funded, coverage is dependent on industry activity	P
11	Scallop Trawl	OPEN	GEN	MA	all	29	18	3	0	-29	0%		P
12	Scallop Trawl	OPEN	LIM	MA	all	95	116	71	30	-65	32%	Industry funded, coverage is dependent on industry activity	P
13 +	Otter Trawl, Ruhle	OPEN	all	NE	lg	22	14	20	11	-11	50%	Fish stock assessment support[1]	
14 +	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	21	13	19	15	-6	73%	Fish stock assessment support[1]	
15	Shrimp Trawl	OPEN	all	MA	all	74	47	7	0	-74	0%		P
16	Shrimp Trawl	OPEN	all	NE	all	18	11	16	18	0	100%	Fish stock assessment support	
17 +	Floating Trap	OPEN	all	MA	all	3	2	0	0	-3	0%		P
18 +	Floating Trap	OPEN	all	NE	all	9	6	8	0	-9	0%		P
19	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	39	25	4	0	-39	0%	(150 days for protected species bycatch not included in SBRM)	P*
20	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	755	477	72	206	-549	27%	Fish stock assessment support[1] (24 days for protected species bycatch not included in SBRM)	
21	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	86	54	8	324	238	377%	Fish stock assessment support[1] (26 days for protected species bycatch not included in SBRM)	
22	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	12	8	11	0	-12	0%	(2 days for protected species bycatch not included in SBRM)	P
23	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	147	93	134	1,822	1675	1239%	Fish stock assessment support[1] (51 days for protected species bycatch not included in SBRM)	
24	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	256	162	233	611	355	239%	Fish stock assessment support[1] (33 days for protected species bycatch not included in SBRM)	
25	Purse Seine	OPEN	all	MA	all	9	6	1	43	34	478%	Fish stock assessment support	P
26	Purse Seine	OPEN	all	NE	all	23	15	21	112	89	487%	Fish stock assessment support	
27	Scallop Dredge	AA	GEN	MA	all	29	35	78	40	11	138%	Industry funded, coverage is dependent on industry activity	P
28	Scallop Dredge	AA	GEN	NE	all	17	21	74	60	43	353%	Industry funded, coverage is dependent on industry activity	P
29	Scallop Dredge	AA	LIM	MA	all	178	217	479	723	545	406%	Industry funded, coverage is dependent on industry activity	
30	Scallop Dredge	AA	LIM	NE	all	170	208	741	755	585	444%	Industry funded, coverage is dependent on industry activity	
31	Scallop Dredge	OPEN	GEN	MA	all	43	27	4	43	0	100%	Fish stock assessment support	
32	Scallop Dredge	OPEN	GEN	NE	all	68	43	62	68	0	100%	Fish stock assessment support	
33	Scallop Dredge	OPEN	LIM	MA	all	1,417	1,731	1,053	935	-482	66%	Industry funded, coverage is dependent on industry activity	
34	Scallop Dredge	OPEN	LIM	NE	all	658	804	489	647	-11	98%	Industry funded, coverage is dependent on industry activity	
35	Mid-water Paired & Single Trawl	OPEN	all	MA	all	30	19	3	30	0	100%	Fish stock assessment support	P
36	Mid-water Paired & Single Trawl	OPEN	all	NE	all	190	120	173	235	45	124%	Fish stock assessment support	
37	Pots and Traps, Fish	OPEN	all	MA	all	24	15	2	0	-24	0%		P
38	Pots and Traps, Fish	OPEN	all	NE	all	12	8	11	85	73	706%	Fish stock assessment support[1]	P
39 +	Pots and Traps, Conch	OPEN	all	MA	all	20	13	2	0	-20	0%		P
40 +	Pots and Traps, Conch	OPEN	all	NE	all	15	9	14	0	-15	0%		P
41 +	Pots and Traps, Hagfish	OPEN	all	MA	all	3	2	0	0	-3	0%		P
42 +	Pots and Traps, Hagfish	OPEN	all	NE	all	60	38	55	0	-60	0%		
43 +	Pots and Traps, Shrimp	OPEN	all	NE	all	8	5	7	0	-8	0%		P
44	Pots and Traps, Lobster	OPEN	all	MA	all	66	42	6	0	-66	0%		P
45	Pots and Traps, Lobster	OPEN	all	NE	all	452	286	411	0	-452	0%		P
46	Pots and Traps, Crab	OPEN	all	MA	all	12	8	1	0	-12	0%		P
47	Pots and Traps, Crab	OPEN	all	NE	all	53	34	48	0	-53	0%		P
48 +	Beam Trawl	OPEN	all	MA	all	29	18	3	0	-29	0%		P
49 +	Beam Trawl	OPEN	all	NE	all	14	9	13	0	-14	0%		P
50 +	Dredge, Other	OPEN	all	MA	all	21	13	2	0	-21	0%		P
51	Ocean Quahog/Surf Clam Dredge	OPEN	all	MA	all	61	39	6	0	-61	0%		P
52	Ocean Quahog/Surf Clam Dredge	OPEN	all	NE	all	32	20	29	0	-32	0%		P
	SAP/B day/US-CAN (now covered as part of NE groundfish)								0				
	Herring CAI coverage								127			Fish stock assessment support	
	Discovery Days								0				
	Total Days					19,507	13,904	13,904	13,904			Notes:	
	Projected Costs					$22,276,200	$15,301,850	$15,301,850	$15,645,050			1. Monitoring coverage is dependent on industry activity	

