

2016
Standardized Bycatch Reporting Methodology
Annual Discard Report with Observer Sea Day Allocation

by

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

and

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

June 13, 2016

Introduction

The Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment was implemented on 27 February 2008 (NMFS 2008, NEFMC 2007) and later vacated by the US District Court for the District of Columbia and remanded back to National Marine Fisheries Service (NMFS) on 15 September 2011 due to a deficiency associated with the prioritization process, an element of the amendment. On 29 December 2011, NMFS removed the regulations implementing the SBRM (NMFS 2011). A revised SBRM Omnibus Amendment (NEFMC 2015), hereafter referred to as the SBRM amendment, was approved on 13 March 2015 and a final rule was implemented on 30 July 2015.

The SBRM amendment requires an annual discard report utilizing information obtained from the Northeast Fisheries Observer Program¹ (NEFOP) for 14 federally managed species groups and sea turtles (Table 1). Specifically, the SBRM annual discard report requirements include:

“...summaries of the trips observed, fishing modes in the relevant time period, funding issues and other related issues and developments, and projections of coverage across fisheries for upcoming time period. More detailed information would be provided in tables and figures that addressed: The number of observer trips and sea days scheduled that were accomplished for each fishing mode and quarter, as well as the number of trips and sea days of industry activity; the kept weight from unobserved quarters and statistical areas summarized by fishing mode; the amount kept and estimated discards of each species by fishing mode; and the relationship between sample size and precision for relevant fishing modes.”(NEFMC 2015, pages 237-238).

This document contains a compilation of the information to meet the 2016 SBRM annual discard report requirements. For fish and invertebrate species groups, several of the required annual discard report elements can be found in Wigley et al. 2016, along with a description of the data sources, methods, results, and discussion. Similarly, for sea turtles, further information can be found in Murray 2012, 2013, 2015a. This document also presents the number of sea days needed to monitor the 15 species groups, the funding available for observer coverage, and the numbers of sea days allocated by fleet² (where a fleet represents gear type, access area, trip category, region, and mesh group combinations) for the April 2016 through March 2017 period.

Summary of Observer Coverage

A total of 4,023 trips (11,726 days) was observed during the July 2014 through June 2015 time period. When these trips were stratified by fleet and quarter, some trips were partitioned between fleets resulting in 4,410 trips (12,723 days). See Tables 2 and 3 in Wigley et al. 2016 for a summary of the number of observed trips and industry trips by fleet and calendar quarter and a summary of the number of observed sea days and industry sea days by fleet and calendar quarter, respectively. There were 57 fleets uniquely identified in the July 2014 through June 2015 data. Based upon the industry activity during this time period, the New England (NE) mid-water trawl groundfish access

¹ Further information on the Northeast Fisheries Science Center’s Northeast Fisheries Observer Program is available at <http://www.nefsc.noaa.gov/fsb/>

² Fleets are synonymous with “fishing modes”.

area fleet (Row 57; a fleet containing exempted trips for which 100% monitoring coverage was required) was added to the collection of fleets analyzed.

A spatial and temporal analysis of the kept weight of all species from statistical areas and calendar quarter was conducted. Over all fleets, 56% of kept weight of all species occurred in statistical areas and calendar quarters that had observer coverage. For a summary of the percentage of kept weight with observer coverage by fleet for the July 2014 through June 2015 time period, see Table 4 in Wigley et al. 2016.

Summary of Discard Estimates

For fish/invertebrate species, the total catch, kept, and estimated discards (in live weight) and their associated coefficient of variation (CV) were derived for fleets using data collected during the July 2014 through June 2015 time period (Wigley et al. 2016). Based upon that discard estimation analysis, an estimated 57,063 mt (125,803,405 pounds) of federally regulated species were discarded (Table 2). Fleet abbreviations used in this report are described in Appendix Table 1. See Table 5A and 5B in Wigley et al. 2016 for summaries by fleet and SBRM species group and by fleet and individual species that compose these 14 species groups, respectively.

The most recent average annual estimates of sea turtle interactions in U.S. Mid-Atlantic commercial fisheries are listed in Table 3. Estimates are summarized by gear type, and estimates with associated CVs allocated across managed fish species can be found in the references cited. The CVs around the estimates allocated across managed fish species were used to estimate coverage needs in 2016, per methods used in Murray (2012).

Summary of Sea Days Needed

For fish/invertebrate species groups, the number of sea days needed to achieve a 30% CV of total discards for each species group was derived for 57 fleets³ by using data collected during July 2014 through June 2015 (Wigley et al. 2016). Based on that sample size analysis, a total of 10,746 sea days would be needed for the 14 fish and invertebrate species groups. Based on this analysis, Table 4 presents the number of sea days needed for each of the 14 species groups, number of pilot coverage days, and number of minimum pilot days and Table 5 Step 1 presents the sea days needed by fleet.

The use of pilot coverage in the sample size analysis may result in too much coverage in cases where little or no observer coverage may actually be needed, when effort changed sharply between years, or when the fleet effort comprises only a few trips. To address the latter, a refinement was made to the sea day analysis (Wigley et al. 2016): if there were less than 3 VTR trips in a fleet and quarter in the July 2014 through June 2015 time period, then pilot coverage and minimum pilot

³ Trips fishing in Pamlico Sound have been removed from the sea day analysis (see Wigley et al. 2016) because the Southeast Region has mandatory observer coverage of the southeastern shrimp fishery and allocates observer coverage to trips fishing in Pamlico Sound (Scott-Denton 2012). The sea days needed for Mid-Atlantic shrimp trawl (Row 20) represent those needed to monitor trips in ocean waters.

coverage was set to zero. This refinement acts on quarterly cells within fleets where industry activity is too low to support the 3 trip per quarter minimum observer coverage and prevents assigning more coverage than could be attained. There were 2 fleets (Rows 10 and 15) where industry activity was so low that pilot coverage and minimum pilot coverage was zero (Table 4). This refinement should not be confused with the trip filter.

As described in Wigley et al. 2007, the importance filter is applied to each of the 14 species groups to remove sea days associated with fleets that contribute the smallest fraction of discards and the smallest fraction of total mortality. This is done to ensure that the observer coverage in the upcoming year is not driven by imprecise estimates of small quantities of discards. The importance filter utilizes discards derived from observer data. In the SBRM analyses, there are some fleets without observer coverage and hence no estimated discards for these fleets to feed into the importance filter. The NE and MA crab pot fleets (Rows 50 and 51, respectively) are among the fleets with no observer coverage. There are several indications that substantial amounts of red crab discards occur in these fleets. These indications are: fishery regulations that prohibit possession of female red crab and set minimum size requirements for male crabs; previous SBRM discard estimates for these fleets; and self-reported VTR discards. Because there was low compliance to report discards in VTR data, these data are not sufficient to derive discard estimates in a systematic manner. However, these self-reported data can be used to inform the observer-derived discard estimates by providing perspective on the amount of the discards estimated from observed fleets.

An investigation revealed that VTR red crab discards⁴ in NE and MA crab pot fleets were large when compared with the total red crab discards from the 40 observed fleets. In particular, the magnitude of VTR red crab discards in those crab pot fleets indicated that the discards associated with the NE large mesh otter trawl fleet (Row 8) were relatively minor, in contrast to the results of the importance filter that was based only on observer-derived discards. Further investigation of VTR data for the other unobserved fleets and for all 14 species groups found no evidence of substantial discarding that would influence importance filter considerations. Given these findings, we used the VTR red crab discards to inform the magnitude of the total red crab discards, which indicated that red crab discards in the NE large mesh otter trawl fleet were minor when compared to discards in the crab pot fleets such that, if observer-derived estimates from the NE and MA crab pot fleet had been available, the importance filter would have removed that red crab sea day requirement for the NE large mesh otter trawl fleet. Therefore, SBRM coverage requirements in the NE large mesh otter fleet were not based on the initially calculated 3,531 days needed to monitor red crab in the NE large mesh otter trawl fleet, but rather on the 760 days needed to monitor fluke-scup-black sea bass.

Due to practical limitations in identifying trips that occur in fleets with few annual trips, a trip filter was developed in 2014 to remove fleets from the sea day allocation that contain the lowest cumulative 1% of total trips. The trip filter (not mandated by the SBRM amendment) was applied in 2014 and 2015 to prevent assigning sea days that could not be accomplished. However, applying this filter resulted in unintended consequences to the importance filter, such as the significant challenges associated with unobserved fleets described above. To allow observer coverage to be obtained in all SBRM fleets, the trip filter will not be applied this year.

⁴ For these two fleets, red crab discards were summed over VTR trips that reported discards for this species.

In addition to these more substantive adjustments, the sea days for NE haddock separator trawl (Row 18) have been removed since this exempted fishery will not be active during the April 2016 through March 2017 time period.

Given the sea day adjustments described above, a total of 7,960 sea days is needed for the 14 fish/invertebrate species groups (Table 5; Step 2).

For loggerhead turtles, the numbers of sea days needed to achieve a 30% CV of turtle discards were estimated by fishery, defined as a managed fish or invertebrate species landed on vessels using bottom otter trawl or sink gillnet gear in the Mid-Atlantic region (Murray 2012). The maximum amount of projected coverage across all the fisheries was considered the desired level of sampling to monitor turtle discards for that gear type. Roughly 3,300 days are needed across bottom trawl fisheries (Murray 2015a, and sea day estimation methods in Murray 2012), and roughly 2,600 days are needed across sink gillnet fisheries (Murray 2013, and sea day estimation methods in Murray 2012). Estimates of sea day needs for turtles are revised when new bycatch estimates are published for a particular gear type (approximately every 5 years).

Coverage needs for turtles on vessels using scallop dredge gear in the Mid-Atlantic were not estimated because the utility of observers as a monitoring tool for turtles in the fishery appears to be decreasing (Murray 2015b). Since May 2013, the use of turtle deflector dredges (TDDs) with chain mats have been required on scallop dredges in times and areas where loggerheads are known to be most common. These modifications are intended to reduce those interactions in which animals are landed or observed from the deck, although other “unobservable” interactions may still be occurring (i.e., those in which animals escape from the gear or come in contact with the gear but are not captured and brought to the surface where they can be observed; Warden and Murray 2011). No loggerhead turtles have been observed in the scallop dredge fleets since 2011. Managers currently monitor dredge fishing hours in the Mid-Atlantic scallop fishery as an indicator of whether elevated turtle interactions may be occurring compared to baseline conditions, due to the likelihood that most dredge-based takes of sea turtles may be unobservable (NMFS 2012)⁵. Therefore, observer coverage levels in the Mid-Atlantic scallop dredge fleets in 2016 will be driven by other species groups. This ensures that some level of coverage still exists to monitor the effectiveness of TDDs and chain mats in reducing observable interactions, and helps monitor turtle interactions outside of gear regulated times and areas.

Sea day requirements for non-loggerhead turtle species (i.e., greens, Kemp’s ridleys, and leatherbacks) are not currently estimated because too few have been observed to estimate total bycatch and CVs for these species using model-based approaches (Murray 2012). Because observers document all protected species interactions on trips, monitoring of other turtles species will still occur via days intended to monitor fish or loggerheads.

⁵ The Incidental Take Statement of the 2012 Sea Scallop Biological Opinion was amended 1 May 2015: <https://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbo.html>

The numbers of sea days needed to achieve a 30% CV associated with the Mid-Atlantic⁶ turtle gear types and fish/invertebrate fleets are given below and in Table 5, Steps 2 and 3.

Turtle Gear Types and Fish/Invertebrate Fleets	Sea Days Needed	
	Loggerhead Turtles	Fish/Invertebrate Species Groups
MA Otter Trawl, MA Scallop Trawl, MA Ruhle Trawl Rows 5, 6, 9-12, and 15	3,309	2,006
MA Gillnet Rows 24-26	2,593	622

The numbers of sea days needed for the combined fish/invertebrate and turtle species groups were derived as followed:

- If the sum of the sea days needed for fish/invertebrate species groups of the corresponding fish/invertebrate fleets exceeded the sea days needed for the turtle gear type, then the sea days needed for fish/invertebrate was used.
- If the number of sea days needed for turtles for the gear type exceeded the sum of the sea days needed for fish/invertebrate groups of the corresponding fish/invertebrate fleets, then the sea days needed for turtles were distributed according to the proportion of VTR sea days corresponding to fish/invertebrate fleets (Table 5; Steps 4a - 4c). The number of VTR sea days by fleet is taken from Table 3 in Wigley et al. 2016 and reflects industry activity during the July 2014 through June 2015 time period.

A total of 11,610 sea days is needed for fish/invertebrates and loggerhead turtles (COMBINED; Table 5; Step 5) during the April 2016 through March 2017 period. Of the 11,610 sea days, 10,291 sea days are needed for agency-funded fleets and 1,319 sea days are needed for industry-funded fleets (Table 5, Step 6).

Summary of Funding available for the April 2016 through March 2017 period

The funds available to the NEFSC’s Northeast Fisheries Sampling Branch in fiscal year (FY) 2016 are estimated to provide support for 8,185 days and 4,405 days are carried over (i.e., bought ahead) from FY2015 funds⁷ for a total of 12,590 (8,185 + 4,405) days for the April 2016 through March

⁶ In the sea turtle sample size analysis, Mid-Atlantic refers to areas fished west of 70°W. In the fish/invertebrate sample size analysis, Mid-Atlantic refers to region based on port of departure from Connecticut and southward. Although it is recognized that port of departure may differ from the area fished, an odds ratio analysis conducted to evaluate broad-scale spatial coherence indicated a strong relationship between area fished (statistical area) and port of departure (region). Based upon this analysis, the “Mid-Atlantic” stratifications used in the 2 analyses were considered similar.

⁷ The best estimate of the FY15 carryover days is 4,405 days (3,993 prioritized carryover days and 412 MMPA carryover days).

2017 time period. Based upon an observer set-aside compensation rate analysis for the Industry Funded Scallop program, there is industry funding for 2,850 days. Hence, 15,440 (12,590 + 2,850) days are available for observer coverage during April 2016 through March 2017.

Below is a summary of the 2 funding source categories: agency-funded and industry-funded. Within the agency-funded category, there are 5 sub-categories: Atlantic Coast Observers, National Observer Program, Northeast Fisheries Observers, Marine Mammal Protection Act, and Reducing Bycatch.

- **Agency-funded:** The funding sources for the 12,590 agency-funded sea days include: Atlantic Coast Observers (1,116 days), Northeast Fisheries Observers (4,129 days), National Observer Program (2,230 days), Reducing Bycatch (71 days), and 3,993 FY15 carryover/bought ahead days collectively fund the sea days for prioritization (11,539 days; Table 5, Step 7); and Marine Mammal Protection Act (MMPA; 639 days) and FY15 carryover/bought ahead (412 days) collectively fund the sea days to monitor protected species (1,051 days; Table 5, Step 7).

- 1,051 agency-funded days are applicable to protected species⁸ only.

The 1,051 MMPA days are associated with trips having sampling protocols that are specific to protected species (marine mammals, sea turtles, Endangered Species Act [ESA] listed fish species) and are not applicable for non-ESA listed fish and invertebrates. Owing to the extra demands of monitoring protected species, information on finfish and shellfish is not collected on these trips. However, these days will provide observer coverage for sea turtles and ESA-listed fish species above that which is allocated.

- 11,539 (12,590 - 1,051) agency-funded days are applicable for all species.
 - 11,539 days are subject to the prioritization process across all fleets. The prioritization approach is described in the next section and given in Table 6.
 - No sea days have been set aside to support discovery days to address emerging questions of scientific and management interest as the year progresses.
- Projected costs (i.e., an estimated rate that includes fixed and variable costs for operations, training, and data processing infrastructure and at-sea costs based on realized cost in FY15): \$1227 for NEFOP days (\$712 for the costs associated with the sea days and \$515 from the infrastructure).

- **Industry-funded:** The number of industry-funded sea days available for scallop fleets is determined by taking 1 percent of the total acceptable biological catch/annual catch limit set for the year. The Industry Funded Scallop (IFS) program allows the vessels an increase in landings to help defray the costs of carrying an observer (i.e., the compensation rate). The

⁸ In this document, protected species refers to marine mammals, sea turtles, and ESA-listed fish.

sale of the additional scallops allocated to each boat supplies the funding for the at-sea costs of observer coverage. Based upon projected landings and expected prices, the IFS program generates funds in support of discard monitoring of the scallop fleets. A compensation rate analysis was undertaken to support observer coverage of the 12 industry-funded scallop fleets (Rows 9-12 and 32-39; Table 5).