P= pilot coverage; P*= pilot coverage for fish only; + = new fleet in 2010 and 2011; see text for fleet abbreviations.

Table 6. The expected coefficient of variation (CV) achieved for the proposed prioritized sea days, by species group and fleet, based on July 2009 through June 2010 data. Red font indicates CVs less than or equal to 30% ; '*' denotes species groups that have been filtered out through the importance filter process.

Row	Gear Type	Access Area	Trip Cat.	Region	Mesh	2011 SBRM Standard Sea Days	2011 SBRM Prioritized Sea Days	BLUE	HERR	SAL	RCRAB	SCAL	SBM	MONK	GFL	GFS	SKATE	DOG	FSB	SCOQ	TILE	TURS	Pilot
1	Longline	OPEN	all	MA	all	79	44																P
2	Longline	OPEN	all	NE	all	184	237	*	*	*	*	*	*	*	*	*	*	0.257	*	*	*	*	
3	Hand Line	OPEN	all	MA	all	74	0																P
4	Hand Line	OPEN	all	NE	all	49	419	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
5	Otter Trawl	OPEN	all	MA	sm	1,449	616	*	*	*	*	*	0.376	*	*	0.323	0.259	0.283	0.290	*	*	0.487	
6	Otter Trawl	OPEN	all	MA	lg	2,835	820	*	*	*	*	*	*	0.114	0.128	*	0.100	0.119	0.114	*	*	0.593	
7	Otter Trawl	OPEN	all	NE	sm	4,274	529	*	*	*	*	*	0.337	*	*	0.365	0.348	0.297	0.300	*	*	1.290	
8	Otter Trawl	OPEN	all	NE	lg	5,183	4,235	*	*	*	0.346	*	*	0.053	0.041	0.086	0.043	0.046	0.073	*	*	*	
9 +	Scallop Trawl	AA	GEN	MA	all	12	30																P
10 +	Scallop Trawl	AA	LIM	MA	all	88	34																P
11	Scallop Trawl	OPEN	GEN	MA	all	29	0																P
12	Scallop Trawl	OPEN	LIM	MA	all	95	30																P
13 +	Otter Trawl, Ruhle	OPEN	all	NE	lg	22	11	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
14 +	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	21	15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
15	Shrimp Trawl	OPEN	all	MA	all	74	0																P
16	Shrimp Trawl	OPEN	all	NE	all	18	18	*	*	*	*	*	*	*	*	0.300	*	*	*	*	*	*	
17 +	Floating Trap	OPEN	all	MA	all	3	0																P
18 +	Floating Trap	OPEN	all	NE	all	9	0																P
19	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	39	0																P*
20	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	755	206	*	*	*	*	*	*	*	*	*	*	0.153	*	*	*	0.691	
21	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	86	324	*	*	*	*	*	*	0.147	*	*	*	*	*	*	*	*	
22	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	12	0																P
23	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	147	1,822	*	*	*	*	*	*	*	0.065	*	*	0.079	*	*	*	*	
24	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	256	611	*	*	*	*	*	*	0.191	*	*	0.099	0.165	*	*	*	*	
25	Purse Seine	OPEN	all	MA	all	9	43																P
26	Purse Seine	OPEN	all	NE	all	23	112	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
27	Scallop Dredge	AA	GEN	MA	all	29	40																P
28	Scallop Dredge	AA	GEN	NE	all	17	60																P
29	Scallop Dredge	AA	LIM	MA	all	178	723	*	*	*	*	*	*	0.110	*	*	0.132	*	*	*	*	*	
30	Scallop Dredge	AA	LIM	NE	all	170	755	*	*	*	*	*	*	0.105	*	*	*	*	*	*	*	*	
31	Scallop Dredge	OPEN	GEN	MA	all	43	43	*	*	*	*	*	*	*	*	*	0.300	*	*	*	*	*	
32	Scallop Dredge	OPEN	GEN	NE	all	68	68	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
33	Scallop Dredge	OPEN	LIM	MA	all	1,417	935	*	*	*	*	*	*	0.125	0.308	*	0.145	*	*	*	*	0.384	
34	Scallop Dredge	OPEN	LIM	NE	all	658	647	*	*	*	*	0.238	*	0.139	0.197	*	0.180	*	0.303	*	*	*	
35	Mid-water Paired & Single Trawl	OPEN	all	MA	all	30	30																P
36	Mid-water Paired & Single Trawl	OPEN	all	NE	all	190	235	*	*	*	*	*	*	*	*	*	*	0.265	*	*	*	*	
37	Pots and Traps, Fish	OPEN	all	MA	all	24	0																P
38	Pots and Traps, Fish	OPEN	all	NE	all	12	85																P
39 +	Pots and Traps, Conch	OPEN	all	MA	all	20	0																P
40 +	Pots and Traps, Conch	OPEN	all	NE	all	15	0																P
41 +	Pots and Traps, Hagfish	OPEN	all	MA	all	3	0																P
42 +	Pots and Traps, Hagfish	OPEN	all	NE	all	60	0																
43 +	Pots and Traps, Shrimp	OPEN	all	NE	all	8	0																P
44	Pots and Traps, Lobster	OPEN	all	MA	all	66	0																P
45	Pots and Traps, Lobster	OPEN	all	NE	all	452	0																P
46	Pots and Traps, Crab	OPEN	all	MA	all	12	0																P
47	Pots and Traps, Crab	OPEN	all	NE	all	53	0																P
48 +	Beam Trawl	OPEN	all	MA	all	29	0																P
49 +	Beam Trawl	OPEN	all	NE	all	14	0																P
50 +	Dredge, Other	OPEN	all	MA	all	21	0																P
51	Ocean Quahog/Surf Clam Dredge	OPEN	all	MA	all	61	0																P
52	Ocean Quahog/Surf Clam Dredge	OPEN	all	NE	all	32	0																P
	SAP/B day/US-CAN (now covered as part of NE groundfish)						127																
	Herring CAI coverage																						
	Discovery Days																						
	Total Days					19,507	13,904																