- Based upon the compensation rate analysis, a total of 2,850 sea days can be funded: 1,579 days for Open areas, 1,151 days for Mid-Atlantic Access Areas, and 120 days in the Nantucket Lightship Access Area (NLAA).
 - The industry-funded schedule runs March through February, a 12-month period that is shifted 1 month from the NEFOP sea day schedule of April to March.
 - Bulletins describing the 2016 set-aside compensation rate calculations and scallop management measures are available online at the Greater Atlantic Regional Fisheries Office webpage <http://www.greateratlantic.fisheries.noaa.gov/nr/index.html>
- Of the 1,579 days for the Open areas, there are 225 days for Limited Access General Category fleets (Rows 11, 36, and 37; Table 6) and 1,354 days for Limited Access fleets (Rows 12, 38, and 39; Table 6).
- Coverage of the 12 fleets depends on industry activity among these fleets during April 2016 through March 2017; the sea days represent the maximum coverage (i.e., caps).
- Projected costs: the cost to industry for at-sea portion is \$675/day for industry-funded scallop fleets. Additional agency funds are needed for training and certification of observers and data processing.

Below is a summary of sea days based on the agency budget and the compensation rate analysis, by funding source for April 2016 through March 2017.

Funding Source	Sea Days
Agency-funded Total	12,590
Agency-funded applicable to all species (prioritized days)	11,539
Agency-funded applicable to protected species only (non-prioritized days)	1,051
Industry-funded Scallop Total applicable to all species	2,850
Total	15,440

Prioritization Trigger and Details of the Allocation of Sea Days to Fleets

Within the agency-funded fleets and prioritization-applicable funding, funded days exceed the needed days resulting in an estimated surplus of funds equivalent to approximately 1,248 (11,539 - 10,291) days (Table 5). The 2016 funding does not trigger the SBRM prioritization approach.

The following describes the steps taken to allocate the 15,440 funded sea days to 54 fleets (Tables 5 and 6).

Step 1. Derive the number of sea days needed for the 14 fish/invertebrate species groups (see Wigley et al. 2016; Table 5).

Step 2. Apply sea day adjustments to the NE large mesh otter trawl fleet (Row 8) and the NE haddock separator trawl fleet (Row 18). Do not apply trip filter. A total of 7,960 days is needed across 54 fleets (43 agency-funded fleets and 11 industry-funded fleets; Table 5).

Step 3. Derive the number of sea days needed for sea turtles (see Murray 2012, 2013, 2015a; Table 5).

Step 4. To support the penultimate prioritization approach, derive the number of sea days needed for loggerhead turtles for each of the fish/invertebrate fleets associated with the turtle gear type group (Table 5).

- a. Summarize the number of VTR sea days corresponding to each fish/invertebrate fleet (see Table 3 in Wigley et al. 2016). The VTR sea days are zero for the fish/invertebrate fleets that do not need observer sea days.
- b. Derive the percentage of VTR sea days for each fish/invertebrate fleet within a turtle gear type group. For each fish/invertebrate fleet associated with a turtle gear type, divide the VTR sea days by the sum of the VTR sea days for the gear type group.
- c. Derive the number of sea days needed for loggerhead turtles by fish/invertebrate fleet. Multiply the number of turtle sea days needed for the gear type by the percentage of VTR sea days for each fish/invertebrate fleet within the turtle gear type group.

Step 5. Derive the number of sea days needed for fish/invertebrates and turtles COMBINED; select the largest of the 2 sea days (i.e., adjusted sea days needed for the 14 fish/invertebrate species groups [Step 2] and sea days needed for loggerhead turtles [Step 4c]) within the fleet.

A total of 11,610 days is needed to achieve a 30% CV on the discards of the 15 species groups in 2016; Table 5).

Step 6. Partition fleets into funding source categories and sum the number of sea days needed, by funding source.

There were 10,291 days and 1,319 days needed to achieve a 30% CV for the 15 species groups for agency-funded and industry-funded fleets, respectively (Table 5).

Step 7. Obtain funded sea days, by funding source category. For agency-funded sea days, calculate the number of sea days applicable to the prioritization process (prioritized versus non-prioritized days).

There are 11,539 agency-funded days applicable to the prioritization process (Table 5).

Step 8. Evaluate needed sea days versus funded sea days for each funding category and calculate shortfall or surplus sea days associated with the prioritization process.

A surplus of 1,248 days is expected for agency-funded fleets (Table 5).

Step 9. Apply the penultimate approach algorithm to allocate sea days to fleets for agency-funded days that are applicable to prioritization process.

In 2016, no prioritization is needed; Steps 9.1 through 9.3 are not applicable this year.

Step 9.4. The 11,539 prioritized sea days provide observer coverage to meet the 10,291 days needed in all 43 agency-funded fleets with remaining funding equivalent to approximately 1,248 days. These funds will be utilized to offset industry costs for at-sea monitoring in the groundfish fishery.

Step 9.5. Identify fleets that cannot be covered by NEFOP this year.

In 2016, there are no practical limitations that prevent the NEFOP from covering these fleets. The NEFOP is working to get a third party provider in place to supplement coverage and ensure the highest rate of accomplished days. The sea days in Step 9.5 equal the sea days in Step 9.4 (Table 6).

Step 10. Allocate agency-funded non-prioritized sea days.

There are 1,051 agency-funded days that are not applicable to the prioritization process (non-prioritized MMPA days; Table 6).

The 1,051 MMPA sea days, all assumed to have limited sampling protocols, are allocated to a row designated as “MMPA coverage” and will be associated with the NE and MA gillnet fleets (Rows 24-29; Table 6).

Step 11. Allocate industry-funded days. The sea days for the industry-funded scallop fleets are assigned to trips via the call-in system⁹. The sea day coverage for industry-funded scallop fleets will depend on industry activity during the April 2016 through March 2017 period and will be capped as described above. The 2,850 industry-funded sea days have not been allocated to individual fish/invertebrate fleets, but rather to groups of fish/invertebrate fleets that correspond to the stratification used in compensation rate analysis: Mid-Atlantic

⁹ For more information on the call-in system for the industry-funded scallop program, see http://www.nefsc.noaa.gov/fsb/scallop/Industry_Scallop_Call_in_Guide.pdf

access area fleets (Rows 9, 10, 32, and 34; Table 6); Open areas fleets (Rows 11, 36, and 37 for Limited Access General Category fleets and Rows 12, 38, and 39 for Limited Access; Table 6); and New England access area fleets (Rows 33 and 35; Table 6). The allocated sea days represent the maximum coverage (i.e., caps).

Industry-funded sea days are expected to meet or exceed the SBRM required sea days for each fleet group corresponding to the stratification used in the compensation rate analysis except for New England access areas (Table 6). The 2016 sea day analyses estimated a total of 266 days needed for the New England access areas (Rows 33 and 35) for the upcoming year based on the July 2014 through June 2015 data. The New England access areas are closed for 2016; however, upon approval of Framework 27 to the Atlantic sea scallop management plan, some fishing activity by Limited Access General Category vessels will be allowed in the Nantucket Lightship. Hence only a portion of the 266 days will be required for this group to cover 2016 compensation fishing trips. It was estimated that a total of 120 days would provide sufficient coverage.

Step 12. The sea days allocated for the April 2016 – March 2017 (TOTAL) is the sum of the prioritized days (Step 9.5), non-prioritized days (Step 10), and industry-funded scallop days (Step 11). A total of 15,440 days is allocated across 54 fleets (Table 6). There are remaining funds equivalent to approximately 1,248 days that will be utilized to offset industry costs for at-sea monitoring in the groundfish fishery (Table 6).

The agency-funded fleets with an * or ** (Table 6) indicate that some or all of the observer coverage will be assigned via the Pre-Trip Notification System (PTNS; Palmer et al. 2013) or the scallop call-in program. This means some or all of the observer coverage within each of these fleets will depend upon industry activity during the April 2016 through March 2017 period. The sea days for agency-funded fleets have been proportionally allocated based on previous year industry activity, and thus should be considered provisional. All other fleets will have sea days assigned to fishing trips via the NEFOP sea day schedule.

The sea days on the NEFOP sea day schedule were proportionally allocated by quarter and state within a fleet based on the VTR trips during the July 2014 through June 2015 time period. For some fleets (including fleets with minimum pilot coverage), there were too few days to allocate sea days by quarter and state, thus sea days were allocated by quarter and the percentage of VTR trips by state were provided.

Discussion

As a practical matter, fleets with low trip activity within a quarter or overall are very difficult to “find” unless they are part of PTNS or a call-in program. Attempts to assign observers can be inefficient since the probability of randomly finding such trips at a specific port or time period will be very low. While some of the challenges may be overcome with vessel select letters and other operational efforts, some fleets may fall below practical detection limits and therefore some of the sea days associated with low trip activity fleets may not be accomplished. If any sea days are not accomplished, they will be carried over.

The sample size analysis conducted by Wigley et al. (2016) derived the expected precision (CV) of the discard estimates for various species groups over a range of sample sizes for each of the species groups that were not filtered out by the importance filter (see Table 7 and Figure 3 in Wigley et al. 2016). Deriving the expected CV assumes the variance of the discard estimate is constant over a range of sample sizes (number of trips).

The 3,993 prioritized carryover days are the result of unaccomplished sea days during the April 2015 - March 2016 time period. The 3,993 prioritized carryover days have increased the number of prioritized sea days to a level that meets the number of sea days needed to monitor the 15 SBRM species groups during the April 2016-March 2017 time period. Due to the unaccomplished sea days during the April 2015-March 2016 time period, it is possible that the lower observer coverage could lead to discard estimates with CVs that are higher than the SBRM precision standard for some fleets. The NEFOP is working to get a third party provider in place to supplement coverage and ensure the highest rate of accomplished days.

The NY Department of Environmental Conservation has secured funding through the Atlantic Coast Cooperative Statistical Program (ACCSP) to support observer coverage (approximately 880 days) for otter trawl, gillnet, and pot/trap fleets in the Mid-Atlantic region. These sea days will provide observer coverage for all species above that allocated in this report.

At-Sea Monitoring (ASM) coverage is used for compliance monitoring and is not used to meet SBRM sea day requirements. Information relating to industry-funded ASM coverage can be found on-line at <http://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/nemultispecies.html>.

Pre-Trip Notification System

The NEFOP uses two systems to select fishing trips for observer coverage: the PTNS and a non-PTNS selection process (based on a sea day schedule) that includes either an observer approaching the vessel at the dock, a phone call to request a trip, or a selection letter in the mail. For some fleets, both systems are used for the groundfish and non-groundfish components of these fleets. The sea day schedule is used for trips in the non-groundfish component. Amendment 16 of the Northeast Multispecies FMP specifies that vessel captains are required to notify the PTNS for any groundfish trip they plan to make. PTNS handles the deployment of NEFOP, NEFOP limited, and ASM coverage for all groundfish trips. For NEFOP and ASM deployments, coverage is deployed proportional to the fishing activity in a given strata. Discussions are underway to modify the PTNS to meet SBRM and other regulatory requirements.

Expanded Sampling Frame for NE and MA Lobster Pot Fleets

The 2016 SBRM analyses for discard estimation and sample size (Wigley et al. 2016) used the VTR (including clam logbook) data to define the sampling frame for the 57 fleets using data collected from the July 2014 through June 2015 time period. Vessels that hold federal fishing permits have VTR reporting requirements except vessels that hold only a federal lobster permit. Consequently, vessels with only a federal lobster permit were not included in the SBRM data sets. The discard estimates in Wigley et al. 2016 appropriately reflect the underlying data used (e.g., the VTR data used to raise the discard ratios to total discards and the observed trips used to derive the discard ratios were from the same VTR-based sampling frame). It is inappropriate to extrapolate beyond the sampling frame used unless it can be shown that the trips with no VTR reporting requirements have the same landings and discard characteristics as the trips with VTR reporting

requirements. An approach was needed to include all federal trips in the NE and MA lobster pot fleets such that the SBRM analyses would be based upon information from all federally permitted vessels.

In late 2015, an approach was developed to expand the sampling frame for NE and MA lobster pot fleets to include all vessels holding a federal lobster permit (Regional Workshop: Lobster Fishery Observer Programs, October 6, 2015, forthcoming on the ASFMC [<http://www.asafc.org>] and NEFOP [<http://www.nefsc.noaa.gov/fsb/program.html>] webpages). The approach uses permit information and dealer data to augment the VTR data such that all trips made by vessels with federal lobster permits are in the sampling frame for the lobster pot fleets.

In January 2016, NEFOP began using the expanded sampling frame for the NE and MA lobster pot fleets. For the January-March 2016 time period (associated with the 2015 sea day allocation), the trips eligible for observer coverage in the NE and MA lobster pot fleets came from trips made by vessels holding a federal lobster permit rather than just vessels that have VTR reporting requirements. Hence, the pool of eligible trips for observer coverage increased; however, the amount of observer sea days was not increased for the January-March 2016 time period.

In April 2016, the agency found that expanding the sampling frame for the NE and MA lobster pot fleet to include all vessels with a federal permit requires a regulatory change to the SBRM Amendment. The agency intends to pursue the required language change through the appropriate regulatory procedures. In the meantime, the NEFOP will not use the expanded sampling frame for lobster pot fleets until a regulatory change is made.

The rest of the SBRM fleets did not need to have the sampling frame expanded because these vessels have VTR reporting requirements associated with their federal fishing permits and their fishing trips are already included in the SBRM sampling frame.

References

Murray KT 2015a. The importance of location and operational fishing factors in estimating and reducing loggerhead (*Caretta caretta*) interactions in U.S. bottom trawl gear. *Fish. Res.* 172:440-451

Murray KT. 2015b. Estimated loggerhead (*Caretta caretta*) interactions in the Mid-Atlantic scallop dredge fishery, 2009-2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-20; 15 p. Available at: <http://www.nefsc.noaa.gov/publications/>

Murray KT. 2013. Estimated Loggerhead and Unidentified Hard-shelled Turtle Interactions in Mid-Atlantic Gillnet Gear, 2007-2011. NOAA Tech Memo NMFS-NE-225. 20 p. Available online at: <http://www.nefsc.noaa.gov/publications/tm/tm225/>

Murray KT. 2012. Estimating observer sea day requirements in the Mid-Atlantic region to monitor loggerhead sea turtle (*Caretta caretta*) interactions. US Dept Commer, Northeast Fish Sci Cent Ref Doc 12-26; 10 p. Available online at: <http://www.nefsc.noaa.gov/publications/crd/crd1226/>

National Marine Fisheries Service (NMFS). 2012. Endangered Species Act (ESA) Section 7 Consultation on the Atlantic Sea Scallop Fishery Management Plan. Consultation No. F/NER/2012/01461. Greater Atlantic Regional Fisheries Organization. July 12, 2012

National Marine Fisheries Service (NMFS). 2011. Fisheries of the Northeastern United States; Removal of Standardized Bycatch Reporting Methodology Regulations. Federal Register, Vol. 76, No. 250, Thursday, December 29, 2011. p. 81844 – 81850.
<http://www.gpo.gov/fdsys/pkg/FR-2011-12-29/pdf/2011-33302.pdf>

National Marine Fisheries Service (NMFS). 2008. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Region Standardized Bycatch Reporting Methodology Omnibus Amendment. Federal Register, Vol. 73, No. 18, Monday, January 28, 2008. p. 4736-4758. Available on-line at:
<https://federalregister.gov/a/E8-1436>

New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council and National Marine Fisheries Service. 2015. Standardized Bycatch Reporting Methodology: An Omnibus Amendment to the Fishery Management Plans of the Mid-Atlantic and New England Regional Fishery Management Councils. March 2015. 361 p. Available on-line at:
<http://www.greateratlantic.fisheries.noaa.gov/regs/2015/June/15SBRMOmnibusAmend.html>

New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council and National Marine Fisheries Service. 2007. Northeast Region Standardized Bycatch Reporting Methodology: An Omnibus Amendment to the Fishery Management Plans of the New England and Mid-Atlantic Fishery Management Councils. June 2007. 642 p. Available on-line at:
<http://www.nefmc.org/issues/sbrm/index.html>

Palmer MC, Hersey P, Marotta H, Shield G, Cierpich, SB. 2013. The design, implementation and performance of an observer pre-trip notification system (PTNS) for the northeast United States groundfish fishery. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 82 p. Available online at:
<http://www.nefsc.noaa.gov/publications/crd/crd1321/>

Scott-Denton E, Cryer PF, Duffy MR, Gocke JP, Harrelson MR, Kinsella DL, Nance JM, Pulver JR, Smith RC, Williams JA. 2012. Characterization of the U.S. Gulf of Mexico and South Atlantic penaeid and rock shrimp fisheries based on observer data. *Marine Fisheries Review*, 74(4): 1-27. Available online at: <http://spo.nmfs.noaa.gov/mfr744/mfr744.html>

Warden ML, Murray KT. 2011. Reframing protected species interactions in commercial fishing gear: moving toward estimating the unobservable. *Fish. Res.* 110: 387-390.