P= pilot coverage; P*= pilot coverage for fish only; + = new fleet in 2010 and 2011; see text for fleet abbreviations.

Appendix 1. Equations used in discard estimation and sample size analysis

Total discarded pounds for species *j* is defined as:

$$(1) \quad \hat{D}_j = \sum_{h=1}^{Q} K_h r_{c,j}$$

where

$$(2) \quad r_{c,j} = \frac{\sum_{h=1}^{Q} N_h \sum_{i=1}^{n_h} \frac{d_{jih}}{n_h}}{\sum_{h=1}^{Q} N_h \sum_{i=1}^{n_h} \frac{k_{ih}}{n_h}}$$

Where $\hat{D}_j$ is total discarded pounds for species *j*; K_h is VTR total kept pounds in stratum *h*; $r_{c,j}$ is the combined ratio of species *j*; d_{jih} is discards of species *j* from trip *i* in stratum *h*; k_{ih} is kept pounds of all species on trip *i* in stratum *h*; N_h is the number of VTR trips in stratum *h*; n_h is the number of observed trips in stratum *h*. In Eq. 2 the summation over strata *h* = 1 to *Q* is over calendar quarters and the other strata values are held constant. Equation 3 (below) requires a more explicit definition of the stratum designation since the summation over quarter relies on an annual average ratio defined in Eq. 2.

Variance of $\hat{D}_j$ for species *j* is defined as:

$$(3) \quad V(\hat{D}_j) = \sum_{q=1}^{4} K_{qh}^2 \left(\frac{N_{qh} - n_{qh}}{n_{qh} N_{qh}} \right) \frac{1}{\left(\frac{\sum_{i=1}^{n_h} k_{iqh}}{n_{qh}} \right)^2} \left[\frac{\sum_{i=1}^{n_{qh}} \left(d_{jiqh}^2 + (r_{c,j})^2 k_{iqh}^2 - 2 r_{c,j}\, d_{jiqh} k_{iqh} \right)}{n_{qh} - 1} \right]$$

where $\hat{D}_j$ is total discarded pounds for species *j*; K_{qh} is VTR total kept pounds in quarter *q* and stratum *h*; $r_{c,j}$ is the combined ratio of species *j* ; d_{jiqh} is discards of species *j* from trip *i* in quarter *q* and stratum *h*; k_{iqh} is kept pounds of all species on trip *i* in quarter *q* and stratum *h*; N_{qh} is the number of VTR trips in quarter *q* and stratum *h*; n_{qh} is the number of observed trips in quarter *q* and stratum *h*.