Wigley SE, Rago PJ, Sosebee KA, Palka DL. 2007. The Analytic Component to the Standardized Bycatch Reporting Methodology Omnibus Amendment: Sampling Design, and Estimation of Precision and Accuracy (2nd Edition). US Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 07-09; 156 p. Available online at:
<http://www.nefsc.noaa.gov/publications/crd/crd0709/>

Wigley SE, Tholke C, Shield G. 2016. 2016 discard estimation, precision, and sample size analyses for 14 federally managed species in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 16-03; 164 p. Available online at: <http://www.nefsc.noaa.gov/publications/crd/crd1603/>

Table 1. A list of the 14 fish and invertebrate species groups and 1 species of sea turtles (in bold), with species group abbreviations in parentheses and scientific names in italics, and the species that compose these groups, corresponding to the 13 federal fishery management plans implements in the waters off the northeastern United States.

ATLANTIC SALMON (SAL)	<i>Salmo salar</i>
BLUEFISH (BLUE)	<i>Pomatomus saltatrix</i>
FLUKE - SCUP - BLACK SEA BASS (FSB)	
Black sea bass	<i>Centropristis striata</i>
Fluke	<i>Paralichthys dentatus</i>
Scup	<i>Stenotomus chrysops</i>
HERRING, ATLANTIC (HERR)	<i>Clupea harengus</i>
LARGE MESH GROUND FISH (GFL)	
American plaice	<i>Hippoglossoides platessoides</i>
Atlantic cod	<i>Gadus morhua</i>
Atlantic halibut	<i>Hippoglossus hippoglossus</i>
Atlantic wolffish	<i>Anarhichas lupus</i>
Haddock	<i>Melanogrammus aeglefinus</i>
Ocean pout	<i>Zoarces americanus</i>
Pollock	<i>Pollachius virens</i>
Redfish	<i>Sebastes fasciatus</i>
White hake	<i>Urophycis tenuis</i>
Windowpane flounder	<i>Scophthalmus aquosus</i>
Winter flounder	<i>Pseudopleuronectes americanus</i>
Witch flounder	<i>Glyptocephalus cynoglossus</i>
Yellowtail flounder	<i>Limanda ferruginea</i>
MONKFISH (MONK)	<i>Lophius americanus</i>
RED DEEPSEA CRAB (RCRAB)¹⁰	<i>Chaceon quinquedens</i>
SEA SCALLOP (SCAL)	<i>Placopecten magellanicus</i>
SKATE COMPLEX (SKATE)¹¹	<i>Rajidae</i>
Barndoor skate	<i>Dipturus laevis</i>
Clearnose skate	<i>Raja eglanteria</i>
Little skate	<i>Leucoraja erinacea</i>
Rosette skate	<i>Leucoraja garmani</i>
Smooth skate	<i>Malacoraja senta</i>
Thorny skate	<i>Amblyraja radiata</i>
Winter skate	<i>Leucoraja ocellata</i>
SMALL MESH GROUND FISH (GFS)	
Offshore hake	<i>Merluccius albidus</i>
Red hake	<i>Urophycis chuss</i>
Silver hake	<i>Merluccius bilinearis</i>
SPINY DOGFISH (DOG)	<i>Squalus acanthias</i>
SQUID¹² - BUTTERFISH - MACKEREL (SBM)	
Atlantic mackerel	<i>Scomber scombrus</i>
Butterfish	<i>Peprilus triacanthus</i>
Northern shortfin squid	<i>Illex illecebrosus</i>
Longfin inshore squid	<i>Doryteuthis (Amerigo) pealeii</i>
SURFCLAM - OCEAN QUAHOG (SCOQ)	
Surfclam	<i>Spisula solidissima</i>
Ocean quahog	<i>Arctica islandica</i>
TILEFISH (TILE)	<i>Lopholatilus chamaeleonticeps</i>
LOGGERHEAD TURTLE (TURS)	<i>Caretta caretta</i>

¹⁰ Red deepsea crab was referred to as red crab in documents prior to 2014.

¹¹ Skate complex comprises 7 species as well as skate, unknown.

¹² Squid, unclassified is included in this species group. Longfin inshore squid and northern shortfin squid are also known as Loligo squid and Illex squid, respectively.

Table 2. Total catch (live lb), Vessel Trip Report landings (kept; live lb), estimated discards (live lb), associated coefficient of variation (CV), and standard error of the estimated discards (SE; live lb) for 14 SBRM species groups combined, by fleet, based on July 2014 through June 2015 data. Dark shading indicates fleets not considered or with no Northeast Fisheries Observer Program trips in the annual analysis. These CVs were not used in the annual sample size analysis. Blank CV indicates either no discards or discards equals 0. "P" indicates fleets with "pilot" designation. Taken from Table 5C in Wigley et al. 2016.

Species: 14 SBRM SPECIES GROUPS COMBINED

Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Total	Kept	Discarded	CV	SE	Pilot
1	Longline	OPEN	all	MA	all	1,779,607	1,663,161	116,446	0.386	44,939	
2	Longline	OPEN	all	NE	all	3,450,002	3,343,427	106,575	0.990	105,559	
3	Hand Line	OPEN	all	MA	all	285,583	283,724	1,859	0.649	1,206	P
4	Hand Line	OPEN	all	NE	all	1,896,880	1,832,723	64,156	0.603	38,654	
5	Otter Trawl	OPEN	all	MA	sm	32,890,827	25,734,057	7,156,771	0.151	1,079,920	
6	Otter Trawl	OPEN	all	MA	lg	32,346,375	13,640,578	18,705,797	0.093	1,744,884	
7	Otter Trawl	OPEN	all	NE	sm	62,304,639	53,574,756	8,729,883	0.100	873,613	
8	Otter Trawl	OPEN	all	NE	lg	87,293,310	50,928,385	36,364,925	0.065	2,378,096	
9	Scallop Trawl	AA	GEN	MA	all	580,852	429,539	151,313	0.504	76,206	P
11	Scallop Trawl	OPEN	GEN	MA	all	737,554	302,630	434,923	0.146	63,336	
12	Scallop Trawl	OPEN	LIM	MA	all	43,203	43,203				P
13	Otter Trawl, Twin	OPEN	all	MA	all	2,814,039	1,136,191	1,677,848	0.528	885,103	
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	1,564,121	1,409,864	154,257	0.035	5,444	P
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	799,102	703,151	95,951	0.052	5,012	P
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	8,982,734	6,448,116	2,534,619	0.124	314,259	
20	Shrimp Trawl	OPEN	all	MA	all	708,834	378,256	330,579	0.000	0	P
21	Shrimp Trawl	OPEN	all	NE	all	132,543	132,543				P
22	Floating Trap	OPEN	all	MA	all	99,526	99,526				P
23	Floating Trap	OPEN	all	NE	all	5,698	5,698				P
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	1,989,396	1,508,681	480,715	0.914	439,170	
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	4,531,724	4,321,157	210,566	0.804	169,204	
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	6,836,857	6,094,991	741,865	0.091	67,422	
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	17,059	17,059				P
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	12,983,953	9,479,800	3,504,153	0.111	387,526	
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	21,703,621	19,510,458	2,193,163	0.079	172,967	
30	Purse Seine	OPEN	all	MA	all	0	0				P
31	Purse Seine	OPEN	all	NE	all	60,894,904	60,894,749	155	0.284	44	
32	Scallop Dredge	AA	GEN	MA	all	6,533,627	5,738,125	795,501	0.289	230,225	

Table 2, continued. Total catch (live lb), Vessel Trip Report landings (kept; live lb), estimated discards (live lb), associated coefficient of variation (CV), and standard error of the estimated discards (SE; live lb) for 14 SBRM species groups combined, by fleet, based on July 2014 through June 2015 data. Dark shading indicates fleets not considered or with no Northeast Fisheries Observer Program trips in the annual analysis. These CVs were not used in the annual sample size analysis. Blank CV indicates either no discards or discards equals 0. "P" indicates fleets with "pilot" designation. Taken from Table 5C in Wigley et al. 2016.

Species: 14 SBRM SPECIES GROUPS COMBINED

Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Total	Kept	Discarded	CV	SE	Pilot
33	Scallop Dredge	AA	GEN	NE	all	310,287	295,522	14,765	0.000	0	P
34	Scallop Dredge	AA	LIM	MA	all	45,583,606	42,748,672	2,834,935	0.207	586,738	
35	Scallop Dredge	AA	LIM	NE	all	52,298,363	45,926,321	6,372,043	0.089	565,272	
36	Scallop Dredge	OPEN	GEN	MA	all	10,708,390	8,503,097	2,205,293	0.096	211,411	
37	Scallop Dredge	OPEN	GEN	NE	all	8,392,008	7,441,196	950,811	0.125	118,806	
38	Scallop Dredge	OPEN	LIM	MA	all	39,699,288	32,681,559	7,017,729	0.114	797,130	
39	Scallop Dredge	OPEN	LIM	NE	all	134,376,602	113,651,751	20,724,851	0.081	1,677,566	
40	Danish Seine	OPEN	all	MA	all	0	0				P
41	Mid-water Paired & Single Trawl	OPEN	all	MA	all	5,864,525	5,864,525	0			P
42	Mid-water Paired & Single Trawl	OPEN	all	NE	all	122,771,598	122,356,757	414,841	0.647	268,267	
43	Pots and Traps, Fish	OPEN	all	MA	all	429,005	315,059	113,947	0.448	51,002	
44	Pots and Traps, Fish	OPEN	all	NE	all	279,303	182,435	96,868	0.249	24,085	P
45	Pots and Traps, Conch	OPEN	all	MA	all	21,262	19,649	1,613	2.224	3,587	P
46	Pots and Traps, Conch	OPEN	all	NE	all	635	425	210	0.316	66	
47	Pots and Traps, Hagfish	OPEN	all	NE	all	0	0				P
48	Pots and Traps, Lobster	OPEN	all	MA	all	179,024	149,041	29,982	0.586	17,564	
49	Pots and Traps, Lobster	OPEN	all	NE	all	352,726	39,229	313,497	0.273	85,550	
50	Pots and Traps, Crab	OPEN	all	MA	all	384,758	384,758				P
51	Pots and Traps, Crab	OPEN	all	NE	all	2,452,754	2,452,754				P
52	Beam Trawl	OPEN	all	MA	all	132,589	132,589				P
53	Beam Trawl	OPEN	all	NE	all	35,047	35,047				P
54	Dredge, Other	OPEN	all	MA	all	0	0				P
55	Ocean Quahog/Surfcclam Dredge	OPEN	all	MA	all	179,817,208	179,817,208				P
56	Ocean Quahog/Surfcclam Dredge	OPEN	all	NE	all	160,899,490	160,899,490				P
57	Mid-water Paired & Single Trawl	AA	all	NE	all	11,386,689	11,386,626	63	0.201	13	
Confidential fleets						1,064,744	904,806	159,938	0.177	28,316	
Other minor fleets						793,842	793,842				
TOTAL						1,132,440,311	1,006,636,905	125,803,405	0.032	4,031,261	

Table 3. The most recent average annual estimates of sea turtle interactions and their associated coefficient of variation (CV) in U.S. Mid-Atlantic commercial fisheries.

Fishery	Estimate	CV	Years Included	Species	Reference
Bottom trawl, for fish and scallops	231	0.13	01 Jan 2009-2013	Loggerhead	Murray 2015a
Sea Scallop Dredge	22	0.73	01 Jan 2009 - 2014	Loggerhead	Murray 2015b
Sink Gillnet	89	0.26	01 Jan 2007-2001	Loggerhead	Murray 2013
Sink Gillnet	95	0.21	01 Jan 2007-2011	Hard-shelled	Murray 2013

Table 4. The number of sea days needed to achieve a 30% coefficient of variation of the discard estimate for each of the 14 fish and invertebrate species groups, the number of pilot sea days, the number of minimum pilot sea days, and the maximum number of sea days needed for each fleet (2016 Sea Days Needed) for fish and invertebrate species groups based on July 2014 through June 2015 data. Bold red font indicates basis for fleet sea days. “P” indicates fleets with “pilot” designation. Species group abbreviations are given in Table 1. *Taken from Table 6 in Wigley et al. 2016.*

Row	Fleet Gear Type	Access Area	Trip Category	Region	Mesh Group	BLUE	HERR	SAL	RCRAB	SCAL	SBM	MONK	GFL	GFS	SKATE	DOG	FSB	SCOQ	TILE	Pilot Days	Min Pilot Days	2016 Sea Days Needed	Pilot	
1	Longline	OPEN	all	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	93	93		
2	Longline	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	12	12		
3	Hand Line	OPEN	all	MA	all	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	13	66	P
4	Hand Line	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	14	14		
5	Otter Trawl	OPEN	all	MA	sm	0	0	0	0	0	1,717	0	0	1,014	694	676	644	0	0	135	30	1,717		
6	Otter Trawl	OPEN	all	MA	lg	0	0	0	0	0	229	128	0	77	240	217	0	0	187	31	240			
7	Otter Trawl	OPEN	all	NE	sm	0	0	0	0	0	378	0	535	450	464	798	723	0	0	177	35	798		
8	Otter Trawl	OPEN	all	NE	lg	0	0	0	3,531	0	0	287	146	214	286	304	760	0	0	347	38	3,531		
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	P	
11	Scallop Trawl	OPEN	GEN	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	22	22		
12	Scallop Trawl	OPEN	LIM	MA	all	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	P	
13	Otter Trawl, Twin	OPEN	all	MA	all	0	0	0	0	0	0	0	0	0	109	0	0	0	0	19	19	109		
14	Otter Trawl, Twin	OPEN	all	NE	all	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	P	
15	Otter Trawl, Ruhle	OPEN	all	MA	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	P	
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	P	
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	P	
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15		
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	0	0	0	0	0	0	0	109	291	177	628	0	0	0	92	92	628		
20	Shrimp Trawl	OPEN	all	MA	all	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	P	
21	Shrimp Trawl	OPEN	all	NE	all	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	P	
22	Floating Trap	OPEN	all	MA	all	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	P	
23	Floating Trap	OPEN	all	NE	all	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	P	
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	0	0	0	0	0	0	0	0	0	0	0	594	0	0	43	12	594		
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	13	13		
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	15	15		
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	P	
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	0	0	0	0	0	0	0	0	0	0	225	0	0	0	104	25	225		
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xl	0	0	0	0	0	0	190	0	0	89	134	0	0	0	96	19	190		
30	Purse Seine	OPEN	all	MA	all	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	P	
31	Purse Seine	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	19	19		
32	Scallop Dredge	AA	GEN	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	11	11		
33	Scallop Dredge	AA	GEN	NE	all	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	P	
34	Scallop Dredge	AA	LIM	MA	all	0	0	0	0	0	0	195	0	0	0	0	0	0	0	105	89	195		
35	Scallop Dredge	AA	LIM	NE	all	0	0	0	0	193	0	117	266	0	139	0	0	0	0	105	97	266		
36	Scallop Dredge	OPEN	GEN	MA	all	0	0	0	0	0	0	0	0	0	22	0	0	0	0	69	22	22		
37	Scallop Dredge	OPEN	GEN	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	16	16		
38	Scallop Dredge	OPEN	LIM	MA	all	0	0	0	0	0	0	118	0	0	67	0	0	0	0	105	105	118		
39	Scallop Dredge	OPEN	LIM	NE	all	0	0	0	0	534	0	270	300	289	154	0	565	0	0	192	119	565		
40	Danish Seine	OPEN	all	MA	all	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	P	
41	Mid-water Paired & Single Trawl	OPEN	all	MA	all	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	P	
42	Mid-water Paired & Single Trawl	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	440	0	0	0	40	40	440		
43	Pots and Traps, Fish	OPEN	all	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	12	12		
44	Pots and Traps, Fish	OPEN	all	NE	all	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	9	16	P
45	Pots and Traps, Conch	OPEN	all	MA	all	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	12	21	P
46	Pots and Traps, Conch	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	9	9		

Table 4 continued. The number of sea days needed to achieve a 30% coefficient of variation of the discard estimate for each of the 14 fish and invertebrate species groups, the number of pilot sea days, the number of minimum pilot sea days, and the maximum number of sea days needed for each fleet (2016 Sea Days Needed) for fish and invertebrate species groups based on July 2014 through June 2015 data. Bold red font indicates basis for fleet sea days. “P” indicates fleets with “pilot” designation. Species group abbreviations are given in Table 1. Taken from Table 6 in Wigley et al. 2016.