Coefficient of variation (CV) of $\hat{D}_j$ is defined as:

(4) $$CV(\hat{D}_j) = \frac{\sqrt{V(\hat{D}_j)}}{\hat{D}_j}$$

The number of sea days and trips needed to achieve a 30% CV are derived based on the variance of the total discards using the combined ratio method and the d/k discard ratio (Eq. 3).

From Eq. 3, let

(5) $$\hat{S}^2_{jqh} = \left[\frac{\sum_{i=1}^{n_{qh}} \left(d^2_{jiqh} + \left(r_{c,jh}\right)^2 k^2_{iqh} - 2r_{c,j}\ d_{jiqh} k_{iqh} \right)}{n_{qh} - 1} \right]$$ and

(6) $$\delta_{qh} = \frac{n_{qh}}{\sum_{q=1}^{4} n_{qh}}$$

where δ_{qh} is the fraction of the trips in quarter *q* in stratum *h*; $r_{c,jh}$ is the combined annual ratio of species *j* in stratum *h*; d_{jiqh} is discards of species *j* from trip *i* in stratum *h* in quarter *q*; k_{iqh} is kept pounds of all species on trip *i* in stratum *h* in quarter *q*; and n_{qh} is the number of observed trips in stratum *h* in quarter *q*. The $r_{c,jh}$ in Eq. 5 is defined in Eq. 2 where the summation is over quarters within a given strata defined by gear, region, access area, trip type and so forth.

The number of trips necessary to achieve a 30% CV based on the variance of the composite annual total discards for species group *j* in stratum *h* is defined as

(7) $$\hat{T}D_{30\,jh} = \frac{\sum_{q=1}^{4} \left(\frac{K^2_{qh}}{\bar{k}^2_{qh}} \hat{S}^2_{jqh} \frac{1}{\delta_{qh}} \right)}{(0.09)\hat{D}_{jh}{}^2 + \frac{\sum_{q=1}^{4} \frac{K^2_{qh}}{\bar{k}^2_{qh}} \hat{S}^2_{jqh}}{N_h}}$$

where $0.09 = 0.30^2$, the square of the 30%CV, the given target precision level.

The number of sea days necessary to achieve a 30% CV based on the variance of the composite annual total discards for species group *j* in stratum *h* is defined as

(8) $$\hat{S}D_{30\,jh} = \hat{T}D_{30\,jh} * \overline{DA_h}$$

where $\overline{DA_h}$ is the weighted average trip length of VTR trips in stratum *h* (weighted by the number of VTR trips in each quarter) .

When total discards could not be estimated due to little or no observer coverage (no data) or when total discards are zero (no variance), sample size was determined by pilot cover, where 2% of the quarterly VTR trips for a fleet were multiplied by the quarterly mean VTR trip length.

(9) $\hat{S}_{30,jhq} = \hat{T}_{hq} * \overline{DA_{hq}}$

where $\hat{T}_{hq}$ is 2% of the VTR trips in stratum *h* and quarter *q*, and 3 <= $\hat{T}_{hq}$ <= 100 trips; $\overline{DA_{hq}}$ is the average trip length of VTR trips in stratum *h* and quarter *q*. The quarterly trips and sea days were then summed for annual number of trips and sea days.

The achieved precision resulting from the number of funded sea days can be derived by converting funded sea days into funded trips. The number of funded trips, $\hat{TF}_h$ for stratum *h* is defined as:

(10) $\hat{TF}_h = \hat{SF}_h / \overline{DA_h}$

where $\hat{SF}_h$ is the number of funded sea days in stratum *h* and $\overline{DA_h}$ is the weighted average trip length of VTR trips in stratum *h* (weighted by the number of VTR trips in each quarter).

The achieved coefficient of variation (CV) of $\hat{D}_j$ is based on the variance of the composite annual total discards for species group *j* in stratum *h* and the number of funded trips in stratum *h* and re-writing Eq. 7.

From Eq. 7, let

(11) $$CV(\hat{D}_{jh}) = \sqrt{\frac{\sum_{q=1}^{4}\left(\frac{K_{qh}^2}{\bar{k}_{qh}^2}\hat{S}_{jqh}^2\frac{1}{\delta_{qh}}\right) - \hat{TF}_h\left[\frac{\sum_{q=1}^{4}\left(\frac{K_{qh}^2}{\bar{k}_{qh}^2}\hat{S}_{jqh}^2\right)}{N_h}\right]}{\hat{TF}_h * \hat{D}_{jh}^{\,2}}}$$