Row	Fleet Gear Type	Access Area	Trip Category	Region	Mesh Group	BLUE	HERR	SAL	RCRAB	SCAL	SBM	MONK	GFL	GFS	SKATE	DOG	FSB	SCOQ	TILE	Pilot Days	Min Pilot Days	2016 Sea Days Needed	Pilot	
47	Pots and Traps, Hagfish	OPEN	all	NE	all	97	97	97	97	97	97	97	9	97	97	97	97	97	97	97	97	97	97	P
48	Pots and Traps, Lobster	OPEN	all	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	15	15	
49	Pots and Traps, Lobster	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	443	18	18	
50	Pots and Traps, Crab	OPEN	all	MA	all	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	P
51	Pots and Traps, Crab	OPEN	all	NE	all	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	P
52	Beam Trawl	OPEN	all	MA	all	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	P
53	Beam Trawl	OPEN	all	NE	all	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	P
54	Dredge, Other	OPEN	all	MA	all	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	P
55	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	P
56	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	17	46	P
57	Mid-water Paired & Single Trawl AA		all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	16	16	
					Totals	808	808	808	4,339	1,535	2,903	2,214	2,292	3,066	3,086	4,847	3,717	808	808	3,613	1,743	10,746		

Table 5. The number of sea days needed to monitor fish/invertebrates (FISH), loggerhead turtles (TURS), combined species groups (COMBINED) by fleet (Steps 1 through 6), and the number of funded sea days for April 2016 through March 2017 (Step 7) and the differences between needed and funded days (Step 8).

Fleet						Step 1	Step 2	Step 3	Step 4a	Step 4b	Step 4c	Step 5	
Row	Gear Type	Access Area	Trip Cat.	Region	Mesh	2016 Sea Days Needed for FISH	2016 Sea Days Needed for FISH ADJUSTED	2016 Sea Days Needed for TURS	Vessel Trip Report Sea Days	% Vessel Trip Report Sea Days	TURS Sea Days by FISH fleet	2016 Sea Days Needed COMBINED	
1	Longline	OPEN	all	MA	all	93	93		1,456			93	
2	Longline	OPEN	all	NE	all	12	12		904			12	
3	Hand Line	OPEN	all	MA	all	66	66		3,135			66	
4	Hand Line	OPEN	all	NE	all	14	14		3,077			14	
5	Otter Trawl	OPEN	all	MA	sm	1717	1,717	3,309	6,761	0.409	1,352	1,717	
6	Otter Trawl	OPEN	all	MA	lg	240	240		9,350	0.565	1,870	1,870	
7	Otter Trawl	OPEN	all	NE	sm	798	798		8,847			798	
8	Otter Trawl	OPEN	all	NE	lg	3,531	760		17,347			760	
9	Scallop Trawl	AA	GEN	MA	all	12	12		174	0.011	35	35	
10	Scallop Trawl	AA	LIM	MA	all	0	0		0	0.000	0	0	
11	Scallop Trawl	OPEN	GEN	MA	all	22	22		242	0.015	48	48	
12	Scallop Trawl	OPEN	LIM	MA	all	15	15		20	0.001	4	15	
13	Otter Trawl , Twin	OPEN	all	MA	all	109	109		272			109	
14	Otter Trawl , Twin	OPEN	all	NE	all	48	48		115			48	
15	Otter Trawl, Ruhle	OPEN	all	MA	lg	0	0		0	0.000	0	0	
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	29	29		72			29	
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	63	63		139			63	
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	15	0		0			0	
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	628	628		2,458			628	
20	Shrimp Trawl	OPEN	all	MA	all	65	65		597			65	
21	Shrimp Trawl	OPEN	all	NE	all	11	11		91			11	
22	Floating Trap	OPEN	all	MA	all	6	6		80			6	
23	Floating Trap	OPEN	all	NE	all	3	3		17			3	
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	594	594	2,593	2,172	0.3434	890	890	
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	13	13		1,918	0.3032	786	786	
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	15	15		2,235	0.3534	917	917	
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	8	8		14			8	
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	225	225		5,068			225	
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	190	190		4,823			190	
30	Purse Seine	OPEN	all	MA	all	6	6		174			6	
31	Purse Seine	OPEN	all	NE	all	19	19		661			19	
32	Scallop Dredge	AA	GEN	MA	all	11	11		1,774			11	
33	Scallop Dredge	AA	GEN	NE	all	28	28		57			28	
34	Scallop Dredge	AA	LIM	MA	all	195	195		2,895			195	
35	Scallop Dredge	AA	LIM	NE	all	266	266		3,582			266	
36	Scallop Dredge	OPEN	GEN	MA	all	22	22		3,473			22	
37	Scallop Dredge	OPEN	GEN	NE	all	16	16		4,291			16	
38	Scallop Dredge	OPEN	LIM	MA	all	118	118		3,168			118	
39	Scallop Dredge	OPEN	LIM	NE	all	565	565		8,953			565	
40	Danish Seine	OPEN	all	MA	all	6	6		56			6	
41	Mid-water Paired & Single Trawl	OPEN	all	MA	all	30	30		134			30	
42	Mid-water Paired & Single Trawl	OPEN	all	NE	all	440	440		1,189			440	
43	Pots and Traps, Fish	OPEN	all	MA	all	12	12		970			12	
44	Pots and Traps, Fish	OPEN	all	NE	all	16	16		625			16	
45	Pots and Traps, Conch	OPEN	all	MA	all	21	21		976			21	
46	Pots and Traps, Conch	OPEN	all	NE	all	9	9		1,092			9	
47	Pots and Traps, Hagfish	OPEN	all	NE	all	97	97		535			97	
48	Pots and Traps, Lobster	OPEN	all	MA	all	15	15		1,882			15	
49	Pots and Traps, Lobster	OPEN	all	NE	all	18	18		34,443			18	
50	Pots and Traps, Crab	OPEN	all	MA	all	23	23		176			23	
51	Pots and Traps, Crab	OPEN	all	NE	all	84	84		442			84	
52	Beam Trawl	OPEN	all	MA	all	40	40		215			40	
53	Beam Trawl	OPEN	all	NE	all	11	11		37			11	
54	Dredge, Other	OPEN	all	MA	all	10	10		265			10	
55	Ocean Quahog/Surflam Dredge	OPEN	all	MA	all	64	64		3,212			64	
56	Ocean Quahog/Surflam Dredge	OPEN	all	NE	all	46	46		2,292			46	
57	Mid-water Paired & Single Trawl	GFAA	all	NE	all	16	16		62			16	
Total						10,746	7,960	5,902	149,015			11,610	
Step 6						Agency Fleets (Sea Days Needed)	9,476	6,690				10,291	
						Industry Fleets (Sea Days Needed)	1,270	1,270				1,319	
Step 7						Agency Fleets (Sea Days Funded)			Prioritized			11,539	
						Industry Fleets (Sea Days Funded)			Non-prioritized (MMPA)			1,051	
												2,850	
Step 8						Agency Fleet Difference			SURPLUS			1,248	
						Industry Fleet Difference			SURPLUS			1,531	
Turtle Gear Types						MA Trawl	2,006	2,006	3,309	16,547		3,309	3,685
						MA Gillnet	622	622	2,593	6,325		2,593	2,593

KEY: Agency funded fleets Industry funded fleets

Table 6. The number of sea days needed to monitor the combined species groups (COMBINED; Step 5), prioritized days (Steps 9.4 and 9.5), non-prioritized days (protected species [MMPA]; Step 10), industry-funded scallop days (Step 11), and the 2016 observer sea days allocated for April 2016 through March 2017 (Step 12), by fleet. Note: * indicates all coverage is dependent on industry activity; ** indicates some coverage is dependent on industry activity; *** indicates coverage for protected species bycatch.

Row	Fleet	Gear Type	Access Area	Trip Cat.	Region	Mesh	Step 5	Step 9.4	Step 9.5	Step 10	Step 11	Step 12	Comments	
							2016 Sea Days Needed COMBINED	2016 Sea Days PRIORITIZED (Penultimate approach not needed)	2016 Sea Days PRIORITIZED (Penultimate approach not needed)	2016 Sea Days non-prioritized (MMPA)	2016 Sea Days Industry- funded Scallop	Sea Days Allocated for April 2016 - March 2017 (TOTAL)		
1		Longline	OPEN	all	MA	all	93	93	93	0		93	Fish stock assessment support	
2		Longline	OPEN	all	NE	all	12	12	12	0		12	Fish stock assessment support **	
3		Hand Line	OPEN	all	MA	all	66	66	66	0		66	Fish stock assessment support	
4		Hand Line	OPEN	all	NE	all	14	14	14	0		14	Fish stock assessment support **	
5		Otter Trawl	OPEN	all	MA	sm	1,717	1,717	1,717	0		1,717	Fish stock assessment and turtle bycatch support	
6		Otter Trawl	OPEN	all	MA	lg	1,870	1,870	1,870	0		1,870	Fish stock assessment and turtle bycatch support **	
7		Otter Trawl	OPEN	all	NE	sm	798	798	798	0		798	Fish stock assessment support **	
8		Otter Trawl	OPEN	all	NE	lg	760	760	760	0		760	Fish stock assessment support **	
9		Scallop Trawl	AA	GEN	MA	all	35						Industry funded* (see Row 34)	
10		Scallop Trawl	AA	LIM	MA	all	0						Industry funded * (see Row 34)	
11		Scallop Trawl	OPEN	GEN	MA	all	48						Industry funded * (see Row 36)	
12		Scallop Trawl	OPEN	LIM	MA	all	15						Industry funded * (see Row 38)	
13		Otter Trawl , Twin	OPEN	all	MA	all	109	109	109	0		109	Fish stock assessment support	
14		Otter Trawl , Twin	OPEN	all	NE	all	48	48	48	0		48	Fish stock assessment support	
15		Otter Trawl, Ruhle	OPEN	all	MA	lg	0	0	0	0		0		
16		Otter Trawl, Ruhle	OPEN	all	NE	sm	29	29	29	0		29	Fish stock assessment support	
17		Otter Trawl, Ruhle	OPEN	all	NE	lg	63	63	63	0		63	Fish stock assessment support	
18		Otter Trawl, Haddock Separator	OPEN	all	NE	sm	0	0	0	0		0		
19		Otter Trawl, Haddock Separator	OPEN	all	NE	lg	628	628	628	0		628	Fish stock assessment support*	
20		Shrimp Trawl	OPEN	all	MA	all	65	65	65	0		65	Fish stock assessment support	
21		Shrimp Trawl	OPEN	all	NE	all	11	11	11	0		11	Fish stock assessment support	
22		Floating Trap	OPEN	all	MA	all	6	6	6	0		6	Fish stock assessment support	
23		Floating Trap	OPEN	all	NE	all	3	3	3	0		3	Fish stock assessment support	
24		Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	890	890	890	0		890	Fish stock assessment and turtle bycatch support	
25		Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	786	786	786	0		786	Fish stock assessment and turtle bycatch support	
26		Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	917	917	917	0		917	Fish stock assessment and turtle bycatch support	
27		Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	8	8	8	0		8	Fish stock assessment support	
28		Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	225	225	225	0		225	Fish stock assessment support **	
29		Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	190	190	190	0		190	Fish stock assessment support**	
30		Purse Seine	OPEN	all	MA	all	6	6	6	0		6	Fish stock assessment support	
31		Purse Seine	OPEN	all	NE	all	19	19	19	0		19	Fish stock assessment support	
32		Scallop Dredge	AA	GEN	MA	all	11						Industry funded * (see Row 34)	
33		Scallop Dredge	AA	GEN	NE	all	28				120	120	Industry funded * (Rows 33 & 35)	
34		Scallop Dredge	AA	LIM	MA	all	195				1,151	1,151	Industry funded * (Rows 9, 10, 32, & 34)	
35		Scallop Dredge	AA	LIM	NE	all	266						Industry funded * (see Row 33)	
36		Scallop Dredge	OPEN	GEN	MA	all	22				225	225	Industry funded * (Rows 11, 36, & 37)	
37		Scallop Dredge	OPEN	GEN	NE	all	16						Industry funded * (see Row 36)	
38		Scallop Dredge	OPEN	LIM	MA	all	118				1,354	1,354	Industry funded * (Rows 12, 38, & 39)	
39		Scallop Dredge	OPEN	LIM	NE	all	565						Industry funded * (see Row 38)	
40		Danish Seine	OPEN	all	MA	all	6	6	6	0		6	Fish stock assessment support	
41		Mid-water Paired & Single Trawl	OPEN	all	MA	all	30	30	30	0		30	Fish stock assessment support	
42		Mid-water Paired & Single Trawl	OPEN	all	NE	all	440	440	440	0		440	Fish stock assessment support	
43		Pots and Traps, Fish	OPEN	all	MA	all	12	12	12	0		12	Fish stock assessment support	
44		Pots and Traps, Fish	OPEN	all	NE	all	16	16	16	0		16	Fish stock assessment support	
45		Pots and Traps, Conch	OPEN	all	MA	all	21	21	21	0		21	Fish stock assessment support	
46		Pots and Traps, Conch	OPEN	all	NE	all	9	9	9	0		9	Fish stock assessment support	
47		Pots and Traps, Hagfish	OPEN	all	NE	all	97	97	97	0		97	Fish stock assessment support	
48		Pots and Traps, Lobster	OPEN	all	MA	all	15	15	15	0		15	Fish stock assessment support	
49		Pots and Traps, Lobster	OPEN	all	NE	all	18	18	18	0		18	Fish stock assessment support	
50		Pots and Traps, Crab	OPEN	all	MA	all	23	23	23	0		23	Fish stock assessment support	
51		Pots and Traps, Crab	OPEN	all	NE	all	84	84	84	0		84	Fish stock assessment support	
52		Beam Trawl	OPEN	all	MA	all	40	40	40	0		40	Fish stock assessment support	
53		Beam Trawl	OPEN	all	NE	all	11	11	11	0		11	Fish stock assessment support	
54		Dredge, Other	OPEN	all	MA	all	10	10	10	0		10	Fish stock assessment support	
55		Ocean Quahog/Surclam Dredge	OPEN	all	MA	all	64	64	64	0		64	Fish stock assessment support	
56		Ocean Quahog/Surclam Dredge	OPEN	all	NE	all	46	46	46	0		46	Fish stock assessment support	
57		Mid-water Paired & Single Trawl	GFAA	all	NE	all	16	16	16	0		16	Fish stock assessment support	
		Prioritized sea days not allocated MMPA coverage						1,248	1,248			1,248	At-Sea Monitoring support	
									1,051			1,051	Coverage associated with Rows 24-29***	
							Total	11,610	11,539	11,539	1,051	2,850	15,440	
							Agency Fleets (Sea Days Needed)	10,291						
							Industry Fleets (Sea Days Needed)	1,319						
							Agency Fleets (Sea Days Funded)	11,539	Prioritized days					
							Agency Fleets (Sea Days Funded)	1,051	Non-prioritized days (MMPA)					
							Industry Fleets (Sea Days Funded)	2,850	Industry-funded scallop days					
							Agency Fleet Difference	1,248						
							Industry Fleet Difference	1,531						
							Turtle Gear Types MA Trawl	3,685						
							MA Gillnet	2,593						

KEY: Agency funded fleets Industry funded fleets

Appendix Table 1. Stratification abbreviations used for 2016 fleets.

Abbreviation	Definition
MA	Mid-Atlantic ports (CT and southward)
NE	New England ports (RI and northward)
sm	Small mesh (less than 5.50 in)
lg	Large mesh (mesh from 5.50 to 7.99 in for gillnet; 5.50 in and greater for otter trawl)
xlg	Extra large mesh (8 in and greater)
LIM	Limited access category
GEN	General category
OPEN	Non-access area
AA	Access area